

Croatia Public Expenditure Review in Science,
Technology, and Innovation

REPORT ON SMART SKILLS

September 2022

Note

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Acronyms and abbreviations

AI	artificial intelligence
ALMP	active labor market program
BEEPS	Business Environment and Enterprise Performance Survey
CEDEFOP	European Centre for the Development of Vocational Training
CEKOM	Centers of Competence
CES	Croatian Employment Service
CQF	Croatia's National Qualification Framework
GDP	gross domestic product
EU	European Union
GCI	Global Competitiveness Index
HEI	higher education institutions
ICT	information and communications technology
LFS	Labor force survey
LMIS	labor market information system
M&E	monitoring and evaluation
MESD	Ministry of Economy and Sustainable Development
MSE	Ministry of Science and Education
MLPS	Ministry of Labor, Pension System, Family and Social Policy
NDS	National Development Strategy 2030
NEETS	persons not in employment, education, or training
NLP	natural language processing
NCDHP	National Council for Development of Human Potential
NRRP	National Recovery and Resilience Plan
PISA	OECD Program for International Assessment
PPP	public-private partnership
S3	Smart Specialization Strategy
SME	small and medium enterprise
STEM	science, technology, engineering, and mathematics
TFP	total factor productivity
TVET	technical or vocational training
WEF	World Economic Forum

Executive summary

Croatia will need more and better investment in skills to raise growth, productivity, and welfare sustainably. Croatia faces long-standing challenges associated with an aging population, low productivity, an undiversified economic structure, and limited innovation and research capacity, all magnified by the COVID-19 pandemic. Investments in skills development will be essential to foster innovation and welfare growth. Modern economies increasingly depend on comprehensive and agile education and training systems. The best of them adapt to the accelerating pace of change in skill needs, technology developments, and internationalization of production and services, and serve people from early childhood, throughout school, and over their working lives.

This report aims to support the Government of Croatia in developing its skills agenda, with specific attention to skills needed to support smart specialization policy—“smart skills.” Croatia adopted its *Smart Specialization Strategy (S3)* in 2016 with the objective of transforming into a knowledge-based economy through targeted support for research and innovation. However, the S3 and other national development strategies have so far underprioritized skills. The skills agenda will receive more attention in the new (second phase) S3 and the National Recovery and Resilience Plan (NRRP). This report provides analytical input and guidance to these processes, with a focus on smart specialization. Based on data analysis, document review, and interviews with Croatian stakeholders, the report summarizes global and local trends in skills demand and describes the supply of skills and existing skill gaps in Croatia. It also reviews Croatia’s skills development system and policy agenda, identifies the major systemic challenges, and proposes possible actions for reform to close skill gaps.

Demand for a range of transversal and job-technical skills will increase

Technological development, globalization, climate change, and other megatrends are driving demand for new tasks, skills, and jobs. As Croatia aims to increase international competitiveness, international trends will drive skill needs. Increasingly, markets look not only for deep technology, specialist, and research skills but also for transversal capacities complementary to specific technologies. These include problem solving, creativity, entrepreneurial skills, teamwork, leadership, communication skills, green skills that help foster a transition to a sustainable society, and manual skills that are not easily automated. For example, the rate of hiring of green skills now exceeds the rate of hiring of other jobs across most economies, and some digital skills are now required in 85% of jobs in the European Union (EU). The EU post-pandemic recovery plan focuses specifically on building back better by fostering more digital and green skills.

Global demand for skills in sectors related to Croatia’s S3 priority areas reflects these trends. The S3 identified thematic priority areas, based on competitive advantages and potential for excellence. For the first phase of the S3 (2016-2020), the five priority areas chosen were health and quality of life, energy and sustainable environment, transport and mobility, security, and food and bio-economy.¹ International job portal data suggests skills demand in these sectors follow the megatrends. First, the need for digital skills is growing. Digitalization is driving demand for basic digital or information and communications technology (ICT) skills, ICT sector specialist competencies, and digital competencies

¹ The thematic priority areas are now being revised for the second phase S3 (2029). At the writing of this report, five suggested areas remained similar to the previous phase: personalized health, smart and clean energy, smart and green transport, security and dual use, sustainable and circular food. Customized and integrated wood products, and digital products and platforms, have also been added.

in non-ICT sectors. Second, the demand for green skills is growing. In sectors related to Croatia's S3 including health care, construction, transportation, and automotive manufacturing, many jobs require green skills, and jobs requiring more green skills are growing fast. Third, the demand for transversal soft skills is also growing. Digitalization, automation, internationalization, and structural changes to workplaces brought on by COVID-19 drive the need for communicative and collaborative skills. Teamwork and leadership appear to be particularly relevant skills for Croatia's S3 sectors. Fourth, Croatia's S3 sectors will also need specific high- and mid-level technical skills, but increasingly in new "hybrids" combining varied skills set such as entrepreneurial, creative and data skills. Sector-specific skills are especially in demand in the health and energy sectors. The formal higher education sector will need to develop many of these specific and often advanced S3 competencies, such as pharmaceuticals or renewable energy engineering. Croatia's S3 will also require strong mid-level technical and manual skills, for example, in niches related to energy, transport and wood. These skills can emanate from technical and vocational education and training (TVET) systems.

The skills available in Croatia cannot meet the demand

Children and youth have high access to education, but quality problems in education systems hold back both foundational skills and higher-level skills. Enrollment in primary and secondary education is high – near universal, in fact. However, children in Croatia can expect fewer hours of schooling—and schooling of lower quality—than children in the average EU country, with science, technology, engineering, and mathematics (STEM) areas a particular concern. At secondary levels, most Croatian youth move on to technical and vocational education and training (TVET), which currently pays off poorly in labor markets and provides insufficient preparation for further studies. On a positive note, tertiary enrollment rates are now well above the EU average. Still, the flows are only slowly changing the stock: Croatia's share of tertiary-educated adults reaches 25%, which is among the lowest shares in the EU. Rapidly changing skills demand implies that all countries, especially those with aging populations, must ensure that their entire populations can continue to upskill and reskill throughout their working lives. After leaving school, however, very few adults engage in further upskilling or reskilling, whether through their employer or individually, making it difficult to close skill gaps in the adult workforce. An economic structure focused on low productivity activities and low skill jobs has also discouraged investments in skills.

The workforce lacks sufficient transversal and applied skills to transition into a knowledge economy. The adult population in Croatia has gaps in green and digital skills compared to EU countries and in relation to Croatia's aspirations for a digital and green transformation. Entrepreneurial and managerial skills are insufficient to support innovation and competitiveness. Croatian employers find that highly valued competencies such as leadership and people skills are often missing among employees and report difficulties with finding skilled workers. The major problem appears to be a lack of practical and hands-on experience rather than the level of qualification *per se*. Croatia is also losing important skills through outmigration, especially in S3 areas.

Information gaps, limited incentives and system inertia hold back skills development

Skills gaps occur as employers (skills demand-side) and individuals (skills supply-side) face constraints to investing in skills. These constraints include insufficient coordination among key stakeholders in the skills system, lack of relevant training options, lack of information about the value of investing in particular skills, and limited ability to pay for skills acquisition.

Croatia's skills development system needs stronger coordination and more flexibility to close the growing skill gaps. Policies to address information, financing and coordination constraints to foster demand-led education and training have been identified. However, the skills agenda is fragmented across institutions and initiatives with limited coordination and unclear accountability. Projects and initiatives take a long time to develop.

Stakeholders lack information necessary for skills development. Efforts have been made to strengthen labor market information systems and develop the Croatia Qualification Framework (CQF) as the main skills guidance and coordination tool. Yet, individuals and firms do not have enough pertinent information to decide on what training to invest in. Educational institutions cannot make informed decisions on what training to offer, and the government lacks the data and analytics to guide overall resource allocation. Meanwhile, the education sector has limited incentives to reorganize education toward interdisciplinary collaboration or nurture private sector collaborations needed to increase the quality and relevance of Croatian education and research.

Opportunities for adult training are underdeveloped. Active labor market programs (ALMPs) focus on activating the unemployed and offer limited opportunities for training. Policy instruments to foster training among the employed workforce are limited. A new voucher program for employed and jobless people will provide the main skills upgrading instrument addressed to the entire population. However, the program will need a clear strategic framework to link to actual skill needs and support long-term and short-term skills upgrading. Although the private sector is a major stakeholder in skills development, there are few initiatives directed at firms wishing to address skill gaps in their workforces.

Policy reforms could strengthen the provision of smart skills

To accelerate skills development, Croatia needs to substantially strengthen its education and training systems and address training needs from a short- and long-term perspective. Action is needed to:

- (1) improve governance to make the skills system (more) responsive;
- (2) raise the level and relevance of skills developed in the formal education sector; and
- (3) increase access to relevant lifelong learning opportunities.

Improving governance to make the skills system (more) responsive

Croatia needs to act on the skills agenda by moving to decisive implementation, raising awareness, and strengthening stakeholder incentives. Doing so will require clarifying roles, responsibilities, and accountability in the skills development system and consistently applying monitoring and evaluation tools that focus on desired outcomes such as skill levels, innovative capacity, productivity, and job relevance. Low investment in training among firms and individuals suggests these key stakeholders may not yet realize the importance of investing in skills. Those who do may face constraints such as limited training options or financing. Targeted information campaigns explaining the benefits of skill upgrading, what skills are needed, and public support available could be cost-effective means of changing behavior. There is also a need to further develop Croatia's labor market information system (LMIS) and develop new tools for skills forecasting that can complement the CQF.

Raising the level and relevance of skills developed in the formal education sector

Across levels of education, learning situations should include more exposure to practical content and the development of transversal skills in demand. Project-based learning applying knowledge in practice can help strengthen motivation, deepen understanding, and develop collaborative, entrepreneurial, and other important transversal skills. As part of this drive, the dual TVET program model incorporating private-public collaboration and work-based learning should fully replace the traditional classroom-based model. Project-based learning, internships, and interdisciplinary exchanges are all ways to develop more relevant skills in higher education. Specifically, the Ministry of Science and Education (MSE) could pilot the development of programs that provide students with comprehensive internship experiences, especially in S3 sectors. International evidence shows that such programs have good payoffs in terms of productivity and jobs.

There is also a need to develop flexible shorter academic programs targeting adults with medium or higher skills. Shorter programs could be relevant for some competencies in high demand (e.g., advanced ICT), where one- or two-year post-secondary programs may go a long way to produce the skills needed by firms. Providing modular, stackable micro-credentials for other S3 disciplines would serve adults who want to switch careers but need more than *ad hoc* training. Modular training would be more accessible to those with jobs or other time constraints.

Increasing access to relevant lifelong learning opportunities

Croatia needs to expand options for lifelong learning. Croatia's aging population together with rapidly changing skill needs implies that continuous skills development throughout working life is needed to retain or increase productivity levels. The ALMP inclusion objectives remain important. To address Croatia's productivity and innovation gaps, there will be a need to provide more options for upskilling and reskilling also the employed workforce, however. Higher education institutions (HEIs) could be part also of this agenda, for both shorter and longer upskilling needs, together with non-formal providers. Across training providers, more effective training approaches and programs should be promoted to allow for effective resource allocation, based on evidence from evaluations of existing approaches and international best practice. Specific groups such as older workers, or low-skill adults, will need to be targeted with adapted learning approaches to provide effective training that fits their needs.

The planned voucher program needs to include strong targeting mechanisms and fit into a strategic skills framework that ensures relevance. Uptake on adult training is generally skewed toward more skilled workers. The voucher scheme will therefore need significant outreach efforts, not least to bring in the vulnerable populations it is also targeting. The limited evidence on micro-credentials suggests that Croatia will need to align the voucher program with a clear strategy that focuses on relevance, additionality, and quality to raise skills levels and ensure cost-effectiveness.

Schemes targeting small and medium enterprise (SME) skills upgrading could also be expanded as part of the strategy to upgrade the workforce. Firms stand to benefit significantly from an effective skills agenda but their capacity to identify, prioritize, and finance their skill needs requires support. A planned voucher initiative is reserved for SMEs wishing to upgrade digital skills. This instrument could be broadened to encompass other relevant forms of training for firms in S3 sectors, including green and technical skills.

1 Introduction

Key Messages

- Croatia faces structural challenges associated with an aging population, low productivity, lack of diversification, and limited innovation and research capacity.
- Skills are critical to Croatia's future. Improving the country's skill mix is essential for supporting Croatia's structural transformation through smart specialization.
- Croatia needs to develop flexible and high-quality skills development systems that can provide both transversal and specialized skills throughout life.
- A strong skills system needs to address constraints that hold back skills development, such as information and financing gaps, insufficient training supply, and weak coordination.

Croatia's transition to innovation-driven and sustainable growth will need to be underpinned by investment in more and better skills. Croatia faces long-standing structural challenges associated with an aging population, low productivity, and limited innovation and research capacity, all brought into sharper evidence by the COVID-19 pandemic. Croatia adopted its Smart Specialization Strategy (S3) in 2016 with the objective of transforming into a knowledge-based innovation economy through targeted support to research and innovation. Skills—in the form of a well-educated and skilled labor force—will be central to this agenda. Globally, technology, globalization, and other megatrends are accelerating changes in the demand for skills. These shifts raise the imperative for developing flexible and high-quality skills development systems that can provide both transversal and specialized skills and address skill needs throughout working life.

1.1 Croatia's challenges and smart specialization

Croatia is struggling to increase economic growth and welfare. Gross domestic product (GDP) per capita (in purchasing power parity terms) remains at more than a third below the EU average and is not converging.² The dramatic impact of COVID-19 on Croatia's economy and two devastating earthquakes in 2020 compounded the long-lasting effects of the global financial recession on growth, labor markets, and poverty. Unemployment has fallen in response to labor reforms, but higher-productivity sectors are not creating jobs. Regional and socioeconomic disparities within the country remain significant, and young talent is leaving the country.³

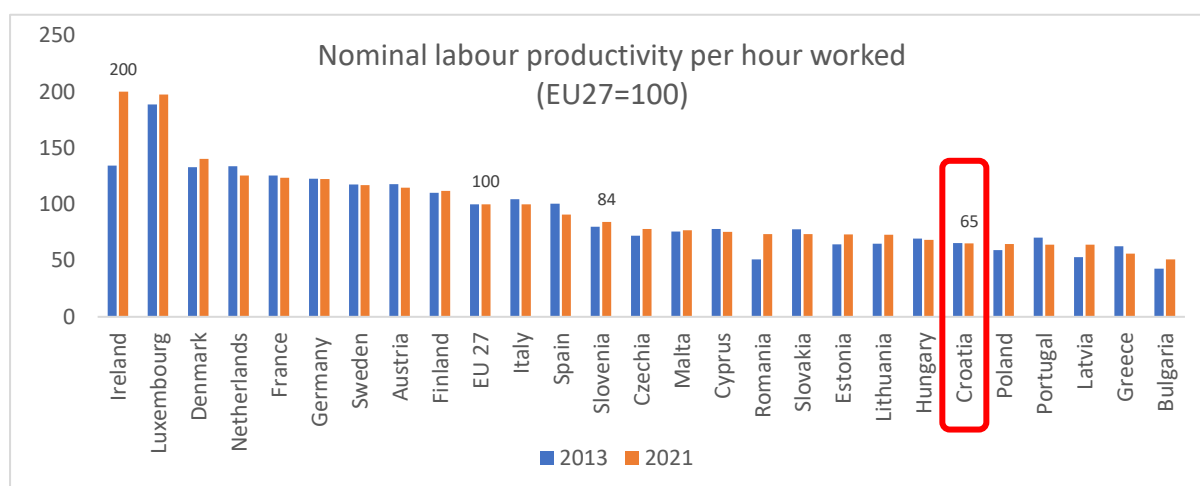
Low productivity undermines Croatia's efforts. Before COVID-19 struck, recent growth was driven largely by the tourism sector, which has limited upstream and downstream linkages to the rest of the economy. Total factor productivity (TFP) growth has played a smaller role in Croatia's economic growth than in the growth of its Central and East European peers.⁴ Labor productivity remains a third below the EU average, 23 percent below Slovenia, two-thirds below Ireland, and unlike many Central and East European peers, Croatia is not converging with the EU (Figure 1).

² Data from World Development Indicators (WDI).

³ World Bank 2020.

⁴ World Bank 2018.

Figure 1: Labor productivity is a third below the EU average and not converging



Source. Estimates based on Eurostat.

Low productivity levels reflect an undiversified economic structure highly dependent on tourism and low value-added activities. The transition to market economy involved major firm and job destruction, especially in industrial sectors. Croatia’s economy is now dominated by services—especially low-technology, low-productivity services, like tourism and retail trade—and construction. Tourism has become the key driver of economic growth and is especially critical for the coastal regions. Although tourism has enabled higher growth in times of prosperity, it has also left the economy vulnerable to sharp global downturns, such as that experienced in the aftermath of the COVID-19 pandemic. The potential for creating productivity gains in tourism is also limited, as it is not an innovation-driven sector. Croatia’s tourism sector competes largely on costs, with low levels of spending per tourist and high share of import content, and few spillovers to other sectors.⁵ As a result, coastal areas over-rely on tourism for employment and output, whereas other regions lag behind in growth, job creation and welfare levels.⁶

A rapidly aging and shrinking population is increasing pressures to raise productivity. With 21 percent of the people above 65 years of age, Croatia’s population is among the oldest in the world. The share of the elderly will increase to over 30 percent of the population by 2050.⁷ High dependency rates will make it even more imperative to invest in the human capital of children and youth, increase productivity in the working-age population overall and retain older adults in productive work. A structural transformation toward higher-productivity activities and employment is essential.

In response to these challenges, the government strategy focuses on fostering the transition to a sustainable growth model based on innovation and human capital. The National Development Strategy 2030 (NDS) and the NRRP describe the envisaged reform agenda. The NDS identifies Croatia’s long-term strategic priorities: fostering a sustainable economy and society, strengthening resilience to crises, enabling green and digital transition, and ensuring balanced regional development. The NRRP reinforces this direction, aligns with the EU agenda of building back better with a green and

⁵ Orsini and Pletikosa 2019.

⁶ A study of labor markets in Slavonia showed that labor productivity levels were half those of the rest Croatia, and that this held across most sectors and irrespective of firm size (Christiansen et al. 2019).

⁷ Data from WDI and United Nations 2019.

digital transition, and includes reform measures to accelerate green transition and digitalization and scale up investment in education and research. Croatia is likely to receive significant EU funding for rebuilding its economy as the NRRP proposes.

Croatia’s innovation and human capital reform agenda is closely linked to Croatia’s S3, adopted in 2016 with the objective of transforming Croatia into a knowledge-based economy through smart, targeted approaches. Smart specialization is essentially a knowledge driven agenda for higher innovation, diversification and productivity. Adopting the S3 was a precondition for disbursing EU funding for research and innovation. EU regions and member states, including Croatia, drew up research and innovation strategies for smart specialization to channel investments in areas that best matched their potential for innovation, based on the identified regional resources and capabilities. A new S3 is now under preparation. In the updated S3,⁸ seven preliminary priority areas have been identified: (i) personalized health, (ii) smart and clean energy, (iii) smart and green transport, (iv) sustainable and circular food, (v) customized and integrated wood products, (vi) security and dual use, and (vii) digital products and platforms. The new S3 is expected to strive toward further specialization and skills development to keep up with emerging technologies and achieve forward-looking transformational objectives.

1.2 Skills—the missing S in smart specialization

Human capital will be necessary to underpin the “smart” transition to innovation-driven and sustainable growth. Human capital is an increasingly essential component of the structural transformation process and the sustainable growth agenda.⁹ Aggregate analytical skills explain three-quarters of cross-country variation in long-term growth rates, and slight skill differences strongly impact growth.¹⁰ The importance of skills is also born out in Croatia, where a study of a sample of firms found that human capital drove performance.¹¹ Innovation, a central pillar of smart specialization, depends on people who are able to generate and apply knowledge and ideas.¹²

Investments in skills acquisition and development are essential to increase absorptive capacity.¹³ Innovation is driven by enterprises’ “absorptive capacity”—their ability to identify, assimilate, and exploit external knowledge toward commercial ends through individual and organizational learning.¹⁴ Recent studies emphasize the role of green absorptive capacity for green innovation and the development of environmental competences.¹⁵ Increasing competitiveness will depend on sufficient and well-targeted investment to (a) improve the performance of the higher education and TVET systems and (b) induce firm-level training to provide the capacity to absorb advanced technologies.¹⁶ To support the S3, these investments need to foster a broad set of both job-specific technical skills

⁸ In draft form at the time of writing of this report. The proposed new thematic areas overlap with those in the 2016-2020 period (health and quality of life, energy and sustainable environment, transport and mobility, security, and food and bio-economy, with ICT and key enabling technologies as transversal themes).

⁹ World Bank 2019a.

¹⁰ Hanuschek 2017.

¹¹ Dabic et al. 2018.

¹² OECD 2011.

¹³ Mason et al. 2017.

¹⁴ Cohen and Levinthal 1990, Sun and Anderson, 2008, Eisenhardt and Martin 2000.

¹⁵ Cooper and Molla 2016, Arfi et al. 2018.

¹⁶ Orlic et al. 2019; Hazelkorn and Edwards 2019.

relevant to S3 areas and transversal skills, which matter across different jobs and sectors and facilitate transitions between jobs (Box 1).

Box 1: Skills in this report

A skill refers to the ability to do a task or a bundle of tasks well; to use knowledge to achieve a specific goal.¹⁷

Thus, skills include competencies, attitudes, beliefs, and behaviors that can be learned and improved. Skills, hence, differ from years of education, diplomas, or years of job tenure. Skills can partly reflect innate capabilities and talent but are further developed through formal and non-formal education and training, including formal education systems and labor market programs, in family and community, at work, and through extracurricular activities.

Skills development is cumulative, and skill needs are complementary. Highly specialized technical or research skills, digital and green skills, soft skills, entrepreneurship skills, and many other skills are based on a solid foundation of literacy and numeracy that help with building additional skills. Skill needs are also highly complementary. For example, numeracy and literacy are needed to develop digital skills in the first place, collaborative skills are needed to take advantage of online solutions, and digital skills are—now—often necessary to access further skills development.

The analysis covers different skills in two broad categories: job-specific technical skills and transversal skills. Job-specific technical skills are needed to perform the technical tasks within different occupations. These are honed through vocational training, higher education, continuous training, and work experience. Transversal skills, by contrast, can be applied across occupations and sectors. For example, higher-order cognitive skills—especially analytical capacity and creative problem solving—are becoming increasingly valuable as more routine tasks can easily be automated. Soft skills (socio-emotional, non-cognitive) such as communication skills, interpersonal skills, creativity, diligence, and flexibility, are also essential complements to analytical skills and technology. Entrepreneurial skills encompass a bundle of different capabilities—managerial, creative, resilience, etc.—that are important to foster successful businesses and organizational innovation. Digital skills enable the use of digital devices, applications, and networks to access, manage, and exploit information. They range from very basic skills that form part of “digital literacy” and applied digital skills focusing on using general workplace digital tools required for most workers in advanced economies, to medium-level skills encompassing, for example, business resource management or client interaction software, and over to advanced skills that enable a person to use or develop advanced ICT tools. Green skills help foster a transition to a sustainable and resource-efficient society. This report also uses the term smart skills, which encompasses the range of job-specific and transversal skills relevant to Croatia’s S3 thematic priority areas (including, hence, many of the above skills sets). In practice, the boundaries between skills categories are not absolute and many skills sets are in fact overlapping.

Globally, the demand for skills is evolving rapidly in response to several interconnected megatrends.

Technological development, in particular the 4th industrial revolution, is changing human interaction and commercial opportunities and is driving the automation of increasingly complex tasks. Technological development is simultaneously increasing the demand for technology savviness, digital skills, and skills that are complementary to technology: higher-order cognitive skills, especially non-routine skills such as creative problem solving, and socio-emotional skills and capabilities such as interpersonal skills, communication, and self-efficacy. Other influences on skills demand include the pressing need to address climate change (calling for green skills), demographic shifts calling for continuous up- and reskilling of aging workers, and internationalization, which is driving an increasing need for competitive skills and accelerating some skills transitions.¹⁸ It is too early to determine the full impact of COVID-19 on skills demand. However, the pandemic is likely to result in faster adoption of automation and artificial intelligence (AI), especially in activities with high physical proximity and in

¹⁷ World Bank 2019a, OECD 2018.

¹⁸ World Bank 2019a.

accelerating shifts to occupations in demand. The result will be more workers needing to transition to new occupations.¹⁹

Skills in Croatia are becoming obsolete at an increasing pace, even for higher-skill workers, underscoring the need for lifelong learning systems that encourage continuous learning and skills upgrading. The average half-life of skills in modern economies is only around five years. It is much shorter in rapidly transforming sectors, such as software development, and areas such as accounting, finance, and manufacturing.²⁰ In the World Economic Forum's Future of Jobs Report 2020, employers across countries estimated that four in ten workers would need reskilling to meet the new needs.²¹ Croatians are feeling the rapid turnover as well. In 2014, across EU countries, 47 percent of adult employees (25–65) believed that their skills were likely or very likely to become outdated in the next five years; in Croatia, three out of five adults feared skills obsolescence (Figure 2). The risk was deemed slightly higher by workers with higher levels of education, suggesting that the skills transformation challenge is not only one of increasing education but of providing relevant skills across levels of education.²² In economies transitioning out of state-led economic systems, skills sets have become obsolete more rapidly than in other countries.²³ Currently, the structure of production and jobs is such that half of the working hours in Croatia could be at risk of automation by 2030.²⁴

Skill shortages can by themselves drive automation processes and rapid labor market changes. An aging population that leaves the active workforce and depletes the market of specific skills can lead to job destruction across generations if the resulting skills shortages cause firms to irreversibly automate production processes.²⁵ For example, firm representatives in mid-skill industries in Croatia's wood sector experience significant skills shortages and report planning to upgrade and automate production technologies.²⁶

¹⁹ McKinsey Global Institute 2021.

²⁰ Deloitte 2017.

²¹ World Economic Forum 2020.

²² Estimates based on CEDEFOP.

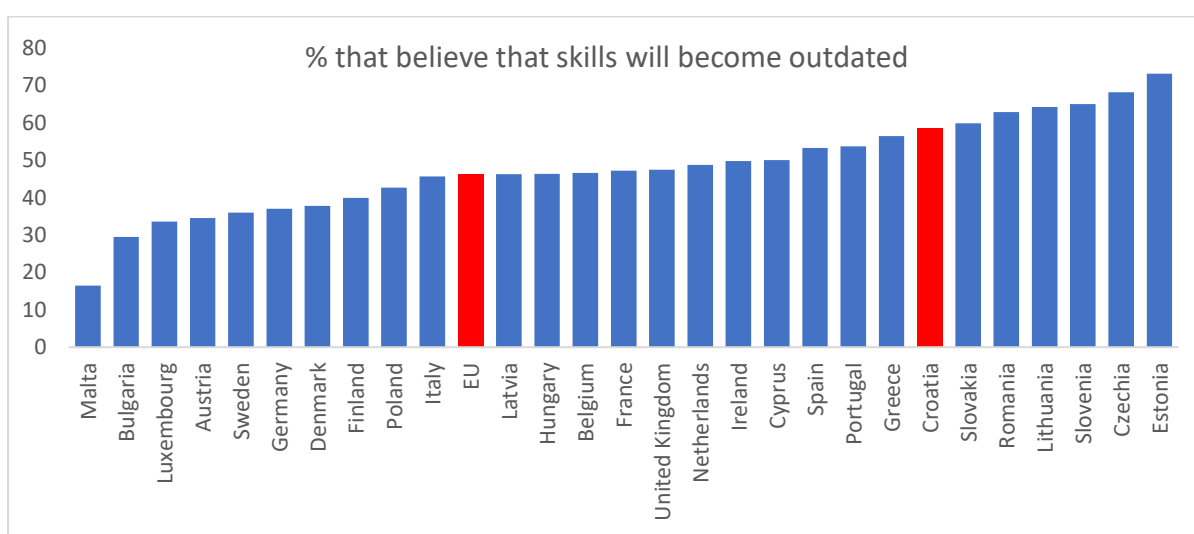
²³ Jedwab et al 2021. Chernina and Gimpelson (2022) show, for Russia, that when time, cohort and experience effects are separated, the cohort and experience factors work in opposite directions, reflecting the massive depreciation of skills.

²⁴ McKinsey & Company 2018.

²⁵ Acemoglu and Restrepo 2022.

²⁶ World Bank 2021a.

Figure 2: Croatian workers foresee high skills turnover



Source: European Centre for the Development of Vocational Training (CEDEFOP).

Note: Latest available data is from 2014.

To help foster skills that can underpin innovation, productivity, and growth, Croatia will now need to step up its skills agenda. Skills and knowledge have been identified as key bottlenecks in Croatia’s innovation agenda,²⁷ and skills permeate the EU recovery and resilience agenda. Investing in digital and green skills are central to helping Croatia return to higher and more resilient growth. To support the recovery and the smart specialization processes, Croatia will need to develop more comprehensive and ambitious reforms than in the past.

In the first phase of the S3, skills received limited attention.²⁸ A firm-level study concluded that despite the importance of human capital, policy support largely focused on equipment and infrastructure.²⁹ Skills initiatives have been scattered across different ministries, with unclear coordination and accountability, reflecting shortcomings in administrative capacity. The skills agenda centered on developing information and forecasting systems to guide career and job decisions, with little attention to fostering more—and higher quality—training opportunities for the workforce or the unemployed. Support to private sector-university collaboration did not focus on skills. Project implementation has overall been slow, and little is known about effectiveness. Skills will now receive more attention and funding in the NRRP. It will be essential to target and implement these initiatives more effectively than in the past. This will also require specific outreach to small- and medium sized enterprises (SMEs), which account for the major share of all formal enterprise employment in Croatia.

1.3. Skills development systems to address skill gaps

Underinvestment in skills results in skill gaps and skill mismatches, unemployment and lower productivity growth.³⁰ Many studies show the positive impact of education as well as on-the-job

²⁷ Aprahamian and Correa 2015.

²⁸ World Bank 2019a.

²⁹ Dabic et al. 2018.

³⁰ A comprehensive framework detailing market and government-imposed failures and related constraints to training is provided in Almeida et al. 2012.

training on individual earnings and firm-level productivity.³¹ If markets were perfectly competitive, individuals would have incentives to invest in relevant training for themselves, and firms would want to invest in their current and even future workforce, knowing that there would be high pay off in terms of productivity, earnings and profits. Markets are rarely perfect, however, creating many potential causes for underinvestment in the right skills. The perceived value of investing in training, and the available opportunities to train, are key factors to consider, for stimulating demand for training at the levels of both firms and individuals.

In reality, several constraints may prevent managers from providing training to their workforce, and individuals—youth or adults, employed or unemployed—from developing the right skills for the labor market.³² Key constraints, affecting both firms and individuals, include: (i) Information gaps, as managers (including self-employed) and individuals may lack information about skills: the value of investing in skills, the skills needed, or the training opportunities available; (ii) Financing constraints, that limit firms' or individuals' ability to pay for training. The cost of training can be high for individuals, small, and credit-constrained firms, particularly when factoring in the opportunity cost of not working while training; (iii) Lack of high-quality relevant training options, a gap which reduces incentives to invest or results in inferior skills for those who go through education and training systems; (iv) Risk of not capturing the returns to training, for example, firms may fear losing the productivity gain from skilled workers to other firms - Croatia's high rates of skilled outmigration suggests fears are warranted (v) Lack of coordination: Croatia's dependence on low value activities and jobs is likely a "low-skills trap" for both firms and individuals, as investment in higher level skills does not necessarily pay off in the current structure of the economy, yet more skills will be needed to achieve a transformation.

Strong skills development systems are needed to alleviate these constraints. Strong skills development systems should coordinate skills development stakeholders at a strategic level, provide pertinent information and guidance to firms and individuals, ensure provision of high quality and relevant demand-led training, and help close financing gaps where warranted. Conversely, weak governance, including unclear incentives and accountability, insufficient coordination mechanisms and lack of information systems, result in underperforming skills development systems and skills gaps.

Successful skill development systems also incorporate a lifelong-learning perspective. Skills begin to form in early childhood and are honed through childhood, adolescence, and adulthood (Table 1). Skills development systems thus encompass early childhood programs, formal education from primary school to university, and adult training and retraining programs. They include formal and informal educational institutions and private sector firms as key skills providers.

This report focuses on those parts of the skills development system that are closer to labor markets and firms' smart specialization needs. Whereas it provides an overview of the skills development system at large, it largely focuses on training systems beyond formal general secondary education: those that prepare for labor market entry (TVET, higher education) or provide training to adults, whether employed or jobless (adult training).

³¹ Almeida et al. 2012.

³² Ibid.

Table 1: Skills Toward Employment and Productivity: The five STEPs

STEPS	Preschool age	School age	Youth	Working age
5. Facilitating labor mobility and job matching			Apprenticeships, skills certification, counseling	Intermediation services, labor regulation, social security portability
4. Encouraging entrepreneurship and innovation		Fostering inquiry	Universities, innovation clusters, basic entrepreneurship training, risk management systems	
3. Building skills in demand (now and future)		Basic vocational training, behavioral skills	Vocational training, higher education, apprenticeships, targeted programs	Firm-provided training, recertification, reskilling, upskilling
2. Ensuring that all students learn		Cognitive skills, socialization, behavioral skills	Second chance education, behavioral skills	
1. Getting children off to the right start	Nutrition, psychological and cognitive stimulation, basic cognitive and social skills	School health and remedial education		

Source: Adapted from World Bank 2010.

1.4. The remainder of the report

This report focuses on building labor market relevant skills with a specific focus on smart specialization priority areas as defined by Croatian stakeholders. It does not prescribe S3 skill needs in detail or estimate quantitative streams of occupations in S3 priority areas, however. Doing so would require a detailed analysis of sector needs and capabilities—including reviewing curricula—beyond this report's scope.

S3 sectors account for a limited share of employment and broader strategies for raising the total pool of skills across sectors is needed. Our estimates suggest that around 15 percent of the employed population work in S3-related sectors (data limitations preclude a precise mapping between employment data and S3 sectors, however.) Even with massive expansion, smart specialization will not absorb a majority of the working age population over the medium term.

Against these caveats the remainder of the report is organized as follows. Section 2 describes the expected demand for skills, based largely on global trends, and the implications for Croatia's skills agenda. Section 3 analyses the supply of skills in Croatia and highlights existing skill gaps. Section 4 reviews the skills development system from the perspective of access to training and assesses the policy landscape forming that system, both past and going forward. Section 5 provides conclusions and proposes policy recommendations to strengthen Croatia's skills development in the context of smart specialization.

2 Skills needs in Croatia—the demand side

Key Messages

- Transversal skills in demand include soft skills—leadership, people skills, and communication skills—as well as basic digital skills and green skills that could apply in any sector.
- S3 sector-specific skills in demand include advanced digital skills, specific green skills related to renewable sources of energy, electrical engineering skills, and mid-level technical skills (e.g., installation, operation, repair, and maintenance) across S3 sectors.
- These skills will need to be developed in TVET, in higher education, and with continued training throughout working lives.

This section focuses on the demand for skills in Croatia, with a focus on S3 needs. In doing so, raising the view to global trends to understand future skills demand is important. There is little data available on specific skill needs in Croatia. International evidence as well as interviews with stakeholders in Croatia also suggest that firms, especially smaller ones, can lack the capacity to articulate skill needs.³³ To increase international competitiveness, moreover, skills demand in Croatia will need to be driven both by global trends and specific local sectoral needs, whereas estimates of skills needs based on employer perceptions will reflect only the current structure of skills needs. This section starts off by looking at transversal skills that apply across different sectors—the digital and green skills that underpin the European recovery agenda, and soft skills that are needed across different sectors. It then looks at specific skills needs in the S3 areas.

A wide range of transversal and specialized skills will be needed, that needs to be developed in TVET, in higher education, and with continued training throughout working lives. Croatia, as other countries, will likely see increased need for higher-order cognitive and soft skills across sectors. The demand for digital skills—both at the level of digital literacy, and for different levels of advanced specialized ICT skills—is rising. The focus on building back better after the COVID-19 pandemic and increasing competitiveness in international markets also puts pressure on raising the level of green skills. At the same time, there will be a need to establish a learning system that can flexibly provide the specialized technical and other skills needed for the S3, even as they change. This will entail demand for both high- and medium-level technical skills. Smart specialization sectors will need a mix of very sector specific higher-order analytical skills and more manual skills. Unlike some of the transversal skills, particularly basic digital skills, such skills will need to come from the education sector.

2.1 Demand for transversal skills

Jobs are increasingly becoming more complex and multidisciplinary, asking for a wide variety of skills. Transversality, or multi-disciplinarity, is thus a key component of future skills demand.³⁴ Analysis of job portal data³⁵ shows that new and hitherto unseen skills combinations are becoming increasingly in demand. The analysis indicates that such “hybrid” jobs grow faster and pay more than other jobs in

³³ According to the World Bank’s enterprise survey of Croatia, smaller firms are also less likely than medium or larger firms to report workforce skills as a major constraint to business.

³⁴ Berger and Frey 2015.

³⁵ Burning Glass 2019a.

the market and that they are at a lower risk of automation. These jobs—product managers, data scientists, etc.—combine technology skills with writing, creativity, and collaboration to a greater extent than in other jobs. Combinations of such varied skills sets as digital skills, analytics and data skills, business and management skills, and design and creative skills, will increasingly be required.³⁶ So-called “T-shaped” individuals that have deep technical expertise but also are creative problem solvers and collaborate effectively with others will contribute most to productivity growth.

Digital skills³⁷

Digitalization is changing goods and service provision, how citizens exercise their rights, and the skill profile of jobs, pushing for both broad and deep, specialized IT competencies. Digital skills are those that enable people to use information technology to find, evaluate, use, share, and create content. Digital skill for jobs needs to include a wide variety of generic and specialized competences, from basic digital literacy for the whole population to ICT sector specialist competencies or specific digital skills embedded in technology within non-ICT sectors (for example, a radiography technician in health care).

In advanced economies, basic digital skills are now essential to enter almost any job, and even middle-skill occupations are becoming digitally intensive. Digital literacy is increasingly essential across occupations whether requiring low or high levels of education. In the EU, some digital skills were required in at least 85 percent of jobs in 2019, and 40 percent of jobs created between 2005 and 2016 were digitally intensive.³⁸ The number of sectors where digital literacy is a *top* required skill (here defined as among top five skills) is increasing, according to LinkedIn data (Figure 3).³⁹ The digital content of tasks is growing also for occupations in the mid-ranges of education. In the US, four in five jobs requiring only middle-level education (typically high school diploma) are now considered “digitally intensive,” and such jobs represent two out of five job opportunities posted in the US (Figure 4).⁴⁰ Jobs with digital skills—even those including very basic skills—pay better, by 30 percent on average, than those with no digital competencies.⁴¹

³⁶ Burning Glass 2019a.

³⁷ In this report, digital skills are largely treated as transversal skills, although the ICT sector is expected to become a specific thematic priority area in the new S3.

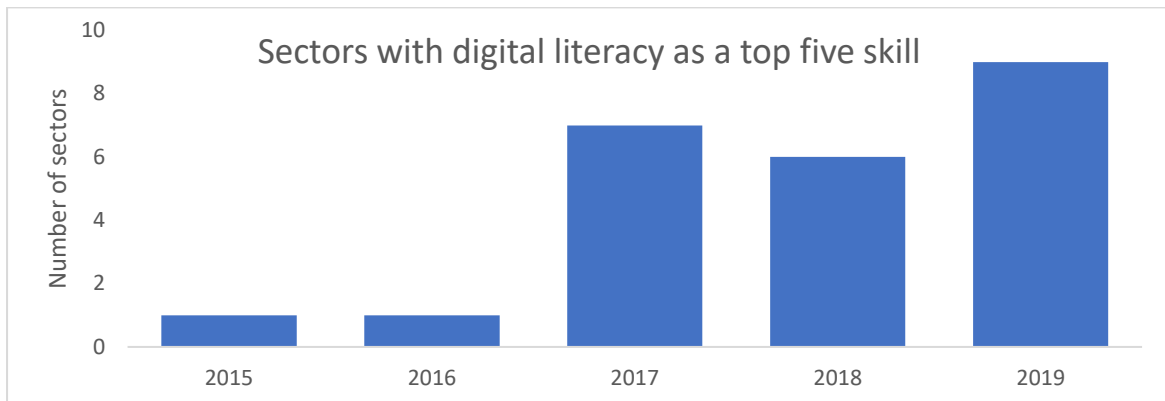
³⁸ European Commission 2020.

³⁹ Online job portals are by nature biased toward digital competence as some digital skills are a prerequisite to register and use such online tools. e

⁴⁰ Burning Glass 2017.

⁴¹ Burning Glass 2019b.

Figure 3: The importance of digital literacy, even as a top skill, is increasing



Source: Authors' estimates based on LinkedIn data. Out of 45 sectors.

Specific digital skills help accessing sustainable and better paid jobs and open up broader career opportunities. Specific digital skills—those that go beyond digital literacy and into more advanced digital skills that complement human competencies—help avoid the risk of automation, foster career progression and career changes, and increase wages.⁴² Programming jobs are growing 50 percent faster than the average job.⁴³ More specialized digital skills help advance careers also in middle-skill occupations. LinkedIn data (shown below) suggests that demand for ICT competencies is increasing faster in non-ICT sectors than in ICT-related sectors. Projections for the EU also suggest that there will be significant demand for both “intermediate” specialized skills (ICT technician competencies) as well as “advanced” specialized skills (ICT professional competencies) over the next decade. And demand for ICT specialized skills will be high in non-ICT sectors (e.g. business services, media, manufacturing, and trade and retail).⁴⁴

Croatia's relatively strong position in ICT results in comparatively high demand for ICT specialties. An analysis of online vacancy data for Croatia showed more than 10 percent of the vacancies in the 2010–2017 period concerned ICT specialists, mostly programmers.⁴⁵ Comparing future job prospects over the period 2020–30, Croatia has a relatively high score for ICT technicians and ICT professionals: 31 and 47, compared to the EU average score of 21 and 42 respectively. Croatia ranks far above other European CEE countries for ICT professionals' job prospects.⁴⁶

⁴² Burning Glass 2019b.

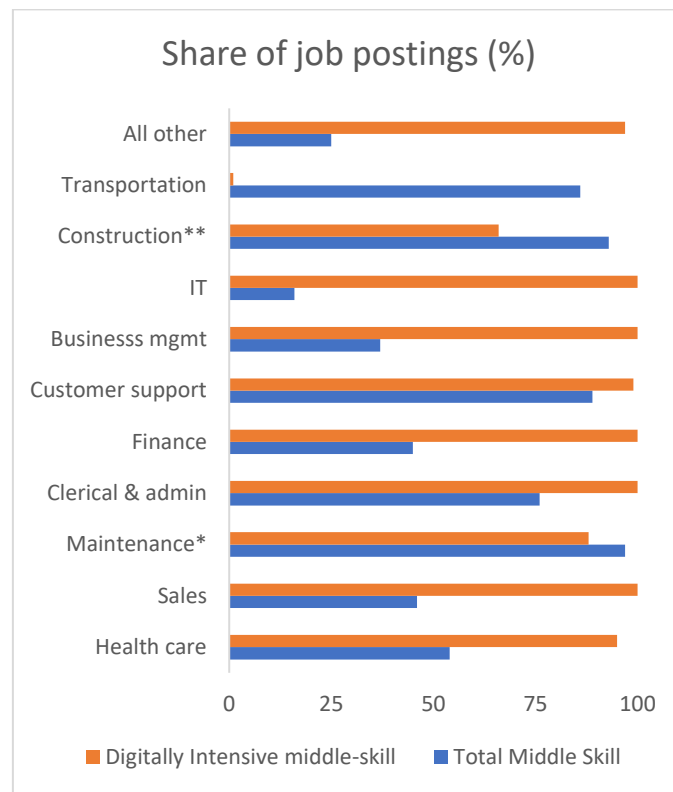
⁴³ Probst et al. 2019.

⁴⁴ CEDEFOP 2020a

⁴⁵ Tkalec et al. 2018

⁴⁶ CEDEFOP 2020a. The indicator compares future number of job openings in occupation X to total employment for occupation X. A score above 60 indicates high growth, 40-60 average job prospects, and below 40 slow growth. Within EU, only Finland, France, Germany, Netherlands and Portugal have better job prospects for ICT professionals than Croatia.

Figure 4: Middle-skill occupations are now digitally intensive.



Source: Burning Glass 2017

Green skills

Green skills are increasingly considered to be transversal rather than sector-specific skills, because they involve understanding and implementing sustainability measures in any sector. Although green skills are well understood in the abstract, they are generally poorly defined and have not been widely analyzed or studied. In the words of CEDEFOP, green skills are “the knowledge, abilities, values and attitudes needed to live in, develop and support a sustainable and resource-efficient society.”⁴⁷ The skills set involves jobs in sectors developing new green technology (most obviously renewable energy) but also, or even more, green competences in sectors not based on green technology per se, such as sustainable fashion, responsible investment finance, sustainable procurement, or environmental legislation.

Green skills are more prevalent in higher-skill jobs. Tasks involving green skills tend use more intensively high-level cognitive and interpersonal skills than non-green skills. Low-skill jobs will likely see smaller changes with respect to green tasks and skills, than middle-skill and high-skill jobs where there will be significant modifications of some jobs, and some entirely new jobs will occur—especially among high-skill activities.⁴⁸ Analysis shows that stricter environmental regulation (which can be thought to represent a structural change in demand for green skills), raises demand for deep green skills in science and engineering.⁴⁹ This highlights a greener economy will require specialist

⁴⁷ CEDEFOP 2012.

⁴⁸ ILO 2019.

⁴⁹ Vona et al. 2015.

competencies that, in turn, will require significant investments in higher education.⁵⁰ Additionally, it will be necessary to identify what green competencies means for lower-skill occupations and individuals.⁵¹

Demand for green skills is growing quickly across sectors, including many related to Croatia's S3 areas. A recent attempt at identifying core green skills and green-related skills in LinkedIn data suggested that globally, many green skills saw double-digit and even triple-digit growth over the past few years, and demand for green skills is increasing faster than the supply.⁵² As of 2019, the rate of hiring of green skills exceed the rate of hiring of other jobs across most economies. Green skills were increasing in demand by 50 percent or more in almost all sectors, including sustainable investing, procurement and auditing, etc.⁵³ LinkedIn data shows that health care, construction, transportation, and manufacturing—none of which are, per se, green technology sectors—have high growth in jobs reflecting green skills (above 3 percent in 2020) and also have the highest shares of green skills.

For the automotive sector, green skills are growing even more rapidly. LinkedIn data shows that the share of green talent has been increasing by 11 percent per year for the past five years—among the highest rates of growth in the manufacturing sectors. Data for Croatia are not available, but Central and Eastern European peers and competitors such as Romania, Slovakia and the Czech Republic, are seeing some of the fastest growing annual rates of green talent concentration.⁵⁴ And evidence shows that firms are participating in green activities: two-thirds of firms commit to green processes in their promotional practices. However, small firms do not engage in green activities to the same extent as large ones.⁵⁵

Soft skills

With globalization of markets and information and the automation of many routine tasks, skills that are complementary to technology, in particular creativity and socio-emotional skills, are becoming increasingly essential in the job market. In the past decades, the share of jobs intensive in socio-emotional skills has been growing, especially in advanced economies.⁵⁶ Technological change and globalization combine to drive these trends: as humans interact with more advanced machines, complementary skills such as creative problem solving, communication skills, and collaboration/team skills, are increasing in value. Demand for global competence, i.e., the ability to communicate effectively, collaborate with, and build trust with people from different cultural backgrounds, will

⁵⁰ Vona et al. 2015.

⁵¹ Waste management may be an area with demand for lower-level green skills: implementing a “circular” economy is expected to increase demand for waste management labour significantly (European Commission, 2018).

⁵² LinkedIn 2022. Green skills are those (out of the 38,000 listed on LinkedIn) that enable the environmental sustainability of economic activities.

⁵³ Visualization available at <https://economicgraph.linkedin.com/blog/building-sustainable-future-requires-green-skills> (accessed February 9).

⁵⁴ LinkedIn 2022.

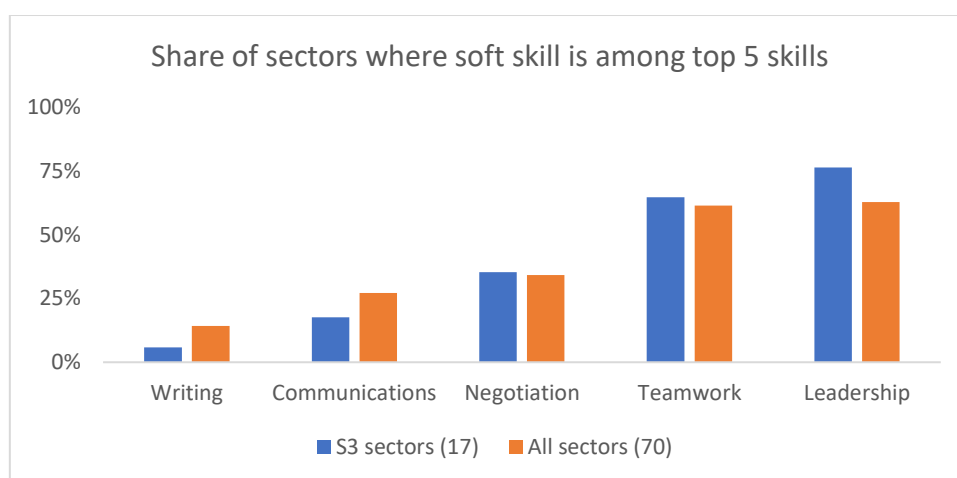
⁵⁵ Licastro and Sergi 2021.

⁵⁶ World Bank 2019a.

increase as technology makes it easier to connect on a global scale.⁵⁷ Projections suggest a continued and even accelerating growth in the demand for such soft skills in the coming years.⁵⁸

Leadership, people skills, and communication skills appear to be particularly important, especially in S3-related sectors. Analysis undertaken for this report shows that leadership/management skills, and teamwork skills are the socio-emotional skills most likely to be rated high (top 5) on LinkedIn (Figure 5). The importance of teamwork and leadership is even more significant in S3-related sectors. In almost 80 percent of 17 LinkedIn subsectors mapped to S3 areas, leadership was considered among the top five skills sought.⁵⁹ Other research, focused on skills listed in job vacancies, shows that effective communication—strong listening skills, friendliness, nonverbal communication, etc.—is the by far most commonly asked-for soft skill.⁶⁰

Figure 5: People skills are among the top five most important socio-emotional skills



Source: Authors estimates based on S3 sectors identified in World Bank and LinkedIn, 2021. See annex 1 for technical details.

The importance of socio-emotional skills is also emphasized by Croatian employers. To prepare training materials to help develop socio-emotional skills, the Essence project⁶¹ asked Croatian employers what skills they considered essential for employability. Critical thinking, creativity, and complex problem solving were highly ranked, but so were typical leadership and teamworking skills, such as coordinating with others and emotional intelligence (Figure 6). People management is important for small (but not micro-firms), whereas micro-firms emphasize negotiation skills—perhaps because sales or procurement functions are less specialized in very small activities.⁶²

⁵⁷ Global Competence is a multi-dimensional construct that requires a combination of knowledge, skills, attitudes and values successfully applied to global issues or intercultural situation. See OECD 2020a.

⁵⁸ Deloitte Access Economics 2017.

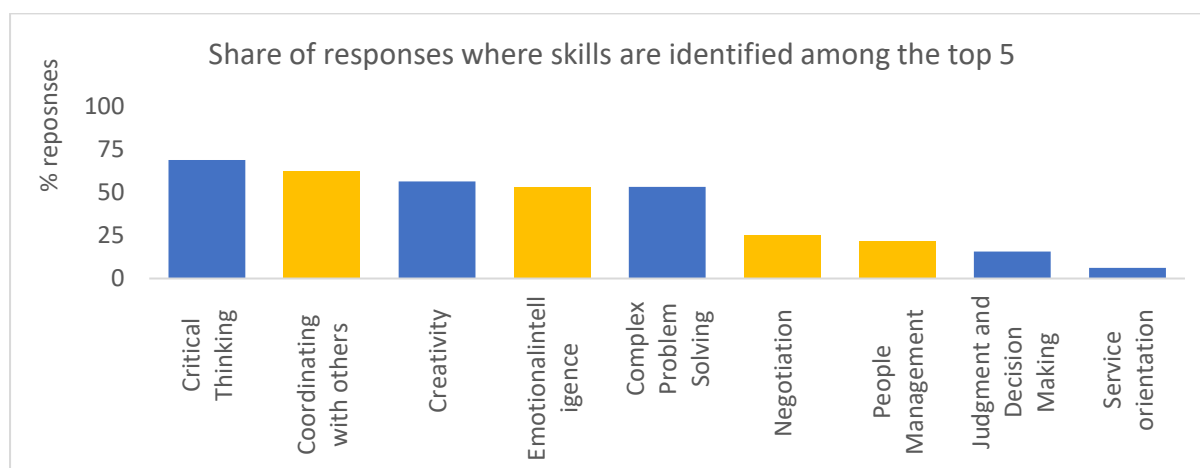
⁵⁹ For the purpose of this analysis, a total of 17 LinkedIn sectors were mapped to S3 areas. For more information on the mapping, please refer to Annex 1.

⁶⁰ Bjorkman 2020.

⁶¹ The project focuses on improving employment opportunities for students in higher education by offering professional development paths that go beyond formal higher education trainings. <https://projectessence.eu/>

⁶² These numbers should be interpreted with caution as the total sample size is very small, 32 firms only.

Figure 6: Soft skills matter for Croatian firms



Source: 2021 data for Croatia provided by Essence. Sample of 32 enterprises.

An additional important dimension is the cross-section of digital and leadership/teamwork skills. Before the pandemic, managing remote technology and the ability to work with physically fragmented teams was gaining importance. In the aftermath of COVID-19 and the structural break it has entailed in terms of the organization of physical workspaces, such skills—a mix of “hard” digital competences and “soft” people skills—are becoming essential, at least to white collar workers in both managerial and non-managerial positions.

Work-ready skills evolve through exposure to applied contexts and work-integrated learning. New graduates’ lack of practical experience and workplace skills is a complaint across fields of study, sectors, firms, and countries. Graduate students also recognize that practice-oriented learning prepares them best: EU graduates that attend universities oriented to project-based learning environments were four times more satisfied with labor market readiness, and those with some form of work-integrated learning program were 50 percent more satisfied.⁶³

2.2 Demand for skills in S3 areas

The focus on achieving higher value-added products and services and the internationalization of goods and services in Croatia’s S3 has key implications for skill needs across sectors. First, digital skills will be needed for internationalization, to address remote technology, logistics, and market information. As firms seek to digitalize production and processes, the need for digital skills to manage and maintain these solutions will expand evermore. Second, there will be strong need for communication and logistics skills to access more lucrative international markets and achieve greater brand recognition through certification procedures. Third, the green transition is a key pillar of the recovery strategy. On international markets, greener products are also a possible niche for Croatia to meet increasingly exacting standards for sustainable resourcing. And fourth, there will also be a need for very specialized higher-order technical skills. The transport and automotive sector will need electrical engineering skills, the energy sector technical skills related to renewable sources, the

⁶³ EUROGRADUATE-pilot research in 8 EU countries (Germany, Austria, Czech, Norway, Greece, Lithuania, Malta and Croatia), sample of 21 000 graduate students from 2012/2013 and 2016/2017 cohort (Rimac et al. 2020).

healthcare sector workers specialized in novel health devices for remote care, and the agricultural sector organic production specialists.

There will also be a need for specialized technical skills in sectors that do not necessarily require higher levels of education. Demand for installation and mid-level carpentry skills will likely increase as traditional wood production shifts toward higher-added value segments of wood processing such as furniture, interior design solutions, and sustainable storage. The transportation and construction sectors are generally among the sectors where non-digitally intensive middle-skills are clustered.⁶⁴ Technological change has nonetheless resulted in significant labor shortages in the wood sector due to skills obsolescence compounded by outmigration to other EU countries. Employers in the wood processing industry already emphasize a need for more workers in crafts and with the capacity to handle wood working machines.⁶⁵ There will be similar needs across other S3 sectors (for example, installation, maintenance, and repair of domestic photovoltaic cells or agriculture equipment) as Croatian firms pivot toward new industry segments.

In the global arena, Croatia's S3 sectors are intensive in specialized industry skills, emphasizing the role of education systems for building the technical competencies needed. Analysis prepared for this report mapped the tentative thematic priority areas in the new S3 to predefined sectors in LinkedIn data on skill needs.⁶⁶ Analysis using job-portal data such as LinkedIn can provide important granular information on labor market trends and new and emerging jobs but is also fraught with limitations⁶⁷, including a bias towards digital intensive jobs and lacking representation for skills demand in manual or lower-skill sectors, such as Croatia's transportation and wood sectors. With this caution in mind, the analysis shows that overall, in subsectors relevant to S3, *sector-specific industry skills* are among the five most frequently cited skills (Table 2).⁶⁸ This is particularly the case for the health and energy sectors. Within the pharmaceutical industry, for example, the five most cited skills are all industry-specific in nature—pharmaceutics, pharmaceutical manufacturing, oncology, etc. The picture is very similar for biotechnology, a subsector of health care, and even for the wellness sector. Similarly, four out of five top-cited skills in renewables and environment are industry-specific rather than transversal skills. The emphasis on specific skills developed during higher education rather than transversal skills in the top five skills lists is not surprising. These occupations require mastery of skills that are essential to enter the profession and are based on several years of study.

⁶⁴ Burning Glass 2017.

⁶⁵ World Bank 2021a.

⁶⁶ After the analysis had been undertaken, an additional pillar—"Digital products and platforms"—was added to the new thematic priority areas. Digital skills and even advanced ICT competencies are mostly treated as transversal skills in this report. An investigation into digital sectors in the LinkedIn data showed, unsurprisingly, that a large majority of skills required would be defined as tech skills and disruptive tech skills.

⁶⁷ Job portal data are now widely used to analyze labor market trends. Caution is needed, however, as job portal data may represent a biased view: some sectors are underrepresented online, job listings rarely include all skills needed, just key skills, patterns of use differ across contexts reflecting digital divide, economic structure and more, simplifications are made in big data analysis. See, e.g., ILO 2020.

⁶⁸ See Annex 1 for data and method.

Table 2: Specialized, soft, and tech skills are needed in S3 areas

Personalized health			Smart and clean energy	Sustainable and circular food	Smart and green transport	Customized and integrated wood products	Security and dual use; Digital products and platforms
<i>Pharmaceuticals</i>	<i>Biotechnology</i>	<i>Health, Wellness & Fitness</i>	<i>Renewables & Environment</i>	<i>Food Production</i>	<i>Automotive</i>	<i>Paper and forest products</i>	<i>Computer & Network Security</i>
Pharmaceutics	Pharmaceutical Manufacturing	Wellness	Environmental Science	Food Manufacturing	Automotive	Chemical Processing	Cybersecurity
Pharmaceutical Manufacturing	Genetic Engineering	Physical Medicine and Rehabilitation	Power Systems	Food Service Operations	Negotiation	Forestry	Computer Networking
Research	Research	Personal Coaching	Utilities	Digital Literacy	Leadership	Manufacturing Operations	Development Tools
Product Testing	Evolutionary Biology	Leadership	Negotiation	Teamwork	Manufacturing Operations	Negotiation	System Administration
Oncology	Physiology	Communication	Project Management	Leadership	Digital Literacy	Digital Literacy	Web Development

Source: Authors based on World Bank and LinkedIn 2021. The subsectors in italics are sectors defined in LinkedIn, that have been mapped to S3 priority areas. This approach has limits as there is no good fit for the wood sector or the transport sectors (as a services sector). Further, the table does not separately consider the S3 priority area “Digital products and platforms”, which was introduced in the S3 draft after the analysis was undertaken; it is presented together with Security (Cybersecurity only).

Tech Skills
Specialized Industry Skills
Business Skills
Disruptive Tech Skills
Soft Skills

People skills and digital skills are also important, however. This is reflected in a high ranking of socio-emotional skills, in particular negotiation and leadership, in all S3 areas except pharmaceuticals and biotechnology. Again, this does not suggest that socio-emotional skills are not important in health sectors, only that specialized technical skills are essential for entry. In addition, it is interesting to note that in manufacturing sectors, digital literacy is now a must, reflected among the top five skills. Stakeholders in primary sectors such as agriculture and wood (“smart farming”) are seeing an uptick in digital technologies including robotics, that will also inevitably necessitate greater digital literacy and more advanced digital skills.⁶⁹

Other research also highlights the multidisciplinary, hybrid nature of emerging S3 area skill needs. Table 3 below, adapted from Berger and Frey (2015), focuses on new and emerging jobs in S3-related sectors. It presents the skills, subject knowledge, attitudes, and values needed across different occupations and provides evidence of the transversal nature of these. Examples include project management and oral expression for biostatisticians; writing, decision-making, and reliability for fuel cell engineers; persuasion, social perceptiveness, and accountability for solar sales representatives.

Table 3: New and emerging jobs in S3 sectors are hybrid jobs

Occupation	Description	Examples of Skills	Examples of Knowledge	Examples of Attitudes and Values
Biostatisticians (S3: personalized health)	Develop and apply biostatistical theory and methods to the study of life sciences	Inductive reasoning, oral expression, mathematical reasoning	Mathematics, English Language, Education and Training	Project/program management, execution, inquisitiveness
Fuel cell engineers (S3: smart and green transport)	Design, evaluate, modify, or construct fuel cell components or systems for transportation, stationary, or portable applications	Judgment and decision-making, writing, critical thinking	Physics, Mathematics, Chemistry	Focus, reliability; feedback
Solar sales representatives and assessors (S3: smart and clean energy)	Contact new or existing customers to determine their solar equipment needs, suggest systems or equipment, or estimate costs	Active listening, persuasion, social perceptiveness	Sales and marketing, Engineering and Technology, Customer and Personal Service	Accountability; focus, results orientation

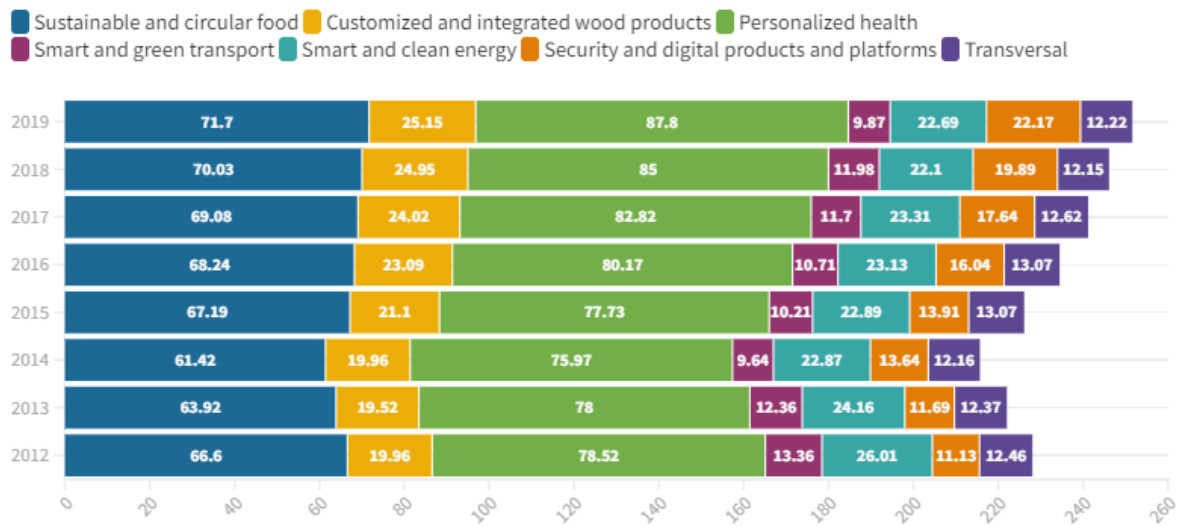
Source: Adapted from Berger and Frey 2015.

In Croatia, demand for S3-related skills —as reflected in job creation—has been increasing in some cases but not systematically. Analysis of Labor Force Survey data shows that there has been a noticeable increase in the number of employees in personalized health, sustainable and circular food, and ICT related competencies (security and digital products and platforms), by nearly 10,000 jobs in each sector (Figure 7). The Croatia Employment Services (CES), which is one of the entities in charge of skills forecasting, has identified ICT, medicine, and pharmacy as sectors where there is a manifest

⁶⁹ European Commission, n.d.a

shortage of workers and where enrollment should be encouraged in HEIs.⁷⁰ The number of jobs in energy, research, and transport remained the same (research) or fell (energy, transport). Set against total employment in Croatia, which reached around 1.7 million workers in 2019, S3 sector employment and the skills captured in them thus represents rather small numbers, however (around 15 percent).

Figure 7: The number of employed in S3-related sectors is increasing
(in thousands)



Source: Croatian Bureau of Statistics. The S3 area “Security and dual use and digital products and platforms” essentially refers to ICT (it includes cybersecurity; other security sectors are not possible to identify in the LFS).

⁷⁰ CES 2021.

3 The supply of skills and skill gaps

Key Messages

- Outside of formal education, Croatia offers few options for closing skill gaps, and employers train few of their employees.
- Investing in vocational/professional (TVET) skills or higher education does not pay off sufficiently well in labor markets, emphasizing problems with quality and relevance.
- Croatia needs to improve transversal skills, including digital, green and entrepreneurial skills.
- Croatian firms have difficulties finding skilled workers. There are persistent shortages of graduates in physics and mathematics, construction, ICT, medicine, and pharmacy and scarce skills are also leaving through migration

This section looks at the supply of skills, and how well skills available in Croatia match current and future needs related to S3. Good matches between skills supply and skills needs—in the number, level and quality of skills—can create dynamic and innovative economies which offers productive employment opportunities. Conversely, skill gaps can cause productivity losses for firms and in employment mismatches—where employed are not working at the “right” level of skills and qualification. General skills built in primary and secondary school are the foundation of more advanced skills. They are not sufficient, but necessary to continue to build skills. The section begins by a brief overview of access to education and training, from school to life-long learning. It then presents evidence on Croatia’s foundational skill levels, transversal skills including digital, socio-emotional, and managerial skills and finally identifies skill gaps.

There is evidence of a “smart skills” gap in Croatia. Access to primary and secondary education is high, but the quality of learning in basic education, in TVET and higher education training needs to increase. Croatia has an aging population, and whereas investment in children and youth is essential it will not be sufficient to provide skills. Adult learning opportunities are very limited, however. Foundational skills are below those of EU peers, especially for STEM competencies. Digital skills are high among youth but lag among older adults. Whereas green skills are essential for building back Croatia’s economy in better, more sustainable, and resilient ways, green talent growth appears to be increasing comparatively slowly. Transversal skills such as problem-solving, creativity, leadership, and entrepreneurial skills are not sufficiently developed in school and university. The workforce in S3-related sectors has comparatively low levels of education in relation to their expected transformational role, and S3-related skills are also migrating. Targeted investment in education to increase development and quality of specialized skills is needed but must be combined with short- to medium term skill upgrading initiatives.

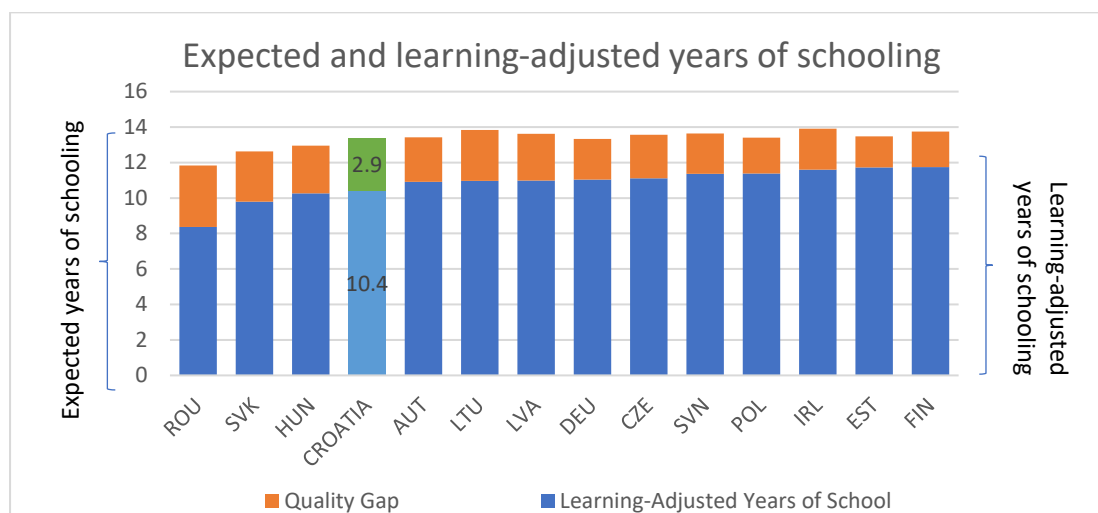
3.1 Access to education and training

Formal education

Access to basic education is universal but quality problems reduce learning outcomes. Children in Croatia can expect to attend, on average, 13.4 years of school, which is the same as the EU average. Yet, due to shorter hours, a Croatian child will receive many fewer hours of school than the EU average (this is now part of school reforms). Moreover, whereas Croatian children are unlikely to drop out of

school prematurely⁷¹ they lose, on average, almost three years of school due to ineffective learning systems, including the shorter hours (Figure 8). Croatia is performing much above Romania with two years more of effective learning. Nonetheless, Croatia has the sixth lowest level of learning-adjusted schooling in the EU. As a result, Croatian children can expect 1.3 fewer years of learning-active years in school compared to the top-rated country, Finland. These outcomes are likely to have worsened with COVID-19 impact on learning.

Figure 8: Quality of education needs to increase to improve learning outcomes



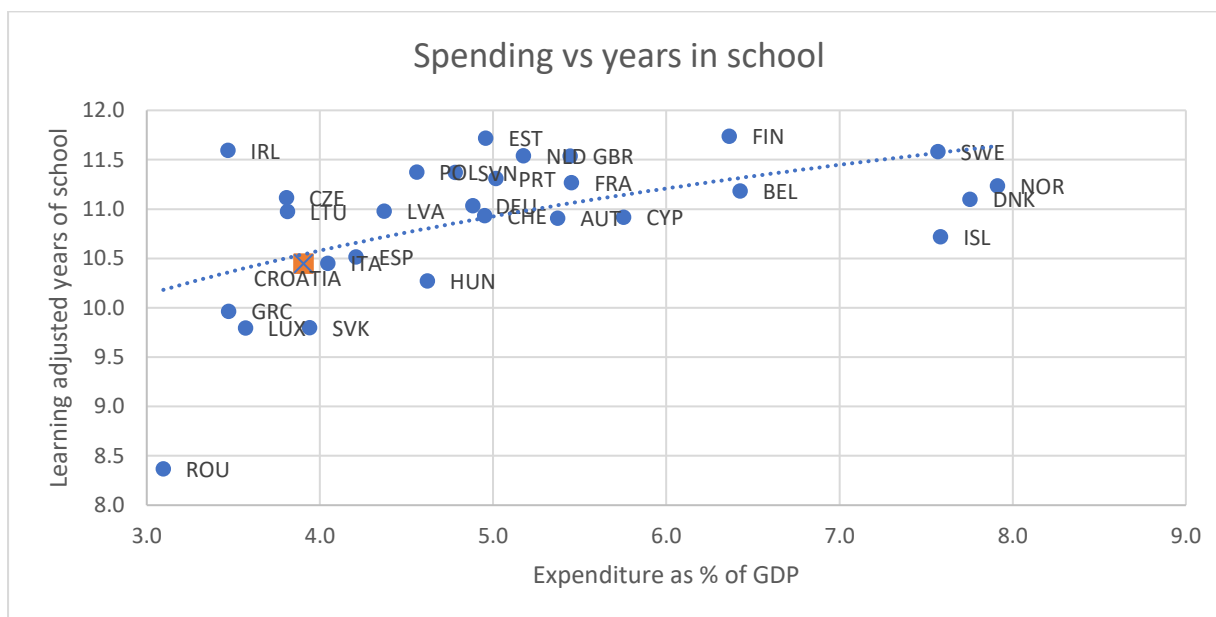
Source: Estimates based on World Bank Human Capital Database. Note: The quality gap is the difference between expected years of school and learning-adjusted years of school.

Education spending is below the EU average which may explain some of the performance gap. Measured as percent of GDP, spending on education is below most European countries (3.9 percent in 2017), especially the Nordic countries. Spending efficiency, as measured in the years of quality learning delivered for a specific level of spending, is similar to that of other EU countries and better than Slovak Republic or Hungary. However, countries with similar spending levels (Lithuania, Czech Republic) deliver significantly better learning outcomes than Croatia does (Figure 9).

There is a shortage of STEM and foreign language teachers. Teachers are almost all fully certified across Croatia’s schools. However, there are teacher shortages in STEM areas (mathematics and physics, informatics as well as in foreign languages. Although tertiary enrolment in STEM areas (including in teaching streams) is encouraged in the CES recommendations for education enrolment policy and scholarship policy, such study programs continue to face low demand by prospective students.

⁷¹ European Commission n.d. b.

Figure 9: Increasing level and efficiency in spending to increase learning outcomes



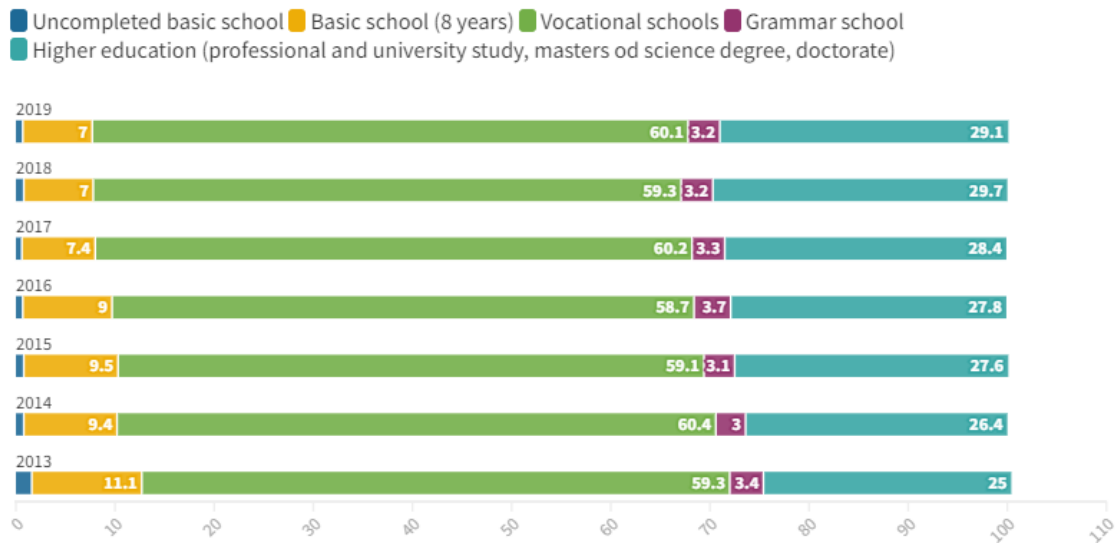
Source: Estimates based on World Development Indicators (WDI) and the World Bank’s Human Capital Database.

Croatia has a comparatively high share of adults with technical or vocational training. In 2019, 93 percent of the adult employed population had completed education at least at secondary (post-basic) level, and this share has steadily been increasing. The vast majority (60 percent) had completed TVET, whereas only half as many (30 percent) had completed higher levels of education (Figure 10). This trend is not waning, as Croatia has the highest share of TVET students in lower secondary education among EU countries (10.5 percent compared to 2.3 for EU in 2019), and among the highest for upper secondary (69.0 versus 48.4).⁷²

TVET training does not pay off sufficiently well in Croatia’s labor markets. TVET graduates remain overrepresented among the unemployed and inactive compared to those with higher levels of education. Although the TVET system is intended to provide skills directly applicable in the labor market, TVET currently does not guarantee job opportunities (Figure 11).

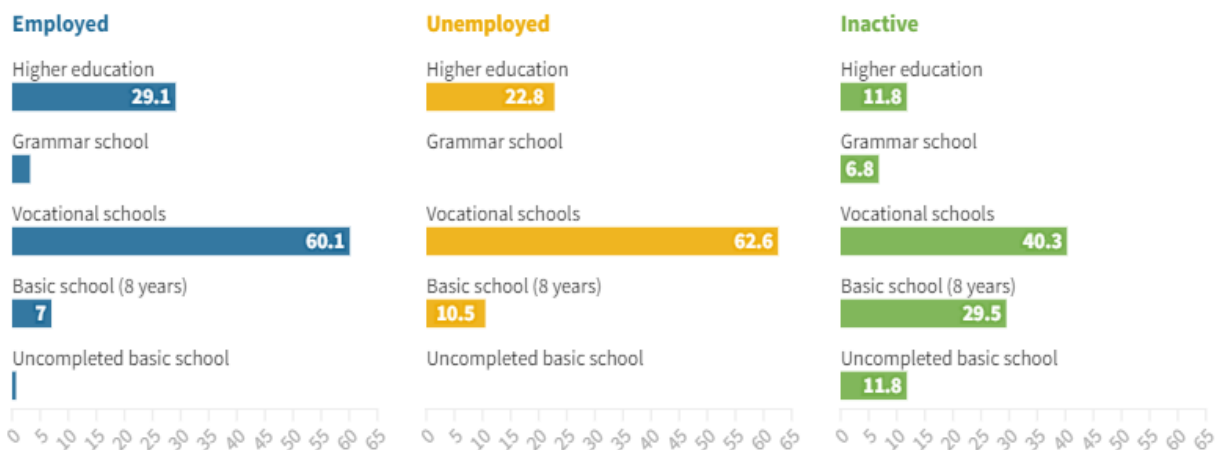
⁷² Estimates based on data from EUROSTAT.

Figure 10: Vocational training is the most common level of training among the employed



Source: Estimates based on Croatian Labor Force Survey (LFS) data.

Figure 11: Vocational training pays off less well in job markets than tertiary training.



Source: Estimates based on Croatian LFS data.

TVET is an inefficient pathway for further academic studies. Most TVET students in upper secondary (71 percent in 2017) are enrolled in four-year programs, which are designed to provide access to higher education. TVET students also aspire to further education—in 2017, 98 percent of TVET (4-year) graduates applied for tertiary education programs. However, only 65 percent passed the State secondary-exit examination (Matura) and 45 percent entered the same year. By comparison, 96 percent of students from general secondary (gymnasium) programs passed the exam, and 87 percent actually entered higher education.⁷³

⁷³ Puzić et al. 2021.

Several factors may contribute to weaker labor market outcomes from TVET, many of them similar across CEE countries. An earlier overview of Croatia’s TVET sector concluded that critical constraints include low quality of instruction, little strategic direction, and lack of labor market relevance in the offer.⁷⁴ Compared to general education, TVET streams often attract less academically inclined or able students who face more challenges in any learning environment. It is also possible that TVET systems struggle to keep up when technology changes at a high—and accelerating—speed. In contrast, the payoff to general education is higher, as it can incorporate modern general-purpose technologies (such as ICT).⁷⁵

The stock of working-age people with higher education levels is changing, but slowly. Compared to EU countries, Croatia lacks persons with higher education levels, and this is only slowly changing. Croatia is promoting access to higher education and tertiary enrollment rates are now higher than the EU average and top education and innovation performers, like Finland (Figure 12, a). However, population aging means that student cohorts are shrinking each year and the inflow of tertiary education persons in labor markets is moderate at best. The share of tertiary-educated persons in the population 15-64 is changing—from 18 percent to 25 percent between 2011 and 2020 (Figure 12, b), but the transition is too slow to help Croatia converge with EU countries. Croatia’s share remains 8 percentage points below EU (33 percent) and 15 percentage points below Finland, where almost half of the adult population (48 percent) has achieved higher levels of education. An implication of this is that Croatia’s need for advanced skills cannot be solved only with new university graduates entering labor markets. To measurably increase skill levels, Croatia must also address skill levels among its stock of workers—including older workers—and consider policies to retain educated workers in Croatia and attract educated workers from abroad.

The share of students in STEM fields is increasing. Between 2014 and 2020, the rate (number per 1,000 of population aged 20-29) of graduates in STEM graduates increased from 15.7 to 20.6 percent, representing a convergence with EU27 averages (21.0 percent in 2020).⁷⁶ The number of doctoral students in STEM areas is low, however, at 0.4 per 1,000 of population aged 25-34, compared to 0.7 in EU27 and around 1.0 or above in Nordic countries.

Tertiary education is not a guarantee for jobs, underlining problems of quality and relevance. Tertiary educated persons have higher employment rates than other groups, but their share among the unemployed has increased significantly in the past years: from 12 percent in 2012, to 21 percent in 2020.⁷⁷ Employment rates are lower than EU averages.⁷⁸ When the World Bank’s Human Capital Index education score is adjusted for access to, and quality of, higher education, Croatia’s ranking among European and Central Asian countries falls, and the gap to education leaders, especially Nordic countries, increases.⁷⁹

⁷⁴ UNESCO 2016.

⁷⁵ Krueger and Kumar 2003.

⁷⁶ Estimates based on Eurostat education data.

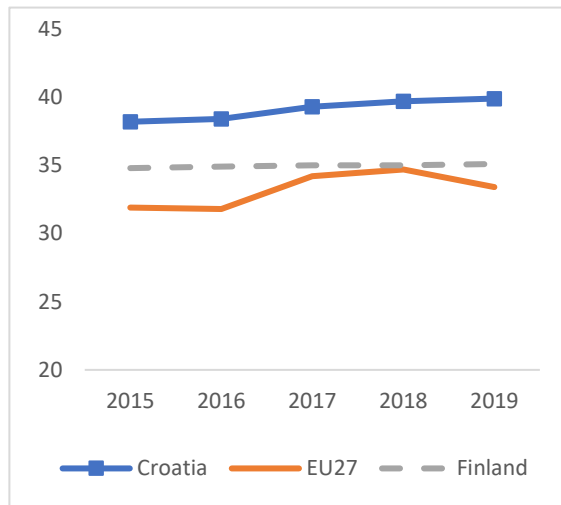
⁷⁷ Estimates based on Eurostat LFS data.

⁷⁸ European Commission 2021.

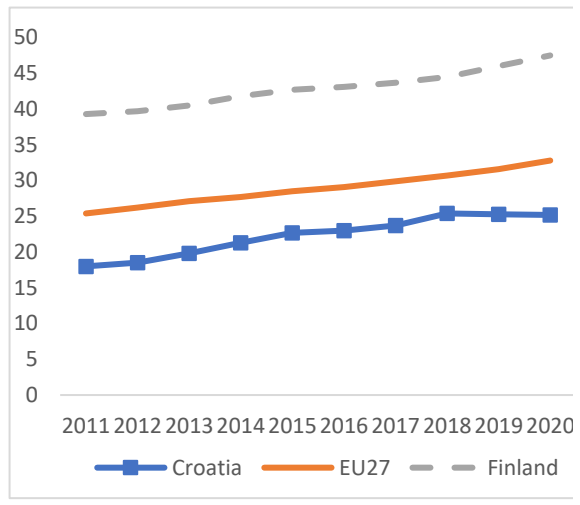
⁷⁹ Demirgüç-Kunt and Torre 2020.

Figure 12: Flow of students in tertiary educated is increasing but the stock of tertiary educated remains low

a. Tertiary enrollment, % of population 20-24



b. Share of tertiary educated in population 15-64

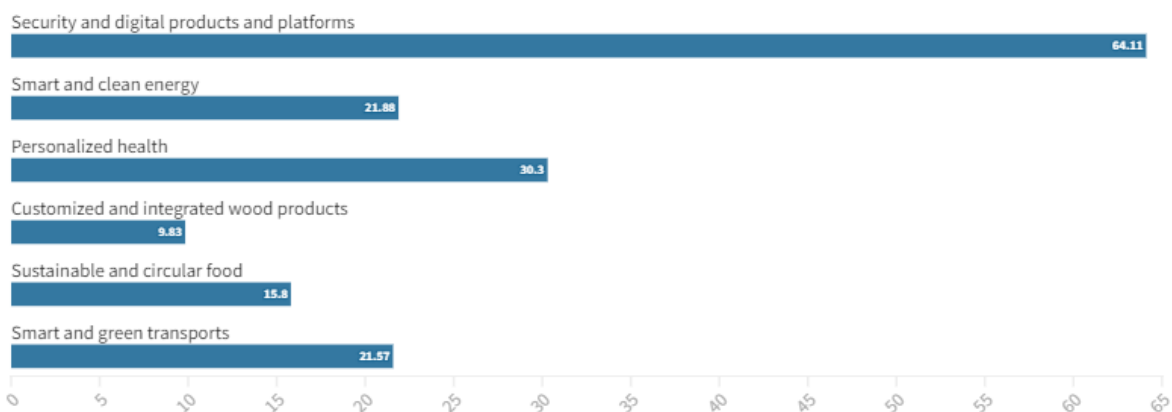


Source: Estimates based on Eurostat LFS data.

Outside of ICT, the level of education in S3-related sectors is low but increasing. According to data from the Business Environment and Enterprise Performance Surveys (BEEPS), the share of employees with university degrees in health, food, wood, and transport sectors is, in fact, below the average for all firms (Figure 13).⁸⁰ The number of university students in a few S3-related sectors is now increasing—especially personalized health, smart and clean energy, and digital products and platforms are seeing increasing numbers of enrollment. The share of students in S3-related sectors increased only moderately, however, from 31.4 percent in 2013/14 to 34.2 percent in 2018/19 (Figure 14).

Figure 13: The share of tertiary educated is low in S3 related sectors, except ICT

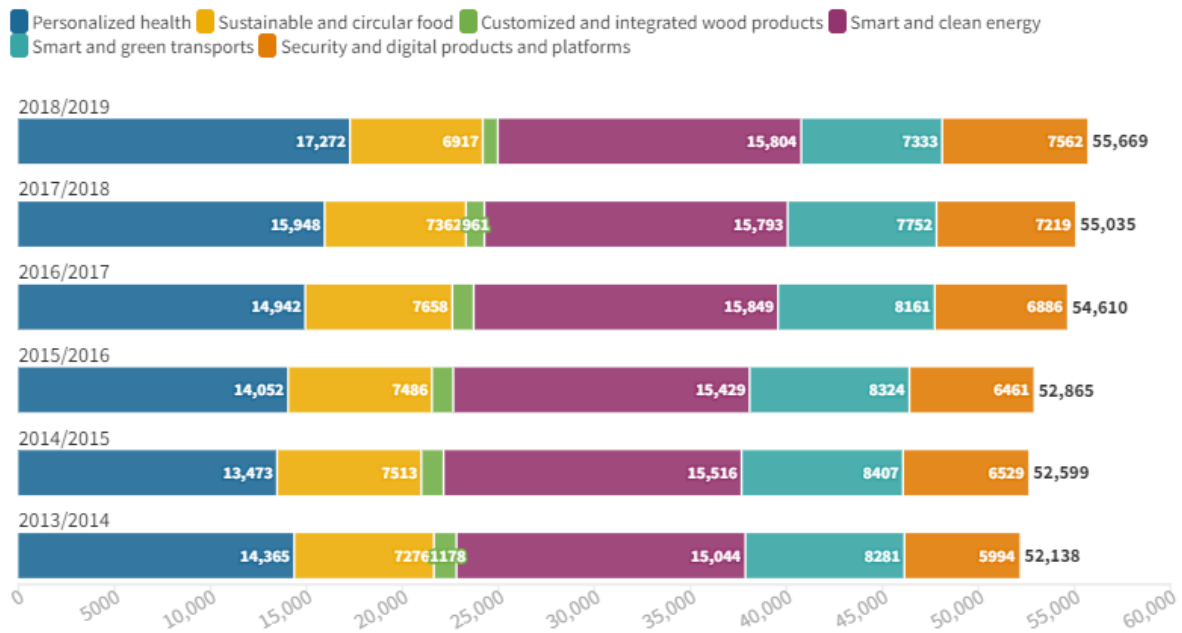
% of permanent full-time employees with uni-degree per firm, by sectors



Source: Estimates based on BEEPS. Cybersecurity is included in the ICT (digital) sector.

⁸⁰ Sectors in the BEEPS were mapped to the S3 areas.

Figure 14: Number of enrolled students in S3 sectors is increasing (slowly)



Source: Estimates based on data from Agency for Higher Education.

Adult training systems

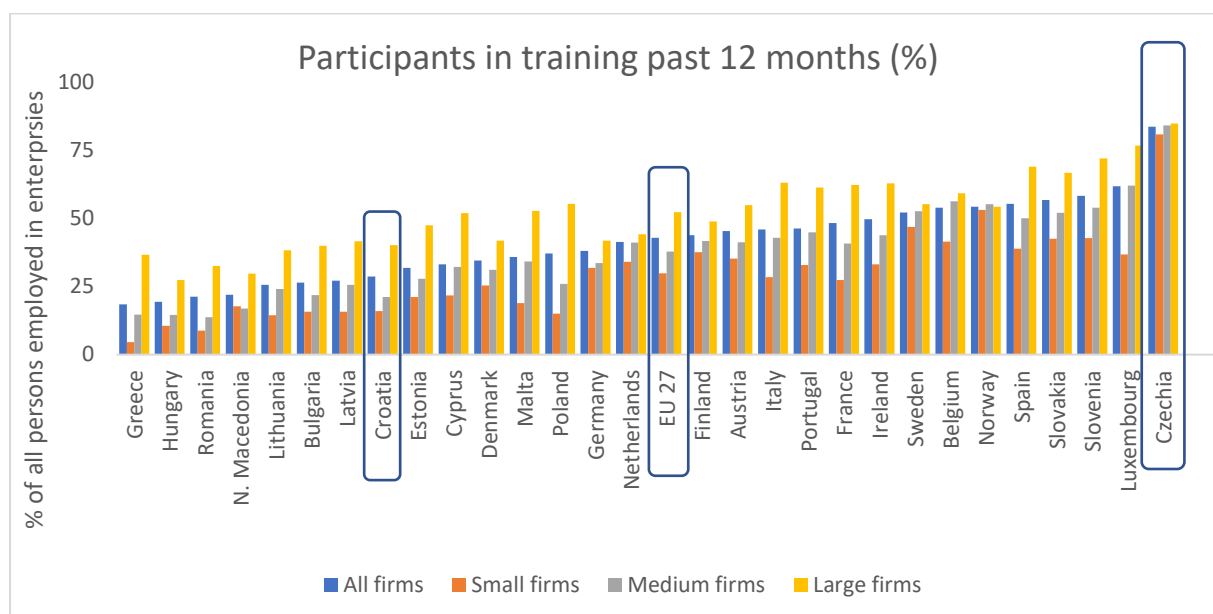
There are few options for closing skill gaps after leaving formal education. Lack of adult training is surprising given sizable skill gaps and mismatches and the importance employers place on skills development. And acquiring new skills is important for workers too: it is identified as the most important job priority for new labor market entrants in Croatia and among the top priorities across workers of all ages.⁸¹ Yet, access to continuous education is low in the adult population. In 2020, only 8 percent of adults 25-64 with tertiary education, and 3 percent of adults with secondary education, participated in recent education and training (within the last four weeks), which is low compared to the EU average (19 and 9 percent) and much below top trainers like Finland (36 percent and 24 percent) and Sweden (42 percent and 29 percent).⁸²

Access to training provided or paid for by employers is also low. In 2016, some 30 percent of employees had participated in training in the past 12 months. This compared poorly to 43 percent in the EU on average, and substantially higher rates in several Central European countries, such as Czech Republic or Slovenia (Figure 15). Thus, although some 60 percent of firms do provide training, few workers benefit from such training. Moreover, the duration of training is relatively short in Croatia (at 4 per 1000 hours compared to over 6 for EU countries, and up to 7 and 8 hours for Czech Republic and Slovenia, respectively). As in other countries, the major share of training is on technical, practical, or job-specific skills, rather than more transversal competencies such as communication skills, teamwork, or digital skills.

⁸¹ Deloitte 2018, Savez Samostalnih Sindikata 2018.

⁸² Estimates based on Eurostat data.

Figure 15: Inadequate access to adult training opportunities



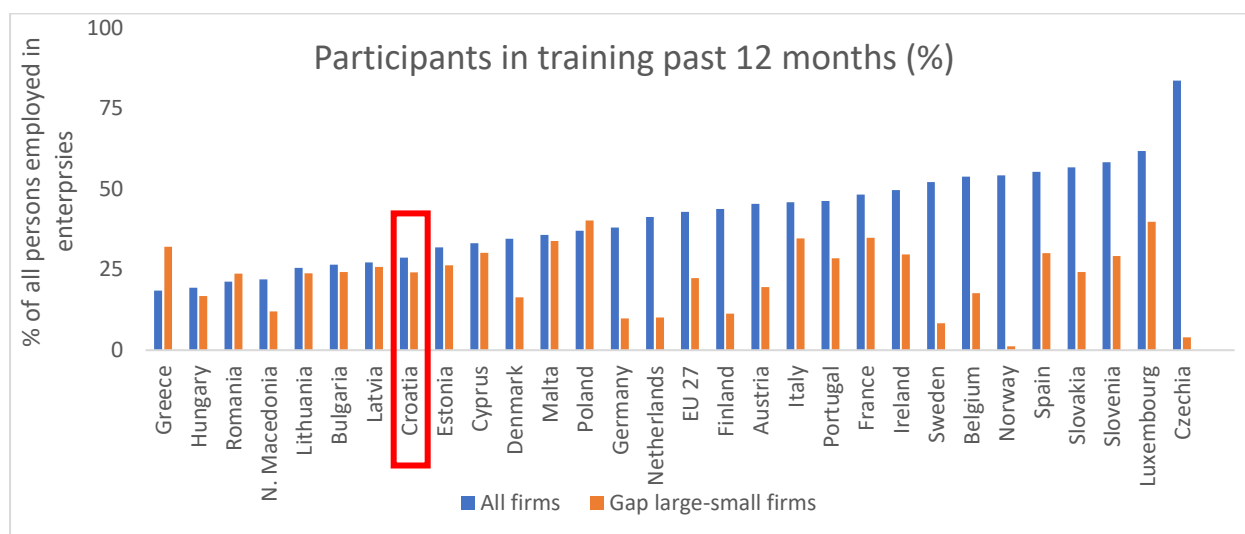
Source: Estimates based on Eurostat CVTS.

Small firms are less prone to upgrading their employees' skills. Among SMEs (10-49 employees), only 16 percent of employees had received training (30 percent in EU) whereas 40 percent of employees in firms with 250+ employees had received training. This gap between training incidence in small firms vs. large firms was also higher than the EU, and much higher than in, for example, the Nordic countries, Germany, or Austria. A similar message comes from the BEEPS survey, showing that small and especially medium firms in Croatia are less likely to provide any training compared with firms in Central and Eastern Europe as a whole, or the global averages: 23 percent and 25 percent of small and medium firms provide training, compared to 29 and 44 percent in Europe and Central Asia (Figure 16).

There are potentially many reasons why individuals and firms underinvest in training. The perceived value of investing in training, and opportunities to train, are key factors. Croatia's dependence on low value activities and jobs is likely a "low-skills trap" for both firms and individuals, as investment in higher level skills does not necessarily pay off in the current structure of the economy, yet more skills will be needed to achieve a transformation. Moreover, firms may fear losing the investment if workers are prone to leave their jobs; Croatia's high rates of skilled outmigration suggests fears are warranted. Individuals and firms may lack accurate information about the value of training for productivity, wages, and profits. They may not know what skills are needed, or what training opportunities are available. And the cost of training can be high for individuals, or small and credit-constrained firms, perhaps especially the opportunity cost of not working while training.⁸³ Finally, the training market – including public and private education institutions – may be too small to provide the skills upgrading needed.

⁸³ Almeida et al. 2012.

Figure 16: Lifelong learning opportunities are very limited—especially in small firms



Source: Estimates based on Eurostat.

3.2 Supply of skills

Supply of foundational skills'

Basic functional competencies need strengthening, especially in STEM, and special efforts are needed to address equity gaps. Competencies in reading, writing, and mathematics are foundational skills necessary for further learning. Reading is also strongly associated with global competence. Results from the OECD Program for International Assessment (PISA) in 2018 suggests that Croatia generally scores slightly better than the OECD average and EU comparators on reading, and better on global competence. However, Croatia scores lower than European comparators on basic STEM competencies (mathematics and science). A particular concern is mathematics, where 30 percent of the students performed below functional numeracy (below level 2 out of 6), which is twice the level of the EU target at 15 percent. Only 5 percent reach high-performing levels (5 or 6). In science, the share of underachievers increased significantly between 2009 and 2018. COVID-19 is likely to have further worsened inequality in outcomes. Croatian students have also underperformed on problem solving relative to most EU countries. This relates to both individual problem solving (measured in PISA 2012) and collaborative problem solving (measured in PISA 2015).⁸⁴ Finally, PISA shows that a majority (56 percent) of Croatia students have a “growth” mindset,⁸⁵ which is important to boost achievement by helping students set long-term goals, take on challenges, and build resilience to adversity. The share is higher in Croatia than in many EU countries but below the OECD average and significantly behind countries like Estonia.

⁸⁴ OECD 2017.

⁸⁵ A growth mindset implies belief that ability is not a trait or matter of innate talent, but that ability can be strengthened, which in turn will raise learning ambitions. OECD 2021a.

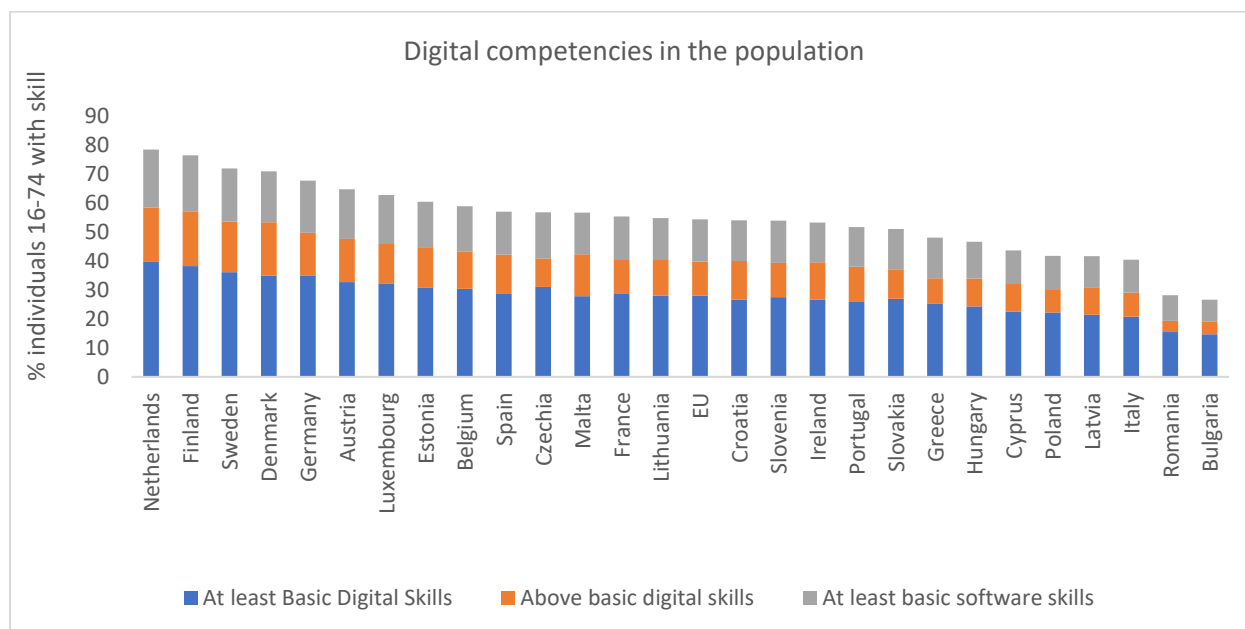
Supply of transversal skills for S3

Digital skills

Croatia has several strengths in digital skills, including a digital-savvy youth and a competitive ICT sector. First, the ICT industry is a fast-growing sector, with value added, firm growth, exports, and employee growth exceeding the average for the Croatia economy—by far—in the past few years.⁸⁶ Broad competencies among youth are high—Croatia has the highest share of youth (20–34) with above average digital skill use in the EU. As for specialist competencies, with 4.4 percent of university graduates in ICT, Croatia scores below top countries like Estonia (8.0 percent) or Finland (7.6 percent) but above the EU average (3.9 percent).

Looking at the entire labor force, digital skills are lower and compare unfavorably to other EU countries, however. Among individuals aged 16–74, the share of population with basic skills or above is the same as the EU average. However, digital skill levels in Croatia are much below the levels of populations of Finland or Netherlands, where 57 and 58 percent of the population have at least basic digital skills, and 20 percent have basic software skills, compared to 14 percent in Croatia (Figure 17). Croatia’s workforce lags digital forerunners in terms of digital skills, arguably due to limited opportunities for training overall and lack of ICT-specific training provided by enterprises.⁸⁷ Discussions with industry experts in Croatia suggest that there is as big a gap for specialized ICT mid-level skills, equivalent to a few years of post-secondary school, as for very advanced skills at graduate levels or above. The evidence is anecdotal but in line with the global trends, pointing to a growing but also differentiated need for specialized ICT skills.

Figure 17: Digital competencies are moderate in the population



Source: Estimates based on DESI.

⁸⁶ Žitnik and Subotičanec 2020.

⁸⁷ McKinsey & Company 2018.

Green skills

Green skills are not yet well defined in Croatia, let alone measured. Despite a significant global push for “building back better” with green activities and the recognition that this will need skills, green skills have no widely accepted definition in the academic or policy-oriented literature. Croatia is not unique as European countries do not adhere to a standard definition either.⁸⁸ New approaches are emerging to identify what “green” means in skills development, that highlight the difference between green sectors, jobs, tasks, and skills.⁸⁹ In Croatia, interviewed individuals representing different stakeholders (policy makers, private sector and sector of education) underscore that there is lack of understanding of what green skills can mean. They are generally understood as pertaining to green sectors (e.g., renewable energy, agriculture) or green jobs and occupations (e.g., environmental specialists), with little consideration to their transversal nature.

Analysis of LinkedIn data suggests that green talent growth in Croatia is lagging behind that in most European countries.⁹⁰ Between 2015 and 2021, the annual growth in green skills among LinkedIn members in Croatia increased by 10 percent for workers with high school diplomas, compared to 9 percent for workers with tertiary education. These are strong growth rates, but they are below growth rates reported for many other countries. In particular, Croatia is seeing less growth than other countries in workers with tertiary education adding green skills to their LinkedIn profiles.

Entrepreneurial and soft skills

There is a need to strengthen entrepreneurial skills as a transversal competence. Entrepreneurial skills are needed to spur the creation and successful growth of businesses, but interviews reveal that employers also look for entrepreneurial skills among their workforces. Employees that can identify and respond to market opportunities are highly valued. There is also wide agreement that the business mindset is not strong among the workforce, nor is it being developed in school or HEIs as a transversal skill across fields of study.

Strengthening entrepreneurial skills can also benefit inclusion, as self-employment can be a low-threshold entry into labor markets for more vulnerable groups. In Croatia, the rate of self-employment fell significantly between 2010 and 2019, to below EU averages. Most of this self-employment is necessity-driven rather than opportunity-driven—especially for seniors (50–64), who account for almost 40 percent of self-employed people. Between 2015 and 2019, one-third of early-stage entrepreneurs were started due to lack of other employment opportunities—double the level registered in the EU.⁹¹

A review of management practices also shows that their quality is mixed. Good managerial practices are partly overlapping with entrepreneurial skills but are focused on the specific managerial role: performance monitoring for continuous improvement, target setting over the short- and long run, and performance incentives and actions. There is substantial empirical evidence that good management practices raise productivity and overall performance for small and large firms.⁹² However, results from

⁸⁸ CEDEFOP 2018.

⁸⁹ Vona 2021.

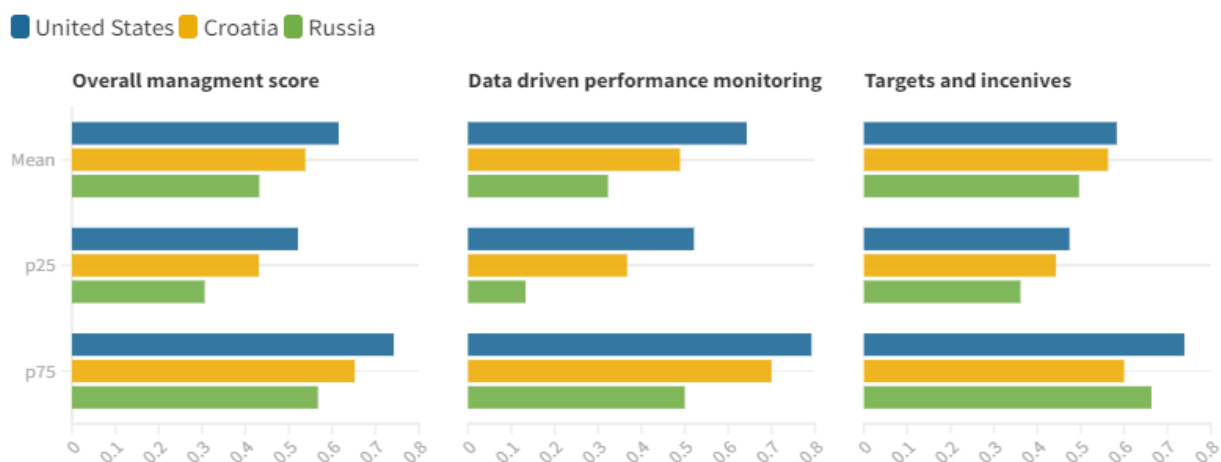
⁹⁰ LinkedIn 2022. Croatia is a small country and LinkedIn Big Data may not be representative, however—see Annex 1.

⁹¹ OECD 2020b. Early-stage entrepreneurs include those working to start a business or managing a new one that is less than 42 months old.

⁹² Bloom et al. 2016.

the IMD World Talent ranking from 2018 place Croatia in the last place out of 63 countries in terms of availability of competent senior management and their international experience, and fourth to last in terms of the quality of management education.⁹³ A study of management capabilities in Croatia⁹⁴ finds these vary significantly, but that, compared to higher performers (US), a larger share of firms are poorly managed, and a smaller share of firms are well managed (Figure 18). Croatia lacks “basket cases” but also “top performers”—the badly managed firms are better managed than in middle-income countries such as Mexico or Pakistan, but the well managed firms are not better managed than in these countries. Poor managerial performance is associated with lower average sales, lower average wages, less innovation, and fewer skills development opportunities for workers. Improving practices—moving from 10th to 90th percentile—would improve sales per employee by more than one-third.

Figure 18: Managerial skills lag behind high performers



Source: Grover et al. 2019. Management score from 0 (the least structured management practices) to 1 (the most structured management practices).

Views on Croatia’s level of soft skills vary depending on source. In the report on skills in Slavonia,⁹⁵ employers rated socio-emotional skills highly, with a majority claiming that their employees were good or excellent in teamwork, communications skills, or using foreign languages. But conversely, interviewed Croatian stakeholders also claim that soft skills need to become more prominent on the skills agenda. Moreover, a review of soft skills provision and demand in Croatia showed that surveyed firms consider some strategic soft skills to be missing among employees including leadership and creative skills (Figure 19). The same study finds that although public institutions offer soft skill modules in Croatia, the approach is relatively superficial, focusing on communication, negotiation, and the like, with little attention to more strategic soft competencies such as leadership or crisis management—i.e., the strategic competencies firms feel are missing.⁹⁶

⁹³ Grubešić 2019.

⁹⁴ Grover et al. 2019.

⁹⁵ World Bank 2021a.

⁹⁶ Essence project 2021.

Figure 19: People and leadership skills are missing



Source: Estimates based on data from Essence project.

3.3 Skills gaps

Given access to education and training systems and the resulting supply of skills, are there skill mismatches or skill gaps in Croatia?

Tertiary degrees are not “wasted” on low-skill jobs, but skills mismatches are higher among TVET graduates. High demand for tertiary education and low levels of tertiary education reduces the incidence of overqualification for jobs. In 2020, 13 percent of employed university graduates (ages 20–64) were overqualified for their jobs, in the sense that they worked in an occupation that would not require a tertiary degree (known as a “vertical mismatch”). This was significantly below the EU27 average of 22 percent. Similarly, 22 percent of tertiary educated youth (age group 25–34) worked in a field other than that which they had trained in (known as a “horizontal mismatch”). This also was lower than the EU27 average (28 percent). However, Croatian youth (15–34) with secondary education are much more likely to be mismatched compared to their European peers. When this group is included with tertiary graduates, the mismatch rate increases to 33 percent, compared to 28 percent for EU, pointing to the low payoff to TVET.⁹⁷

Croatian firms report difficulties with finding skilled workers. The message from the private sector is consistent: there is a gap between the skills required and the skills available in the workforce, and the main problem is the lack of applied training across education and training systems. This perception is consistent across interviews with key informants in S3 sectors undertaken for this report, as well as larger firm-based surveys across sectors. In the WEF’s Global Competitiveness Index (GCI) Croatia is ranked 128 out of 141 countries on workforce skills. According to Croatian executives, these weaknesses are due to inadequate training: limited staff training in firms, low quality of vocational training, and lack of critical thinking in higher education systems.⁹⁸ In the BEEPS from 2019, lack of workforce skills is the second most cited “biggest obstacle to business,” after tax rates. The Croatian Employer Service’s firm-level survey from 2019 suggested that 69 percent of firms in the private sector

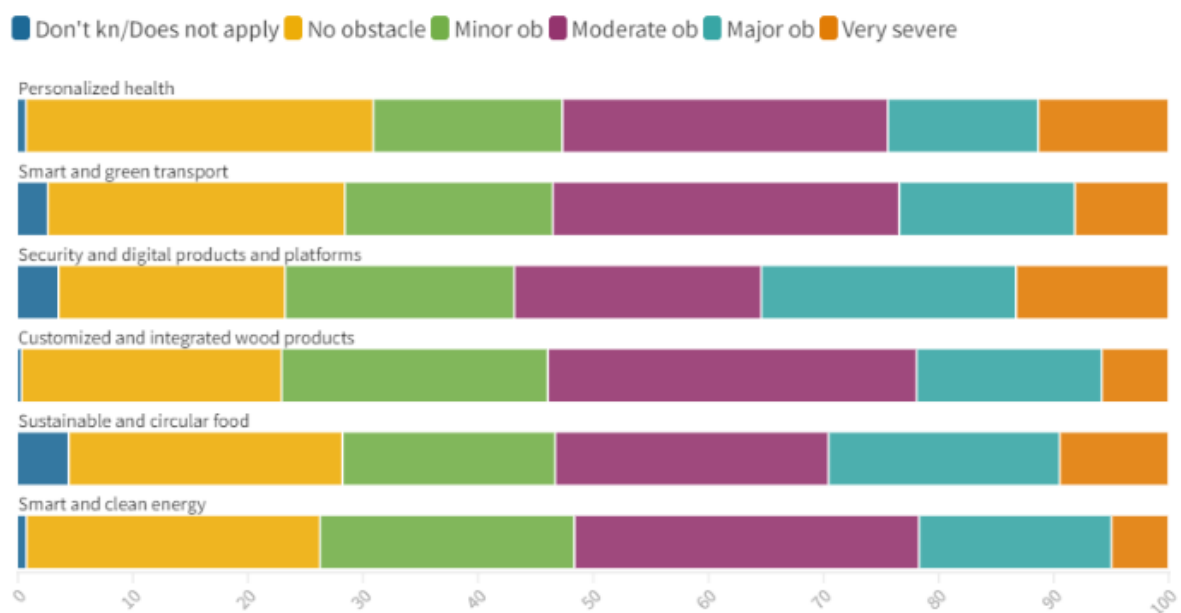
⁹⁷ Estimates based on Eurostat data. Horizontal mismatches could also be evidence of a growth in “hybrid” jobs, and as such not a mismatch at all. More research is needed to investigate whether this is the case, however.

⁹⁸ WEF 2019. Workforce skills is partly evaluated on executive opinion surveys undertaken by the WEF for the Global Competitiveness Index.

had difficulties finding workers, mostly due to lack of required work experience or educational background⁹⁹. Similarly, a World Bank survey of enterprises in Eastern Croatia from 2019 showed that three in four firms believed the education and training of their employees was inadequate for business needs.¹⁰⁰ Overall, the lack of practical and hands-on experience, rather than the level of qualification per se appears to be the main issue. Croatian employers argue an inadequate level of applied skills in the workforce is constraining the growth of SMEs.¹⁰¹ In lagging regions, very high inactivity and unemployment rates co-exist with skill deficits.¹⁰²

Judging by the enterprise surveys, skills gaps are not necessarily larger in S3 areas than elsewhere. Data suggests that skills gaps are much more persistent in security and digital sector, than in other S3 areas. Almost 15 percent of firms in security and digital consider skills to be a very severe obstacle to doing business (Figure 20).

Figure 20: Is an inadequately trained workforce an obstacle to business growth?



Source: 2018–2020 BEEPS data.

Unemployment co-exists with persistent labor shortages for some occupations requiring higher education levels, a few of which are directly related to S3 areas. The CES uses skill anticipation outputs and projections of labor market demand by occupations to make recommendations for enrollment in higher education.¹⁰³ The latest study, from 2021, suggests that labor shortages occur mostly for higher-level education in Croatia. There are persistent shortages for graduates in physics and mathematics, construction, ICT, medicine, and pharmacy.

⁹⁹ CES 2020.

¹⁰⁰ World Bank 2021a.

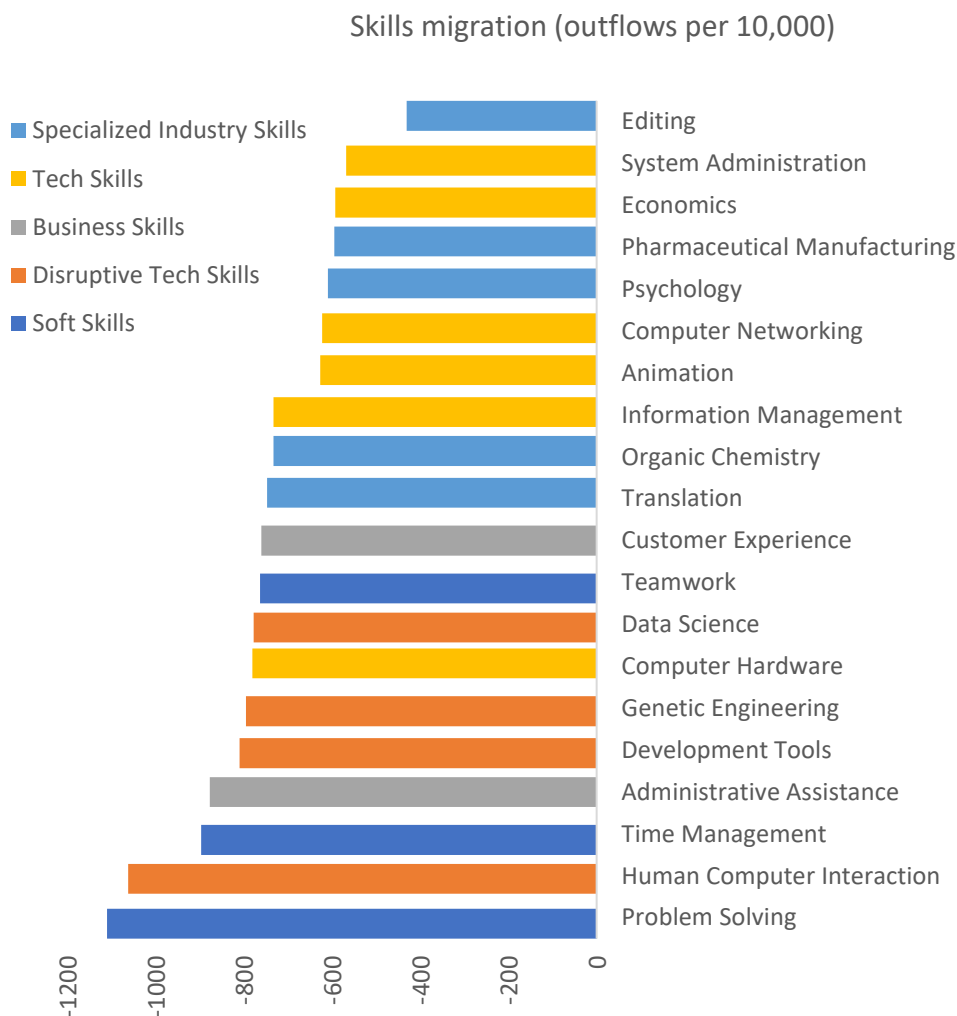
¹⁰¹ Aprahamian and Correa 2015.

¹⁰² Christiansen et al. 2019.

¹⁰³ CES 2021.

Scarce skills are also leaving Croatia. Important skills, both those directly related to S3 areas such as pharmaceuticals, transversal digital skills needed in S3 areas and elsewhere, and important soft skills, are migrating out of Croatia. LinkedIn data shows that between 2015 and 2019, tech skills were disappearing at large scale from Croatia (Figure 21). Moreover, net skills migration was highest for generic soft skills like problem solving, and for different ICT-specific skills such as human computer interaction and development tools. However, specific advanced skills for in particular the health sector or possibly food—pharmaceutical manufacturing, genetic engineering, organic chemistry—were also among the top emigrating skills. Looking at industry level, there is significant net outmigration in key sectors such as research, hospital and health care, computer software, IT services, and pharmaceuticals.¹⁰⁴ The rate of skills migration in Croatia is high by comparison with other new EU member states, at least for the top three skills leaving Croatia (Figure 22).

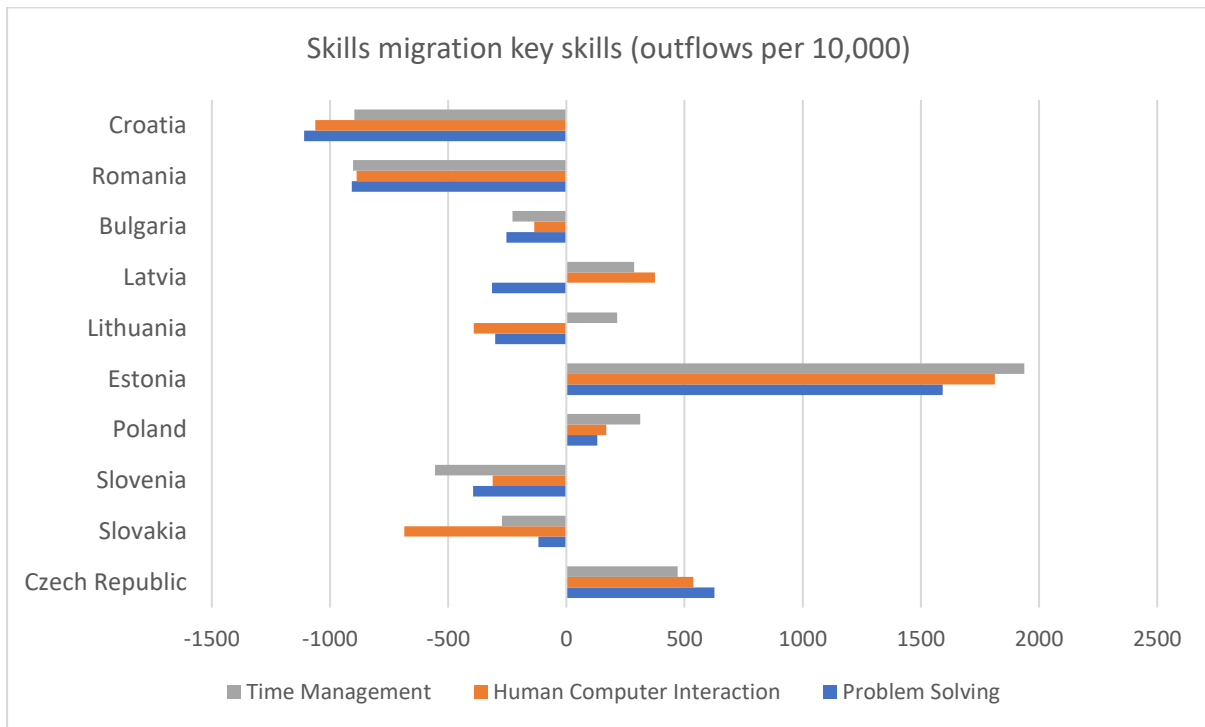
Figure 21: Important skills in high demand are emigrating



Source: Estimates based on LinkedIn data.

¹⁰⁴ Estimates based on LinkedIn data.

Figure 22: Skills migration is high in comparison with other new EU member states



Source: Estimates based on LinkedIn data.

4 Croatia's skills development system and policy landscape

Key Messages

- The first phase of the S3 did not prioritize skills. Progress on developing skills identification and forecasting system has been slow.
- The formal educational system in Croatia is the subject of several ongoing reforms, but the TVET system remains characterized by low-quality training, and both TVET and higher education offer limited opportunities for applied learning.
- Adult training options are insufficient, especially for people who are already employed.
- System inertia, information gaps, and lack of incentives are limiting the skills development system and preventing Croatia from developing relevant skills. The education and skills agenda is fragmented across stakeholders, and accountability and governance is limited.
- More recent development strategies envision an education system reform focused on preparing students for lifelong learning, increasing the relevance of skills, and supporting digital transformation. However, the system needs to do more to foster adult education and provide skill-building resources to SMEs.

This section reviews the skills development system and the related policy agenda from the perspective of S3. It begins by showing that the S3 in its first phase set out very limited objectives regarding skills. Against this policy background and the skills gaps analysis from section 3, the section provides a snapshot of the skills development system in the formal education system and adult learning systems and highlights some policy gaps. The section concludes with a review of upcoming skills development strategies, set against Croatia's skill gaps, constraints identified in the current system, and resulting gaps in reforms.

The analysis points to constraints to developing relevant skills owing to system inertia, information gaps, and lack of incentives. This results in a fragmented, yet rigid skills development system which lacks the agility to respond to continuously changing skill needs. Although the role of the private sector in strengthening the quality of skills development system is widely recognized, the links between the private sector and education system, and links within the education system remain weak. The lifelong learning agenda has yet to encompass the entire population and involve firms as stakeholders. New strategies are more focused on upskilling and reskilling needs but narrow down on very marginal upskilling opportunities and inclusion objectives which will not meet Croatia's skill needs.

4.1 Skills in the S3 2016-2020 policy

Skills were not prioritized in the first phase of Croatia's S3, and initiatives focused mostly on closing information gaps and putting in place coordination mechanisms. For skills, the S3 strategy 2016-2020 laid out the basis for developing a labor market information system (LMIS)—a "Registry of Human Resources" by connecting different sources of data,¹⁰⁵ developing a skill forecasting model, collecting

¹⁰⁵ The Pension fund (employed, recipients of child benefits), Employment Service (the unemployed, recipients of active labor market measures, unemployment benefit recipients), Tax Authorities (wages and salaries, financial indicators of firms), Social Services (recipients of social benefits), Ministry of Justice and Public Administration (demographic data), MSE (enrolment in all kinds of training). Source: Government of Croatia 2016.

information toward occupational standards and skills demand through an annual survey of employers. The strategy assigned the CQF as the main mechanism for identifying and coordinating skills agenda. The budget allocated for these efforts was small, however, around 360,000 euros. Beyond resolving information gaps, no provision was made for targeted measures to incentivize training among individuals or through firms.

Progress on the objectives of achieving a more advanced skills identification and forecasting system has been slow. At the writing of this report (June 2022), the revised CQF was not yet fully operational, despite its pivotal role. A first forecasting exercise was undertaken in 2016, but there is no regularly used macro-forecasting model. Some progress has been made on preparing an internet portal as the main platform for the LMIS, but the various sources of data have not yet been connected to form the Registry of Human Resources, and the portal is not open to the public. Most of these activities are now planned under the European Structural Funds (ESF+) operational program for 2021–2027 period (see Annex 2). To address these shortcomings and ensure the principles of smart specialization are implemented in full, the new S3 2029 will place additional focus on addressing skills gaps and propose interventions at the systemic and thematic priority area level. It is important these initiatives be in line with other contemporary strategies, especially the NRRP.

4.2 The skills development system

Formal education

Like many European countries, Croatia has embarked on significant reform of its education sector to increase quality, equity, and relevance. Skills gaps in the population result from weaknesses across the skills development system. Participation in early childhood education and care, which can be a significant factor for subsequent learning progress, remains low. At the level of primary and secondary education, the process to decentralize management and decision-making has not been accompanied with sufficient capacity building, appropriate resource management, coordination, and quality assurance. Ongoing reform focus on providing both more effective instruction, including with a transition to single-shift schools, and transitioning to outcome-based learning.¹⁰⁶ The higher education system has yet to shift decisively to performance-based financing, and its overall effectiveness is held back by a complex and unclear governance system.¹⁰⁷

The TVET system remains characterized by insufficient quality of training, with limited opportunities for applied learning, whether through school or work. Many schools suffer from outdated curricula, and lack of relevant material and equipment. Opportunities for internships—work-based learning—in the private sector are limited, internships vary in length, and there are no quality assurance mechanisms in place. Interest from private firms for partnering arrangements is reportedly low despite fiscal incentives.¹⁰⁸

Croatia's TVET system is undergoing significant reform towards an outcomes-oriented learning system. In addition to curricula reform, two important initiatives aim at increasing the quality of TVET and strengthening labor market relevance. One is the establishment of regional competence centers

¹⁰⁶ World Bank 2019b.

¹⁰⁷ World Bank 2021a.

¹⁰⁸ In return for employing and providing training and continuous professional development to mentors, and to ensure quality of work-based learning, firms receive tax deductions, up to 15 percent depending on the number of interns (CEDEFOP 2020b).

in vocational education, supported by EU funding.¹⁰⁹ In 2018, 25 such centers were selected in tourism, machinery, electrical engineering and computing, agriculture, and healthcare. These are intended to offer both TVET programs to students, continuous education opportunities for workers, training of trainers, and cooperation with the private sector. However, experience from private-public partnerships under the first phase of the S3 (see below) shows that collaborations between education sector and private sector is progressing slowly. There is not enough systematic monitoring and evaluation to ensure timely and effective implementation and accountability for results. Effective collaborations do happen in Croatia, but are not emerging because of an overall reform momentum in the system. Rather, they are driven by the initiative of individual firms or enthusiastic individuals in TVET institutions (Box 2).

Box 2: Bjelin Wood, a Private-Public Partnership in the wood sector

Wood industry has been the main industry sector in Ogulin and the surrounding area. The situation changed after Croatian independence, when most industrial facilities were abandoned and emigration took its toll. However, a tradition of high-quality wood works remained, and Bjelin recognized its potential. They opened a new factory for production of wooden floors and have been expanding over time.

In addition to quality resources, Bjelin needed a skilled workforce. They utilized the comparative advantage and positive reputational effect from woodwork, and willingness of local government, to partner-up with a local TVET school for students to complete part of their education within Bjelin's facilities. The firm provided materials for practical exercises, worked with teachers to develop the curriculum and transfer new technology. They also incentivized students, by providing scholarships, job opportunities, or opportunities to continue their schooling, with particular emphasis on programs complementary with their production. The collaboration has generated a successful flow of students into TVET training and as workers for Bjelin. New IT-based technology used in production is also generating demand for engineers of different profiles.

Source: Interviews.

Croatia is also piloting a program of dual TVET education with the intention of scaling up this approach across the system but is not achieving systemic change. Following the Austria-Germany-Swiss model, the dual model is intended to provide alternating access to workplace-based (in firms) and school-based learning, where training plans ideally are designed in collaboration between firms and education systems. The dual education model is now being rolled out as a pilot in some TVET schools. However, the model is being adopted as complement rather than substitute for the established model, which reduces speed of transition, adds complexity, and lowers resource efficiency and effectiveness. A contributing factor to this layered approach is institutional resistance to changes that would affect staff intensity in TVET institutions.

The higher education sector has limited capacity to provide competencies relevant to the private sector. The provision of higher education remains fragmented, as many institutions offer similar programs. The combination of shrinking student populations and increasing supply of programs is creating inefficiencies and the authorities have recognized a need to consolidate the offer of courses. Education has low signaling value for skills acquired.¹¹⁰ Youth express similar disillusionment with the

¹⁰⁹ Regional competence centers are institutions for vocational education designated by the MSE and focused on skills upgrading of in vocational education. In addition, Croatia provided significant funding to centers of competence (CEKOMs) which are consortia of private companies and research organizations which focus on collaborative research projects, but can also play a role in training and upskilling.

¹¹⁰ Gvozdanić et al. 2019.

higher education system, especially its ability to provide skills needed for labor market success.¹¹¹ Transversal skills including digital skills, communications skills, and entrepreneurial skills are underprioritized in training although they are in high demand. Stakeholders in the skills development system agree that problems of outdated technologies and poorly equipped training facilities are not limited to TVET but also reduce learning outcomes in some HEIs. Programs are skewed toward theoretical knowledge rather than practical application and creative problem solving.

More collaboration with private sector is needed to foster demand-led education. Many factors influence the performance and relevance of higher education system, but institutional rigidity and insufficient collaboration between academia and the business sector have been established as major detriments to developing innovation capacity in Southeast Europe, including Croatia.¹¹² Several initiatives and examples of close and successful collaborations between firms and universities in Croatia are ongoing but as in the TVET case, occur as the result from personal initiative and grit, rather than from a conducive governance and incentive structure. Higher education programs rarely offer opportunities for internships and workplace-based learning where both practical application and workplace skills may be developed, despite the demonstrated effectiveness of such programs. Key informants suggest there is great variation in the quality of training depending on program and institution.

Links between disciplines are underdeveloped. Interdisciplinary collaborations and competencies are rising in importance as a necessary approach to solve complex problems in research and for succeeding in the jobs market of the future.¹¹³ The potential for collaboration transcends the boundaries between technical and natural sciences on the one hand and humanities and social sciences on the other (Box 3). However, higher education programs remain highly compartmentalized and “bundled” within disciplines and as such more inflexible to include elements from outside.

Box 3: Interdisciplinary exchanges in S3: ICT and Cybersecurity

In the modern world, humanities and social sciences disciplines need to incorporate ICT as a tool for both learning and research. Does ICT need humanities and social sciences as well? Two examples are provided below.

Natural language processing (NLP) involves machine learning and other computational methods to analyze texts and speech in natural languages. Beyond programming skills, this requires a good understanding of the structure of language and how words and grammar relate to meaning. Eriksson, a global telecom company present in Croatia has struck up a collaboration with the Humanities Department of Rijeka University, providing an example of “digital humanities.” Through engagement with a faculty member, a collaboration was set up to involve students of linguistics in developing NLP. The collaboration is a positive example of how humanities students could be involved in multidisciplinary teams.

Cybersecurity, an S3 focus area, is another example of strong interdisciplinary connections. Cybersecurity depends as much on insights from psychology research as it does on ICT solutions to identify corporate vulnerabilities—generally in staff—and predict what motivates attackers and how this affects their strategies.

Source: Interviews.

In conclusion, the formal education sector does not provide training based on actual labor market demand. In particular, it does not provide enough applied training to be relevant and is not adapting

¹¹¹ In a survey of Croatia youth, a majority felt that universities do not provide them with skills and qualifications that will help them find jobs (Deloitte 2018).

¹¹² Radanovic and Gerussi 2020.

¹¹³ Bridle et al. 2013.

to the growing need for hybrid skills through interdisciplinary collaborations or more transversal skills training.

Adult learning opportunities

Adults, especially those that are working, have limited opportunities to reskill or upskill. Adult education governed by the public sector involves formal adult education and non-formal programs. The offer covers basic skills (literacy, numeracy, digital literacy), training toward qualification (mid-level skills), and programs facilitating the transition to labor market. Private and public institutions can seek accreditation for delivering training programs. Many providers exist and many of the registered institutions only offer one adult education program. Formal and non-formal training programs that are approved by the MSE to provide recognized qualifications are organized on a full-time basis, much like primary or secondary school. This effectively excludes the employed workforce. Learners also largely pay for their own training, which suggests access may be limited for adults with more severe financing constraints.

ALMPs are focused on those that struggle most to enter or establish themselves on labor markets. The adult training policy agenda is under the responsibility of the Ministry of Labor, Pension System, Family and Social Policy (MLPS)/CES, and the MESD. The CES holds the main responsibility for delivering publicly funded adult training programs, including ALMPs. In Croatia, ALMPs focus on increasing employability of persons not in employment, education, or training (NEETs) by providing them with job experience (mostly) or training (less) (Table 4).

Table 4: Active Labor Market Programs

Active Labor Market Program	Target group
Employment incentives <ul style="list-style-type: none"> • Wage subsidies • Subsidized internship 	<ul style="list-style-type: none"> • Unemployed • New labor market entrants
Upskilling or reskilling <ul style="list-style-type: none"> • Training subsidies 	<ul style="list-style-type: none"> • Employed
Training <ul style="list-style-type: none"> • Training for unemployed (classroom) • Workplace-based training (certification) • Internship (replaced in 2019) 	<ul style="list-style-type: none"> • Unemployed, specific focus on vulnerable people or those unable to attend regular adult education
Direct job creation (public works) <ul style="list-style-type: none"> • Wage subsidies for socially beneficial activities in community or NGO in not-for-profit activities 	<ul style="list-style-type: none"> • Unemployed, specific focus on vulnerable people, especially older people
Income maintenance/job preservation <ul style="list-style-type: none"> • Wage subsidies 	<ul style="list-style-type: none"> • Employed workers in at risk of job losses; focuses on specific industries
Seasonal workers <ul style="list-style-type: none"> • Wage subsidies/income support during low season 	<ul style="list-style-type: none"> • Permanent seasonal workers

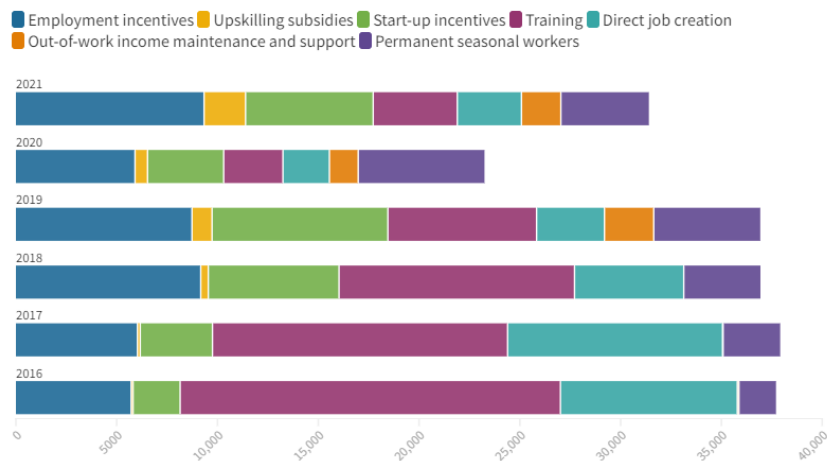
Source: Elaborations based on CES website.

Participation in direct training programs among ALMPs has fallen significantly in the past few years, as have resources allocated to such programs. The drop in training participants is remarkable—from around 20,000 persons in 2016, to around 5,000 in 2021. As seen in Figure 23, the decline in training is a long-term trend and not COVID-19 related. Instead, the number of participants in business start-ups, and employment incentives (wage subsidies, internships), has increased significantly. By 2021, ALMP resources were mostly allocated to employment incentives (wage subsidies, internships) and start-up incentives—the latter include capital transfers and not only skills transfers and as such are more expensive per individual served. The training budget, meanwhile, has collapsed (Figure 24).

There are skills programs for employed persons but participation is low, and resources allocated for improving the skills of employed people are negligible. Employed persons wishing to upgrade their skills or change careers are only marginally catered to by programs under the CES. Training subsidies for employed individuals wishing to upskill or reskill to remain employable were used by about 2000 persons in 2021, set against a labor force of 1.8 million people.¹¹⁴

Figure 23: Fewer participants in training

Number of participants in ALMPs, by program, 2016-2021

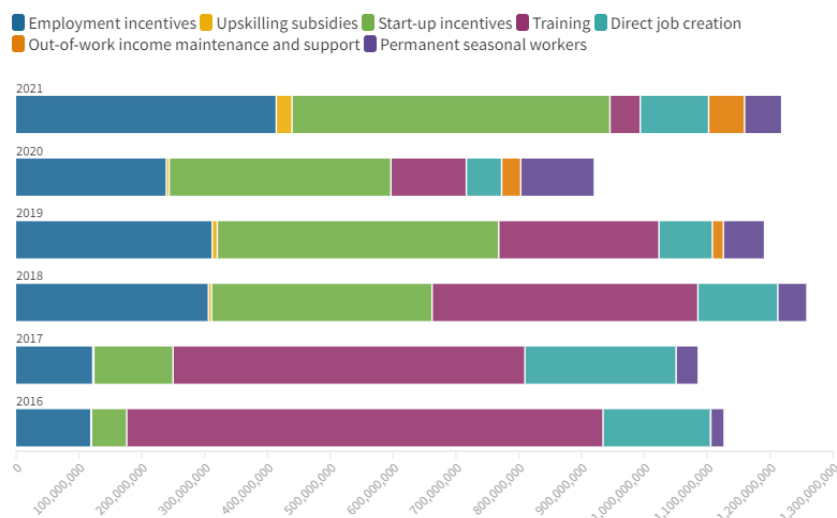


Source: Authors based on CES data.

¹¹⁴ A more detailed description of training and upskilling programs is provided in Annex 3.

Figure 24: Resources to training have been reduced

ALMP funds, by program, 2016-2021



Source: Authors based on CES data.

ALMPs are not systematically evaluated and their effectiveness in creating jobs or skills hence largely unknown. Employment incentive and internships can be considered an indirect form of training (on-the-job training), but the evidence suggests large variations in their impact and that evaluations are needed to gauge effectiveness.¹¹⁵ A study of paid internship programs for unemployed persons showed that effects were nil or even negative.¹¹⁶ Evaluations of the training ALMPs in Croatia suggest these have been among the least effective at increasing employment, and had a negative effect 12 months after program completion.¹¹⁷ International evidence on ALMPs—including on training, job search assistance, wage subsidies, and job creation schemes—suggests that they have, at best, moderate effects on employment and earnings. Outcomes on training programs vary tremendously, reflecting the very varied nature of training offered and the difficulties with capturing quality and relevance.¹¹⁸ Wage subsidies—which can help provide work experience and workplace skills—have also a mixed record in terms of increasing employability.¹¹⁹ This speaks to the importance of careful design, monitoring, and evaluation to identify the most effective approaches for different employment and skills objectives.

Many firms lack the capacity to identify skills needs and training opportunities, find costs prohibitively high, or do not see their workforce as trainable. As shown in section 3, access to training through firms is low in Croatia, except for ICT training. An important reason is the limited capacity to assess the importance of skills development and anticipate future skill needs, or transversal non-technical skills, among smaller and larger firms. Many experts pointed out that managers are focused on day-to-day operations and lack the growth mindset needed to identify future opportunities and the concomitant skill needs and prioritize investment in training; this is perhaps especially the case in

¹¹⁵ Almeida et al. 2014.

¹¹⁶ CES 2020.

¹¹⁷ Taylor et al. 2021.

¹¹⁸ Kluwe et al. 2019, Card et al. 2018.

¹¹⁹ Honorati and Posadas 2019.

SMEs which account for around 70 percent of employment in Croatia.¹²⁰ One reason for low investment in skills upgrading may be the finance constraints faced by SMEs. The cost of training has been a binding constraint for Croatian firms, more so than in most other European countries.¹²¹ Finally, given low levels of education and broad skill gaps, many firms may consider upgrading workforce skills a wasted investment. In Europe's transition countries, including Croatia, firms report that the level of skills of the staff is a constraint to investment in training. The level of firm training is higher in countries with higher shares of tertiary educated.¹²²

Digital Innovation Hubs are intended to assist firms with strengthening skills needed to adopt digital technologies. Digital Innovation Hubs have been established as part of a European network of such hubs, under the Ministry of Economy and Sustainable Development (MESD). These are expected to serve as one-stop shops to assist companies in improving their businesses using digital technologies. Skills development and training provision to help firms meet the challenges of the twin transition to a green and digitally based economy, and encourage entrepreneurial skills are major tenants. Lack of oversight means, however, that information generally is not collected or verified as to the extent of training, to whom, or how it is being delivered.

Adult training, hence, remain limited in Croatia despite the substantial needs for up- and reskilling. This reflects both limited demand among firms and individuals, partly due to lack of information/guidance as well as financing constraints, and limited supply of relevant training with a strong impact on jobs and productivity.

Constraints to skills development: Inertia, information gaps, and incentives

Inertia, incentives, and information gaps limit the potential of the skills development system. Maintaining relevance in a rapidly changing environment requires a responsive and adaptive system for identifying skill needs and providing training. Coordination with key stakeholders, in particular the employer side, is essential to ensure relevance and flexibility. Adequate, high-quality, and timely information is a critical input for stakeholders that make decisions on training, jobs, and investments in a world in rapid transformation. The overall governance system must build in incentives for each set of stakeholders to act in the interest of the overall system.

The skills agenda within S3 has so far focused on resolving information gaps around what skills are needed and on providing coordination, but with limited results. Although the S3 recognized and proposed actions to address important information and coordination constraints related to the skills agenda, implementation progress has been limited. Many activities have not yet been completed; the labor market information system is at an early stage of development and not accessible to the public, and there are no new skills forecasting methods. The digital innovation hubs and centers of competence—the main mechanisms to diffuse technical skills and coordinate training offer with private-sector skill needs—have taken time to establish and have not yet been evaluated against skills development (or other) objectives. The Chamber of Economy is not acting as an interface between policy and firms, and no other entities are stepping up to fill that role. Communication between the public sector agencies and potential public or private training providers on skill needs is inadequate. Moreover, employed adults that wish to upskill or reskill, or enterprises that need to identify new skill needs and find training opportunities for their workforce, have had limited public support.

¹²⁰ European Commission 2019.

¹²¹ Brunello and Wruuck 2020.

¹²² Ibid.

The slow progress reflects a fragmented education and skills system, lack of clear and actionable objectives for the skills agenda, and limited accountability among key stakeholders. The effectiveness of the overall S3 agenda has been marred by lack of clarity on roles and responsibilities and resulting coordination challenges.¹²³ The skills agenda is no exception. The National Council for Development of Human Potential (NCDHP) is officially the main coordination and advisory entity, but the CES is the main implementor in terms of resource allocation for the skills agenda under the NRRP. The TVET agency also holds some responsibility for skills guidance and forecasting and the lifelong-learning agenda. Hierarchy, division of tasks, and coordination mechanisms between these agencies are not well established, which reduces accountability and effectiveness.

The CQF remains the main vehicle for education reform, system coordination, and skills forecasting, but will not be a silver bullet for systemic change. Building on the European model for qualifications frameworks, the CQF is developed to classify qualifications by “skills”: i.e., define what the holder of a certificate or diploma is expected to know, understand, and be able to do. The CQF is both a framework and a process, which starts off by defining competencies needed, involving the private sector through sectoral councils. These define occupational standards that are translated into qualifications and learning outcomes (Figure 25). The CQF process has been inclusive, but has progressed slowly, due to the many stakeholders involved and requirement for consensus building at each sequential step. International experience suggests that, in practice, national qualifications frameworks can be difficult to develop and implement which reduces their efficiency as a skills development tool. Countries with more effective national qualification frameworks have treated the development of frameworks as complementary to, rather than as a substitute for, improving institutional capability or re-shaping institutions, and have clearly defined the role, structure, and processes of stakeholders.¹²⁴ Hence, rather than *delivering* better coordination, the national qualification framework is one of several *outcomes* of better coordination.

Figure 25: Developing Croatia Qualifications Framework



Source: Authors.

The skills development system is rigid, affecting capacity to adapt training offer to changes in demand. Unclear governance and accountability result in significant inertia with different entities waiting for input from others to move forward. Green skills and competencies are a good example, as the CQF process has not assigned responsibility for leading the process of defining green skills. Each set of stakeholders—the private sector, ministries, agencies, educational institutions—is waiting for

¹²³ World Bank 2021b.

¹²⁴ A review of national qualification frameworks in ten middle income countries indicated that at least over the short term, the national qualification frameworks have not delivered fully on the—very high—expectations and had not substantially improved communication between education and training systems and labor markets. Allais 2010.

other entities to articulate needs and provide guidance. The sequential nature of the CQF and its status as the unique coordinating mechanism has cemented this inertia further.

Institutional and regulatory restrictions contribute to slowing down or blocking systemic change. In the formal education and training system incremental changes may be possible, but more profound curricula reform, for example in response to new technologies, is slower. In public HEIs, which make up a majority of the universities, procedures for changing curricula are slow, whereas private institutions have more flexibility. The TVET system requires verification of occupational standards and qualification standards for possible audits at least every five years. This inertia causes problems in establishing networks and efficient communication between included stakeholders.¹²⁵ Since educational programs also remain highly “bundled,” with sets of fixed components, there is little flexibility to adapt them.

S3 skills projects have suffered from significant time lapses in preparation and implementation, and are inflexible once in place. Within the S3 framework, to date, three collaborative umbrella programs between researchers and companies have been implemented or are in progress, with a total budget of almost EUR 129 million. The largest of those programs (Support for development of centers of competence – CEKOMs) aimed to support consortia of private companies and research organizations to conduct research and innovation projects, but also training activities. However, the selection process took almost three years from program start (call publishing date, in 2016) to start of operation (date of contract signing for the first project in the program, in 2019). Once fixed, projects and programs can be modified to changing circumstances but the process to do so is slow and administratively demanding. The slow processes lock in design features from an early stage, raising the risk of lower relevance as skills demand evolves.

The LMIS is underdeveloped, as are monitoring and evaluation practices. An interconnected system combining some basic labor market, social protection, and education data has been developed but is not yet live for the public. As a result, Croatia’s LMIS remains at a basic level, providing only basic information via surveys and national data, and no services aside from job matching.¹²⁶ Individuals lack information about the level and type of skills needed in labor markets, what to expect in terms of conditions of work, or the need to build transversal skills including digital skills or communications skills. Firms lack information on the future of skills in their respective sectors, training available for their workforce, and opportunities for public support for training. Education systems lack information on the kind and level of skills needed to increase employability. There is not sufficient information to monitor and evaluate policy instruments.

Skills needs assessment remains backward-looking. The CQF is considered the main tool for skills forecasting but is by construction a relatively backward-looking mechanism and, given slow development, likely to be outdated. As discussed, the CES and the TVET Agency also undertake skills needs assessment based on the current labor market information. CES reports are delivered once a year and are based on vacancy rates and unemployment. In parallel, the TVET Agency analyses occupations and skills needs with industry representatives and through workplace visits to determine competencies and activities. Both these approaches represent snapshots of current needs and are not forward looking, however. Furthermore, these different activities are not coordinated.

¹²⁵ Radovanovic and Gerussi 2020.

¹²⁶ Sorensen and Mas 2016.

Information from the private sector is underutilized. In addition to the sectoral councils under the CQF, the Chamber of Economy is a main actor for collecting and transferring information between private and public sectors, especially at the local level. Local offices could hold a more active role in coordinating and transferring information from firms to education sector and to local and central policy makers, and to inform private sector of opportunities for training. The Chamber of Economy forms part of several working groups under the skills agenda, follow EU-level initiatives through the EU chamber and form part of some EU projects. Overall, however, they act more as observers than central stakeholder representatives. The situation seems different for the Chamber of Crafts, as they have more proactive role and serve as a mediator between crafts and the Ministry. Most of their actions are initiated by crafts sectors and they interact with line ministries.

Feedback from public or private skills development assessments could be used more effectively to inform education and training programs. The CES undertakes some skill needs analysis, based on information collected by local CES offices in collaboration with the Chambers of Economy or directly with the private sector. There is no evidence these assessments weigh in when designing education programs, however.¹²⁷ The NCDHP may provide recommendations on the direction for education and training, but these are not binding.

Public HEIs enjoy high autonomy but lack incentives to provide attractive education programs that appeal to many students. Programs that are labor market relevant should in principle attract more students. However, public institutions lack strong incentives to design programs and courses that increase enrollment of students, their productivity, or their employability. A minimum number of hours of studies are officially required to retain a program, but this regulation rarely is enforced. The incentives to develop innovative learning components, beyond what is required through curricula, are also limited. For the same reasons, the individual or institution level incentives to increase partnerships through practical training and exchanges with the private sector are limited. Investments in laboratories and machinery, for example, are expensive, and collaborations with the private sector—either through investments in workshops, or through internships—could help, but are not happening. Studies also show that commercialization of collaborative work is almost non-existent, due to resistance to change, insufficient science industry cooperation, and lack of entrepreneurialism in the higher education sectors.¹²⁸

Professional interchange between research and business could increase the relevance of training and research, and increase the use of research results in the business sector. As instructors, private-sector representatives can bring a current, market-driven, and applied perspective to education and provide role models. However, arrangements involving outside expertise are rare in Croatia and not institutionalized—where they occur, they are, as elsewhere, a result of personal initiative. A person without academic credentials cannot develop a program or lead a unit in strictly academic programs, although they may lead vocational programs at post-secondary levels. Conversely, in the medicine field, professors often share their time between research and active work in hospitals. This natural continued exposure to practice is rare in other disciplines and professors and teachers do not, in general, spend time in practice.

¹²⁷ World Bank 2021a.

¹²⁸ Svarc and Dabic 2019.

4.3 Skills development strategies going forward

Skills take a more prominent role in more recent development strategies. The NDS 2030 sets the long-term goals for the skills agenda recognizing the need for quality assurance and management; these have been operationalized in the NRRP. The overarching objectives of the NRRP are to foster resilience and competitiveness through green and digital transitions, with particular emphasis on environmental and sustainability objectives. In terms of skill objectives, the NRRP goes beyond closing skills information gaps and puts more emphasis on stimulating training through different initiatives.

Education system reform will be focused on raising quality of training by preparing students for lifelong learning, increasing the relevance of skills, and supporting digital transformation. Basic education is set to focus on digitalization and providing the skills necessary for a modern economy. Vocational programs will be consolidated and become more modular, with increased emphasis on work-based learning, and on supporting the green and digital transition. In the higher education sector, more emphasis will be placed on ICT as a learning tool, as a transversal competence, and as a sector (e.g., by increasing STEM programs). HEIs will be encouraged to develop shorter programs that help upskilling and reskilling for both actual and future workers, including for green and digital skills. Programs are also planned for connecting young researchers (especially in STEM) with private-sector needs.

For adult education, traditional ALMPs, with a new voucher scheme, will remain the main public policy instrument. Programs are largely unchanged with the overarching objective to orient them toward green and digital transition. Under the NRRP, the CES will continue to provide (i) employment support (wage subsidies) (ii) work-based learning—apprenticeships and (iii) self-employment support; for a total budget of 1.1 billion HRK, corresponding to approximately 150 million EUR. These measures come with a training voucher for green and digital skills, for a budget of some 300 million HRK (40 million EUR). The voucher system allows individuals to identify training needs, suitable training, and accredited providers. The CES will approve the training with respect to two objectives: fostering transitions with green skills (70 percent of total) and digital skills (30 percent of total training), and reaching vulnerable populations (40 percent of total beneficiaries). The voucher is expected to bring significant flexibility to training offer compared to the current system where training courses must be identified and procured by the CES. The voucher system will serve as a pilot for later expansion toward other types of (transversal) skills including soft skills. The vouchers also constitute a first step toward developing individual learning accounts, whereby individuals are given funds over their lifetime to pay for trainings of their choice and training rights are delinked from employment or job status.

Skills policy remains targeted to inclusion objectives. Between 2021 and 2026, some 26,400 persons are planned to be included in the standard ALMP measures in 2021, with special attention to bringing in long-term unemployed and vulnerable groups, defined as persons with disabilities, victims of violence, homeless people, migrants, Roma, inactive young people, or people over the age of 50, especially women. The voucher is targeting an additional 30,000 persons, both employed and unemployed. The voucher scheme is also partially reserved for vulnerable groups, who should make up two in five participants. Hence, the major share of the training budget is allocated to the unemployed rather than the employed, and within the category of unemployed, to those facing most difficulties in labor markets.

Employed people wishing to upskill or reskill in response to changing labor market requirements have little access to public support. Raising skills for vulnerable people is important from the perspective of inclusion. Subsidizing training for low-income groups (who are also more likely to

underinvest in training) often represents most efficient use of funds as it is more likely to increase training (and hence skills) that otherwise would not have taken place, rather than replacing private with public funding.¹²⁹ However, Croatia’s need for upskilling will exceed the number of unemployed people or new graduates. Reskilling and upskilling of the workforce, where incremental and small skill upgrades may be low-hanging fruits for increasing skills, is also essential, but not sufficiently prioritized.

The individual voucher, with a value of 1,300 Euros, will support the acquisition of micro-credentials.

The EU skills agenda recognizes the need for such alternative credentials, as a way of allowing individuals to build their own skill profile by accumulating learning in flexible ways.¹³⁰ However, investment in education and training is cumulative, and micro-credentials cannot be expected to resolve skills problems related to overall low levels of training and education—which may be the case for a large share of the vulnerable unemployed. This is perhaps especially the case for green skills where skill needs for low-skill occupations are likely to be very generic (environmental awareness; simple adaptations to work procedures) and possibly not sufficient to improve job prospects. There is not yet sufficient research on micro-credentials as a main form of training, but a recent study of micro-credentials in the “gig-economy” suggests that micro-credentials can improve labor market outcomes, but do not necessarily represent skills upgrading.¹³¹ The voucher program under CES can be used and co-financed with private-sector participation. Interviewees suggested that firms are often not aware of public training opportunities via CES, including the voucher, however.

Firm-level initiatives are focused on increasing management capacity, information services, and digitalization of firms.

Coordination problems in the SME sector will be addressed through business support organizations capacitated to provide information services to SMEs. Resources are also allocated to a voucher program for digital skills upgrading in firms, and to raising managerial capacities in SMEs. There is no broader support program for skills upgrading, however. This is likely underplaying the role of employers in identifying and supporting skills development: across Europe, firms finance around 90 percent of job-related education and training.¹³²

In sum, resources allocated to the upskilling agenda are largely focused on individuals (rather than firms), and on those with larger and more challenging reskilling needs.

Efforts to increase human capital in the vulnerable population are important to ensure activation but will not meet the overarching upskilling needs of a modern economy striving for smart specialization. Resources earmarked for SMEs skills amount to a few percent of the total budget, whereas resources for employed workforce amount to about 20 percent (Table 5).

¹²⁹ Referred to as “deadweight loss”. See OECD 2019a.

¹³⁰ European Commission 2021.

¹³¹ Kässi and Lehdonvirta 2021 show that micro-credentials do increase earnings, especially for workers with some, but limited, experience, but that they do so by reducing employer uncertainty (signalling ability) but not by increasing actual productivity

¹³² Brunello and Wruuck 2020.

Table 5: Overview of initiatives related to skills for lifelong-learning

Program	Type of support	Budget (HRK million)
SMEs: Investing in the management capacity of SMEs	Coaching, training	30.0
SMEs: Business Services for SMEs through Business Support Organizations	Information services	22.8
ALL firms: Business Organizations Network Development (BOND)"	Coaching/coordination	50.0
Voucher for improvement of workforce digital skills	Digital skills training	14.5
Firms TOTAL		124.5
Of which SMEs only		52.5
NEETS: Training, skills upgrading Internship subsidy Employment subsidy	Training, work placement for NEETs, in digital and green	1,100
ALL: Voucher for skills upgrading	Digital and green	300
Individuals TOTAL		1,400

Source: NRRP.

5 Conclusions and recommendations

Key Messages

- Coordination and responsiveness of the skills development system should improve in order to create systemic conditions for producing relevant and high-quality skills. The main priorities are strengthening skills development governance, M&E, raising awareness among stakeholders, accelerating the development of the labor market information system, and building capacity for skills forecasting.
- The relevance of formal education for skills should be enhanced by continuing with basic education reforms, introducing more applied approaches in the curriculum at all levels, raising transversal skills beyond digital competencies, and accelerating the transition to dual programs in TVET. An internship program in S3 areas could be introduced to raise applied, workplace, and problem-solving skills among new graduates.
- Croatia needs to allocate more resources toward adult skills development. It can pilot the development of such programs in higher education, increase training programs in ALMPs and expand financial support for skills upgrading over the life-cycle. Programs that target training for the employed workforce should receive higher priority with initiatives addressed at both individuals and SMEs.

More and better skills are at the core of Croatia's efforts to rebuild its economy in the post-pandemic world and advance on the smart specialization agenda. The negative impact of COVID-19 and continued international instability, have raised the stakes for building back Croatia into a more sustainable and competitive economy. These difficulties add on to long-standing structural challenges, including the need to raise living standards to those of EU peers, reduce regional and socioeconomic disparities, and increase welfare levels despite a rapidly aging population. The smart specialization agenda aims to address these challenges by supporting Croatia's transition to a knowledge-based economy, fostering diversification toward higher-productivity activities, and increasing productivity levels across economic sectors.

Croatia's skills policy could be strengthened to better support S3 objectives, with more emphasis on demand-led education and training and collaborative approaches to skills development and lifelong learning. Globally, trends point to increased demand for deep specialized skills, hybrid (interdisciplinary) competencies, digital capacity at different levels, and transversal non-technical skills that are complementary technology. The diversity of S3 sectors implies that both advanced university and mid-level sector-specific technical competencies will be needed, but transversal skills will also be increasingly important. Policy needs to encourage the development of such skills by stimulating adequate training offer and ensure that continued skills development is available, attractive and encouraged over the life cycle.

5.1 Conclusions: the missing S for skills in the S3

Skills are the core of the knowledge-based economy and will be central to achieving the green and digital transition set out in Croatia's NRRP. The problems related to quality and relevance of training systems and the value of establishing strong skills development systems, are well recognized across stakeholders in Croatia. Yet, until recently, skills have received limited attention in design and

implementation of Croatia's S3 policy and other national development strategies. Initiatives have been scattered across different policy areas and have largely focused on closing information gaps and establishing stakeholder coordination. Implementation has been somewhat piecemeal and progress slow, moreover. For example, significant resources have been allocated to encourage educational institutions and firms to foster excellence in education and research and engage in private-public partnerships to increase innovation and improve skill levels. Joint projects have taken time to take-off, however, and it remains unclear what their achievements in terms of skills or innovation have been or can be expected to be.

Global and national trends show that skills needs are changing rapidly, adding pressures for reforms.

Global megatrends including technological change, globalization, climate change and the COVID-19 pandemic, are rapidly changing the nature of work, transforming skills needs and the speed at which they change. Layered over Croatia's specific challenges, these trends call for a broad but flexible skills agenda anchored in lifelong learning and addressing a wide spectrum of skill needs. Whereas S3 is a strategic and selective approach to economic development, the underlying skills agenda is by necessity wider to encompass foundations of learning and transversal and transferable skills.

An effective skills agenda needs to foster both transversal and specialized skills. To meet the specific needs of S3 sectors, education and training systems need to develop specialized skills through advanced academic studies in some areas, but also mid-level skills that will be relevant for sectors such as transportation, wood, and even the ICT sector. Globally, digital skills are becoming an entry-level requirement for jobs and specialized digital skills are a pathway to better jobs. Green skills and jobs are growing across different sectors including those related to Croatia's S3 strategy, such as health, construction, transportation, and manufacturing. Employers in Croatia align with employers across the world in placing significant emphasis on socio-emotional skills including business mindsets, leadership skills, communication, and collaborative skills.

The shrinking and aging population implies that upskilling and reskilling efforts will need a strong lifelong learning agenda to involve the entire population- "the stock of skills"—and not only youth—"the inflow of skills." To build skills foundations and facilitate continued upgrading, skills policy must permeate all ages, from early childhood through school age and university years, for jobless as well as the employed, and throughout adulthood and working age. Investment in skills development in early years is most cost-effective—skills beget skills—but takes many years to bear fruit, whereas global skills demand changes rapidly. With shrinking youth populations, moreover, the flow of skills into labor markets will be too low to close skill gaps. New skills must also be continuously developed in the stock of adults (working and not working).

So far, neither the level nor the pace of change of skills has been sufficient to foster knowledge-based growth in Croatia. Basic functional competencies developed in school need strengthening. Too many students pass through TVET programs with unsatisfactory learning and labor market outcomes. The share of tertiary-educated persons remains low compared to EU peers and the requirements of a modern economy. Once out of formal education, adults have little access to further training. There is also evidence that skills produced in the education system lack relevance: employers generally find that workforce skills are insufficient in number and quality. A vibrant ICT sector and high levels of digital talent among youth co-exist with overall low level of digital skills. Green talent appears to be expanding, but at a slower pace than in many other EU countries. Managerial skills—including those related to workforce development—are lagging advanced economies. Skills are also out-migrating in relatively high numbers, not least skills related to S3 sectors.

Weak links between the private sector and education system, as well as within the education system, are holding back demand-driven education. The absence of private sector input (through contributions to curricula or physical infrastructure and learning materials, apprenticeships/internships, collaborative projects, or participation of private-sector experts as lecturers) results in a lack of practical, applied experience and transversal skills among graduates from the TVET and higher education systems. Interdisciplinary collaborations to foster transdisciplinary education and training programs or facilitate interdisciplinary exchanges—in line with growing need for hybrid skills—are also underdeveloped.

The lifelong learning agenda, in particular adult training, needs to develop into a more comprehensive strategy encompassing the entire population, employed and unemployed. Training programs as active labor market programs under the CES have been the main policy vehicle for the lifelong learning agenda. However, as ALMPs, their main objective has been inclusion and as such have focused on those further from the labor market. Participation in training under ALMPs has also fallen in recent years, giving way to other forms of support to labor market activation. Meanwhile, limited options and resources have been provided for the employed workforce to upgrade their skills.

System inertia, information gaps and lack of incentives are critical obstacles to moving ahead on the skills agenda. Limited achievements show that the current skills development system is not sufficiently able to alleviate key constraints, due to slow decision-making processes, lack of communication channels, unclear division of responsibilities, and lack of accountability. The CQF is intended to serve as the main coordinating mechanism and information source, but is by construction a multistep and sequential process and as such slow. A skills forecasting tool has yet to be established, and the labor market information system is only nascent.

In the NRRP, the main skills upgrading instrument for the entire adult population will be a pilot voucher program under the CES, supporting acquisition of micro-credentials. The program potential faces limitations, however. First, there is no clear identification of strategic skills, beyond “digital and green” at an aggregate level, and green skills are not well defined. The low monetary value of the voucher also suggests only very incremental upskilling can be supported. The number of eligible training providers is limited. Finally, knowledge and interest from the private sector appears so far limited. More generally, the voucher program, as ALMPs in general, are likely to struggle with meeting two different objectives: inclusion of those furthest from the labor market, and general upskilling of the workforce to support the digital and green transition toward higher productivity.

5.2 Policy recommendations to strengthen the provision of smart skills

Skills are now high on Croatia’s policy agenda, but the speed, range, and depth of reforms needs to increase to close the gaps. Croatian policy makers and other stakeholders concur on the need to raise skill levels to achieve smart specialization and other development goals. There is general agreement on the diagnosis spelled out above. To some extent, appropriate policy solutions have also been identified: fostering private-public sector and university-firm collaborations to increase the relevance of training, involving employers in formulating the skills agenda, strengthening labor market information, and providing financial incentives to individuals to stimulate training uptake. Yet, the report shows that skills policy remains fragmented, information and awareness about skill needs is limited, and the effectiveness of past initiatives—especially those aiming to link education and the private sector—is unknown. Reskilling and upskilling options for adults are limited. Systemic inertia due to slow decision-making procedures and lack of information and incentives to change from the status quo is holding back Croatia’s potential. To address skill gaps, Croatia needs to substantially

strengthen education and training systems and address training needs from a short- and long-term perspective.

Policy recommendations are organized into three interconnected areas. Table 6 summarizes findings on skill and systemic gaps, existing policy initiatives, and additional recommendations emanating from the analysis to close policy gaps. The analysis is separated into three (albeit strongly connected) goals:

- (i) A **well-governed skills development system** ensuring strong coordination across stakeholders and access to information and guidance, providing strategic direction and quality assurance, including information systems and M&E frameworks that provide individuals, firms, policy makers, and other stakeholders with up-to-date relevant information for skills investments and policy direction;
- (ii) A **relevant formal education and training system** where young people are equipped with strong foundational skills, and progress throughout education systems acquiring specialized and transversal cognitive, socio-emotional, and technical skills relevant for the labor market, thus reducing skill gaps;
- (iii) **An expanded lifelong learning system** where adults can identify and access opportunities for relevant upskilling throughout their working lives and firms can identify and provide opportunities for relevant upskilling of their workforce, through formal education and other training options.

Table 6: Croatia skills development: gaps, policy, potential complementary reforms

Key skill gaps	Proposed policy framework	Recommendations
Skills system governance: A responsive skills development system providing strategic and labor-market-relevant skills;		
Information systems, including M&E, provide individuals, firms, policy makers, and other stakeholders with up-to-date relevant information for skills investments		
<ul style="list-style-type: none"> ● Unclear governance and accountability structure ● Insufficient monitoring and evaluation ● Slow progress on skills reforms under S3, especially Private-Public Partnerships ● Limited information on skills needs (e.g., green skills, skills forecasting) ● Limited knowledge of the skills agenda among stakeholders ● 	<ul style="list-style-type: none"> ● Skills agenda involves different ministries, CES, and NCDHP ● CQF remains central mechanism for coordination and skills forecasting ● BOND network of business support organizations strengthened role for coaching/coordination of skills initiatives ● Business support organizations strengthened role for information dissemination ● LMIS portal under preparation ● 	<ul style="list-style-type: none"> ● Clarify roles, responsibilities, authority, and accountability between actors and step-up M&E ● Targeted information campaigns <ul style="list-style-type: none"> ○ Importance of skills upgrading ○ Skills in demand ○ Options and opportunities for upgrading ● Accelerate LMIS development and complement CQF with other sources of information including real-time data ● Develop skills forecasting method according to best practice
Education sector: Young people are equipped with strong foundational skills from early years;		
Youth graduate from TVET and university equipped with specialized and transversal skills relevant for firms		
<ul style="list-style-type: none"> ● Insufficient foundational skills, including STEM; equity concerns ● Lack of S3 skills <ul style="list-style-type: none"> ○ Including mid-level digital skills ● Limited workplace skills and applied knowledge: <ul style="list-style-type: none"> ○ Limited interface between private sector-education ○ PPPs in education/innovation have not taken off ● Insufficient transdisciplinary skills <ul style="list-style-type: none"> ○ Low transdisciplinary offer and exchange 	<ul style="list-style-type: none"> ● School reform: learning outcome-based curricula, single-shift schools, digital skills ● TVET dual training reform piloted ● Ongoing PPPs, especially competence centers ● Development of new/ increase of the existing programs with digital components (such as STEM) 	<ul style="list-style-type: none"> ● Continue and deepen reforms in basic education ● Increase applied content and development of transversal skills beyond digital competencies ● Accelerate transition to dual programs in TVET by replacing traditional programs ● Strengthen accountability and incentives in HEIs and TVET institutions with respect to labor market relevance ● Evaluate competence centers from skills perspective and strengthen accordingly ● Support development of shorter academic programs (IT, other) responding to S3 and other needs ● Pilot development of programs in HE: <ul style="list-style-type: none"> ○ Comprehensive internship experience

Key skill gaps	Proposed policy framework	Recommendations
		<ul style="list-style-type: none"> ○ Project-based education ○ Interdisciplinary programs
Lifelong learning: Adult population can identify and access opportunities for skill upgrading throughout their working lives; firms can identify and provide opportunities for relevant upskilling of their workforce		
<ul style="list-style-type: none"> ● Lack of S3 skills ● Limited key transformative skills <ul style="list-style-type: none"> ○ Digital skills ○ Green skills ○ Soft skills ○ Managerial skills ● Limited participation in training among adults and SMEs due to lack of information, low affordability and limited training supply 	<ul style="list-style-type: none"> ● HEI to develop shorter programs for adults ● Most skills development resources allocated to ALMPs, focused on digital and green skills ● Voucher program for individuals' upskilling and reskilling directed at employed and NEETs ● SME managerial upskilling program ● Voucher for digital skills upgrading in firms 	<ul style="list-style-type: none"> ● Allocate more resources toward adult learning skills upgrading ● Pilot development of programs in HE <ul style="list-style-type: none"> ○ Modular short programs for adults in strategic sectors ● Evaluate and increase training programs through ALMPs ● Allocate more resources toward training for employed workforce ● Earmark specific resources for tailor-made training programs toward <ul style="list-style-type: none"> ○ older workers, including for digital and green skills ○ low-skill individuals, especially in S3 sectors ● Strengthen strategic direction of voucher program ● Develop programs supporting general skills upgrading for firms, especially in SMEs

System Governance towards more coordination, information and effectiveness

Croatia needs to strengthen skills development governance. Strategic leadership and clear accountability are needed to address coordination and information constraints.

Clarifying roles, responsibilities and accountability mechanisms is essential to move toward more effective implementation, increased flexibility, and system coordination and oversight. The public sector is responsible for ensuring quality, efficiency and equity in skills development. The NCDHP or a similar structure could play a stronger role in coordination, strategic direction and oversight. Consistent application of monitoring and evaluation tools that focus on outcomes (skills, innovative capacity, productivity) rather than outputs (projects) are also needed to increase the speed of reform and help policy makers assess next steps. Several Asian “tigers” provide examples of highly strategic and successful skills development systems where independent public agencies (“apex agencies”) have held central role in closing current skills gaps and create skills for the future (Box 4). To work effectively, central agencies require significant administrative capacity and leadership skills.

Box 4: Skills Development Governance Models: Lead Agencies

In the Republic of Korea, Singapore and Taiwan, so called “apex agencies” have played a significant role in fostering labor market relevant and strategic skills development. They coordinate skills development with other apex level leaders in government, industry, training providers and research institutions. Such agencies have invited employers to participate in identifying priorities, designing programs and curricula, providing inputs and internship opportunities, and have established strict monitoring and quality criteria. Well-design agencies work closely with employers, have authority over funding decisions, and are responsible for oversight (but not direct provision) of training.

Source: Glick et al. 2015, World Bank 2013.

Targeted information campaigns on skills and skills policy would help stakeholders make informed decisions on training. One reason for low investment in training among firms and individuals is that key stakeholders including training providers, employers, and individuals, lack information on the importance of investing in skills, and on the opportunities to do so. Knowledge around skills demand, available information, and available options for reskilling and upskilling appears to be low. As an example, a coherent understanding of what “green skills” are, and their importance for Croatia, will be necessary to target such skills. Encouraging the uptake of training requires considerably raising awareness about the urgency of the skills agenda, explaining emerging skill needs (including smart skills), and strengthening information around public interventions such as vouchers or subsidies directed at firms. Information campaigns highlighting returns to skills investment can be very effective in influencing education and training choices, and/ but that vulnerable groups need specific targeting to become involved. In other countries, social partners have approached stakeholders that typically underinvest in skills (SMEs, lower-skill workers), providing information on the benefits of, and options for, skills development.¹³³

The development of Croatia’s skills and labor market information system needs to accelerate and provide a complement to the CQF. The CQF is one valuable tool to coordinate stakeholders and connect labor market needs with educational standards, but it is not sufficient for coordinating policy development and implementation, or for providing information on labor market flows and skills

¹³³ OECD 2019b.

demand. Croatia can learn from other countries and sub-national governments in developing a more advanced LMIS that can attract more users with tailored services and high-quality data. Again, the Republic of Korea may provide a useful model for an advanced LMIS. For the short-term, activities to build the LMIS could focus on comparatively low-hanging fruits such as mapping existing sources of data on the labor market, economic development, and policy; establishing institutional arrangements with public and private stakeholders to provide information and input to the system; moving ahead on system interoperability, career guidance services, evaluation and monitoring; and attracting more users with targeted information.¹³⁴

Box 5 Key features of an advanced LMIS

Korea’s labor market information system is an advanced LMIS playing a key role in skills development. The LMIS provides highly relevant, reliable and comprehensive information, including analysis, based on efficient technology solutions, strong links to client needs, and stakeholder coordination.

An online platform is the central feature and provides key functions such as (i) job matching (ii) (b) information on skills available in the workforce, (c) current and future jobs and skills in demand, (d) education and training sought by employers for different careers, jobs, and skills, (e) measures to evaluate personal fit to specific careers and (f) support from the government for acquiring skills through different measures.

Korea’s LMIS is underpinned by strong institutional arrangements involving the private sector, central and local governments, and incorporates labor market data together with information from other relevant online systems such as social security and education and training networks.

Source: World Bank 2021c.

Strengthening Croatia’s LMIS also involves building capacity for skills forecasting. Skills forecasting tools are critical to identify potential imbalances in terms of sectors, occupations, qualifications, and skills and guide policy makers, education and training systems, firms, and individuals. Good practice involves combining quantitative and qualitative methods and continuously updating the model (Table 7). Success also depends on a network of engaged producers and users of the results and ultimately improve the precision of the LMIS and the model with more users.¹³⁵

Table 7: Methods and approaches used in forecasts

Quantitative methods	Qualitative methods
Mechanistic/extrapolative techniques	Expert opinion/consultations
More complex time series models	Case studies
Behavioral/econometric models	Focus groups
Survey of employer’s opinions	Holistic modeling approaches
Skills audits	Scenario planning

Source: ETF 2017.

¹³⁴ World Bank 2021c.

¹³⁵ ETF 2017.

Education sector – raising the level and relevance of skills

The education sector, from basic education and including higher education, needs to address the quality and relevance constraints that reduce the value of education and training. Applied approaches and more coordination and collaboration with the private sector and within education systems is needed.

Croatia needs to press ahead on reforms of the basic education system to strengthen basic skills development and close equity gaps. Early investment in skills pays off the most because cognitive skills are formed early, and because education investment is cumulative. Basic literacy, numeracy, and digital skills are essential assets to pursue further training, whether vocational or academic. Addressing inequity in opportunity is critical as equity gaps are difficult to reverse in later ages. Ongoing initiatives involve curricula reform, single-shift schools, emphasis on digital and other transversal skills, and fostering more effective learning environments.

Learning should include more exposure to practical content and development of transversal skills in demand across education sectors, from basic education until higher education. Applying techniques and knowledge in practice and developing collaborative, entrepreneurial, and other important transversal skills early in education is important to develop awareness and hone such skills. The approach by STEMI, a tech start-up collaborating with elementary and secondary schools, provides a good example of how to bring in technology and transversal skills into education and build private-public partnerships (Box 6).

Box 6: Bringing STEM industry to schools—the STEMI approach

STEMI is a tech start-up providing STEM education solutions to school, with the primary market in the US. The program has been rolled out in different regions of Croatia. Unlike in the US, where this is a for profit business, activities in Croatia are undertaken on a cost recovery basis and draw on partnerships with companies.

The business idea is based on the recognition that feedback loops from industry to education were slow, and that a bottom-up approach would be needed. The company brings in technology, practical learning, and knowledge from industry into school classrooms, starting in elementary schools. Students are given material, instructions and online support to develop AI solutions or work on projects in robotics.

The training focuses on interdisciplinary and transversal (collaborative) skills, problem solving, entrepreneurial mindsets, and internationalization, by fostering interactions with teams across the world. The STEMI program also connects schools with NGOs to solve local community problems and draws on industry collaborations to have engineers participate in motivational lectures.

Source: Interviews.

The transition to dual programs in TVET needs to accelerate. The importance of practical and firm-based experience for TVET programs is well acknowledged in Croatia. A dual TVET program model is being implemented, but is an illustrative example of incomplete reforms due to systemic resistance: rather than replacing the old, classroom-based model, dual programs are rolled out in parallel with traditional programs. This impedes the transition to a modern and labor market relevant TVET and goes against Croatia's objectives of rationalizing TVET programs to meet demand.

The incentive system and accountability of higher education institutions needs to be better realigned with skill reforms agenda. Actors in the higher education system are not accountable for

program relevance and lack incentives to adapt training and involve industry. As in many other countries, outcomes in terms of PPPs are not monitored.¹³⁶ Consistent monitoring and evaluation incorporating basic indicators such as enrollment of students in different fields, or number of collaborative projects, and surveys of labor market outcomes of students and relevance for the private sector, would provide a basis for more informed decisions, including resource allocation. Ear-marked resources could then be targeted to programs with stronger demonstrated success in meeting skill needs or that target future skills requirements.

There is a critical need to evaluate the outcomes from the various centers of competence against their objectives of linking private sector and TVET/higher education institutions. Regional centers of competence have been devised as a central mechanism for skills-based public-private partnerships in Croatia. Little is known about the extent to which they fulfill their role in linking industry with education, and in providing skills upgrading to firms, however. Evaluations are needed, that go beyond monitoring indicators (firms involved, projects developed), to provide qualitative insights into the type of collaborations achieved against Croatia’s skills agenda, and collect lessons learned from all stakeholders on achievements, obstacles, and areas for improvement.

Flexible shorter academic programs for students in some disciplines with high demand, especially ICT, could help close skill gaps over the short term. Although there will be a need for very specialized ICT competencies to advance research and innovation, much of market demand for ICT competencies can be covered with shorter trainings than are currently available. There are high opportunity costs for students to enroll in many years of training rather than learning basic programming on their own.

MSE could also foster the development of shorter programs in HEIs targeted at adults with medium skills or higher skills. Reskilling needs are significant and will not least apply to the workforce with mid-level skills and higher-level skills. Adults—whether working, unemployed, or inactive—often face significant constraints, financial, time, psychosocial or otherwise, that prevent them from returning to formal education systems. Micro-credentials (discussed below) can help address more substantial reskilling needs if they are integrated in a coordinated system where credentials are recognized across institutions and micro-credential programs form part of a set of “stackable” qualifications that can lead to formal education diploma, over and above short-term certificates and “nano-degrees.” HEIs should be encouraged to develop modular programs that can help people change career while lowering their opportunity costs.

Regulations and practices should be revised to encourage the participation of “experts in practice” in higher education and TVET. Beyond guest lecturers, there are limitations to involving private sector representatives in educational programs. It is impossible for a person without academic credentials to develop a program or lead a unit in academic programs. Croatia could look at the example of Japan’s VET system, where industry professionals with relevant experience can acquire a special or temporary teacher license, where requirements for license is waived for part-time lecturers, and where a subject related degree can be complemented with teaching related credit for a teacher’s license.¹³⁷

Specifically, to increase work-based experience in higher education, MSE could pilot the development of programs that provide comprehensive internship experience in S3 areas. Higher education programs with organized internship programs exist in Croatia but are not commonplace. There appears to be little coordination or guidance around how to design, implement and evaluate

¹³⁶ OECD 2019c.

¹³⁷ OECD 2021b.

internship programs (length, remuneration, roles and responsibilities among partners, etc.). International evidence shows that providing such practical experience during university education develops technical and especially transversal skills, including entrepreneurial skills, and that these programs bring significant benefits for students, firms, and HEIs. All else equal, internships, and especially longer ones, significantly increase employability and wages and reduce skill mismatches. This positive relationship holds as much for more generalist academic fields as for vocational higher education.¹³⁸ Such programs also help universities build connections with the private sector and broader community.¹³⁹ There is also some evidence that programs providing paid internships are more successful than unpaid internships.¹⁴⁰ These programs can be costly to develop, however, especially when no strong links to private sector exist a priori.¹⁴¹ This may motivate allocating additional public resources to developing programs and identify cost-sharing modalities with the private sector. The program could, for example, focus on increasing applied skills in S3 areas, as well as workplace and problem-solving skills.

Project-based education is potentially another promising format to increase the level of higher education graduates' readiness to work. Traditional learning environments cannot foster either important higher-order skills such as cognitive knowledge and professional skills, or transversal skills such as problem solving and teamwork.¹⁴² Students' participation in a real problem-solving environment strengthen these abilities. Empirical studies find that project-based education increases students' academic achievements¹⁴³ and skills, in STEM particularly.¹⁴⁴ Still, project-based learning is largely missing from the higher education curriculum worldwide¹⁴⁵ and anecdotal evidence shows that the practice exists in Croatia, but as an exception rather than mainstreamed. There are some private-sector initiatives such as case study competitions organized by leading Croatian firms (JGL and Končar, among others), but there is a scope for these initiatives to be more institutionalized (Box 7). For education to be project-based, the approach must occupy a central place in the curriculum.¹⁴⁶

Box 7: Project-based learning in pharmaceuticals: JGL

In 2015, JGL started a Case Study competition, with the aim to bring students closer to the practice in the pharmaceutical industry. Tasks within their case study are embedded in the real-life context and are multidisciplinary, which are the key elements of project-based learning. Students are given an opportunity to choose a topic for case study that is the area of their interest, which is another important aspect.

Their work is a good signal for a company regarding a student's abilities in the light of prospective employment within a company. Recognizing that, the most successful applicants can do a paid internship in the summer months for two years, after which they can work with the company.

¹³⁸ Bolli et al. 2021.

¹³⁹ Atfield et al. 2021.

¹⁴⁰ O'Higgins and Pinedo 2018.

¹⁴¹ Atfield et al. 2021.

¹⁴² Guo et al. 2020.

¹⁴³ Chen and Yang 2019.

¹⁴⁴ Ralph 2016; Wu et al. 2018. Mills and Tregust (2003) provide a review of good examples of project-based learning in engineering.

¹⁴⁵ Lee et al. 2014.

¹⁴⁶ Thomas 2000.

Source: interviews.

Policy should foster the development of interdisciplinary programs and interdisciplinary exchanges in S3 areas. First, this would increase the level and relevance of skills where strong synergies exist between fields of study: psychology skill needs in cybersecurity sector and the study of languages in ICT are but two examples. In the EU, the Bologna reform process has contributed to the development of interdisciplinary programs (albeit largely at graduate level). Beyond interdisciplinary fields of study, it would also be important to foster interdisciplinary exchanges, with a few modules in other disciplines incorporated in the field of study—entrepreneurship training, for example, could be provided as such a module. In coordination with the private sector, the MSE could begin with priority sectors where synergies are obvious or fields where student labor market outcomes are less strong despite skills gaps.

Lifelong learning – expanding quality training options

Resources are needed to increase lifelong access to learning opportunities. Policy needs to address potential financing constraints and help foster quality training options, as well as increase information to support training (discussed above). Labor market equity and inclusion should remain an important focus, not least as Croatia's aging population implies that everybody will need to contribute to the pool of skills.

As discussed above, strategic direction should be given to support HEIs piloting modular formal training programs, especially in S3 sectors. The development of shorter academic programs envisaged in the NRRP could include a strategic focus based on skills demand in S3 areas. These programs should include options for adults who have left formal education but are looking for reskilling or upskilling options.

The CES managed voucher program will need to be complemented with more opportunities to address skill gaps. Going forward, the main instrument for adult training is the voucher program under the CES, supporting micro-upgrading of green and digital skills and with a focus on vulnerable groups. So far, international evidence suggests that micro-credentials are not (yet) substitutes for post-secondary education, but complementary to higher levels of education. The voucher intervention needs to be complemented (or expanded) with more opportunities to address the growing skill gap, however, including by increasing options for the employed workforce.

Outreach activities will be essential. Reaching more vulnerable groups will also need specific efforts to sensitize the population and assist them in identifying training needs. Experience shows that individual learning accounts, vouchers, and similar individual incentives are more intensively used by those with higher levels of education. To reach other groups, including lower skilled or older adults, comprehensive and multipronged support, including on life skills and motivation, is often needed.

Training programs under ALMPs should be carefully expanded. The recent decline in participation in training programs under the CES is not helping Croatia strengthen skills. Because little is known about the effectiveness of existing training programs, a first step would be to carefully evaluate both these and, in time, the experience with vouchers. This would help identify what works, in terms of interest from individuals, labor market outcomes, and private-sector expectations and needs. International evidence suggests that training programs including those promoting internships can be effective in raising skills, but that there is significant variation in labor market outcomes, pointing to the need for

careful design and evaluation.¹⁴⁷ The impact of internship programs as well wage subsidies as potential skills development programs should also be considered. In all, more effective approaches and programs should be expanded to allow for effective resource allocation based on “what works.”

Expanding options for training for the entire adult population should be a priority, with initiatives addressed to individuals and firms. As per the overall mandate of CES as a public employment agency, its training activities have a strong focus on activation of unemployed, and especially those further from the labor market. These are important objectives but need to come with an expansion of opportunities for reskilling and upskilling for those who are already employed. Such opportunities currently account for a small share of total CES training beneficiaries and an even smaller share of total resources, suggesting that training has been focused on short, job-complementary skills training. The voucher program will partly address this gap. Given program parameters (40 percent vulnerable participants, low value of voucher, exclusive focus on digital and green skills), it is unlikely to suffice, however. A key feature of individual learning accounts is that they are personal and de-linked from labor market status, which should be considered in future iterations of the voucher scheme.

Retaining older workers in the labor force with incremental skills upgrading is a cost-effective approach to increase skill levels. Prolonging the working life of a healthy and active workforce can have many positive benefits, not least since these groups may retain productivity with incremental but continuous training to stay relevant. Although research shows that older workers can continue to contribute to productivity growth, evidence also suggests that they receive less training than younger counterparts, due to “ageist” views (whether internalized or from the employer) or lack of information on the benefits of training.¹⁴⁸ CES, in collaboration with other stakeholders, could consider earmarking training program resources for workers above 50. Targeting older workers with training programs will require training methods adapted to older workers’ neuropsychic situation and physical health as well as a set of complementary interventions to reduce information gaps around capability and trainability, and eliminate discrimination.

Some S3 areas have a workforce with lower levels of education and training policy needs to adapt training for lower-skill adults. Experience from other countries suggests that training uptake among low-skilled adults is limited. Low-skilled adults face more significant barriers to participating in training including (i) psychosocial barriers (personality traits and perceptions around the value in training) (ii) situational barriers such as lack of employer or family support, care responsibilities, etc. and (iii) institutional barriers including lack of appropriate training offer (modular, time flexible, etc.). Program design can overcome such barriers, however. The Swiss Project GO targets employed adults with low basic skills, offering tailor-made educational interventions directly at the workplace with costs shared between employers and the public sector. The project is overall positively reviewed by firms (that see productivity gains) and individuals (feeling empowered).¹⁴⁹

The voucher for skills upgrading for micro-credentials needs to form part of a coordinated approach to adult training including oversight and strategic direction. First, the voucher program needs to be reinforced with a more consistent and widely communicated definition of digital and (especially) green skills. This will help to better understand the capacity of individuals and the training market to identify and provide relevant micro-credential trainings. Moreover, international evidence suggests learner profiles of vouchers and other short-term programs tend to include higher educated, male workers,

¹⁴⁷ E.g. Card et al. 2018.

¹⁴⁸ Johansson de Silva and Santos 2022 (forthcoming).

¹⁴⁹ OECD 2021c.

meaning that Croatia will need significant outreach efforts to bring in the vulnerable populations it is targeting with the voucher. Specific strategies to involve vulnerable populations in e.g. green skills upgrading and green skills jobs will likely be necessary. The experience from OECD also shows that micro-credentials can work well as lifelong learning tools but need strong quality and coherence oversight to work to measurably raise skills, and that employers need to be aware of the programs to value them.¹⁵⁰ New Zealand has recently transitioned from generic non-formal training to providing only micro-credential schemes (Box 8). For accreditation in New Zealand, programs must respond to quality *and* private sector/labor market relevance criteria.

Box 8: Strategic approval of micro-credentials

The New Zealand Qualifications Authority retains a strong position in ensuring the quality and strategic value of these schemes by applying a set of quality standards before approval. These include general quality assurance criteria but also criteria directly related to skills strategy and relevance:

- Evidence that the learning outcomes match the purpose, can achieve intended learning outcomes and is coherently structured to this effect
- Evidence of quality and capacity of educational institution
- No significant weaknesses or gaps in either program or institutional capacity
- Evidence of addressing unmet skill needs and required/supported by relevant industries, employers, or communities
- Evidence that micro-credential proposed is additional and does not duplicate existing quality assured learning.

Source: New Zealand Qualifications Authority and OECD 2021d.

Schemes targeting SMEs skills upgrading should also be expanded as part of the strategy to upgrade workforce. Although firms may have limited capacity to identify skill needs, they are an important source for identifying gaps and ultimately a top beneficiary of an effective skills agenda. As mentioned, digital innovation hubs and regional competence centers have been created in line with EU policy and with the objective of increasing skills provision to SMEs, but little is known about the extent, content, quality, and outreach of training. Aside from the different centers and hubs created where skills are part of a broader the agenda, the resources allocated to SME upskilling is limited to a digital skills training program and information services. The World Bank is supporting the development of a skills upgrading program in the Pannonian region (Eastern Croatia), using vouchers (Box 9). Pending evaluation, such initiatives could be mainstreamed at a national level. A national skill upgrading program should provide resources to raise workforce skill upgrading in Croatian firms, with particular focus on S3 areas. The program should include a diagnostic of skills needs and funding for skills upgrading. Such a program will need to identify the category of skills supported, raise awareness around the initiative to firms, workers and training institutions.

Box 9: Key features of the Prosperity and Jobs in Pannonian Croatia Smart Skills Scheme

The objective of the project is to promote the development and use of smart skills for industrial transformation in Pannonian Croatia. It concentrates on four regional value chains: continental tourism, agri-food, creative industries, and green solutions. Key program key characteristics are:

- Focused on smart skills to make the four Regional Value Chains more competitive by developing new business models and making use of modern digital and green solutions
- Directed at firms of all sizes but co-financing will differ depending on firm size

¹⁵⁰ OECD 2021d.

- Targeted, regular outreach to raise awareness
 - A skills portal containing information on the scheme and a self-assessment tool
 - Business coaches to guide skills assessment and skills strategy development in firms
 - Vouchers accorded to firms based on a clear strategy in line with the regional overarching strategy for industry transformation, the quality of the business development plan and the creation of clusters to promote collaboration and coordination of skills agenda among firms
 - Education-industry collaboration to develop new courses based on identified gaps
-

Source. Draft program, March 2022.

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Annex 1. Methodology

The report is based on (i) desk research (ii) qualitative interviews and (iii) secondary data, both publicly available but also data with restricted access. Interviews were held with stakeholders in MSE, MLPS, MESD, CES, TVET Agency, private companies involved in S3 areas (ICT, transport, health, wood, cybersecurity), Chamber of Economy, Chamber of Crafts, representatives for several competence centers, and the University of Rijeka. Publicly available data are drawn from official statistics at state level (such as Croatian Bureau of Statistics, CES or Agency for Higher Education), and from international sources (Eurostat, World Bank, EBRD, OECD, CEDEFOP or WEF).

Analysis is also based on ad-hoc survey data (such as data from the Essence project) and data from LinkedIn. The World Bank teamed up with LinkedIn and created Digital Data for Development to identify skill requirements trends. LinkedIn, as global platform storing data on 830 million members and 39,000 skills, 58 million employers and 120,000 schools, is generating data on industry employment, workers skills, emerging industries, and talent migration. LinkedIn data is an important source for better understanding global trends in sectors analogous to Croatia's S3 areas. LinkedIn data has an extensive coverage of the most innovative part of the economy (particularly, digital and disruptive technology sector), more frequent data collection than government sources and can capture dynamic changes in terms of skills requirement at the labor market often overlooked by the government statistics. The bias toward certain population segments and the fact that data are self-reported are identified as their main drawbacks. LinkedIn data are skewed toward certain sectors (such as knowledge-intensive and tradable sectors), developed countries, and generally better educated individuals. However, this is to a lesser extent problematic in our report, as knowledge-intensive sectors and skills are in the focus of our analysis. LinkedIn also impose quality control of data in the database with aim to improve accuracy such as removal of inactive profiles, imposition of rules for skill identification, identification of employment industry by company and not by individual, normalization of data against total country membership. Two metrics from LinkedIn data have been presented in this report: industry skill need and skill migration.

Industry skill needs

One metric used in the report is industry skills needs, measuring the most represented skills in the industry. The most represented skill is calculated by selecting all members who work in the industry and counting the number of times each skill is identified in their profiles. This count is used to compute the weight for each skill, and the most-represented skills are the ones with the largest weights. To avoid over-representation of generic skills such as Microsoft Office, skills have been matched with positions during which skills are reported, to avoid inclusion of skills generated previously and that not necessarily represent the industry of employment. Further, adjustments is made by down-weighting skills generic for many industries. Essentially, if skill appears in most (or all) industries and countries, its weight is small (or zero), and that skill is not considered as an industry representative. The next step assumes grouping of skills into broader categories, by clustering skills based on the likelihood of co-occurrence in profiles. Finally, ranking of all skills in a certain skill group is averaged for each industry-country pair to create the average ranking of the skill group.

Skill migration

LinkedIn data allow enable country to identify the skills and industries gained or lost due to migration. Change in the self-reported location of LinkedIn member is counted as migration. Skill migration is calculated as follows:

$$Net\ skill\ migration_{C_s,b_s,t} = \frac{Net\ skill\ flows_{C_s,B_s,t}}{Member\ skill\ account_{C_s,B_s,t}}$$

where: s-skill; C-country of interest (Croatia);B-source of inflows and destination for outflows; t-time.
Net flows= arrival- departure.

OECD international migration flow data is used as a comparator for a LinkedIn migration rates. It shows that coverage is the highest among high-income countries, which is the pool for most talent migration from Croatia.

Sector mapping

The different thematic priority areas have been mapped to predefined sectors in LinkedIn data. As seen, LinkedIn data are a good match for personalized health and smart and clean energy but is less useful to cover security (only cybersecurity), transport and logistics services, or wood production outside of paper. The S3 thematic priority areas are typically multisectoral and the mapping is an approximation.

Annex Table: Mapping priority areas with LinkedIn data.

Thematic Priority Area	LinkedIn sector
Personalized health	Pharmaceuticals Biotechnology Health, wellness, and fitness
Smart and clean energy	Renewables and environment
Smart and green transport	Automotive manufacturing Packaging Containers Industrial automation
Sustainable and circular food	Food production
Customized and integrated wood products	Paper and forest products
Security and dual use; Digital products and platforms	Cybersecurity Computer software Computer networking Internet Information technology and services
Transversal	Research Translation and localization

Annex 2. Planned projects of the Labor Market and Employment Directorate under the ESF+ 2021-2027

Project name	Activities	Duration	Value (HRK million)
Mapping skills for green and digital transition	<ul style="list-style-type: none"> - sectoral skills mapping and modeling to anticipate the future labor market needs for green and digital skills; - preparation of a catalog of green and digital skills; - substantive analysis of existing ICT services for lifelong career guidance and career development; - establishing an integrated lifelong career guidance portal and lifelong career guidance module development 	2 years	7.6
Mapping skills for the labor market	<ul style="list-style-type: none"> - sectoral skills mapping and modeling to anticipate future labor market skills needs; - preparation of the skills catalog 	2 years	7.6
Further development of the labor market monitoring portal	<ul style="list-style-type: none"> - technical upgrade of the portal; - refining the methodology of data collection and processing 	2 years	7.6
Improvement of the system of lifelong career guidance and career development	<ul style="list-style-type: none"> - development of a methodology for determining the current and projections of future labor market needs; - improving e-services for lifelong career guidance; improving lifelong career guidance systems according to the needs of target groups; - improving the system of continuous training of lifelong career guidance service providers; - establishing a quality assurance system; - strengthening the capacities of the members of the lifelong career guidance and Career Development Forum 	2 years	22.8
Strengthening the connection between education and the labor market"	<ul style="list-style-type: none"> - establishment of a system for monitoring persons with acquired qualifications (CQF Act) and NEETs; - further implementation of European Skills, Competences, Qualifications and Occupations framework in the National Qualification of Occupations; ensuring the quality of valuation of occupational standards; - improving the register of regulated professions; educating and strengthening the capacity of stakeholders; - preparing for individual learning accounts 	5 years	9.5
Production and revision of occupational standards	<ul style="list-style-type: none"> - further development of occupational standards; - revision of existing occupational standards 	5 years	63.6

Source: MLPS.

Annex 3. CES programs providing support for skills

Measure	Aim	Target group	Size of subsidy	End users
Upskilling subsidies	Provision of targeted support to employees needing additional skills for job retention and employers in need to invest in the development and productivity of their workforce to adapt to market changes	Employed in need of additional competences and skills for job retention	Up to HRK 15,000 per participants	Employers
Training of the unemployed	Enable to unemployed to acquire in-demand skills and competences	Unemployed	Education costs, health protection, financial assistance to unemployed	Educational institutions selected through public procurement for implementing educational program and unemployed
Training of the employed	Enable to employed to acquire in-demand skills and competences	Employed	Education costs	Educational institutions selected through public procurement and employed
Workplace training	Enable to unemployed to acquire practical knowledge and skills needed for the job, or that are lost over time		Mentoring costs and financial assistance to unemployed	Employers and unemployed
Occupational training without commencing employment	Enable to unemployed young people to be included in the labor market and gain professional experience	Unemployed young people (up to 30 years old)	Minimal salary in the current year	Employers and unemployed

Source: Elaborations based on CES website.