

2 Higher education in the Slovak Republic

This chapter provides context for the OECD-European Commission-Slovak Republic Project's action plan to improve higher education in the Slovak Republic. It starts with a brief overview of the Slovak economic context, describes key features of the Slovak higher education system and presents the Slovak Republic's higher education performance from an international perspective.

2.1. The Slovak Republic's economy and labour market context

Over the past two decades, the Slovak Republic has sustained robust economic growth of almost 4% on average, experienced falling unemployment rates, and living standards converging towards the OECD average (OECD, 2019^[1]). However, the Slovak Republic's benefits from participating in the global economy remained limited by its downstream positioning in global value chains. While the Slovak Republic has pockets of innovative activities in information communication and technology (ICT) and engineering, biomedicine, and bioeconomy, the country's economy continues to rely on the manufacturing sector (MIRRI, 2020^[2]). While productivity gains in the manufacturing sector have been particularly large – multiplied by more than five since 1995, well above increases in Austria, the Czech Republic, Hungary and Slovenia – the productivity of business services only increased by 20% over the period, the smallest increase in the region. Productivity and innovation have also been disproportionately concentrated in large manufacturing firms, with little benefits to local small and medium-sized enterprises (SMEs) (OECD, 2019^[1]).

While a large share of Slovaks has benefitted from the economic development of the past decades and the country benefits from lower income inequality than on average among OECD countries, some regions and groups continue to face significant barriers to economic success. The coronavirus (COVID-19) pandemic may exacerbate these difficulties, as it has particularly affected sectors such as tourism, retail and construction, hitting workers hard in these sectors, who were already facing economic challenges, including low-skilled workers, women, youth, and Roma populations (OECD, 2021^[3]).

The pandemic may also accelerate the digital transformation across economic sectors and increase automation, already taking place at a fast pace in the Slovak Republic. OECD estimates based on the Survey of Adult Skills (a product of the Programme for the International Assessment of Adult Competencies, PIAAC) suggest that about 34% of Slovak workers face a high risk of seeing their jobs automated, and another 31% face significant changes in their job tasks due to automation (Nedelkoska and Quintini, 2018^[4]). Moreover, the share of jobs at risk of being automated is the highest among OECD-PIAAC countries due to the size of the Slovak manufacturing sector (OECD, 2020^[5]).

The impact of the digital transformation on labour market demand is difficult to predict, particularly with the disruption caused by the pandemic. Forecasts on future labour market demand in the Slovak Republic conducted before the pandemic by Cedefop, and the National Project on Forecasting Labour Market Developments (Národný projekt: Prognózy vývoja na trhu práce, NPPVTP) suggested that strong labour market demand across both high-skilled and medium-skilled occupations was likely to extend into the future. Most employment growth is expected in medium-skilled occupations, followed by high-skilled occupations. Forecasts suggest that employment growth in medium-skilled occupations will be driven by replacement demand resulting from the large shares of workers nearing retirement age, while employment growth in high-skilled occupations will be driven by new job creation (OECD, 2020^[5]).

With a population of 5.4 million, the Slovak Republic has one of the fastest ageing populations among OECD countries, resulting in a shrinking working-age population. For every ten adults of working age in the Slovak Republic, approximately two adults are currently aged 65 and over. This ratio is currently low compared to most OECD countries but will increase drastically and surpass the European Union (EU) average in 2050. In 2060, it is projected that there will be six adults aged 65 and over for every ten adults of working age. This trend poses a significant challenge to the Slovak economy. For instance, the total number of employed persons could decrease by one-fifth, and the catch-up rate of per capita income with the average for OECD countries might slow down and even be reversed in the long term. This drop in the contribution of labour utilisation to economic growth will make productivity improvements an even more critical driver of economic growth in the future (OECD, 2020^[5]). The knowledge and skills of workers in the Slovak Republic thus represent an increasingly important focus of government policy to sustain and promote economic prosperity and well-being in the country.

The Slovak Republic has seen impressive growth in the higher education attainment rate, which doubled for 25-34 year-olds- from 16.3% in 2005 to 31.3% in 2015 (OECD, 2021^[6]). The attainment rate for 25-34 year-olds reached 39.2% in 2019, just below the rate in the EU28 of 40.9% (Eurostat, 2021^[7]). This rapid and recent expansion can be explained by historical events, such as the change of political regime, the separation of the Czechoslovak Republic into two independent states, the creation of new public universities in the country, and the convergence with economic and social trends seen in Western Europe. It can also be explained by the high premium for higher education when attainment was low, attracting many young people to pursue a higher education degree, traditionally conceived of as a theoretical programme, with very few options for short-cycle or vocationally oriented higher education.

However, the Slovak Republic faces significant challenges across its “skills pipeline”, from school-level education, higher education through to adult education (OECD, 2020^[5]). The higher education system plays a pivotal role in helping Slovaks of all ages succeed in a labour market that is likely to transform in important ways in future years.

2.2. Key features of the Slovak Republic’s higher education system

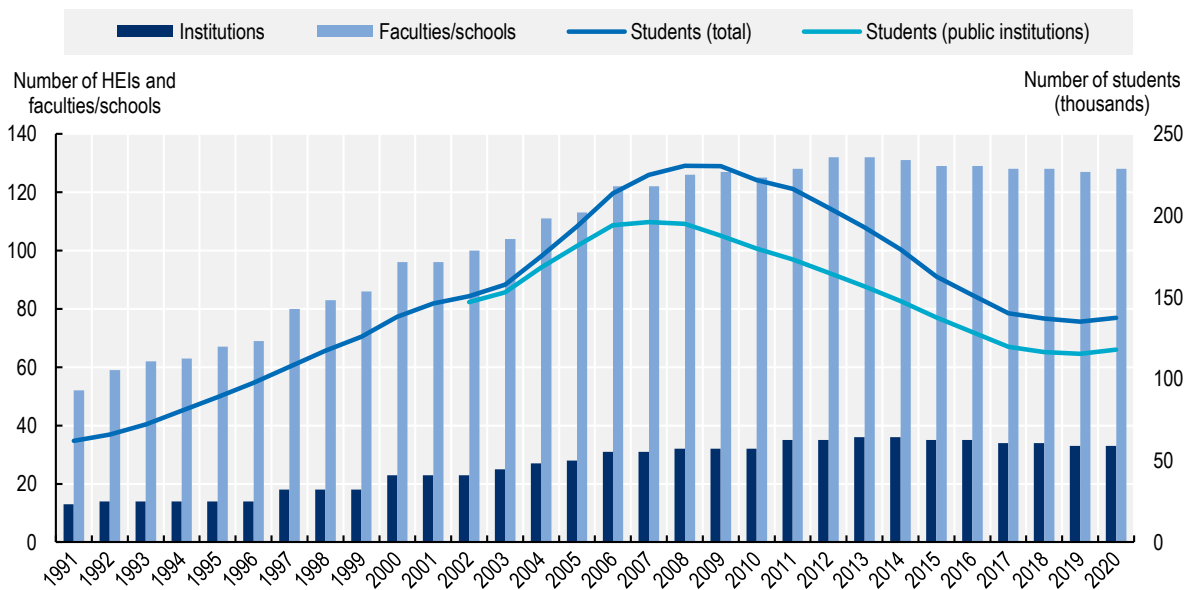
Historical context and the current landscape

Slovak higher education has witnessed significant changes during the last three decades of independent statehood, after being a part of the Czechoslovak education system from 1918 until 1993 (except for a short period of Slovak independent statehood during the Second World War). Since 1993, the Slovak Republic has been building its higher education system in the face of challenges similar to those met by other post-communist Central and Eastern European (CEE) countries. Among other issues, the Slovak higher education system underwent a transformation of the governance and management structures of its higher education institutions (HEIs), curricula changes, and the incorporation of research into the mission of mainly teaching-oriented institutions (Westerheijden and Sorensen, 1999^[8]). Most importantly, CEE post-communist countries had to deal with the massification of higher education, which took place in Western European countries decades earlier (Trow, 1972^[9]; Neave, 1986^[10]; OECD, 2006^[11]). Furthermore, Slovak higher education, its structure and regional distribution played an important role in the nation building of the newly established state.

The Slovak higher education sector has since grown in size and changed in structure. In 1991, the Slovak higher education system (still a part of then Czechoslovak Republic) consisted of 13 HEIs and 52 faculties¹ accommodating approximately 62 000 students (CVTI, 2021^[12]). Following a period of rapid massification, the number of students in Slovak HEIs peaked in 2008, then decreased steadily. In 2020, there were 33 HEIs and 128 faculties, with a total student enrolment of around 137 000 (CVTI, 2021^[13]). This downward trend is a key feature of contemporary Slovak higher education, resulting from a combination of demographic factors and issues specific to the higher education system, including a decline in the share of young Slovaks applying to Slovak HEIs and a high share preferring to study abroad (see the section entitled “Performance of Slovak higher education”).

The types of HEIs in the Slovak Republic have also changed over the past decades, with the introduction of state and private HEIs alongside public HEIs. State HEIs provide professional education in key areas of public service (e.g. health, defence, police). As shown in Figure 2.1. , while student enrolment has declined substantially since 2009, the number of HEIs and faculties within HEIs (that used to exist as independent legal entities until 2002) have remained broadly stable.

Figure 2.1. Number of students and HEIs in the Slovak higher education system (1991-2020)



Note: Students refer to both full-time and part-time students. Only HEIs providing full-time study programmes are included in the number of institutions.

Source: CVTI (2021^[12]), *Časové rady [Timelines]*, https://www.cvtisr.sk/cvti-sr-vedecka-kniznica/informacie-o-skolstve/statistiky/casove-rady.html?page_id=9724.

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In the academic year 2020/21, the Slovak higher education system was comprised of:

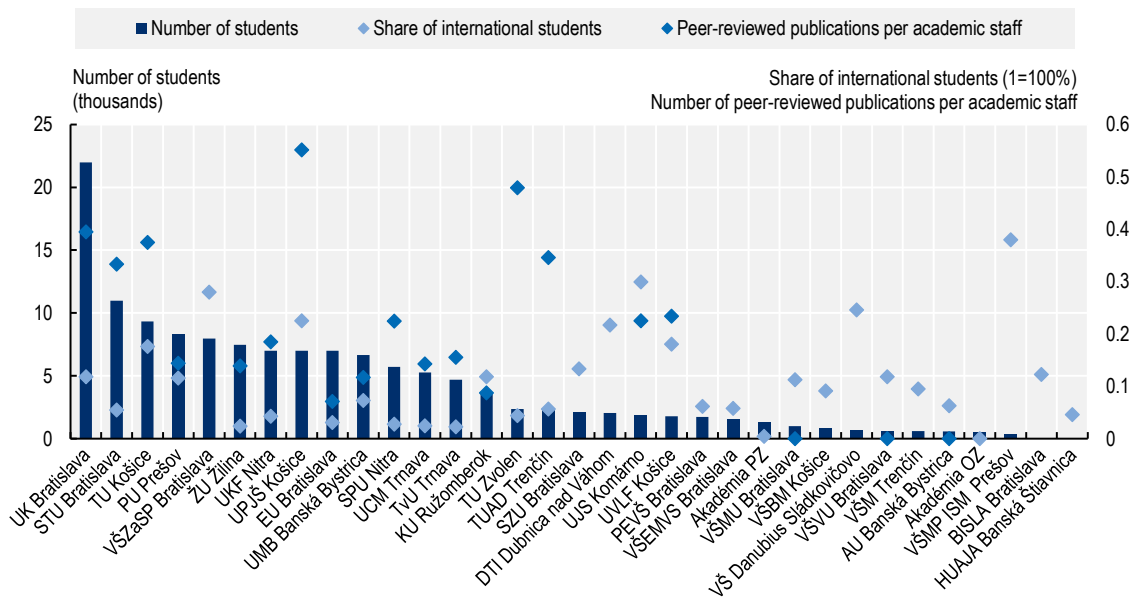
- 20 public HEIs, with 117 955 students and 106 faculties
- 10 private HEIs, with 15 356 students and 16 faculties
- 3 state HEIs, with 4 010 students and 6 faculties
- 5 foreign-based HEIs that have permission to provide higher education in the Slovak Republic.²

The average size of HEIs is small in the Slovak Republic, although there is high variability across HEIs. In 2020, the average number of students per HEI was approximately 5 900 among the public HEIs, 1 500 among private HEIs and 1 300 among state HEIs (CVTI, 2021^[13]).

However, 19 of the total 33 Slovak universities reported having fewer than 2 500 students and 10 reported having fewer than 1 000 in 2019. By contrast, the largest Slovak university - Comenius University in Bratislava (UK Bratislava) - reported more than 20 000 students, twice as many as the second-largest university - Slovak University of Technology in Bratislava (STU Bratislava). St. Elizabeth College of Health and Social Work in Bratislava (VŠZaSP Bratislava) was the largest private university with around 8 000 students, while the Slovak Medical University (SZU Bratislava), with around 2 000 students, ranked as the largest state HEI (see Figure 2.2.).

Slovak HEIs are also highly heterogeneous in terms of their level of internationalisation (measured by the share of international students) and research performance (measured by the number of publications per employee registered in the Web of Science Contents Connect database (Clarivate, 2021^[14])). Moreover, the western part of the Slovak Republic is home to most HEIs and the largest ones, with almost one-third of all HEIs located in Bratislava (see Figure 2.3). Nonetheless, the high diversity of Slovak HEIs does not translate into any variation in their status or funding allocation model, as discussed later.

Figure 2.2. Overview of Slovak HEIs (2019)

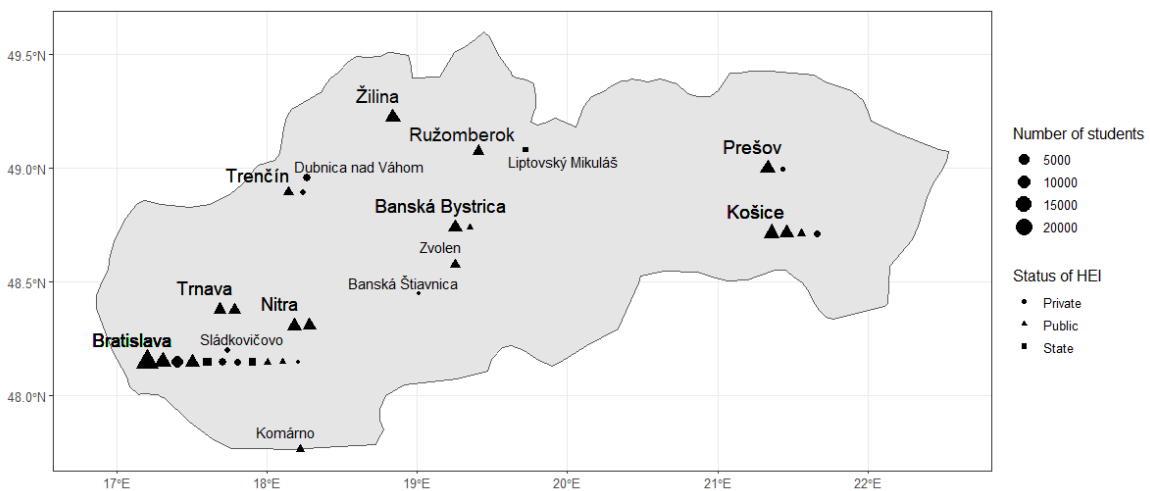


Note: Students refer to both full-time and part-time students.

Sources: Ministry of Education, Science, Research and Sport of the Slovak Republic (2019^[15]), *Výročná správa o stave vysokého školstva za rok 2019 [Annual Report on the State of Higher Education for 2019]*, <https://www.minedu.sk/vyrocnne-spravy-o-stave-vysokeho-skolstva/>; CVTI (2021^[16]), *Štatistická ročenka - vysoké školy [Statistical Yearbook - Universities]*, https://www.cvtisr.sk/cvti-sr-vedecka-kniznica/informacie-o-skolstve/statistiky/statisticka-rocenka-publikacia/statisticka-rocenka-vysoke-skoly.html?page_id=9596.

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Figure 2.3. Regional distribution of Slovak HEIs and number of students (2019)



Note: Students refer to both full-time and part-time students.

Sources: Ministry of Education, Science, Research and Sport of the Slovak Republic (2019^[15]), *Výročná správa o stave vysokého školstva za rok 2019 [Annual Report on the State of Higher Education for 2019]*, <https://www.minedu.sk/vyrocnne-spravy-o-stave-vysokeho-skolstva/>; CVTI (2021^[16]), *Štatistická ročenka - vysoké školy [Statistical Yearbook - Universities]*, https://www.cvtisr.sk/cvti-sr-vedecka-kniznica/informacie-o-skolstve/statistiky/statisticka-rocenka-publikacia/statisticka-rocenka-vysoke-skoly.html?page_id=9596.

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Legislative framework

Types of institutions and key actors in higher education

The Act on Higher Education No. 131/2002 (hereafter “HE Act”) is the main legislation organising the Slovak higher education system (National Council of the Slovak Republic^[17]). The HE Act recognises and defines the types of HEIs: public, state and private. Public HEIs are funded and regulated by the Ministry of Education, Science, Research and Sport (MoE); state HEIs are funded and regulated by ministries with responsibility in the area in which they deliver education (e.g. the Ministry of Health for state medical universities); private HEIs operate within the legislative framework but do not receive government funding. The legislation sets out in detail the internal governance structure of HEIs at both the institution and faculty levels, as discussed in Chapter 3.

The HE Act was amended in 2007 to introduce three types of institutional profiles, respectively called “university”, “higher education institution” and “professional higher education institution”, according to the level of teaching provision and the kind of research pursued. Universities provide programmes at all three levels of higher education – bachelor’s, master’s and doctoral levels – and focus on carrying out basic research. Universities’ study programmes are expected to be carried out in close connection with leading-edge research undertaken by the university. Professional HEIs are to provide study programmes at the first level (bachelor’s) and to conduct applied research. HEIs are to be an intermediate type of institution, conducting basic research like universities, but only providing first- and second-level study programmes – bachelor’s and master’s degree programmes (Reichert, 2009^[18]). These three institutional profiles were little discussed during the project, suggesting they have had a limited impact on the orientation of Slovak HEIs.

In addition, the HE Act identifies three national bodies representing higher education stakeholders in their interactions with the MoE, the key funder of the Slovak higher education system:

- The Higher Education Council (HEC) is an association whose membership mainly comprises HEI employees, appointed by academic senates, either at the HEI or faculty level.
- The Student Higher Education Council (SHEC) is the highest representative body of higher education students in the Slovak Republic. It comprises two student representatives from each HEI. One of the student representatives is elected by the student part of the academic senate, and the other is elected through a direct vote by all the students of the HEI.
- The Slovak Rectors Conference is a platform for all Slovak rectors and represents them in discussions with the MoE, the HEC and SHEC. In November 2020, nine rectors announced the creation of an alternative rectors’ platform, open to all interested in higher education reform (Alternatívna platforma slovenských rektoriek a rektorov).

The MoE plays a crucial role in steering the Slovak higher education system, particularly with regard to the public HEIs, which it funds. The MoE’s main policy lever is the annual allocation of public funding through a formula, discussed in Chapter 3 (see in particular Table 3.4). The MoE also keeps the central registers of HEIs, HEIs consortia, and HEI study programmes, of higher education students and employees, of theses and publications and manages a financial information system for public HEIs called IS SOFIA. In addition, the ministry performs a monitoring role by issuing a comprehensive annual report with key information and data on the higher education system (MoE, 2019^[15]). The Ministry also issues regulations, policies and procedures and communicates related changes to HEIs, such as instructions for accounting, tuition fees, or keeping internal records of students and research publications.

Substantial changes in higher education policy require legislative amendments to the HE Act or the introduction of new acts, such as the 2018 Act on Quality Assurance in Higher Education, discussed below. Amendments of the HE Act are relatively frequent, with five changes to the Act made in 2019. In 2020,

changes were made to accommodate responses to the COVID-19 crisis, notably authorising distance education activities and prolonging terms for some elected academic functions.

In addition to the MoE, several government agencies play an essential role in Slovak higher education policy, as presented in Table 2.1.

Table 2.1. Slovak government agencies that play a role in higher education

Agency	Role
Research Agency (RA) (http://www.vyskumnaagentura.sk/en/)	The RA is a research grant agency bilaterally administered by MoE and the Ministry of Economy. RA administers the allocation of EU funds under the Operational Programme Research and Innovation (https://www.opvai.sk/). It issues calls for larger project proposals, including investment projects or supporting public-private research collaborations. The annual allocation of RA is not published.
Slovak Research and Development Agency (APVV) (https://www.apvv.sk/?lang=en)	APVV is a smaller research grant agency that supports particular research activities as well as international research collaborations. APVV usually supports middle-sized projects up to EUR 250 000. In 2018, APVV allocated EUR 39.2 million, out of which EUR 21.35 million was on research projects of HEIs (Statistical Office of the Slovak Republic, 2019 ^[19]). Allocation channeled through APVV was volatile in time, though the transparency of the decision process is considered higher in comparison to the Scientific, Cultural and Educational Grant Agencies (VEGA or KEGA) (MoE, 2016 ^[20]).
Scientific, Cultural and Educational Grant Agencies (VEGA and KEGA) (https://www.minedu.sk/podpora-vysokoskolskej-vedy-a-techniky-vega-kega/)	VEGA and KEGA are funded from the state contribution to public HEIs, as one of its items, with the total allocation being annually decided and published by the MoE. VEGA is also co-financed from the resources allocated to the Slovak Academy of Science (a different item in the state budget). VEGA and KEGA support small-scale research, cultural and educational projects, with usual annual budgets of a few thousand euros, covering everyday expenses of selected research, cultural and teaching activities. KEGA is focused on supporting cultural and educational activities, VEGA on research activities. In 2020, KEGA allocated EUR 4.4 million to cover 505 projects of public HEIs (KEGA, 2020 ^[21]). In 2019, VEGA allocated EUR 11.75 million to HEIs and EUR 4.5 million to the Slovak Academy of Sciences (VEGA, 2020 ^[22]).
Slovak Centre of Scientific and Technical Information (CVTI) (https://www.cvtisr.sk/)	CVTI hosts the research librarian services, including registers of Slovak research publications, and facilitates access to international research databases. It supports open access publishing and plays a co-ordinating role in international research collaboration. It notably initiated a nationwide academic ethics initiative within the SK4EAR project. It also collects and processes statistics of the educational sector (e.g. the number of students, graduates or teachers). Since 2014, CVTI integrated the Institute for Information and Prognosis in Education, responsible for collecting educational statistics. In the area of higher education, these include: <ul style="list-style-type: none"> - admission to HEIs (including applicants, accepted and enrolled) - numbers of HEI students and graduates - numbers of HEI employees, working hours and salaries - HEIs financing - basic information on social and economic conditions of HEI students (during study and shortly after graduation through a tracking tool).
National Institute for Certified Educational Measurements (NUCEM) (https://www.nucem.sk/en)	NUCEM administers national and international testing of students' outcomes and other data collection initiatives (including the OECD Programme for International Student Assessment [PISA], the OECD Teaching and Learning International Survey [TALIS] or the PIAAC).
State Vocational Education Institute (ŠIOV) (https://siov.sk/)	ŠIOV administers projects focused on the development of vocational educational programmes. ŠIOV also provides a structure for the national contact points of international professional networks, such as the National Skills Observatory, European Quality Assurance in Vocational Education and Training (EQAVET) and the Electronic Platform for Adult Learning in Europe (EPALE).
National Institute for Education (ŠPÚ) (https://www.statpedu.sk/en/) Methodological Pedagogical Centre (MPC) (https://mpc-edu.sk/)	ŠPÚ steers the pedagogical processes at the level of primary and secondary education. ŠPÚ, together with the MPC, support teachers at the primary and secondary level with methodological instructions and training.

Accreditation and quality assurance

The Act on Quality Assurance in Higher Education No. 269/2018 and on amendment of Act No. 343/2015 on Public Procurement (hereafter “QA Act”), passed in 2018, introduced a new model for the accreditation of higher education institutions and study programmes in the Slovak Republic (National Council of the Slovak Republic^[23]). This new model introduces an independent quality assurance body – the Slovak Accreditation Agency for Higher Education (SAAHE) – and places a strong focus on the capacity of HEIs to create effective systems of quality assurance in line with European-level practices. This model contrasts with the previous model, where an Accreditation Commission served as an advisory body to the government, but the government was responsible for granting accreditations.

The law sets out a governance structure for the SAAHE that aims to ensure that stakeholders' views are represented in decision making. The SAAHE's highest executive body is the Executive Board, a nine-member entity whose members (except for the Chair, who is selected via public competition) are appointed by the MoE based on nominations received from the Slovak Rectors Conference (two members), the Student Council for Higher Education (two members), the Higher Education Council (two members), representative associations of employers, professional organisations established by law, the Slovak Academy of Sciences, research and development institutions (out of several nominations, two members are appointed by MoE). The QA Act further identifies several funding sources for the SAAHE, including: 1) fees for the agency's activities; 2) funds from the state budget allocated by the MoE; 3) revenues from business activity; and 4) other revenues. Finally, the QA Act requires the SAAHE to be assessed by the European Association for Quality Assurance in Higher Education (ENQA) at least once every five years. The next assessment is planned for 2024.

The SAAHE supports the accreditation process by publishing standards to be met by HEIs. It has published three sets of QA standards since 1 September 2020: 1) standards for the internal quality assurance system of HEIs; 2) standards for study programmes; and 3) standards for habilitation procedures as well as procedures for appointing professors. In addition to standards, the SAAHE also published the list of evaluators conducting quality assurance processes, which it identified based on an open call for applications.³

The QA Act obliges HEIs to develop and maintain an internal system of quality assurance. The first applications for the internal quality assurance system of HEI evaluation were expected in the second half of 2021. HEIs' internal quality assurance systems will be assessed in the next accreditation process, which was initially expected to be completed by 2024. However, a legislative amendment in December 2020 moved the deadline to 2023. Accreditations will be granted by the SAAHE, based on applications submitted by HEIs, and after assessing HEIs' internal quality assurance systems.

While both institutional and programmatic accreditation exists in the Slovak Republic, programmatic accreditation is expected to be phased out, and programme quality to be ensured internally by HEIs. Programme-level accreditations were conducted in two recent rounds, by 1 September 2020 for programmes in fields where HEIs had not yet provided programmes and by 31 March 2021 for programmes in fields in which HEIs had already provided programmes.

2.3. Performance of Slovak higher education

The following section presents an overview of the performance of Slovak higher education in education and research from a comparative perspective.

Education performance

Attainment

Increased investments in higher education have yielded significant growth in the share of Slovaks participating in and attaining tertiary education. At the beginning of the 1990s, tertiary education attainment in the Slovak Republic lagged that of other European countries. However, the share of tertiary educated in the 25-34 year-old age bracket more than tripled between 1998 and 2019, from 11% to over 39% (OECD, 2021^[6]). Table 2.2 presents tertiary education attainment for 25-34 year-olds in 2009 and 2019.

Table 2.2. Trends in tertiary education attainment rates of 25-34 year-olds by gender (2009, 2019)

	Men		Women		Total	
	2009	2019	2009	2019	2009	2019
Slovak Republic	17%	31%	24%	48%	21%	39%
OECD average	32%	39%	41%	51%	36%	45%
EU23 average	29%	38%	40%	51%	35%	44%

Note: Data for the Slovak Republic: There is a break in the time series, as data for 2019 refer to International Standard Classification of Education (ISCED) 2011 while data for 2009 refer to ISCED 1997.

The EU23 average refers to the average of 23 EU countries that were also OECD members as of the end of 2019 (see Endnote 4 for the countries).

Source: OECD (2020^[24]), *Education at a Glance 2020: OECD Indicators*, <https://doi.org/10.1787/69096873-en>, Table A1.2.

Access, completion and choice of study programmes

Access

Access to higher education has increased significantly in recent decades (Figure 2.4). This is due to the expansion of the system and a reduction in student cohorts without a corresponding reduction in the number of institutions. This has led to a steadily growing acceptance rate, resulting in decreased selectivity of HEIs. In 2019, around 90% of applicants to Slovak HEIs were accepted, and around 90% of accepted applicants enrolled (MoE, 2019^[15]).

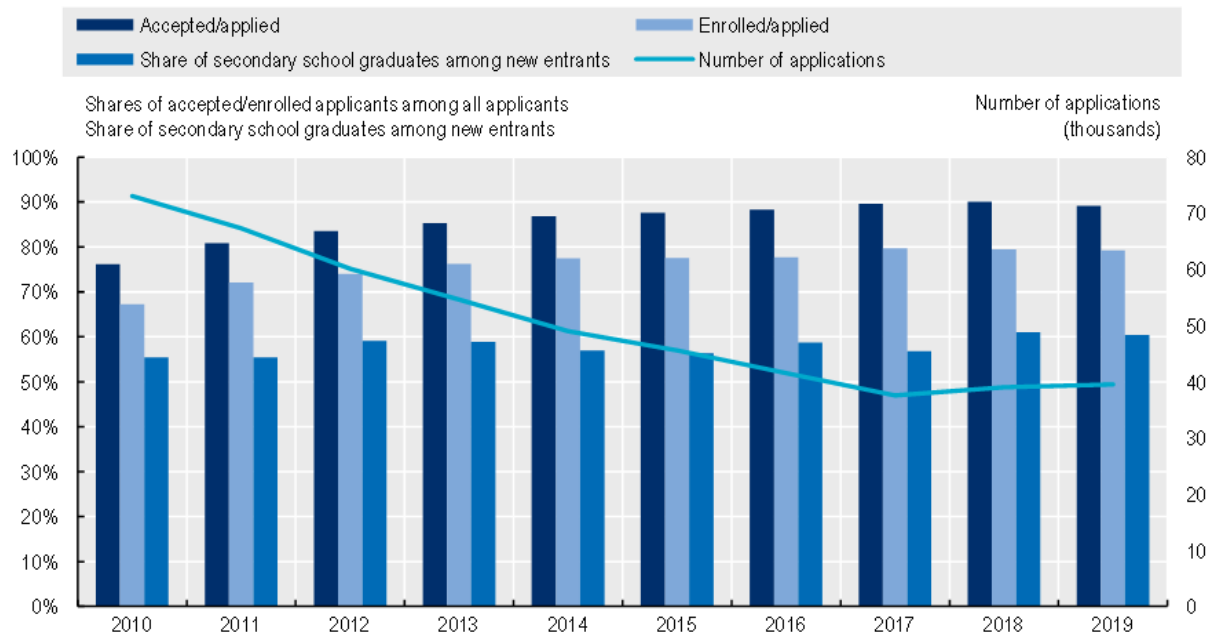
The high acceptance rate is a consequence of the decline of the age cohorts usually entering higher education on the one hand and the decline in the number of applications received by Slovak HEIs on the other. For example, in 2019, the reference population of 19-year-olds declined to approximately 70% of its 2010 level (Eurostat, 2021^[25]), while the number of higher education applications dropped to 54% of its 2010 level (MoE, 2019^[15]). This suggests that both demographic decline and the low attractiveness of higher education as a pathway for young adults contribute to shrinking the size of higher education cohorts.

Application statistics produced annually by the MoE reveal different rates of selectivity among HEIs. Small HEIs with a focus on the arts (VŠMU, VŠVU Bratislava and AU Banská Bystrica), along with the state police academy (Akadémia PZ), and HEIs in the healthcare field are able to be the most selective in their acceptance process (accepting every third applicant), and have seen more than 80% of accepted applicants enrol in the HEI (MoE, 2019^[15]). Various causes explain the differences in selectivity rates, including the small number of study spaces available in highly specialised institutions. However, it may

also be a signal of the greater attractiveness of these HEIs. In contrast, some HEIs have acceptance rates close to 100% and a low share of enrolled students, as illustrated in Figure 2.5).

Figure 2.4. University application process at the national level in the Slovak Republic (2010-19)

Bachelor's and long first-degree programmes



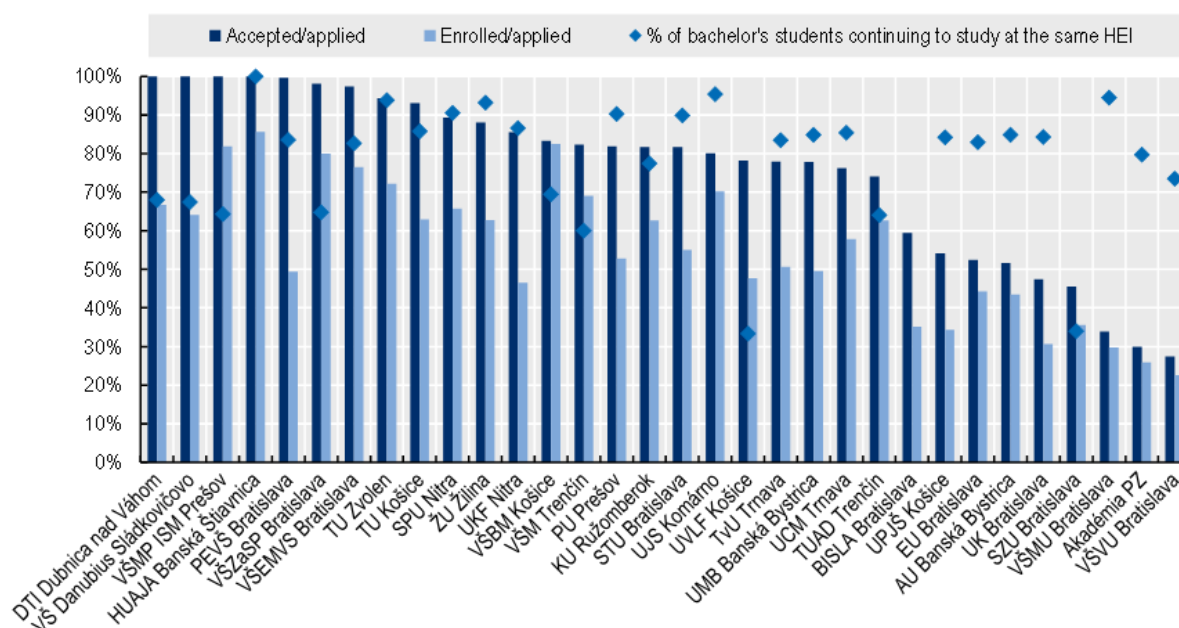
Source: Ministry of Education, Science, Research and Sport of the Slovak Republic (2019^[15]), *Výročná správa o stave vysokého školstva za rok 2019* [Annual Report on the State of Higher Education for 2019], <https://www.minedu.sk/vyrocne-spravy-o-stave-vysokeho-skolstva/>.

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While the average selectivity of Slovak HEIs has declined, this does not mean that students from all backgrounds can access higher education. Some groups remain significantly under-represented in Slovak higher education (particularly Roma students), raising key equity issues (OECD, 2019^[11]).

In addition, adult learners comprise a small share of higher education students in the Slovak Republic. Approximately 85% of new entrants at the bachelor level in the Slovak Republic are below the age of 25. While this is broadly in line with the OECD average (84%), the share of students below the age of 25 varies significantly across countries, from more than 96% in Belgium, Japan and Korea, to 68-69% in Israel, Sweden and Switzerland. The gap between the Slovak Republic and the OECD average widens at the master level, as 88% of new entrants at master level are below the age of 30 in the Slovak Republic, significantly above the OECD average of 74%. Similarly, 66% of new entrants at the doctoral level are below 30 in the Slovak Republic, significantly above the OECD average of 57% (OECD, 2020, pp. 212, Table B4.3^[24]). The age profile of higher education students is consistent with findings of recent analysis that pointed out the need to increase the accessibility and attractiveness of educational and training opportunities for adults in the Slovak Republic (OECD, 2020^[5]).

Figure 2.5. University application process at the HEI level in the Slovak Republic (2019)



Sources: Ministry of Education, Science, Research and Sport of the Slovak Republic (2019^[15]), *Výročná správa o stave vysokého školstva za rok 2019 [Annual Report on the State of Higher Education for 2019]*, <https://www.minedu.sk/vyrocnne-spravy-o-stave-vysokeho-skolstva/>; CVTI (2021^[16]), *Štatistická ročenka - vysoké školy [Statistical Yearbook - Universities]*, https://www.cvtisr.sk/cvti-sr-vedecka-kniznica/informacie-o-skolstve/statistiky/statisticka-rocenka-publikacia/statisticka-rocenka-vysoke-skoly.html?page_id=9596.

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Completion

Higher education completion rates refer to the proportion of students who enter a higher education programme and graduate from it within the theoretical duration of the programme or within a set timeframe (for example the theoretical duration of the programme plus three years). While students may leave a programme for a variety of reasons, such as to pursue attractive employment opportunities or to find a programme better fit to their needs (OECD, 2019^[26]), completion rates provide important information on whether complete higher education “on time”, and therefore on the efficiency of HEIs (OECD, 2019^[27]).

In 2017, across the eight OECD countries that submitted cross-cohort data (as no true cohort data was available for the Slovak Republic), 77% of students who entered a bachelor’s programme completed it within the theoretical duration of the programme. The Slovak Republic was significantly below this average with a 62% completion rate. At short-cycle higher education level (a level few Slovak students pursue), the Slovak Republic had the lowest completion rate at 55% among the eight countries with cross-cohort data, below the eight-country average of 70% (OECD, 2019, pp. 225, Table B5.1^[26]).

There are notable gender differences with respect to completion rates in the Slovak Republic. In line with every other country with cross-cohort data, women in short-cycle and bachelor’s programmes had higher completion rates than men. This difference was smaller in short-cycle higher education programmes, with a 6 percentage-point difference between women and men in the Slovak Republic (57% for women, 51% for men), below the 10 percentage-point difference on average in the eight countries with cross-cohort data (75% for women, 65% for men). By contrast, it was comparatively larger at bachelor’s level reaching

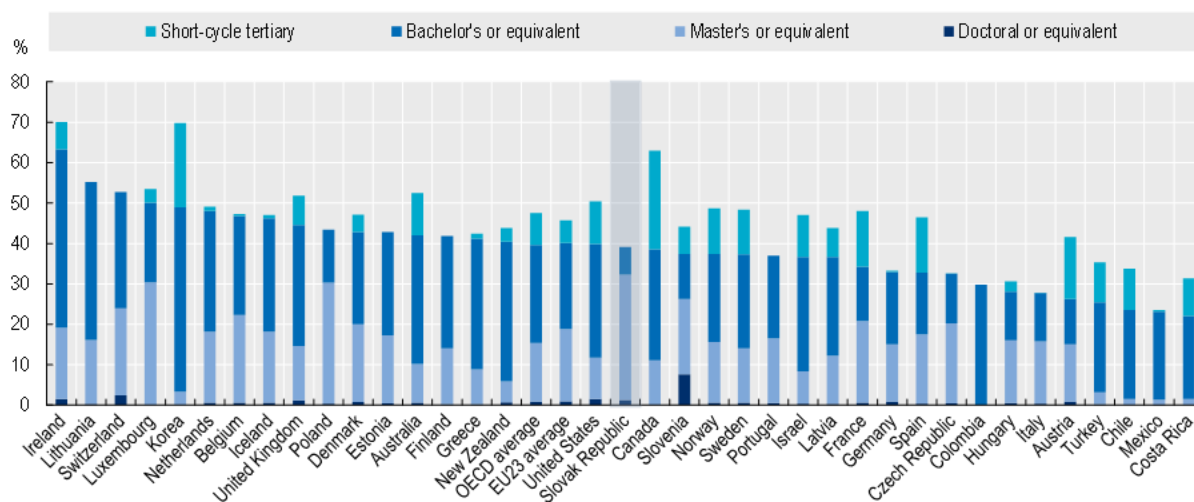
17 percentage points (70% for women, 53% for men) in the Slovak Republic, above the OECD average of 12 percentage points (82% for women, 70% for men). (OECD, 2019, pp. 225, Table B5.1_[26]).

Choice of study programmes

Students' choice of study programmes is not a measure of performance per se. However, it provides important information on the potential alignment of the skills of future graduates with the needs of the labour market. The following section briefly reviews attainment rates – which provide information about the field of graduates currently in the labour force, and entry rates – which provide indications as to the profile of future graduates.

Higher education attainment data reveal that the Slovak Republic is the OECD country with the largest share of higher education graduates holding a master's degree, with 31% holding such qualification level in 2019, compared to 14% on average among OECD countries (OECD, 2020_[24]) (see Figure 2.6). This feature is shared, albeit to a lesser extent, by Central and Eastern European countries, such as the Czech Republic, Poland and Slovenia. This is due to the very high share of students (nearly 90%) who complete a bachelor's degree and continue immediately to a master's degree programme the following academic year (Lukáč and Hall, 2019_[28]).

Figure 2.6. Share of 25-34 year-olds with tertiary education in OECD countries, by level of tertiary education (2019)



Note: Countries are ranked in descending order of the percentage of 25-34 year-olds with a bachelor's, master's or doctoral or equivalent degree. Some categories might be included in other categories. Refer to the source for more information.

The EU23 average refers to the average of 23 EU countries that were also OECD members as of the end of 2019 (see Endnote 4 for the countries).

Chile: Year of reference differs from 2019. Refer to the source for more details.

Source: OECD (2020_[24]), *Education at a Glance 2020: OECD Indicators*, <https://doi.org/10.1787/69096873-en>, Figure A1.6.

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By contrast, in 2019, only 7% of Slovak higher education graduates held a bachelor's degree as their highest qualification, compared to 24% among OECD countries. Short-cycle tertiary education is also very limited in the Slovak Republic, with no data reported for 2019 versus 8% on average in the OECD. At the other end of the spectrum, the share of doctoral graduates (1% of all higher education graduates) in the

Slovak Republic is similar to the OECD average. This suggests that Slovak students do not view the bachelor's degree, and even less, short-cycle tertiary education, as standalone educational pathways.

Turning to entry rates provides information about the choice of current students and future graduates. Excluding international students in 2018, the bachelor's entry rate for students under the age of 25 was 38% in the Slovak Republic, below the OECD average of 44%. The master's entry rate for students under the age of 30 was 27%, almost twice the share on average in the OECD (14%), suggesting continued student preference for pursuing master's level studies. The doctoral entry rate for students under the age of 30 was 1.5%, above the OECD average of 1% (OECD, 2020, pp. 212, Table B4.3_[24]).

Students choose their field of study based on their career aspirations and preferences, which are often formed well before they enter higher education (Hofer, Zhivkovikj and Smyth, 2020_[29]). Looking at the fields of recent graduates sheds light on the potential alignment between the knowledge and skills of graduates and the needs of the labour market. Looking at 2018 graduates from all tertiary education levels (short-cycle to doctoral), the field of business, administration and law was the most popular, although only one in five graduates in the Slovak Republic completed programmes in this area, compared to one in four graduates on average in the OECD. The health and welfare field was the second most popular, with 17% in the Slovak Republic, slightly above the OECD average of 15%. The field of education was the third most popular in the Slovak Republic, with 14% of graduates, above the OECD average of 10%. The field of engineering, manufacturing and construction concentrated 14% of OECD country graduates and 12% of Slovak graduates, making it the third most popular among OECD countries and the fourth most popular in the Slovak Republic. Only 4% of graduates in the OECD and in the Slovak Republic completed programmes in information and communication technologies, despite high labour market demand for graduates from these fields across OECD countries (OECD, 2020, pp. 224, Table B5.2_[24]).

Entry patterns by field of study reveal a strong gender bias in study choices in the Slovak Republic, consistent with other OECD countries. In bachelor programmes, there was an overwhelming majority of women (77%) among students entering health and welfare fields in 2017 in the Slovak Republic, which is the same proportion found on average across OECD countries. At the other end of the spectrum, men dominated science, technology, engineering and mathematics (STEM) fields, with 71% of new entrants in bachelor programmes in the Slovak Republic, slightly above the OECD average of 70%. The gap was narrower in the business, administrative and law field, with 59% of women entering this field at the bachelor level in the Slovak Republic, yet it remained above the OECD average of 54% (OECD, 2019, pp. 205, Table B4.2_[26]).

Internationalisation

The Slovak Republic faces significant brain drain as large numbers of young people completing upper secondary education choose to leave the country to pursue their higher education studies. The Slovak Republic has one of the highest rates of higher education students enrolled abroad, second only to Luxembourg, with 19%, compared to 4% on average in the EU23⁴ and 2% on average in OECD countries (OECD, 2020, pp. 240, Table B6.3_[24]). Due to historical ties and language similarities⁵, the Czech Republic represents the top study destination for Slovak students. In 1992, the number of Slovak students studying in the Czech Republic was around 2 500 according to an estimate from the MoE (Šerý et al., 2013_[30]). Almost 30 years later, around 22 000 Slovak students are enrolled in study programmes within the Czech higher education institutions, accounting for almost half of all international students (OECD, 2021_[6]).

On the other hand, the Slovak Republic is lagging in attracting international students, especially at advanced levels of study. Although international students make up 9% of new entrants at the bachelor level in the Slovak Republic and on average across OECD countries, the Slovak Republic fails to attract more international students at higher levels of education. For example, the share of international new entrants at the master's level on average among OECD countries (21%) is almost three times that of the Slovak Republic (8%). Similarly, at the doctoral level, one out of ten new entrants is international in the

Slovak Republic (10%), compared to three out of ten on average in the OECD (29%) (OECD, 2020, pp. 212, Table B4.3_[24]).

There have been improvements in recent years, however, with 7 international students per 100 national students (whether enrolled at home or abroad) in 2018, compared to 6 on average in OECD countries (OECD, 2020, pp. 240, Table B6.3_[24]). National data suggests the figure might be higher, with international students representing about 11% of all students enrolled at the bachelor's, master's and doctoral levels in 2020 (CVTI, 2021_[16]). It is notable that the upward trend in international enrolment is driven in large part by Ukrainian students, who typically study in Slovak-language programmes, combined with a decline in domestic students. In 2020, Ukrainian students represented approximately 37% of international students enrolled in Slovak institutions at the bachelor's, master's and doctoral level (CVTI, 2021_[16]).

However, despite progress in attracting international students, the ratio between international students in the Slovak Republic and Slovaks studying abroad shows a pattern opposite to the OECD average. In 2018, there were three foreign or international students for each national student studying abroad, on average among OECD countries, while this ratio was 0.4 in the Slovak Republic (OECD, 2020, pp. 240, Table B6.3_[24]).

Furthermore, international students in the Slovak Republic concentrate in selected fields of study (e.g. medicine, veterinary medicine, pharmacy) and tend to study separately from Slovak students. According to a recent study, the limited availability of English-language programmes in Slovak higher education, the low internationalisation of the curriculum, and the low integration of international students and staff within the Slovak higher education environment limit the benefits of internationalisation for both domestic and international students (MESA10, 2021_[31]).

Skills and labour market outcomes

The following section focuses on two measures often used to assess higher education outcomes: graduates' information-processing skills, as measured by the OECD Survey of Adult Skills (PIAAC), and graduate labour market outcomes. However, a wide range of factors beyond higher education influence graduate skills and labour market outcomes – for instance, broader economic and employment conditions influence the opportunities available to higher education graduates. The data provided must thus be read with this caveat in mind.

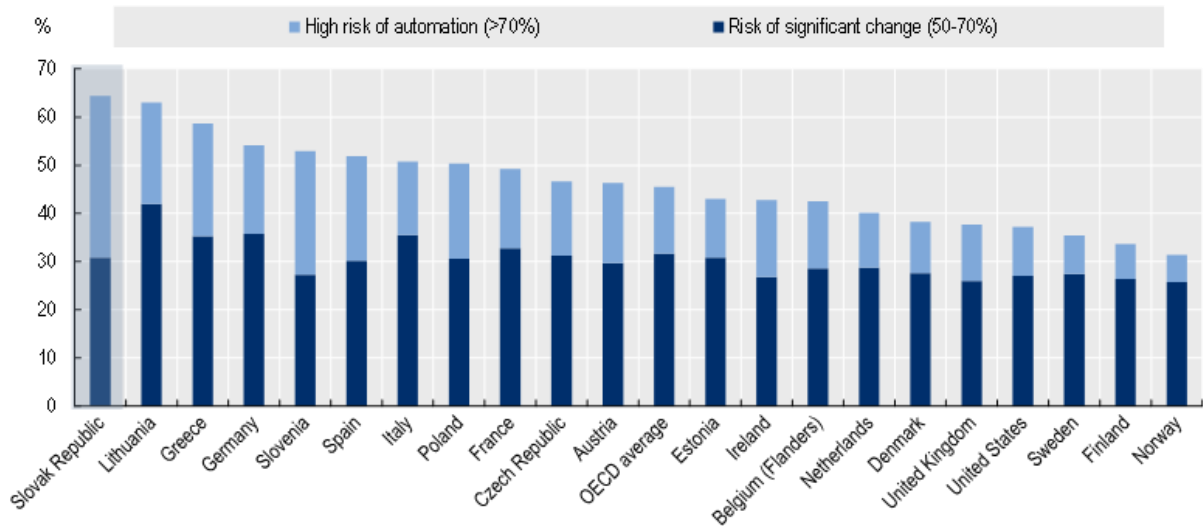
Slovak higher education graduates scored relatively well in key information-processing skills in the Survey of Adult Skills (PIAAC) (the first cycle was collected in 2011-12). Comparing mean scores, Slovak graduates scored above the OECD average in numeracy (274 compared to 266) and literacy (276 compared to 262). However, the value added by higher education to the literacy of secondary education graduates is relatively smaller than on average among OECD countries, with the literacy scores of secondary school graduates approaching those of higher education graduates (OECD, 2019_[32]).

Slovak graduates scored below the OECD average in problem solving in a technologically rich environment, which is particularly important to succeed in an interconnected and digital world. Some 25.6% of adults in the Slovak Republic had high levels of skills in the area (scoring at Level 2 or 3), below the OECD average of 29.7% (OECD, 2019, pp. 58, Figure 2.15_[32]). This suggests that the skills of graduates may not be well matched to the needs of businesses making growing use of robotics and information technology (IT) solutions in the Slovak labour market.

In addition, Slovak workers' soft skills, such as management, communication and self-organisation seem under-developed compared to OECD countries (OECD, 2019_[11]). Data collected by Profesia, the largest Slovak work portal, suggests that soft skills appear more often in job descriptions than technical skills: while four soft skills were listed among the top ten most sought-after skills in 2010, six soft skills appeared in the top ten in 2020, a larger number than technical skills. In addition, new skills such as “teamwork” and “responsibility” have entered the top ten and “independence” has become more important in 2020

compared to 2010 (Molnárová, 2021^[33]). Given that the Slovak Republic is the OECD country with the highest percentage of jobs at high risk of automation (see Figure 2.7), soft and transversal skills are likely to be increasingly important to labour market success.

Figure 2.7. Cross-country variation in job automatability and percentage of jobs at risk of significant change in selected countries (2012, 2015)



Note: "High risk" means more than 70% probability of automation. "Risk of significant change" means 50-70% probability.

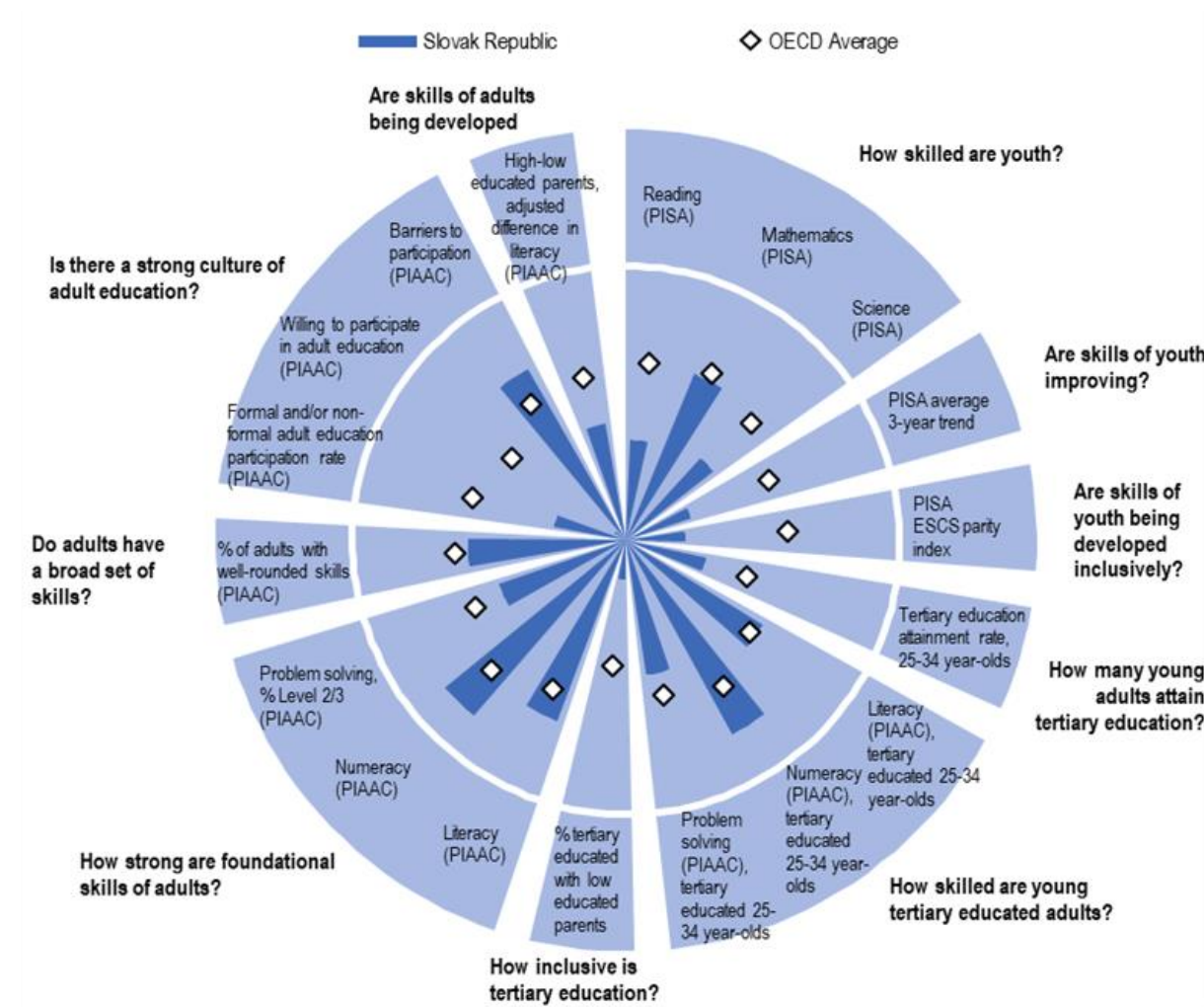
Source: Nedelkoska and Quintini (2018^[4]), *Automation, skills use and training*, <https://doi.org/10.1787/2e2f4eea-en>, Figure 4.2.

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In some OECD countries, individuals continue to develop labour-market-relevant skills, including through adult education. However, as illustrated in Figure 2.8, Slovak adults are among the least willing to participate in adult education compared to the OECD average, with a normalised score of 0.49 compared to a normalised score of 5.14 on average in the OECD. This puts pressure on the higher education system to equip young graduates with transversal skills so they can adapt to changes in job requirements and to provide programmes attractive to workers who will need to upgrade their skills later in life.

Figure 2.8. Key indicators for developing relevant skills, Slovak Republic and OECD average (2012, 2015, 2018)

Relative position in country ranking (based on normalised scores), where higher values reflect better performance



Note: How to read this chart: The normalised scores indicate the relative performance across OECD countries. So the further away from the core of the chart, the better the performance. For example, the indicator “willing to participate in adult education” has a low score compared to the average, indicating a share of employees willing to participate near the bottom of the ranking.

The OECD average (when using PIAAC data) is based on the sample of OECD countries/regions assessed in the Survey of Adult Skills (PIAAC). Source: OECD (2020^[24]), *OECD Skills Strategy Slovak Republic: Assessment and Recommendations*, <https://doi.org/10.1787/bb688e68-en>, Figure 1.4.

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In terms of employment outcomes, 2020 data provided to the OECD team by the MoE suggests high rates of employment across study fields 6-18 months after completing higher education, with an average employment rate for graduates from over more than 2 600 study programmes reaching 95.2 % after 6 months, with very high rates across fields.⁶ MoE uses this data as part of the funding formula calculation (specifically, to calculate the graduate employment coefficient).

However, OECD data based upon standard international methodologies highlight key challenges regarding graduate employment and earnings in the Slovak Republic, compared to other countries. Across OECD

countries, higher education graduates have higher employment rates than individuals who have completed upper secondary education. This is true in the Slovak Republic but to a lesser extent than on average among OECD countries for bachelor's, master's and doctoral degree holders, with the exception of graduates from short-cycle tertiary programmes (Table 2.3).

Table 2.3. Employment rates of graduates, by education attainment and age in the Slovak Republic (2019)

	Below upper secondary		Upper secondary		Tertiary							
	25-64 year-olds	25-34 year-olds	25-64 year-olds	25-34 year-olds	Short-cycle tertiary		Bachelor's or equivalent		Master's or equivalent		Doctoral or equivalent	
					25-64 year-olds	25-34 year-olds	25-64 year-olds	25-34 year-olds	25-64 year-olds	25-34 year-olds	25-64 year-olds	25-34 year-olds
Slovak Republic	38%	34%	78%	81%	91%	m	75%	67%	85%	81%	85%	87%
OECD average	59%	60%	77%	78%	82%	84%	84%	83%	88%	88%	93%	m
EU23 average	57%	58%	77%	80%	83%	86%	84%	82%	88%	87%	93%	88%

Note: m: Data are not available – either missing or the indicator could not be computed due to low respondent numbers.

The EU23 average refers to the average of 23 EU countries that were also OECD members as of the end of 2019 (see Endnote 4 for the countries).

Source: OECD (2021^[6]), *OECD Education Statistics*, <https://doi.org/10.1787/edu-data-en>.

There are important differences in graduate employment between age groups in the Slovak Republic. Young higher education graduates have difficulties transitioning to the labour market: 79% of young higher education graduates (all levels) aged 25-34 are employed in 2019, one of the lowest rates across OECD countries, and 6 percentage points below the OECD average. By contrast, the employment rate for 45-54 year-olds higher education graduates is one of the highest across OECD countries, at 94% compared to the OECD average of 90% (OECD, 2020, pp. 82, Table A3.3^[24]).

Looking at employment trajectories upon graduation, 82% of Slovak adults holding a bachelor's degree as their highest attainment aged 15-34 at graduation were employed less than two years after their graduation, compared to 85% after two to three years, and declining to 73% after four to five years (Table 2.4).

Table 2.4. Employment rates of young adults who have recently completed higher education, by educational attainment and years since graduation, Slovak Republic (2018)

Adults aged 15-34 at graduation, not in education

	Bachelor's or equivalent			Master's or equivalent		
	Less than two years	Two to three years	Four to five years	Less than two years	Two to three years	Four to five years
Slovak Republic	82%	85%	73%	78%	81%	77%
OECD average	80%	87%	87%	83%	89%	89%
EU23 average	80%	87%	86%	82%	89%	89%

Note: The time periods of "less than two years", "two to three years" and "four to five years" refer to 0-23 months, 24-47 months and 48-71 months since completion, respectively.

The EU23 average refers to the average of 23 EU countries that were also OECD members as of the end of 2019 (see Endnote 4 for the countries).

Source: OECD (2020^[24]), *Education at a Glance 2020: OECD Indicators*, <https://doi.org/10.1787/69096873-en>, Table A3.5.

On the contrary, on average in OECD countries, employment rates increase as graduates gain working experience: 80% of adults holding a bachelor's degree as their highest attainment aged 15-34 at graduation were employed less than two years after their graduation, compared to 87% after two to three years and 87% after four to five years. Similarly, for master's degree holders, their employment rate rises from 78% two years after graduation to 81% after two to three years, before falling to 77% after four to five years. Once again, the Slovak trend does not match the OECD average, as 83% of adults holding a master's degree as their highest attainment aged 15-34 at graduation were employed less than two years after graduation, compared to 89% after two to three years and 89% after four to five years on average among OECD countries (Table 2.4).

Higher education graduates across OECD countries enjoy an earnings premium compared to workers with upper secondary education as their highest educational credential. In 2019, Slovak graduates aged 25-64 earned 55% more than upper secondary graduates, consistent with the OECD average (54%). However, this average figure is partly a result of the distribution of graduates across levels of study – with a much greater share completing master's degrees in the Slovak Republic than in the rest of the OECD – and of wide differences by level of study, as illustrated in Table 2.5. Graduates with a master's degree or above enjoy an earnings premium that is about two-thirds of the average figure in the OECD (60% compared to 89%). In contrast, this premium is only half in the Slovak Republic, compared to the OECD average for bachelor's degree graduates (23% compared to 43%). However, the earnings premium for short-cycle tertiary graduates is almost 1.5 times higher in the Slovak Republic than on average in the OECD, at 19% compared to 14%.

Table 2.5. Relative earnings of workers in the Slovak Republic, by educational attainment (2018)

25-64 year-olds with income from employment (full-time full-year workers)

	Baseline: Upper secondary education = 100			
	Below upper secondary	Short-cycle higher education	Bachelor's or equivalent	Master's, doctoral or equivalent
Slovak Republic	78	114	123	160
OECD average	83	119	143	189
EU23 average	85	120	136	169

Note: Slovak Republic: Index 100 refers to the combined ISCED Levels 3 and 4 in the ISCED 2011 classification.

The EU23 average refers to the average of 23 EU countries that were also OECD members as of the end of 2019 (see Endnote 4 for the countries).

Source: OECD (2020^[24]), *Education at a Glance 2020: OECD Indicators*, <https://doi.org/10.1787/69096873-en>, Table A4.1.

As in the rest of the OECD, the earnings of higher education graduates increase with age. In 2018, higher education graduates aged 45-54 earned 28% more than their peers with upper secondary education in the Slovak Republic, which is well below the age-related earning premium observed on average among OECD countries (48%). It is below that of neighbouring countries, such as the Czech Republic (34%) and Hungary (30%), but is above countries with a low premium for older graduates, such as Estonia, Latvia and Lithuania, where it is below 10%. However, for those without higher education, the Slovak Republic is one of the few OECD countries, alongside Estonia, Latvia and Lithuania, where older workers with an upper secondary or post-secondary non-tertiary education earn less than younger workers (OECD, 2020, pp. 90, Figure A4.3^[24]).

The moderate earnings premium of higher education graduates compared to those with upper secondary education in the Slovak Republic and the relatively low progression of earnings with age may in part explain falling rates of applications and enrolment in higher education in the Slovak Republic, as discussed earlier.

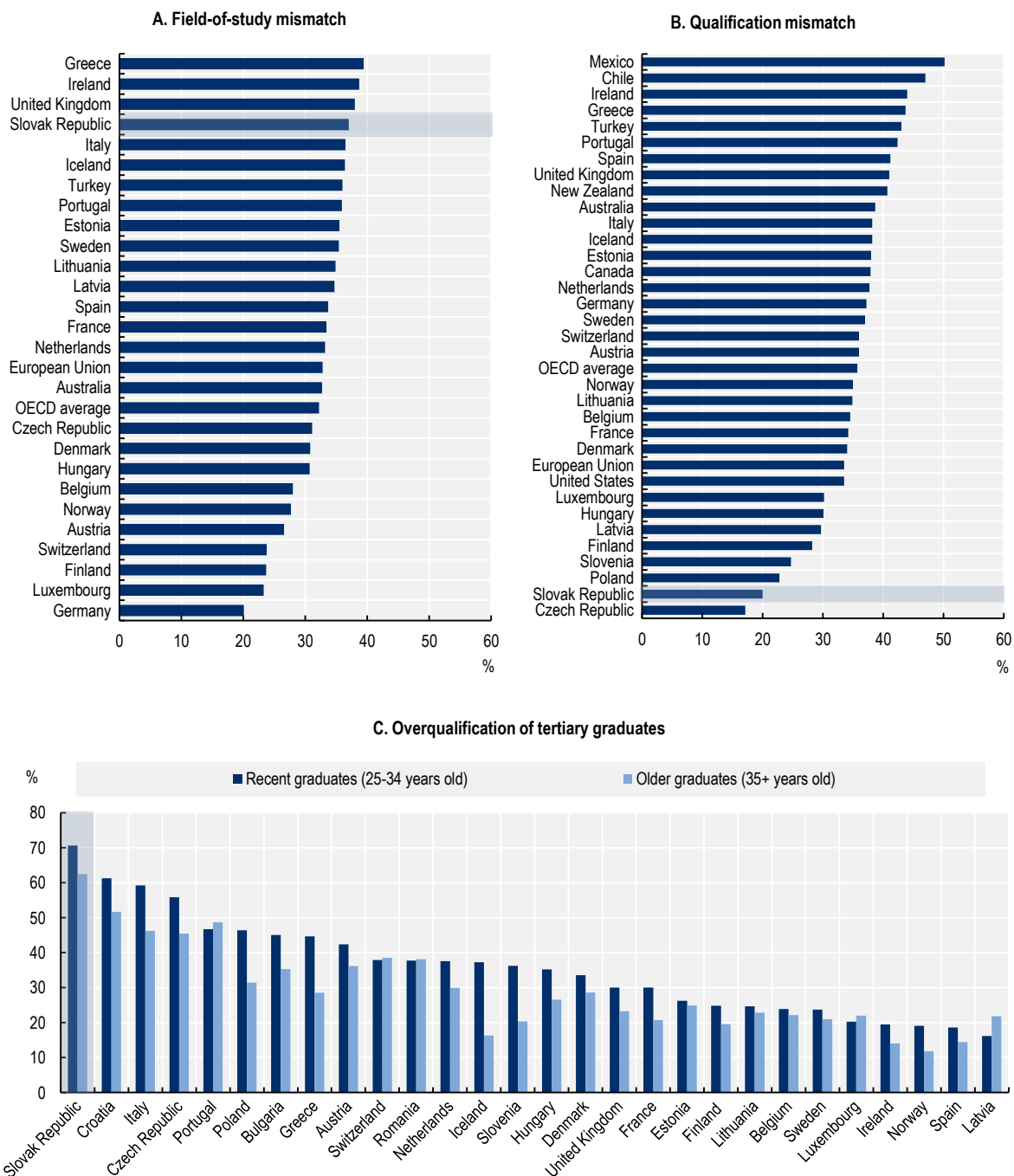
Furthermore, many graduates work in jobs that are not well matched to their programme of study. As shown in Figure 2.9, while qualification mismatch – having a qualification that is higher or lower than that required for one’s job – was significantly lower in the Slovak Republic (20%) than on average in the OECD (36%), the Slovak Republic had the fourth highest rate of field-of-study mismatch among countries with available data, at 37%, above the OECD average of 32%. Moreover, while the methodology tends to overestimate over-qualification in countries experiencing rapid higher education attainment, the Slovak Republic was the EU/European Economic Area (EEA) country with the highest share of over-qualified higher education graduates.

OECD analysis further shows that the imbalance between graduate skills and the demand for skills in the labour market comes with a cost: it reduces the productivity and salaries of Slovak workers by an estimated 6%, a high level by international standards considering that gains to labour productivity from reducing skill mismatch ranges from 2.3% in Poland to 10.1% in Italy (Giorno, 2019^[34]).

Many factors contribute to skills mismatches in the labour market. Recent OECD analysis suggests that, in the Slovak Republic, the “curricula of higher education courses generally prepare students in theoretical rather than practical ways and do not equip students with the mix of technical and transversal competencies demanded in the labour market” (OECD, 2020, p. 93^[5]). At the same time, workplaces in the Slovak Republic may not be making full use of graduate skills. Practices that are known to positively affect the performance of employees and firms are often referred to as high-performance workplace practices (HPWP) and include, among others, quality mentoring and leadership, the provision of workplace training, and employee incentives such as awards, bonus pay, and flexible working hours (OECD/ILO, 2017^[35]). The adoption of HPWP is associated with more effective skills use; however, only 17% of all Slovak jobs adopted HPWP in 2012, compared with 26% among OECD-PIAAC countries (OECD, 2020^[5]).

Figure 2.9. Skills mismatches in the Slovak Republic (2018)

OECD Skills for Jobs database



Note: The countries considered across the different indicators change due to the availability of data. The field-of-study indicator can only be calculated for workers aged 15-34. The qualification mismatch index calculates the share of under- or over-qualified workers by computing the modal (i.e. most common) educational attainment level for each occupation and using this as a benchmark to measure whether individual workers' qualifications match the "normal" education requirement of the occupation. This approach has the advantage of being comparable across countries. However, occupational averages will tend to be driven by the majority of older workers with longer tenure. This means that the index might tend to reflect historical rather than current entry requirements. This could lead to over-estimated rates of over-qualification for countries that have seen an increase in tertiary attainment, such as the Czech Republic, the Slovak Republic and Poland.

Source: OECD (2020^[5]), *OECD Skills Strategy Slovak Republic: Assessment and Recommendations*, <https://doi.org/10.1787/bb688e68-en>, Figure 3.3.

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Research and development performance

Research and development (R&D) is a key component of higher education performance. Research outcomes are often measured using output indicators, such as publications and citations, doctoral degrees awarded, successful patent applications, external research funding obtained, income from science and technology transfers, publishing and researchers, etc. Input indicators, such as the number of doctoral students/candidates and patent applications, as well as spending on R&D, are also useful indicators to analyse countries' potential progress in this area.

Gross domestic expenditure on R&D (GERD) in the Slovak Republic has more than doubled in recent years as the country received substantial funding through the EU structural funds. GERD increased from USD 600 million in 2009 to USD 1 900 million in 2015, and declined to USD 1 400 million in 2018. Despite this general upward trend, GERD was 0.8% of gross domestic product (GDP) in 2018, below the OECD average of 2.4% (OECD, 2021^[36]).

Reflecting on the increase in GERD, there has been significant progress in terms of scientific research production in recent years. Between 2009 and 2018, the total number of scientific publications in the Scopus database across OECD countries increased from approximately 1.3 million to 1.6 million, an increase of around 20%. By comparison, the production of scientific publications almost doubled in the Slovak Republic over the same period, from 3 200 to 5 900 (OECD, 2021^[36]). However, the amount of scientific production is still low compared to international peers. As shown in Table 2.6, the number of publications per thousand inhabitants aged 25-64 was 1.9 in 2018, below the OECD average of 2.7.

Until recently, Slovak HEIs received funding for research activities based mainly on the number of publications, which led researchers to focus on the quantity rather than the quality of publications. In 2018, while the number of publications per full-time equivalent researcher was 0.36 in the Slovak Republic, which was close to the OECD average of 0.35, the average GERD per publication was one of the lowest among OECD countries (Figure 2.10.). The average impact of these publications, measured by the average number of citations per document, was also one of the lowest (Table 2.6). In 2017, the financing of public HEIs was revised to motivate publishing in international, high-impact research journals, as further discussed in Chapter 3. Nevertheless, the capacity of the Slovak higher education system to produce high-impact research needs more time to adjust.

Table 2.6. Quantity and impact of scientific production in selected countries (2018)

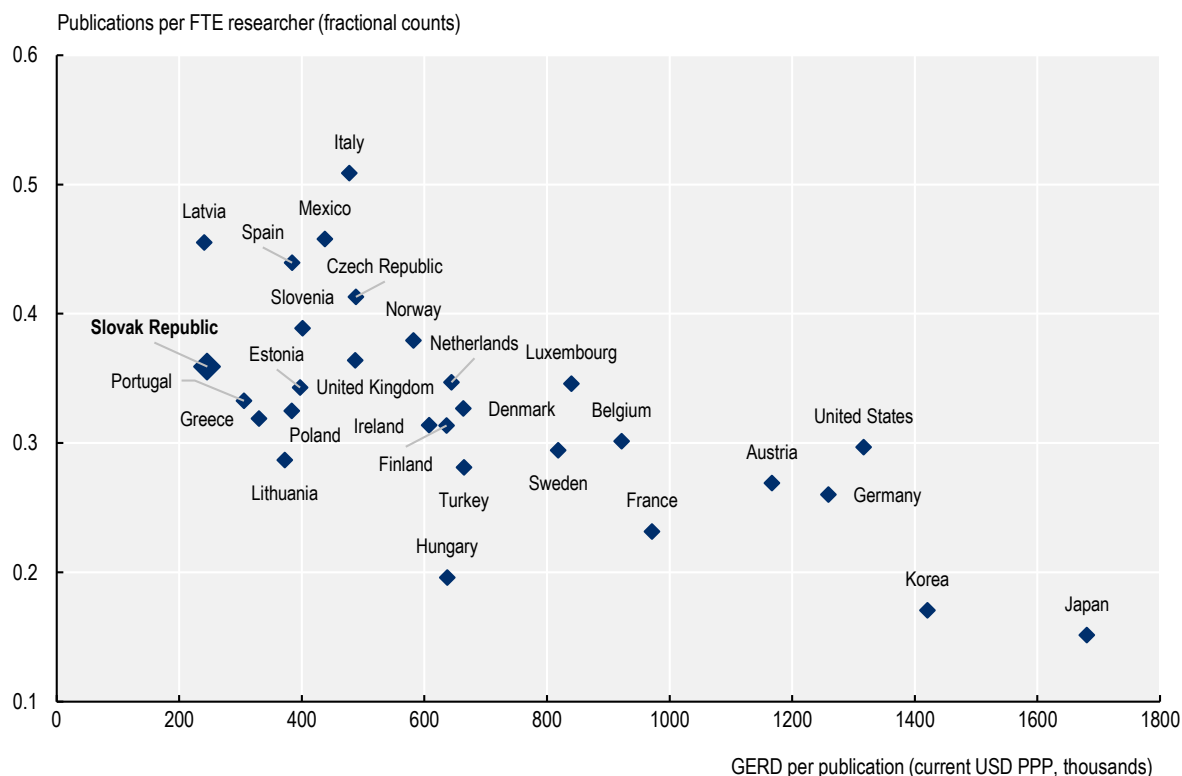
Fractional counts

	Number of publications per thousand inhabitants aged 25-64	OECD rank (number of publications)	Percentage of publications among the world's 10% most cited	OECD rank (10% most cited)
Finland	4.2	6	12.2	11
OECD average	2.7	-	9.7	-
Czech Republic	2.9	16	5.1	33
Germany	2.5	21	11.4	12
Slovak Republic	1.9	28	4.5	35

Note: OECD calculations based on Scopus Custom Data, Elsevier, Version 1.2021, May 2021.

Sources: OECD (2021^[37]), *Historical population*, <https://stats.oecd.org/Index.aspx?DataSetCode=HISTPOP>; OECD (2021^[36]), *OECD Science, Technology and Innovation Scoreboard*, <https://www.oecd.org/sti/scoreboard.htm>.

Figure 2.10. Publication performance of Slovak R&D (2018)



Note: OECD calculations based on Scopus Custom Data, Elsevier, Version 1.2021, May 2021.

Source: OECD (2021^[36]), *OECD Science, Technology and Innovation Scoreboard*, <https://www.oecd.org/sti/scoreboard.htm>.

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Another way to look at the performance of the R&D system supported by public resources is the number of applications to European Research Council (ERC) grants⁷ by individual countries. Slovak applications were consistently low between 2006 and 2015, with 36 applications in 2007, compared to 80 from the Czech Republic, 177 from Hungary and 193 from Poland (Technology Centre of the CAS, 2017^[38]). Since 2007, the ERC has supported only two project proposals from the Slovak Republic, one of the lowest numbers among the EU28 member states (European Research Council, 2021^[39]).

Higher education rankings also continue to play an important role in comparing the performance of higher education institutions worldwide, particularly with respect to research, as they rely largely on bibliometric indicators (OECD, 2019^[27]). According to various university rankings, Slovak higher education institutions perform consistently below institutions in neighbouring countries:

- *Times Higher Education (THE) World University Ranking 2021*: Six Slovak universities are listed in the rank 1001+, namely Comenius University in Bratislava, the Slovak University of Agriculture in Nitra, Pavol Jozef Šafárik University in Košice, the Slovak University of Technology in Bratislava, the Technical University of Košice, the University of Žilina (Times Higher Education, 2021^[40]).
- *THE Young University Ranking 2021* (universities established less than 50 years ago): None of the Slovak universities is listed among 414 evaluated institutions (Times Higher Education, 2021^[41]).
- *QS World University Ranking 2021*: Four Slovak HEIs are included in the final top 1 000 universities that are selected out of over 5 500 institutions evaluated and considered: Pavol Jozef Šafárik University in Košice (the 651-700 range), Comenius University in Bratislava (the 701-750 range),

the Slovak University of Technology in Bratislava (the 801-1000 range) and Technical University of Košice (the 801-1000 range) (Quacquarelli Symonds Limited, 2021^[42]).

- *Best Global Universities 2021*: This ranking published by *U.S. News* includes more than 1 600 universities around the world. Among Slovak HEIs, Comenius University in Bratislava scores the highest (rank 572), followed by the University of Pavol Šafárik Košice (1148) and Slovak University of Technology Bratislava (1321). In the same ranking, Hungary is represented by 8 institutions, the Czech Republic by 11, and Poland by 31 institutions (U.S. News, 2021^[43]).
- *Academic Ranking of World Universities (ARWU 2020)*: This ranking list includes only Comenius University in Bratislava in the world rank 601-700 (Shanghai Ranking Consultancy, 2020^[44]).

According to the Universitas 21 Ranking, a benchmark for governments that focuses on ranking national higher education systems instead of individual universities, Slovak higher education scores below neighbouring countries. The Slovak Republic was ranked 38th out of 50 higher education systems in 2020, with particular weaknesses regarding joint scientific publications with industry and knowledge transfer (Universitas 21, 2021^[45]).

Notes

1. The names of the HEIs and their faculties had to be listed in the annex to the Higher Education Act (172/1990), which was a federal legislation valid for both the Czech and Slovak Republics of the then Czechoslovakia.
2. The five foreign-based institutions are the College of International and Public Relations Prague (Czech), the Hochschule Fresenius University of Applied Sciences (German), the MOD'SPE PARIS Central Europe (French), the Old Polish University (Polish) and Szent István University (Hungarian) (Eurydice, 2020^[46]).
3. The standards, as well as the list of evaluators, can be found at <https://saavs.sk/> (accessed on 2 June 2021).
4. The EU23 average refers to the average of 23 EU countries that were also OECD members as of the end of 2019. The 23 countries included in this average are Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, the Netherlands, Poland, Portugal, the Slovak Republic, Slovenia, Spain, Sweden and the United Kingdom.
5. Slovak students are able to study in Czech study programmes, so they have the same conditions as Czech nationals, including tuition-free education at public and state HEIs. Due to significant demographic decline in the Czech Republic, HEIs have been intensively targeting Slovak students.
6. Natural sciences: 95.75%; Technical sciences/Engineering: 94.7%; Health sciences: 97.34%; Social sciences/Humanities: 95.18%.
7. Grants include Starting, Consolidator, Advanced, Proof of Concepts and Synergy grants. For more details, see the European Research Council website at <https://erc.europa.eu/>.

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