On average, the breakdown of HERD by type of cost does not differ greatly to the breakdown of GERD; overall around 12% of costs relate to capital expenditure (Figure 6.5). But capital costs can vary over time in countries according to national plans for building or improving physical structures. For example, in Latvia and Poland, capital expenditure represented more than 30% of HERD in 2015, which may indicate that these countries were investing in expanding their research infrastructure.

In the participating jurisdictions, varying levels of capital expenditure were evident in 2015. Estonia spent 15% of GERD and 17% of HERD on capital costs, significantly higher than the OECD average, which could reflect additional investments under the Estonian Research Infrastructures Roadmap (see below). Belgium, the Netherlands and Norway spent below the OECD average proportion on capital expenditure in 2015, amounting to approximately 8% in each of these jurisdictions. However, in general, capital expenditure in higher education tends to show some volatility over time, depending on the levels of investment in infrastructure required and priorities for expenditure.

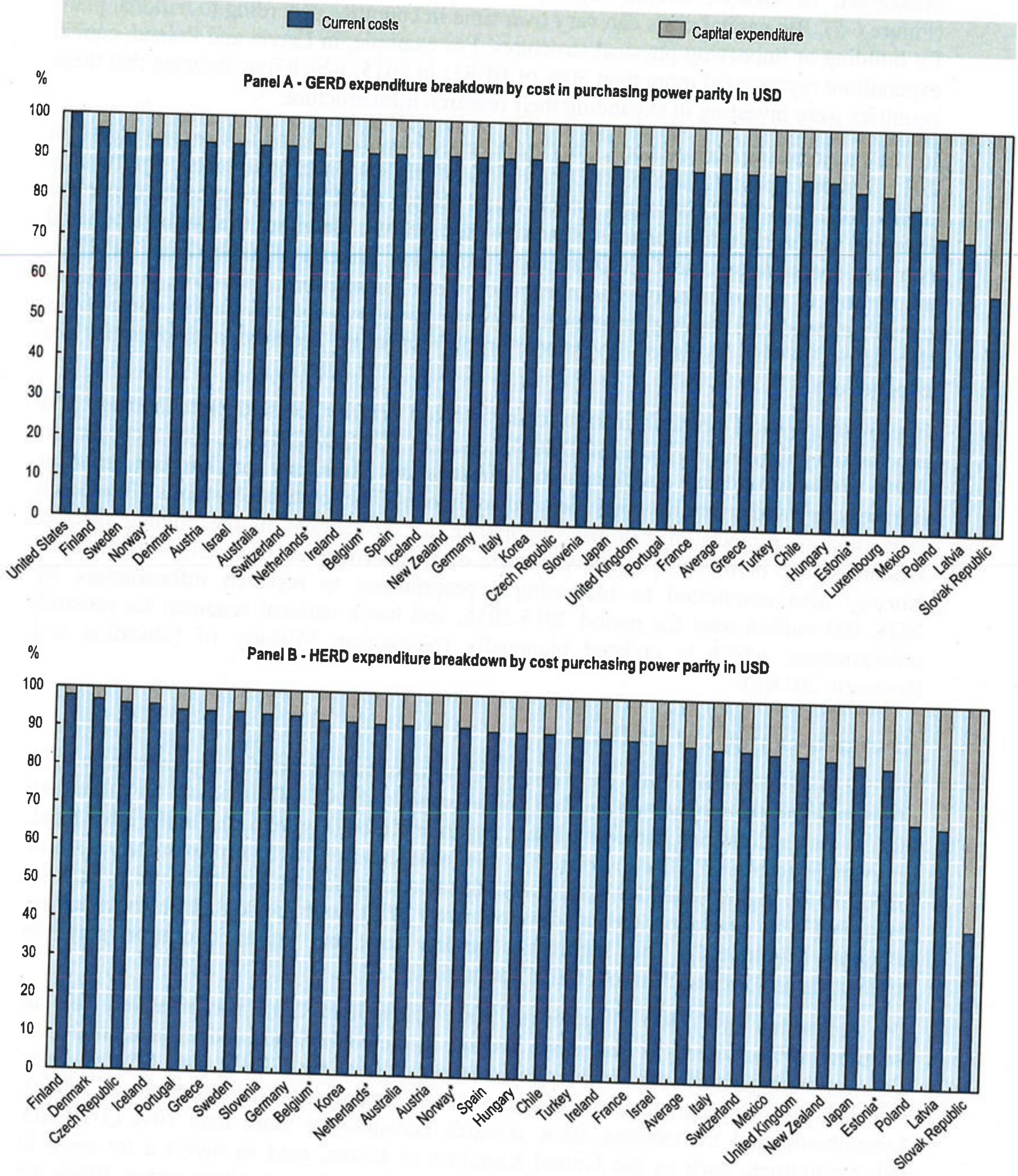
Improving physical research infrastructure is a top priority for science technology and innovation policymakers in most OECD countries (OECD, 2017[13]). For example, in 2019, Estonia updated its Research Infrastructure Roadmap to improve existing infrastructure and create new facilities and equipment. The roadmap earmarks 17 research infrastructure projects of national importance for investment in the coming decade. Estonia is also involved in the development of 14 international research infrastructures. Norway also committed to increasing appropriations to research infrastructure by NOK 400 million over the period 2015-2018, and has a national roadmap for research infrastructure, which is updated biannually (Norwegian Ministry of Education and Research, 2018[7]).

Expenditure by type of R&D

Overall, applied research and experimental development account for approximately 75% of gross domestic expenditure on R&D on average in the OECD area, and for more than 80% in eleven countries, including Israel, Japan or Korea (Figure 6.6). On the other hand, on average across OECD countries with available data for 2015, approximately 53% of GERD in the higher education sector was allocated to basic research, followed by applied research (35%) and experimental development (10%), with marked differences across countries (Figure 6.6). This highlights the key role that higher education plays in conducting basic research across OECD countries.

The proportion of GERD allocated to basic research in 2015 was relatively low in Belgium (16%), while it is just above average in the Netherlands and Estonia, at around 27% for both jurisdictions. In Norway, the breakdown for GERD was 17% on basic research, 36% on applied research, and 40% on experimental development. In France, Luxembourg and Switzerland, basic research accounts for more than 70% of HERD. Other countries, such as the United Kingdom or Korea, tend to invest a lot more in applied research and experimental development in the higher education sector. While the Netherlands and Estonia also spend a slightly higher than average proportion of HERD on basic research (approximately 57%), the proportion of HERD in Belgium devoted to basic research was the lowest in OECD countries in 2015, making up less than 20% of spending (Figure 6.6).

Figure 6.5. Expenditure on R&D by type of cost (2015)



Note: *Participating in the Benchmarking Higher Education System Performance exercise 2017/2018. Data refer to 2015 or most recently available year.

Source: Adapted from OECD (2018[16]), *OECD Science, Technology and R&D Statistics*, https://doi.org/10.1787/strd-data-en.

StatLink https://doi.org/10.1787/888933941310

Table 6.2. Success rates in attracting Horizon 2020 funding (2014-2016)

	Number of applications	% of overall applications 2014-2016	Application success rate %
Belgium	14 840	3.7	18
Austria	9 705	2.4	17
France	30 660	7.7	17
Luxembourg	1 095	0.3	17
The Netherlands	22 226	5.6	17
Germany	44 811	11.2	16
Sweden	11 464	2.9	16
Norway	5 847	1.5	16
Denmark	8 981	2.2	15
Ireland	6 394	1.6	15
United Kingdom	49 412	12.4	15
The Czech Republic	4 385	1.1	14
Spain	42 403	10.6	14
Finland	8 671	2.2	14
Estonia	2 020	0.5	13
Greece	12 839	3.2	13
Portugal	9 521	2.4	13
The Slovak Republic	1 901	0.5	13
Italy	44 820	11.2	12
Lithuania	1 095	0.3	12
Latvia	1 419	0.4	12
Poland	7 901	2	12
Hungary	4 874	1.2	11
Slovenia	4 512	1.1	11

Note: *Participating in the Benchmarking Higher Education System Performance exercise 2017/2018.
Source: Adapted from European Commission (2018[19]), *Horizon 2020 in full swing - Three Years On - Key facts and figures 2014-2016*, https://doi.org/10.2777/778848.

6.2.3. How research and development funding is spent

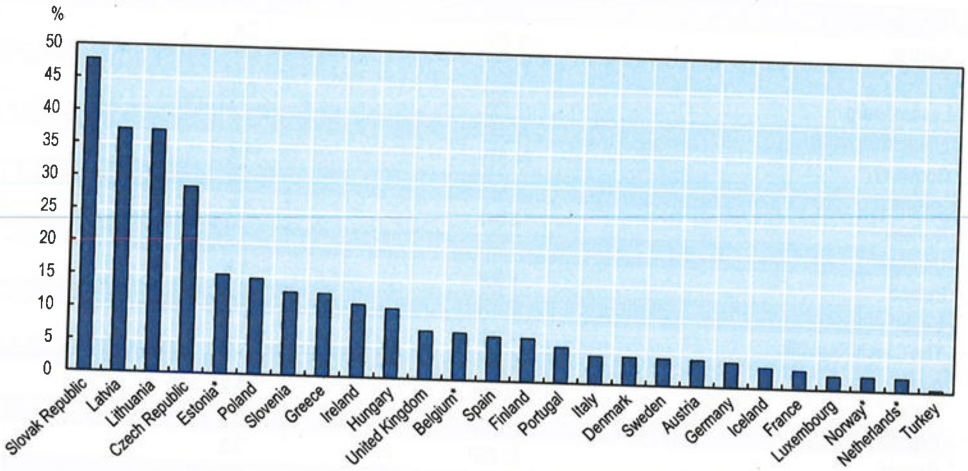
Current and capital costs

Current expenditures in R&D are composed of labour costs of R&D personnel; other current costs used in R&D, such as services and items (including equipment) used and consumed within one year; and annual fees for the use of fixed assets. Capital costs cover the purchase of fixed assets such as land and buildings, machinery and equipment, capitalised computer software and other intellectual property products that are used in R&D for more than a year (OECD, 2015[1]). This increasingly includes electronic infrastructure such as data, computing and communications networks that are used within R&D systems or, in some fields of research, shared between systems (European Strategy Forum on Research Infrastructures Long-Term Sustainability Working Group, 2017[20]).

On average across the OECD in 2015, current costs represent 89% of GERD, and capital costs just 11%; though in many countries, the proportion of expenditure dedicated to current costs is above 90%. Research is intensive on human resources, and therefore labour costs are generally the largest component of current costs (OECD, 2015[1]).

Figure 6.4. European Commission funding of government and higher education R&D in selected European countries (2015)

Share of government and higher education R&D funded by EC as a percentage



Note: *Participating in the Benchmarking Higher Education System Performance exercise 2017/2018. For Austria, Belgium, Denmark, and Sweden, data refer to 2013. For Germany, France, Italy, Lithuania, Luxembourg, the Netherlands, Poland, Portugal and Slovenia, data refer to 2014.
Source: Adapted from OECD (2017[13]), *OECD Science, Technology and Industry Scoreboard 2017: The digital transformation*, http://dx.doi.org/10.1787/9789264268821-en.

StatLink https://doi.org/10.1787/888933941291

As can be seen in Figure 6.4, funding from international sources represents a small proportion of funding overall across OECD countries, although it tends to be more substantial for countries that are eligible to receive funding from the European Union (EU). Funds provided by the EU are especially important for R&D undertaken in a small group of European countries, reaching almost half the funding in the Slovak Republic in 2015. EC funding is also important for Estonia (15% in 2017), while it accounts for 7% of Belgian funding. On the other hand, Norway and the Netherlands have some of the lowest shares of their overall higher education R&D funding coming from the European Commission, at around 2% (Figure 6.4).

In recent years, countries have had varying rates of success in attracting R&D funding from EC sources (Table 6.2). Over the period 2014-2016, Belgium was the most successful of all European Union countries in successfully attracting funds from the Horizon 2020 framework programme for R&D, with an 18% success rate from almost 15 000 applications. The Netherlands and Norway also had relatively high success rates for their applications, at 17% and 16% of applications respectively. In Estonia, where approximately 2000 applications were submitted for funding over the period, there was a success rate of 13%.

Table 6.1. Types of funding for R&D in the participating jurisdictions

	Estonia	The Flemish Community	The Netherlands		Norway
			Universities	Professional HEIs	
Base funding	Yes (provided by the Ministry of Education and Research to R&D institutions that received a positive evaluation)	Yes (provided by the Department of Education and Training)	Yes (part of the block grant where fixed allocations constitute 58%, another 5% is allocated for doctoral training)	Yes (to support practice-oriented research, provided as part of the lump sum funding for professional HEIs)	Yes (constitutes 70% of the block grant without detailed specifications of its use)
Performance-based funding	Yes (base funding is performance-based)	Yes (provided by the Department of Economy, Science and Innovation through Special Research Funds and Industrial Research Funds)	Yes (part of the block grant is formula-based with performance elements, constitutes 37% of the block grant) Research-related indicators are also included in the performance agreements		Yes (constitutes 6% of the block grant for HEIs provided based on performance)
Project- and/or programme-based competitive funding/research grants	Research grants for research groups, institutions or individuals	Yes (project-based funding provided by the Research Foundation)	Yes (competitive project- and programme-based funding provided by the Research Council and the Royal Academy of Sciences)	Yes (NWO competitive funds for practice-oriented research; supports knowledge exchange between SMEs and professional HEIs and the creation of Centres for Expertise)	Yes (competitive project-based funding, primarily provided by Research Council of Norway)
Funding to support research infrastructure	Yes	Yes (through the programme infrastructure of the Research Foundation)	Yes (in support of the "top sectors" activities)		Yes (it aims to increase appropriations to research infrastructure by NOK 400 million by 2018)
Indicators or other considerations attached to funding mechanisms	To be eligible for baseline funding, R&D institutions must have a positive evaluation in the regular government research evaluation process. In total, 95% of funding is awarded based on performance criteria (high level research publications, patents and patent applications, co-financing of R&D and doctoral graduates); and 5% is allocated to humanitarian research of national significance.	Special Research Funds are awarded based on number of master degrees, defended doctorates, gender diversity, publications and citations. Industrial Research Funds are awarded based on defended doctorates, publications and citations, revenues from licences, revenues from EU contracts, patents and spin-off companies.	Formula-based funding (37% of the core R&D funding of universities) considers degrees and defended doctoral degrees. Indicators in performance agreements include research contracts funded by research councils and the EU, scientific impact, scores in research assessment exercises, doctorate degrees awarded.	Competitive funding to support co-operation between professional HEIs and business.	Performance-based funding is awarded based on several indicators: including scientific production, student credits, degrees, exchange students, competitive funding from the research council and regional research funds, funding from the EU and other third-parties.

Source: Adapted from Jonkers and Zacharewics (2016[18]), *Research Performance Based Funding Systems: a Comparative Assessment*, https://doi.org/10.2760/70120; information provided by the participating jurisdictions. See the reader's guide for further information.

higher education. This may be related to relatively low availability of internal funds (e.g. income from endowments or student fees) within the higher education sectors of the participating jurisdictions, compared to some other OECD countries.

Disparities of funding from different sources can be related to the funding mechanisms in place for research in particular country contexts; while some systems may fund R&D from general institutional funds, in other cases institutions may receive a specific allocation of R&D funding from government. Differences are also related to the relative availability of funding from different sources. For example, European countries are eligible to apply for targeted R&D funding from the European Union, so they may have more capacity to attract funding from abroad. In other countries, notably Canada, Sweden, the United Kingdom and the United States, the private non-profit sector is an important source of funds.

Table 6.1 summarises the key funding mechanisms for each of the four participating jurisdictions. As can be seen from the table, performance-based formula funding and competitive funding mechanisms for R&D, as well as block grant funding, are in place in all jurisdictions. For example, in the Flemish Community, in addition to the block grant funding for research provided by the Department of Education and Training, higher education institutions can receive special research funding from the Department of Economy, Science and Innovation, which is provided based on performance (Jonkers and Zacharewicz, 2016[18]). These "Special Research Funds" (BOF), are awarded based on the number of master's and doctoral degrees awarded, gender diversity, and research productivity and impact. Institutions can also benefit from "Industrial Research Funds" (IOF) if they engage in technology transfer activities such as licensing, patenting and spin-offs.

The Netherlands directs a special stream of funding towards practice-oriented research as part of the funding allocated to the professional HEI sector. This stream of funding can be used to appoint associate professors (lectors) who specialise in developing research projects in conjunction with stakeholders, which serves their mutual interest. In addition, competitive funding is available for professional HEIs to establish Centres of Expertise, public-private partnerships set up to encourage partnership between higher education institutions, industry and government. Most of the Centres of Expertise are affiliated with one of the "top sectors", key sectors of importance to the Dutch economy (Section 6.7).

Funding from international sources

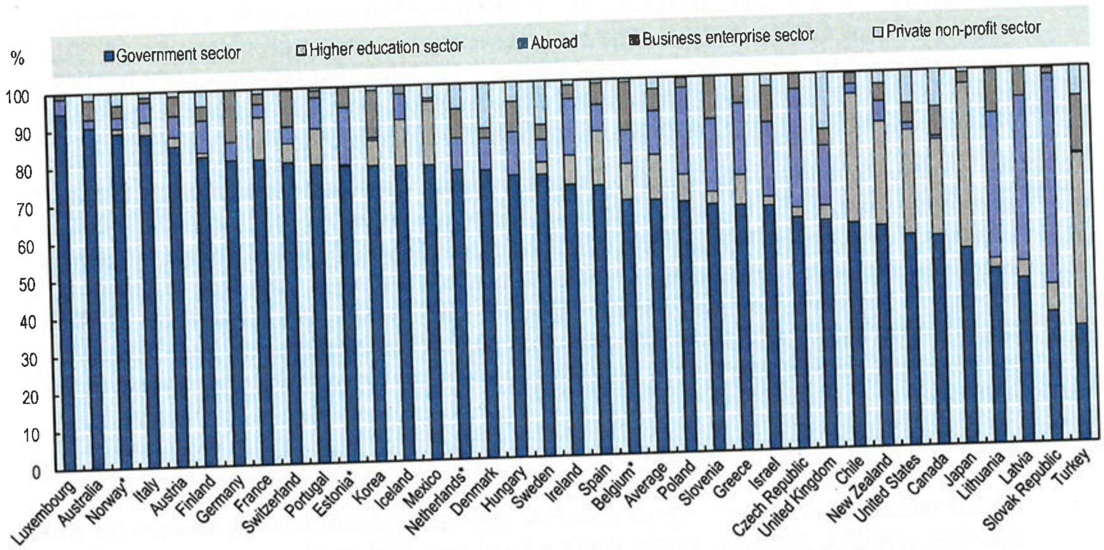
A number of countries rely heavily on funding from abroad to finance higher education R&D, including from international organisations and supranational entities. In five of the countries for which data was available for 2016, funding from international sources represented over one-fifth of total funding, ranging from 23% of funding in Poland to over 56% of funding in the Slovak Republic (Figure 6.3). However, for EU countries, some of the differences between countries can also be related to how funding from European Structural Funds is accounted for in budgets. In some countries, it may be classified directly as funding from abroad, while in others it may be incorporated into national funds before being allocated, meaning it is then classified as government funds.

Netherlands, 8% of HERD in 2016 was financed from abroad and another 8% came from the business enterprise sector. With 3% of HERD originating from the business sector, Norway had the lowest contribution from business among jurisdictions participating in the benchmarking exercise in 2016.

Compared to other sources of funding for HERD, the contribution of the business sector is relatively small (5% of HERD on average across the OECD in 2016). However, these figures may understate the full extent of businesses' overall contribution to HERD, which can also involve payments for the use of facilities or outcomes of R&D such as licensing income or investment in spin-offs.

Figure 6.3. Expenditure on research undertaken by the higher education sector, by source of funding (2016)

As a percentage of total funds



Note: *Participating in the Benchmarking Higher Education System Performance exercise 2017/2018.
Data refer to 2016 or most recently available year.
Source: Adapted from OECD (2018[16]), *OECD Science, Technology and R&D Statistics*, https://doi.org/10.1787/strd-data-en.

StatLink https://doi.org/10.1787/888933941272

In addition to contributions from businesses, funding from private non-profit organisations is an important indicator of engagement in R&D performed by the higher education sector. In some countries, such as Denmark, Sweden and the United Kingdom, the contribution of private non-profit organisations to HERD far exceeds that of the business sector. However, in the four participating jurisdictions, private non-profit funding in higher education is not a substantial source of funding; while it was the source of more than 6% of funding in the Netherlands in 2016, it made up less than 4% of funding in Norway and less than 1% in Belgium and Estonia.

When compared to the OECD average, the higher education sectors in Belgium, Estonia, the Netherlands and Norway contribute less funding to support R&D undertaken by

Data refer to 2016 or most recently available year.
Source: Adapted from OECD (2018[16]), *OECD Science, Technology and R&D Statistics*, https://doi.org/10.1787/strd-data-en.

StatLink https://doi.org/10.1787/888933941253

Figure 6.2 shows that in all OECD countries except Hungary, Korea, Luxembourg, Mexico and Slovenia, the higher education sector was responsible for a larger proportion of R&D expenditure than the government sector in 2016.[1] The proportion of expenditure on R&D performed by government was slightly above the OECD average in Flanders (11%), Estonia (11%) and the Netherlands (12%). In Norway, approximately 14% of R&D was undertaken by the government. However, although the government sector is a relatively minor performer in research and experimental development, it represents a major source of funding of R&D undertaken by the higher education and business sectors (OECD, 2015[17]).

In Flanders the business enterprise sector and the private non-profit sector represented almost 70% of GERD in 2016. The business enterprise sector provided around 50% of GERD in Estonia, the Netherlands and Norway, implying that HERD and GOVERD are more important in these jurisdictions. The higher education sector is particularly important in Estonia; in 2016 it was responsible for around 40% of expenditure.

As Figure 6.2 shows, the higher education sector has been attracting an increasing proportion of GERD in recent years in many countries, even as GERD itself also expands. For example, Portugal increased the proportion of GERD allocated to the higher education sector by more than 10 percentage points between 2006 and 2016. In other countries, however, such as Greece, Hungary and Turkey, the proportion of GERD allocated to higher education has been falling. In the Netherlands and Norway, the proportion of GERD spent in the higher education sector in 2016 was similar to 2006 levels.

6.2.2. Sources of funding for higher education research and development

Higher education draws on various domestic and international funding sources for R&D activities (OECD, 2015[17]). While R&D activities in higher education may be to some extent funded by internal funds (e.g. income from endowments or student fees), the majority of funding comes from outside the higher education sector. Given the pressures of financing higher education faced by the public sector (see Chapter 1), higher education institutions are increasingly seeking to diversify sources of R&D funding, as well as other higher education activities. This section assesses how well-diversified the funding sources are for R&D across OECD higher education systems.

On average, across OECD countries with available data, R&D undertaken by higher education in 2016 was, for the most part, heavily financed by the government sector (68%), followed by funding from within the higher education sector itself (12%), funding from abroad (12%), business enterprises (6%), and the private non-profit sector (3%). However, some systems are also able to raise funding from the business enterprise sector, such as Germany (14% of overall funding) or Korea (13% of overall funding) (Figure 6.3).

Government funding accounted for more than two-thirds of HERD in Belgium, Estonia and the Netherlands, and close to 90% of HERD in Norway. Funding from abroad is the second largest source of funding of HERD in Estonia (15%), while the business enterprise sector is the second largest source of funding in Belgium (13%). In the

StatLink https://doi.org/10.1787/888933941234

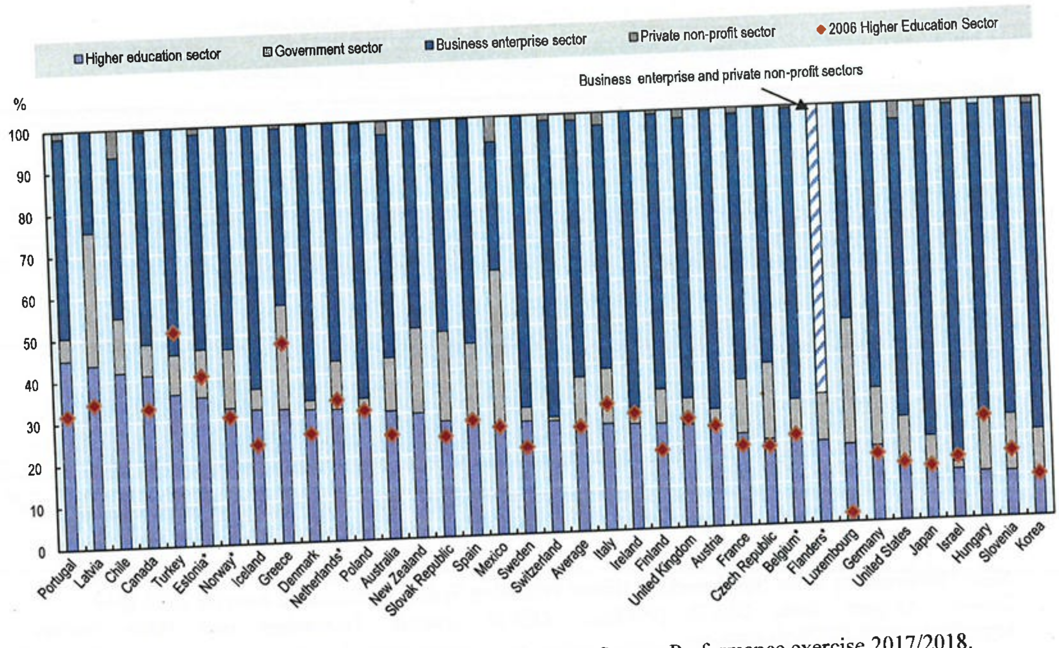
Overall, GERD in the OECD area amounted to 1.9% of GDP in 2016, compared to 1.8% of GDP in 2006. At the level of individual countries, expenditure as a proportion of GDP increased in 23 of the 31 countries with available data for 2006 and 2016; with the most significant increases occurring in Austria (0.7% of GDP) and Korea (1.4% of GDP). Countries with decreasing investment over the period 2006-2016 include Canada, Finland and Luxembourg (Figure 6.1).

In Flanders, GERD is higher than the OECD average, with investment equivalent to 2.7% of GDP in 2016, while in the Netherlands and Norway, GERD was at approximately 2% of GDP. The Netherlands and Norway have moved steadily from below or at the average level of investment in 2006 to above average levels by 2016, and while comparable data for 2006 for Flanders are not available, Belgium was already slightly above the OECD average in 2006, with GERD as a proportion of GDP of 1.8%.

GERD patterns have been more volatile in Estonia in recent years, though it must be noted that in relatively small research systems, the ratio between GERD and GDP can be affected by single investments involving relatively large financial amounts. For example, R&D investments related to an Estonian oil shale refinery contributed to GERD reaching 2.3% of GDP in 2011 (from a 2005 level of 1.1%) and progressively decreasing since, reaching a level of 1.3% of GDP in 2016.

Business enterprise expenditure on research and development represents the largest portion of GERD, accounting for over 60% of R&D on average across the OECD (Figure 6.2). HERD is the next largest expenditure category, while GOVERD in OECD countries is lower on average than HERD. Overall, around 26% of GERD in 2016 was allocated to research undertaken by the higher education sector alone.

Figure 6.2. Gross domestic expenditure on R&D by performing sector (2016)



Note: *Participating in the Benchmarking Higher Education System Performance exercise 2017/2018.

education expenditure relates to the broader R&D investment in countries, where investment comes from and how it is spent.

6.2.1. Higher education investment within the broader R&D sector

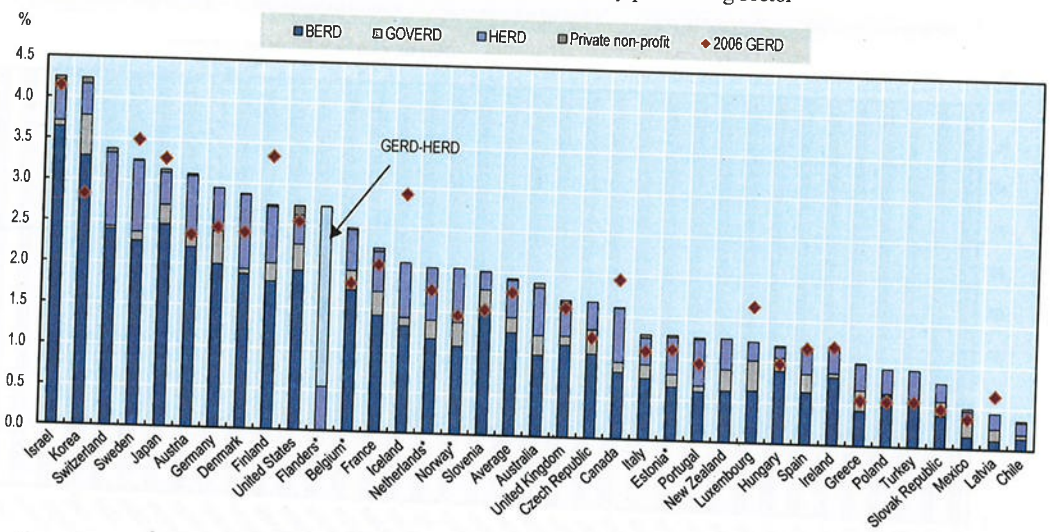
Gross domestic expenditure on research and experimental development (GERD) measures all intramural expenditure on research and development within a jurisdiction. It includes expenditure on R&D from outside the jurisdiction, but not domestic expenditure which is spent in another jurisdiction, and so provides a clear measure of the volume of expenditure on R&D within any one economy.

GERD is distributed among the four R&D-performing sectors: business enterprise, government, higher education and private non-profit, as defined by the Frascati manual (OECD, 2015[11]). Therefore, GERD encompasses expenditure on Higher Education R&D (HERD), expenditure on research in the government sector (GOVERD), business research and development expenditure (BERD) and expenditure in the private non-profit sector. Government policy and targets in R&D tend to focus on either the R&D sector as a whole, or the public research sector, rather than specifically focusing on higher education R&D.

Many countries across the OECD have set targets to increase GERD. For example, in line with the EU 2020 strategy for smart, sustainable and inclusive growth, European countries including Denmark, Germany and France envisage increasing GERD to 3% of GDP by 2020; while Finland, Sweden and Japan have set more ambitious spending targets of 4% of GDP by 2020 (OECD, 2014[15]). However, as can be seen from Figure 6.1, some OECD countries invest considerably more in R&D than others. For example, in Israel and Korea, GERD amounts to more than 4% of GDP; while Turkey, Latvia, Mexico and Chile spend less than 1% of GDP on R&D.

Figure 6.1. Gross domestic expenditure on R&D (2016)

As a percentage of GDP, overall and by performing sector



Note: *Participating in the Benchmarking Higher Education System Performance exercise 2017/2018.
Source: Adapted from OECD (2018[16]), *OECD Science, Technology and R&D Statistics*, https://doi.org/10.1787/strd-data-en.

committed: the value of science further elaborated on the 2025 vision, particularly in terms of policy initiatives (Dutch Ministry of Education, Culture and Science, 2019[9]). The *Strategic Agenda for Higher Education, Research and Science 2015-2025* (Dutch Ministry of Education, Culture and Science, 2015[10]), also includes objectives to enhance research into higher education practices in order to improve education quality and build strong, permanent links between education, research and practice (for example, through Centres of Expertise to tackle the greatest societal challenges).

In **the Flemish Community**, the policy note *Work, Economy, Science and Innovation 2014-2019* outlines the Flemish commitment to reach the EU 2020 target investment of 3% of its gross domestic product (GDP) in research and development, comprising 1% from government funding and 2% by the business sector. There is also increased focus on the participation of higher education institutions in European programmes such as European Research Council and Marie Curie, and aligning the Flemish research strategy with the European instruments (Flemish Government, 2014[11]).

The ***Estonian*** *Research and Development and Innovation Strategy 2014-2020* sets goals for the system, including achieving the 3% EU 2020 GDP target, moving to 10th place on the EU Innovation Scoreboard, increasing the number of doctoral graduates and the impact of scientific publications. Estonia is also aiming to increase its share of EU research funding and become more active and visible in international research, development and innovation co-operation initiatives (Estonian Ministry of Education and Research, 2014[12]). Estonia also has particular goals in relation to the levels of investment in R&D by source, by targeting a level of investment of 2% of GDP from the private sector, with 1% of GDP coming from the state and local budget.

6.2. Investment in research and development

The combined expenditure of OECD countries on public R&D currently represents 65% of the global public R&D investment, though the growth of public science systems in emerging economies is likely to change the balance of expenditure in the years to come (OECD, 2016[3]). The higher education sector performs a substantial share of public research activity across OECD countries, and also plays a key role both in performing basic research and training researchers through doctoral education. Expenditure on R&D within higher education has been on a pattern of sustained growth, more than doubling since 1995, though growth has begun to slow in recent years (OECD, 2017[13]).

The policy arguments for investing in R&D are complex. The timelines as well as the economic and social payoffs of research projects are not always clear in advance at the level of individual investments, particularly when it comes to investment in basic research. However, investment in research creates value by improving the body of knowledge and new ideas from which the economy can draw to innovate, create new products and services and improve existing ones. This increased stock of knowledge can provide wider economic or social benefits through knowledge, market or network spill-overs (Georghiou, 2015[14]).

With the goal of promoting innovation high on the policy agenda in many OECD countries, investment in knowledge creation to feed into innovation is increasingly considered crucial. Indicators on the source, destination and distribution of expenditure can provide insight into how much governments are prioritising the R&D sector and which subsectors and types of research are attracting the majority of funding. The comparative data presented in this section focus on the key questions of how higher

Box 6.1. Public research systems in the participating jurisdictions

As of 2017, the main actors in the research system of Estonia are the six public universities. Of these institutions, Tartu University and Tallinn University of Technology receive the largest share of public funding and have the highest number of students and staff (Kattel and Stamenov, 2017[4]). In addition, there are seven public research organisations and seven private R&D institutions (including one private university) that play an important role in the research system.

In Norway, the public research system includes universities and university colleges, research institutes and hospitals (health trusts). The Research Council of Norway (RCN) funds research over the whole range of R&D activities, and assumes an advisory role to the government in research policy matters. The council also funds the establishment and operation of specially designated research centres which carry out specific functions, such as Centres of Excellence (SFF) in specific fields of science, Centres for Research-based Innovation (SFI), and Centres for Environment-friendly Energy Research (FME).

In the Netherlands, universities carry out the majority of public research, though in recent years there has been some increase in practice-oriented research at professional HEIs. Public research institutes consist of scientific research institutes that are under the Netherlands Organisation for Scientific Research (NWO) and the Royal Netherlands Academy of Arts and Sciences (KNAW); government laboratories; and applied research (TO2) institutes, the latter of which are the most significant of the public research institutes in terms of expenditure (OECD, 2014[5]).

Research in the public system of the Flemish Community is carried out by higher education institutions and four Strategic Research Centres (SRC). There are also a number of additional scientific institutes, knowledge institutes and policy research centres. Each Strategic Research Centre focuses on one key specific area of research (nanotechnology, biotechnology, automotive and machine production, and multidisciplinary research); centres are also active in the commercialisation of their research. Belgium also has ten federal scientific establishments, which often conduct research in partnership with universities in the Flemish and French Community (Flemish Department of Economy, Science and Innovation, 2017[6]).

In **Norway**, the *Long-term Plan for Research and Higher Education 2019–2028* sets the priorities for Norwegian higher education over the period. The government aims to further increase investment in higher education over the period and also work to facilitate the greater use of knowledge. Key measures of the plan related to R&D are an investment package to improve technology (including increasing basic research in ICT and building an e-infrastructure for open research), boosting the role of R&D for renewal and restructuring of the business sector (including expanding researcher education in new business creation), and increasing commercialisation, research-based innovation and business-oriented research (Norwegian Ministry of Education and Research, 2018[7]).

The Netherlands has set out a *2025 Vision for Science: Choices for the Future* (Dutch Ministry of Education, Culture and Science, 2014[8]), which aims to consolidate the Dutch position as a world leader in research and ensure that the system can evolve to maintain its position amid emerging challenges. Specific commitments include considerable investment in research projects which attract Horizon 2020 funding, and the development of a National Research Agenda (NWA) to set priorities. The policy note *Curious and*

6.1. Introduction

Research and development (R&D) is one of the three key missions of higher education institutions. As defined in the Frascati Manual (OECD, 2015[1]), R&D comprises basic research, which is aimed at creating new knowledge with no specific application in view; applied research, which is aimed at creating new knowledge towards a specific practical aim; and experimental development, which has the goal of developing new products or processes.

Higher education institutions carry out all three forms of R&D. As discussed in Chapter 1, there has been a substantial expansion in research and experimental development activity across the OECD in recent years. The volumes of R&D investment and output are on strong growth trajectories in many countries, notwithstanding a reduction in expenditure in many cases following the economic crisis.

However, measuring the return on investment in research and development can be problematic, regardless of whether the return relates to economic or social gain. Indeed, the level of capacity within individual higher education systems to assess and compare the quality and volume of their research output is far from clear.

This chapter looks at how successful higher education systems are in terms of ensuring a strong foundation for investment in R&D expenditure, providing equitable opportunities and attractive working conditions for researchers, and producing high quality research.

6.1.1. Research systems and strategies

A strong framework for systematically creating and diffusing knowledge is a key pillar of any innovation strategy (OECD, 2015[2]). Public research plays a vital role in delivering innovations that have social and economic benefits. Research activities carried out in the public higher education sector, along with the activity of public research institutes (PRIs) compose the public research system. Public research systems are organised differently in the participating jurisdictions (Box 6.1). Overall, three-quarters of total basic research is carried out in the public research system, even though public R&D only accounts for 30% of the overall volume of R&D in the OECD (OECD, 2016[3]).

No consensus has yet emerged on how the quality of research can be measured, how efficient higher education R&D is at driving innovation, and how research infrastructure can be designed and funded most effectively to meet the needs of economies and societies. The traditional role of public research has been to ensure research and development in areas that have long term possibilities for societal value although they may not provide an immediate economic gain. Currently, there are increasing expectations on public research systems to transfer knowledge and increase the impact of research (OECD, 2016[3]).

As research and development activity has expanded, OECD governments are increasingly developing specific strategies covering public research and innovation. Each of the participating jurisdictions also has specific plans with measures aiming to improve the performance of research and innovation.

Chapter 6. Research

This chapter looks at the performance of higher education research and development. It covers the financial and human resources that are allocated uniquely to research, the distribution of research expenditure, the profile of research personnel, access to research careers, the profile of doctorate holders, research activity, internationalisation, research productivity and impact.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

Universities UK (2016), *Student Experience: Measuring Expectations and Outcomes*, Universities UK, London, http://www.universitiesuk.ac.uk/policy-and-analysis/reports/Documents/2016/student-experience-measuring-expectations-and-outcomes.pdf. [78]

Van Damme, D. (2015), "Global Higher Education in Need of More and Better Learning Metrics. Why OECD's AHELO Project Might Help to Fill the Gap", *European Journal of Higher Education*, Vol. 5/4, pp. 425-436, http://dx.doi.org/10.1080/21568235.2015.1087870. [100]

Wächter, L. and F. Maiworm (eds.) (2014), *English-Taught Programmes in European Higher Education: The State of Play in 2014*, Lemmens Medien GmbH, Bonn. [58]

Wolfensberger, M. (2015), *Talent Development in European Higher Education: Honors Programs in the Benelux, Nordic and German-Speaking Countries*, Springer, Dordrecht, http://dx.doi.org/10.1007/978-3-319-12919-8. [88]

Xianglei Chen and Matthew Soldner (2013), "STEM Attrition: College Students' Paths Into and Out of STEM Fields", *NCES Statistical Analysis Report*, No. 2014-001 , National Center for Education Statistics, Washington, DC, https://nces.ed.gov/pubs2014/2014001rev.pdf. [97]

Zlatkin-Troitschanskaia, O. et al. (2017), *Modeling and Measuring Competencies in Higher Education*, Springer Nature, Wiesbaden, http://dx.doi.org/10.1007/978-3-658-15486-8. [111]

Sneyers, E. and K. De Witte (2017), "The Effect of an Academic Dismissal Policy on Dropout, Graduation Rates and Student Satisfaction. Evidence from the Netherlands", *Studies in Higher Education*, Vol. 42/2, pp. 354-389, http://dx.doi.org/10.1080/03075079.2015.1049143. [99]

Støren, L. et al. (2016), *Kandidatundersøkelsen 2015: I hvor stor grad er nyutdannede mastere berørt av nedgangskonjunkturen? [Candidate Survey 2015: To What Extent are Recent Graduates Affected by the Economic Downturn?]*, NIFU, https://brage.bibsys.no/xmlui/handle/11250/2393490. [134]

Studiekeuze123 (2018), *Factsheet National Student Survey 2018: Universities*, https://www.studiekeuze123.nl/nse-studenten/2018-national-student-survey-results (accessed on 12 September 2018). [80]

Studiekeuze123 (2018), *Factsheet National Student Survey 2018: Universities of Applied Sciences*, https://www.studiekeuze123.nl/nse-studenten/2018-national-student-survey-results (accessed on 12 September 2018). [81]

Techniekpact (2016), *National Technology Pact 2020: Targets for 2016-2020*, Techniekpact, https://www.techniekpact.nl/cdi/files/726f41be06952b95e997a0d0fef52c4ced83bef2.pdf. [13]

Teixeira, P., B. Jongbloed and D. Dill (2014), *Markets in Higher Education: Rhetoric or Reality?*, Springer, Dordrecht. [79]

Tellmann, S. et al. (2017), *Råd for Samarbeid med Arbeidslivet: En Underveisevaluering [Advice for Collaboration with the Working Life: A Way Review]*, Nordic Institute for Studies in Innovation, Research and Education (NIFU), https://www.nifu.no/publications/1472570/. [129]

Thune, T. and L. Støren (2015), "Education + Training For Authors Study and Labour Market Effects of Graduate Students' Interaction with Work Organisations During Education", *Education + Training*, Vol. 57/5, pp. 757-773, http://dx.doi.org/10.1108/ET-10-2014-0126 (accessed on 7 January 2018). [135]

Tomlinson, M. (2012), "Graduate Employability: A Review of Conceptual and Empirical Themes", *Higher Education Policy*, Vol. 25, pp. 407–431, http://dx.doi.org/10.1057/hep.2011.26. [118]

UNESCO Institute for Statistics (2014), *ISCED Fields of education and training 2013 (ISCED-F 2013): Manual to accompany the International Standard Classification of Education 2011*, UNESCO Institute for Statistics, http://dx.doi.org/10.15220/978-92-9189-150-4-en. [8]

UNESCO Institute for Statistics (2012), *International Standard Classification of Education ISCED 2011*, UNESCO Institute for Statistics, Montreal. [1]

United Nations Population Division (2018), *World Population Prospects 2017*, https://esa.un.org/unpd/wpp/Download/Standard/Population/ (accessed on 16 May 2018). [23]

Peters, J., P. Sattler and J. Kelland (2014), *Work-Integrated Learning in Ontario's Postsecondary Sector: The Pathways of Recent College and University Graduates*, Higher Education Quality Council of Ontario, Toronto, http://www.heqco.ca/SiteCollectionDocuments/WIL_Grad%20Follow-up%20ENG.pdf. [131]

Porter, S. (2011), "Do College Student Surveys Have Any Validity?", *The Review of Higher Education*, Vol. 35/1, pp. 45-76, http://dx.doi.org/10.1353/rhe.2011.0034. [74]

Reimer, D. and M. Jacob (2011), "Differentiation in Higher Education and Its Consequences for Social Inequality: Introduction to a Special Issue", *Higher Education*, Vol. 61, pp. 223-227, http://dx.doi.org/10.1007/s10734-010-9373-z. [7]

Ritzen, J. (2010), *A Chance for European Universities*, Amsterdam University Press, Amsterdam. [25]

Rostan, M. (2011), "English as "Lingua Franca" and the Internationalization of Academe", *International Higher Education*, Vol. 63, pp. 11-13, http://dx.doi.org/10.6017/ihe.2011.63.8548. [56]

Sámi University of Applied Sciences (2018), *About SUAS: Sámi Teaching - Sámi Research - Sámi Institution*, http://samas.no/en/node/204 (accessed on 20 November 2018). [38]

Sataøen, H. and A. Wæraas (2016), "Building a Sector Reputation: The Strategic Communication of National Higher Education", *International Journal of Strategic Communication*, Vol. 10/3, pp. 165-176, http://dx.doi.org/10.1080/1553118X.2016.1176567. [60]

Schleicher, A. (2015), "Value-Added: How Do You Measure Whether Universities Are Delivering For Their Students?", *HEPI Reports*, No. 82, HEPI, Oxford. [106]

Schnepf, S. (2014), "Do Tertiary Dropout Students Really Not Succeed in European Labour Markets?", *IZA DP*, No. 8015, IZA, Bonn. [92]

Schuetze, H. and M. Slowey (2002), "Participation and Exclusion: A Comparative Analysis of Non-traditional Students and Lifelong Learners in Higher Education", *Higher Education*, Vol. 44, pp. 309-327, https://doi.org/10.1023/A:1019898114335. [27]

Schüle, U. (2006), *Joint and Double Degrees within the European Higher Education Area: Towards Further Internationalisation of Business Degrees*, Consortium of International Double Degrees, Paris. [49]

Severiens, S. and G. ten Dam (2012), "Leaving College: A Gender Comparison in Male and Female-Dominated Programs", *Research in Higher Education*, Vol. 53, pp. 453–470, http://dx.doi.org/10.1007/s11162-011-9237-0. [93]

Skills Development Scotland (2016), *Graduate Level Apprenticeships: Work-based Learning Principles*, https://www.skillsdevelopmentscotland.co.uk/media/42493/gla_wbl_principles.pdf (accessed on 29 January 2018). [133]

OECD (2016), "The internationalisation of doctoral and master's studies", *Education Indicators in Focus*, No. 39, OECD Publishing, Paris, http://dx.doi.org/10.1787/5jm2f77d5wkg-en. [53]

OECD (2015), *In It Together: Why Less Inequality Benefits All*, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264235120-en. [29]

OECD (2015), *OECD Skills Outlook 2015: Youth, Skills and Employability*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264234178-en. [119]

OECD (2015), *The Innovation Imperative: Contributing to Productivity, Growth and Well-Being*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264239814-en. [5]

OECD (2014), *Skills beyond School: Synthesis Report*, OECD Reviews of Vocational Education and Training, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264214682-en. [116]

OECD (2013), *Assessment of Higher Education Learning Outcomes AHELO: Feasibility Study Report: Volume 2 Data Analysis and National Experiences*, OECD Publishing, Paris. [108]

OECD (2013), *Assessment of Higher Education Learning Outcomes Feasibility Study Report Volume 3 – Further Insights*, OECD Publishing, Paris. [109]

OECD (2013), *Flanders – Country Note – Survey of Adult Skills First Results*, OECD Publishing, Paris, http://www.oecd.org/skills/piaac/Country%20note%20-%20Flanders.pdf. [102]

OECD (2013), *Netherlands – Country Note – Survey of Adult Skills First Results*, OECD Publishing, Paris, http://www.oecd.org/skills/piaac/Country%20note%20-%20Netherlands.pdf. [103]

OECD (2013), *Norway – Country Note – Survey of Adult Skills First Results*, OECD Publishing, Paris, http://www.oecd.org/skills/piaac/Country%20note%20-%20Norway.pdf. [104]

OECD (2012), *Assessment of Higher Education Learning Outcomes AHELO: Feasibility Study Report: Volume 1 Design and Implementation*, OECD Publishing, Paris. [107]

OECD (2011), *Inclusion of Students with Disabilities in Tertiary Education and Employment*, Education and Training Policy, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264097650-en. [33]

OECD (2011), *International Migration Outlook 2011*, OECD Publishing, Paris, http://dx.doi.org/10.1787/migr_outlook-2011-en. [64]

OECD (2009), *Higher Education to 2030, Volume 2, Globalisation*, Educational Research and Innovation, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264075375-en. [24]

OECD (2008), *Tertiary Education for the Knowledge Society: Volume 1 and Volume 2*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264046535-en. [48]

OECD (2005), *E-learning in Tertiary Education: Where Do We Stand?*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264009219-en. [44]

OECD (2017), *Education at a Glance 2017: OECD Indicators*, OECD Publishing, Paris, http://dx.doi.org/10.1787/eag-2017-en. [6]

OECD (2017), *Educational Opportunity for All: Overcoming Inequality throughout the Life Course*, Educational Research and Innovation, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264287457-en. [39]

OECD (2017), *In-Depth Analysis of the Labour Market Relevance and Outcome of Higher Education Systems: Analytical Framework and Country Practices Report*, OECD Publishing, Paris, http://www.oecd.org/edu/skills-beyond-school/higher-education.htm. [86]

OECD (2017), *International Migration Outlook 2017*, OECD Publishing, Paris, http://dx.doi.org/10.1787/migr_outlook-2017-en. [67]

OECD (2017), *OECD Economic Surveys: Estonia 2017*, OECD Publishing, Paris, http://dx.doi.org/10.1787/eco_surveys-est-2017-en. [10]

OECD (2017), *OECD Economic Surveys: France*, OECD Publishing, Paris, https://doi.org/10.1787/19990235. [121]

OECD (2017), *OECD Skills Strategy Diagnostic Report: The Netherlands 2017*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264287655-en. [21]

OECD (2017), *PISA 2015 Results (Volume III): Students' Well-Being*, PISA, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264273856-en. [15]

OECD (2017), "Tuition Fee Reforms and International Mobility", *Education Indicators in Focus*, No. 51, OECD Publishing, Paris, http://dx.doi.org/10.1787/2dbe470a-en. [59]

OECD (2016), *Education at a Glance 2016: OECD Indicators*, OECD Publishing, Paris, http://dx.doi.org/10.1787/eag-2016-en. [26]

OECD (2016), *Getting Skills Right: Assessing and Anticipating Changing Skill Needs*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264252073-en. [120]

OECD (2016), "Massive Open Online Courses (MOOCs): Trends and Future Perspectives", OECD Publishing, Paris, http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=EDU/CERI/CD/RD(2016)5&docLanguage=En. [46]

OECD (2016), *OECD Reviews of School Resources: Estonia 2016*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264251731-en. [20]

OECD (2016), *OECD Survey of Adult Skills*, OECD Publishing, Paris, http://www.oecd.org/skills/piaac/data/ (accessed on 21 August 2018). [101]

OECD (2016), *PISA 2015 Results (Volume I): Excellence and Equity in Education*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264266490-en. [18]

Norwegian Ministry of Education and Research (2001), "Gjør din Plikt – Krev din Rett, Kvalitetsreform av Høyere Utdanning [Do Your Duty - Demand Your Right, Higher Education Quality Reform]", *Report to the Storting (White Paper)*, No. 27, Norwegian Ministry of Education and Research, Oslo, https://www.regjeringen.no/contentassets/eebf61fb4a204feb84e33355f30ad1a1/no/pdfa/stm200020010027000dddpdfa.pdf. [89]

Norwegian Ministry of Education and Research (2017), *Tilstandsrapport for Høyere Utdanning 2017 [State Report for Higher Education 2017]*, Norwegian Ministry of Education and Research, Oslo, https://www.regjeringen.no/no/dokumenter/tilstandsrapport-for-hoyere-utdanning-2017/id2552473/. [62]

Norwegian MOOC Commission (2014), "MOOCs for Norway - New Digital Learning Methods in Higher Education", *Official Norwegian Reports NOU*, No. 2014: 5, https://oerknowledgecloud.org/content/moocs-norway-new-digital-learningmethods-higher-education. [47]

NSSE (2018), *Lessons from the Field*, Institute for Effective Educational Practice (NSSE), Indiana US, http://nsse.indiana.edu/html/lessons_from_the_field.cfm (accessed on 21 November 2018). [77]

Nusche, D. et al. (2015), *OECD Reviews of School Resources: Flemish Community of Belgium 2015*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264247598-en. [19]

OECD (2018), *Education at a Glance 2018: OECD Indicators*, OECD Publishing, Paris. [4]

OECD (2018), *Higher Education in Norway: Labour Market Relevance and Outcomes*, Higher Education, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264301757-en. [14]

OECD (2018), "How Does the Earnings Advantage of Tertiary-educated Workers Evolve Across Generations?", *Education Indicators in Focus*, No. 62, OECD Publishing, Paris, https://doi.org/10.1787/22267077. [117]

OECD (2018), *OECD Economic Surveys: Norway 2018*, OECD Publishing, Paris, http://dx.doi.org/10.1787/eco_surveys-nor-2018-en. [22]

OECD (2018), *OECD Education Statistics*, OECD Publishing, Paris, http://dx.doi.org/10.1787/edu-data-en (accessed on 21 November 2018). [3]

OECD (2018), *OECD Programme for International Student Assessment*, OECD Publishing, Paris, http://www.oecd.org/pisa/ (accessed on 18 December 2018). [17]

OECD (2018), *The Resilience of Students with an Immigrant Background: Factors that Shape Well-being*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264292093-en. [32]

OECD (2018), *Working Together for Local Integration of Migrants and Refugees in Amsterdam*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264299726-en. [37]

OECD (2017), *Benchmarking Higher Education System Performance: Conceptual Framework and Data*, OECD Publishing, Paris. [2]

Leuven Louvain-la-Neuve Communiqué (2009), *The Bologna Process 2020 - The European Higher Education Area in the New Decade*, European Higher Education Area, Leuven, Louvain-la-Neuve, http://www.ehea.info/Uploads/Declarations/Leuven_Louvain-la-Neuve_Communiqu?_April_2009.pdf (accessed on 10 December 2018). [55]

Marandet, E. and E. Wainwright (2010), "Invisible Experiences: Understanding the Choices and Needs of University Students with Dependent Children", *British Educational Research Journal*, Vol. 36/5, pp. 787-805, http://dx.doi.org/10.1080/01411920903165595. [35]

Mcnaught, K. (2013), "Implementing an Intervention to Assist Certificate IV Students to Transition Successfully to Undergraduate Study within an AQF Contextualisation: A Case Study", *International Journal of Training Research*, Vol. 11/3, pp. 234–245, http://dx.doi.org/10.5172/ijtr.2013.11.3.234. [85]

Mengel, F., J. Sauermann and U. Zölitz (2018), "Gender Bias in Teaching Evaluations", *Journal of the European Economic Association*, http://dx.doi.org/10.1093/jeea/jvx057. [75]

Merriam, S., R. Caffarella and L. Baumgartner (2007), *Learning in Adulthood: A Comprehensive Guide*, Wiley, San Francisco. [28]

Ministry of Economic Affairs and Communications (2014), *Digital Agenda 2020 for Estonia*, Ministry of Economic Affairs and Communications, Tallinn, https://www.mkm.ee/sites/default/files/digital_agenda_2020_estonia_engf.pdf. [11]

Mühleck, K. (ed.) (2015), *Testing the Feasibility of a European Graduate Study - Final Report of the EUROGRADUATE Feasibility Study*, German Center for Higher Education Research and Science Studies, Hannover. [124]

Mühleck, K. (2013), "Second-generation Immigrants in Higher Education – Sketching the European Picture", in Camilleri, A. and K. Mühleck (eds.), *Participation of Students with an Immigrant Background in European Higher Education*, MENON Network, Brussels, http://www.dzhw.eu/pdf/23/camilleri_muehleck_2013_evolving-diversity-2_participation-of-students-with-an-immigrant-background-in-european-he.pdf. [31]

Norwegian Ministry of Education and Research (2017), "Quality Culture in Higher Education", *Report to the Storting (White Paper)*, No. 16, Norwegian Ministry of Education and Research, Oslo, https://www.regjeringen.no/contentassets/aee30e4b7d3241d5bd89db69fe38f7ba/en-gb/pdfs/stm201620170016000engpdfs.pdf. [69]

Norwegian Ministry of Education and Research (2015), "Concentration for Quality – Structural Reform in the Higher Education Sector", *Report to the Storting (White Paper)*, No. 18, Norwegian Ministry of Education and Research, Oslo, https://www.regjeringen.no/en/topics/education/higher-education/innsikt/struktur-i-hoyere-utdanning/need-for-reform/id2415316/. [90]

Heublein, U. (2014), "Student Drop-out from German Higher Education Institutions", *European Journal of Education*, Vol. 49/4, pp. 497-513, http://dx.doi.org/10.1111/ejed.12097. [96]

HITSA (2018), *Strategy 2018-2020*, HITSA, Tallinn, https://media.voog.com/0000/0034/3577/files/HITSA%402020_eng.pdf. [45]

Hoidn, S. and K. Kärkkäinen (2014), "Promoting Skills for Innovation in Higher Education: A Literature Review on the Effectiveness of Problem-based Learning and of Teaching Behaviours", *OECD Education Working Papers*, No. 100, OECD, Paris, https://doi.org/10.1787/19939019. [122]

Jaggo, I., M. Reinhold and A. Valk (2016), *Analysis: Labour Market Success of Vocational and Higher Education Graduates*, Estonian Ministry of Education and Science, Tallinn. [136]

Jamieson, A. (2016), "Retirement, Learning and the Role of Higher Education", *International Journal of Lifelong Education*, Vol. 35/5, pp. 477–489, http://dx.doi.org/10.1080/02601370.2016.1224036. [40]

Järve, J., E. Kallaste and M. Räis (2015), *Tudengite Õpingute Katkestamise Põhjused IKT Erialadel [Reasons for Discontinuing Student Studies in ICT Specialties]*, HITSA - Information Technology Foundation for Education, Tallinn. [98]

Kirkpatrick, A. (2014), "English as a Medium of Instruction in East and Southeast Asian Universities", in Murray N. and Scarino A. (eds.), *Dynamic Ecologies*, Springer, Dordrecht, http://dx.doi.org/10.1007/978-94-007-7972-3_2. [57]

Klemenčič, M. and I. Chirikov (2015), "How Do We Know How Students Experience Higher Education? On the Use of Student Surveys", in Curaj, A. et al. (eds.), *The European Higher Education Area Between Critical Reflections and Future Policies*, Springer, Dordrecht, http://dx.doi.org/10.1007/978-3-319-20877-0. [73]

KNAW (2017), *Nederlands en/of Engels, Taalkeuze met Beleid in het Nederlands Hoger Onderwijs [Dutch and / or English, Language choice with Policy in Dutch Higher Education]*, Royal Netherlands Academy of Arts and Sciences (KNAW), Amsterdam, https://www.knaw.nl/en/news/publications/nederlands-en-of-engels. [61]

Knight, J. (2011), "Doubts and Dilemmas with Double Degree Programs", *RUSC. Universities and Knowledge Society Journal*, Vol. 8/2, p. 135, http://dx.doi.org/10.7238/rusc.v8i2.1067. [50]

Kolster, R. and D. Westerheijden (2014), *Employability of Professional Bachelors From an International Perspective*, CHEPS, Enschede, http://ecahe.eu/assets/uploads/2014/10/CHEPS-study.pdf. [128]

Kool, A. et al. (2017), "Effects of Honours Programme Participation in Higher Education: A Propensity Score Matching Approach", *Higher Education Research & Development*, Vol. 36/6, pp. 1222-1236, http://dx.doi.org/10.1080/07294360.2017.1304362. [87]

Lepori, B. and S. Kyvik (eds.) (2010), *The Research Mission of Higher Education Institutions outside the University Sector*, Springer, Dordrecht, http://dx.doi.org/10.1007/978-1-4020-9244-2. [9]

Estonian Ministry of Education and Research (2018), *Haridussilm Database [Educational Eye Database]*, https://www.haridussilm.ee/?leht=tulemus_2. (accessed on 17 October 2018). [12]

Estonian Ministry of Education and Research (2015), *Adult Skills: Their Use and Usefulness in Estonia - Summaries of Thematic Reports on the PIAAC Study*, Estonian Ministry of Education and Research, Tartu, https://www.hm.ee/sites/default/files/summaries_of_thematic_reports_on_the_piaac_study.pdf. [105]

Estonian Ministry of Education and Research (2014), *The Estonian Lifelong Learning Strategy 2020*, Estonian Ministry of Education and Research, Tallinn, https://www.hm.ee/sites/default/files/estonian_lifelong_strategy.pdf. [42]

Estonian National Audit Office (2015), *Overview of the State's Migration Policy Choices: What Is the Role of Migration in Alleviating Labour Shortage?*, Estonian National Audit Office, Tallinn, https://www.riigikontroll.ee/tabid/206/Audit/2354/Area/1/language/en-US/Default.aspx. [65]

European Commission (2017), *Education and Training Monitor 2017 - Estonia*, Publications Office of the European Union, Luxembourg, http://dx.doi.org/10.2766/713985-NC-AN-17-009-EN-N. [125]

Eurostat (2018), *Education and Training*, http://ec.europa.eu/eurostat/data/database (accessed on 9 November 2017). [54]

Feld, J., N. Salamanca and U. Zölitz (2017), "Students Are Almost as Effective as Professors in University Teaching", *Melbourne Institute Working Papers*, No. 23/17, Melbourne Institute for Applied Economic & Social Research, Melbourne. [123]

Frawley, D., V. Pigott and D. Carroll (2017), *A Study of Progression in Irish Higher Education 2013/14 to 2014/15*, Irish Higher Education Authority, Dublin, http://hea.ie/assets/uploads/2017/06/A-STUDY-OF-PROGRESSION-IN-IRISH-HIGHER-EDUCATION.pdf. [95]

Goff, L. et al. (2015), *Learning Outcomes Assessment: A Practitioner's Handbook*, Higher Education Quality Council of Ontario, Toronto. [110]

Hauschildt, K., E. Vögtle and C. Gwosć (2018), *Social and Economic Conditions of Student Life in Europe: EUROSTUDENT VI 2016-2018 - Synopsis of Indicators*, Bertelsmann Verlag, Bielefeld, http://dx.doi.org/10.3278/6001920cw. [36]

HEFCE (2018), *Learning Gain in English Higher Education: Progress Report*, HEFCE, Bristol, http://www.hefce.ac.uk/media/HEFCE,2014/Content/Pubs/2018/201803/HEFCE2018_03.pdf. [112]

HEFCE (2017), *About the TEF*, https://webarchive.nationalarchives.gov.uk/20180319121020/http://www.hefce.ac.uk/lt/tef/whatistef/ (accessed on 3 December 2018). [70]

CHEPS and NIFU (2015), *Dropout and Completion in Higher Education in Europe - Main Report*, Publications Office of the European Union, Luxembourg, http://dx.doi.org/10.2766/826962. [91]

Coates, H. (2005), "The Value of Student Engagement for Higher Education Quality Assurance", *Quality in Higher Education*, Vol. 11/1, pp. 25-36, http://dx.doi.org/10.1080/13538320500074915. [72]

Conger, D. and M. Long (2010), "Why Are Men Falling Behind? Gender Gaps in College Performance and Persistence", *Annals of the American Academy of Political and Social Science*, Vol. 627, pp. 184-214, http://dx.doi.org/10.1177/0002716209348751. [94]

Cook, D. and R. Hewitt (2017), *NEWDLHE: The Future of Graduate Outcomes Data - The Rationale*, HESA, Cheltenham, https://www.hesa.ac.uk/files/NewDLHE_model_rationale_v2.pdf. [113]

Cross, J. et al. (2017), "Development of a Mechanical Engineering Test Item Bank to Promote Learning Outcomes-based Education in Japanese and Indonesian Higher Education Institutions", *Tuning Journal for Higher Education*, Vol. 5/1, pp. 41-73, http://dx.doi.org/10.18543/tjhe-5(1)-2017pp41-73. [114]

Damen, M. et al. (2016), *Studiebarometeret 2015: Hovedtendenser [Study Barometer 2015: Main Trends]*, http://www.nokut.no. [82]

Dutch Ministry of Education, C. (2017), *Kamerbrief over Beleid voor Wetenschappelijk Talent [Letter to Parliament about Policy for Scientific Talent]*, Dutch Ministry of Education, Culture and Science, https://www.rijksoverheid.nl/documenten/kamerstukken/2017/01/11/kamerbrief-over-beleid-voor-wetenschappelijk-talent. [68]

EC/EACEA/Eurydice (2016), *Structural Indicators on Graduate Employability in Europe – 2016*, Publications Office of the European Union, Luxembourg, http://dx.doi.org/10.2797/989238. [132]

EKKA (2011), *Conditions and Procedure for Institutional Accreditation Conditions and Procedure for Institutional Accreditation I. General Provisions*, http://ekka.archimedes.ee/wp-content/uploads/IA_procedure11.11.16.pdf (accessed on 20 April 2018). [127]

ESAA (2017), *Internationalisation at Home: Interactions between Mobile and Local Students - Benefits and Opportunities*, Icunet, Bonn. [52]

Estonia (2009), *Kõrgharidusstandard [Standard of Higher Education]*, http://www.riigiteataja.ee/en/eli/524092014013/consolide. [126]

Estonian Ministry for Education and Research (2015), *Eesti Kõrghariduse Rahvusvahelise Tutvustamise Strateegia [Estonian Higher Education International Introduction Strategy]*, Archimedes, Tallinn, http://archimedes.ee/wp-content/uploads/2016/05/KH-rahvusvahelise-tutvustamise-strateegia.pdf. [66]

References

Aaberge, R. and A. Brandolini (2015), "Multidimensional Poverty and Inequality", in Atkinson, A. and F. Bourguignon (eds.), *Handbook of Income Distribution*, Elsevier, http://dx.doi.org/10.1016/B978-0-444-59428-0.00004-7. [30]

Australian Government Department of Education and Training (2018), *Quality Indicators for Learning and Teaching (QILT)*, http://www.qilt.edu.au (accessed on 27 March 2018). [76]

Barrie, S. et al. (2012), *Assessing and Assuring Australian Graduate Learning Outcomes: Principles and Practices Within and Across Disciplines*, Office for Learning and Teaching, Sydney, http://dx.doi.org/www.itl.usyd.edu.au/projects/aaglo/. [115]

Beelen, J. and E. Jones (2015), "Redefining Internationalization at Home", in Adrian Curaj et al. (eds.), *The European Higher Education Area Between Critical Reflections and Future Policies*, Springer, Dordrecht, http://dx.doi.org/10.1007/978-3-319-20877-0. [51]

Bergerhoff, J. et al. (2013), "International Education and Economic Growth", *IZA Journal of European Labor Studies*, Vol. 2/3, http://dx.doi.org/10.1186/2193-9012-2-3. [63]

Bettinger, E. and R. Baker (2014), "The Effects of Student Coaching: An Evaluation of a Randomized Experiment in Student Advising", *Educational Evaluation and Policy Analysis*, Vol. 36/1, pp. 3-19, http://dx.doi.org/10.3102/0162373713500523. [84]

Borgonovi, F. et al. (2017), "Youth in Transition: How Do Some of The Cohorts Participating in PISA Fare in PIAAC?", *OECD Education Working Papers*, No. 155, OECD Publishing, Paris, http://dx.doi.org/10.1787/51479ec2-en. [16]

Brooks, R. (2012), "Student-Parents and Higher Education: A Cross-national Comparison", *Journal of Education Policy*, http://dx.doi.org/10.1080/02680939.2011.613598. [34]

Brouwer, J. et al. (2017), "Emergent Achievement Segregation in Freshmen Learning Community Networks", *Higher Education*, http://dx.doi.org/10.1007/s10734-017-0221-2. [83]

Brussels Education Services et al. (2014), *The Changing Pedagogical Landscape – New Ways of Teaching and Learning and Their Implications for Higher Education Policy*, Publications Office of the European Union, Luxembourg, http://dx.doi.org/10.2766/72063. [43]

Callender, C., R. Hopkin and D. Wilkinson (2010), *Career Decision-making and Career Development of Part-time Higher Education Students*, Higher Education Careers Services Unit, London. [41]

Cappelli, P. (2015), *Will College Pay Off: A Guide to the Most Important Financial Decision You'll Ever Make*, Public Affairs, New York. [130]

Chalmers, D. et al. (2014), *Australian University Teaching Criteria and Standards Project: Final Report*, Australian Government Office for Teaching and Learning, Canberra, http://www.olt.gov.au/resource-australian-university-teaching-criteria-and-standards. [71]

Notes

[1] Entry rates measure inflow to higher education during a specific period and represent the percentage of an age cohort that is expected to enter a higher education programme over a lifetime. The estimates are based on the number of new entrants in 2016 and the age distribution of this group. Therefore, the entry rates are based on a "synthetic cohort" assumption, according to which, the current pattern of entry constitutes the best estimate of the behaviour of today's young adults over their lifetime.

Entry rates are sensitive to changes in the education system, such as the introduction of new programmes. The rates can be very high, even greater than 100% (thus clearly indicating that the synthetic cohort assumption is implausible), during a period when there is an unexpectedly high number of entrants. In some countries, high entry rates may reflect a temporary phenomenon, such as the effects of economic cycles and crises, higher education reforms driven by the Bologna Process or a surge in the number of international students. Government efforts to encourage older students to re-enter higher education through second-chance programmes can also boost entry rates (OECD, 2018[4]).

[2] Short-cycle nursing and midwifery programmes are an exception, as they are offered by secondary schools, and they will not be transferred to professional higher education institutions.

[3] Dual programmes are programmes in which the work-based component has similar importance as the education-based component.

[4] The graduate mobility goals of participating jurisdictions and the EHEA differ because the EHEA goal includes degree mobility within the EHEA itself, i.e. students moving from one country to another to earn a full degree (and possibly not undertaking study mobility during their programme abroad).

[5] The EEA comprises the European Union, Iceland, Liechtenstein and Norway.

[6] Response rates to the EUROSTUDENT survey vary from 1% to 66% across participating countries.

[7] In the US, the rate of students leaving without a qualification in the field of education is comparatively high based on the cited references. In Estonia, the relatively low graduates-to-entrants ratio in ICT is consistent with the low completion rate registered at the national level in this field of study. About half of Estonian ICT students already work full-time during their studies, mostly in the IT sector. The availability of good job opportunities before graduation could be contributing to the low completion rate in this field, although the choice not to complete a programme is likely to depend on a wider range of factors (Järve, Kallaste and Räis, 2015[98]).

[8] The authors of the study estimate a 3% increase in the rate of students graduating within one year from the expected time, and a 7% increase in the rate of students leaving the programme during their first year. The authors also find that, following the implementation of the study binding advice, students perceive it as more feasible to complete the programme within the expected time, but that their general level of satisfaction with the programme decreases.

[9] The accuracy of labour force status indicators as measures of higher education performance may be further limited if a large number of graduates move across countries. For example, information is missing for over 10% of Estonian graduates, who are most likely living abroad (Jaggo, Reinhold and Valk, 2016[136]). This could potentially affect the employment, unemployment and inactivity rates of Estonian graduates.

[10] This indicator is similar to the rate of NEETs (individuals Not in Education, Employment or Training), with the exception that it may include some individuals who are undergoing some training different from formal education.

- Several other indicators have been identified that would be relevant to cross-country policy analysis, if data were available. Some examples are the proportion of international students staying on in a country after completing their studies, or the proportion of students involved in different forms of student support or excellence tracks. As with the previous information gaps listed in this section, better data in these areas would help to formulate a more complete assessment of the effectiveness of the higher education system.

As well as metric data, the benchmarking of higher education systems relies on the availability of qualitative information on national policies and on higher education practices. A summary of some of the initiatives presented in this chapter are presented in Table 3.14. These initiatives, one per participating jurisdiction, have been selected to illustrate responses to a variety of policy challenges faced by countries; and to represent, when possible, the distinctive approach of the jurisdiction to the selected policy challenge.

Table 5.16. Selected higher education policies from the participating jurisdictions (2017)

	Motivation	Policies
Estonia	Encouraging students to enrol in fields of study leading to professions in high demand	▪ Scholarships to enrol in natural sciences, mathematics and statistics, ICT, engineering, manufacturing and construction, and teacher education ▪ Free tuition for higher education programmes in nursing ▪ A special programme involving paid work and study for prospective teachers ▪ The proportion of students enrolled in fields of study identified as part of the university's mission or area of responsibility is included in funding mechanisms (Chapter 3)
The Flemish Community	Making participation in higher education more flexible	▪ All higher education institutions must offer part-time studies and all degree programmes must be provided in the form of flexible learning pathways ▪ Tuition fees are based on the number of credits that students are enrolled in ▪ No distinction between part-time and full-time students in terms of financial support ▪ Students can enrol for a full programme, for a module or even just to take an exam
The Netherlands	Better matching students with higher education programmes	▪ Government-funded web-based tool provides information on all bachelor's and master's programmes available across the country, including access requirements and results from the national student satisfaction survey ▪ Institutions are required to offer students a non-binding "study check," which can include online or face-to-face information sessions, self-assessment tests, etc. ▪ Mandatory, non-binding online self-assessment test for prospective students ▪ Institutions can provide students with binding study advice at the end of the first year that results in their expulsion from a programme if they have not made sufficient progress
Norway	Encouraging enrolment in higher education across demographic groups	▪ "Mainstreaming" approach to equity in higher education where financial support in the form of grants and loans is provided to all students, rather than targeted at special groups, and tuition is free ▪ Special grants and academic leave for students with children ▪ Special grants and loans for students with disabilities

Source: Adapted from information provided by the participating jurisdictions. See the reader's guide for further information.

The information in Table 3.14, as well as the other qualitative data on higher education policies in the participating jurisdictions presented in this chapter, have been collected through an ad-hoc questionnaire. As mentioned in Chapter 3, a systematic data collection on higher education policies would greatly facilitate the benchmarking of higher education systems by making the evidence base more consistent across countries and time.

Netherlands. If data by subsector were collected more systematically across OECD countries, this discussion could reach more specific and generalizable conclusions.

- Along with quality, equity is a fundamental attribute of effective higher education systems. The equity dimension cuts across indicators at all stages of higher education system performance, from input to outcome. In addition, a multiplicity of social conditions and background characteristics can concur in determining an individual's lack of educational, economic or social opportunities. A limited set of indicators have been presented for a few relevant demographic groups in this chapter, but more detailed data would be needed to fully account for equity in higher education. The available data already show substantial gaps in access to higher education. Young people whose parents do not have a higher education qualification are between 40% and 60% less likely than other individuals to enter a bachelor's programme, across higher systems for which data are available.
- Internationally comparable data on other dimensions of socio-economic background (e.g. parental income and occupation) could be useful to enhance the understanding of education inequality, but are not available. In addition, data are not available for the most advanced levels of education (master's and doctoral), which limits the analysis of this chapter to short-cycle, bachelor's and long first-degree programmes.
- Internationally comparable data on the flows of students between types of programmes and institutions would help to study the effectiveness of different admission systems in guaranteeing the accessibility of all higher education programmes. The number of students admitted through the recognition of prior learning could also fit this purpose.
- Digitalisation and online learning provide an opportunity to develop new pedagogies, and to offer new ways for students to participate in higher education. Digitalisation offers potential to improve the efficiency of the higher education system (by doing more with the same inputs) and to economise resources across the system. In all the participating jurisdictions, some institutions already offer certain modules entirely online. In Estonia, the national agency responsible for digital and online learning in higher education can certify these modules. However, the internationally comparable data on digitalisation and online learning are limited.
- Young higher education graduates are more likely to be employed than people with upper secondary or post-secondary non-tertiary education, with an average employment premium of 7 percentage points across OECD countries. They also earn more, and are less likely to hold routine jobs with few opportunities to learn. Indicators on graduate outcomes focus on young graduates (e.g. 25-34 year-olds) because they are assumed to have graduated relatively recently. However, indicators on recent graduates (e.g. individuals who graduated five years before the reference year) would be more accurate as a measure of the effectiveness of higher education system in connecting with the labour market. In addition, more information on graduate outcomes by type of institution (universities or professional higher education institutions; public, government-dependent or independent private) would improve our understanding of this connection.

policymakers in Norway may encourage the proliferation of work-based learning by including it as an objective in performance agreements between higher education institutions and the Ministry of Education and Research. The government may also lead by example by expanding the number of work-based learning opportunities through its role as an employer and by facilitating participation among small and medium-sized enterprises (OECD, 2018[14]).

5.10. Concluding remarks

This chapter reviewed the performance of higher education systems in carrying out their education function, discussed relevant higher education policies with a particular focus on the four participating jurisdictions, and highlighted gaps in the existing information base.

This concluding section focuses on summarising some of the key messages of the chapter, along with limitations of current information and gaps in the data which prevent a deeper analysis. Below is a summary of key performance areas discussed in the chapter, including some indications of where an improvement of the information base would be particularly useful.

- Good learning outcomes are crucial to establish the effectiveness of higher education systems. A strong interest in this topic has resulted in a number of initiatives being carried out at the national level, but internationally comparable data are not generally available at this moment. The Survey of Adult Skills is not designed to measure graduate learning outcomes, but it can be used to study the generic literacy and numeracy skills of young higher education graduates. Across countries and economies participating in this survey, a worrying proportion (around 30%, on average) of graduates from OECD higher education systems do not reach literacy proficiency level 3.
- There is a lack of comparable evidence on the pedagogical practices used in higher education (for example the prevalence in different programmes and modules of small tutorials, group assignments, research or practical projects, etc.). Coupled with data on learning outcomes, this evidence could be used to identify effective or promising teaching and learning practices. Given the absence of such evidence, this topic has not been systematically investigated in this chapter.
- Retention and completion play a central role in the assessment of higher education performance, and they are widely regarded as measures of the efficiency of a higher education system. Completion rates tend to be low, on average across higher education systems with available data (around 40% of bachelor's new entrants complete their programmes on time). More insight could be drawn from an extension of the coverage of completion indicators, both in terms of countries and of available breakdowns (e.g. by higher education level and by field of study). Furthermore, data on first-year retention rates (students who are still in higher education one year after entering it) are not yet available.
- This chapter discussed the role of different subsectors (universities and professional HEIs) within the higher education system. Different subsectors are one way of ensuring diversity in higher education, thus making the system more sustainable. In the participating jurisdictions with available data, professional HEIs tend to enrol more part-time and older students than universities, and the employment rate of their graduates is relatively high. The analysis by subsector relied on data specifically provided by Estonia, the Flemish Community and the

mandatory professional practice, co-operative education placements, internships, applied research, project learning and service learning.

Evidence suggests that work-based learning can help students obtain better labour market outcomes. For example in the United States, one out of five higher education graduates participating in an internship ends up being hired by the same organisation (Cappelli, 2015[130]). In Canada, students who take part in work-based learning are more likely to be employed in their field of study (Peters, Sattler and Kelland, 2014[131]). In the EU, students who participate in work-based learning during their studies are more likely to find jobs than their counterparts who did not have relevant work experience; and work-based learning can be particularly important for non-traditional learners (EC/EACEA/Eurydice, 2016[132]).

Graduate apprenticeships are a form of work-based learning involving graduates. Within this apprenticeship scheme, students can combine studies with work while earning a salary (OECD, 2017[86]). For example, Skills Development Scotland began offering Graduate Level Apprenticeships in 2016 in the ICT/digital, engineering and civil engineering fields of study. These apprenticeships will be expanded to other sectors in the future (Skills Development Scotland, 2016[133]).

In Estonia, requirements to include work-based learning apply to all higher education programmes (EC/EACEA/Eurydice, 2016[132]). For the less academically-oriented programmes ("professional programmes"), a minimum of 15% of the study load should consist of work-based learning. This requirement in higher education has been supported by a programme aimed at developing work-based learning in higher and vocational education since 2016, PRÕM (OECD, 2017[86]). PRÕM aims to build better linkages between education and the labour market and greater co-operation between institutions and enterprises. The programme is funded from EU structural funds.

In the Flemish Community and the Netherlands, the professional HEIs must provide a period of work-based learning in bachelor's programmes. In the Netherlands, this period of work-based learning has a minimum duration of 9 months, out of a total duration of four years for the bachelor's programme. Universities may, but are not obliged to, offer work-based learning as part of their education programmes

The OECD's in-depth analysis of the labour market outcomes and relevance of Norway's higher education system found that the provision of work-based learning in Norway is quite low and not evenly distributed across fields of study. In 2015, only 43% of master's graduates reported to have had practice periods (voluntary or mandatory) during their studies (Støren et al., 2016[134]). Some programmes, such as health, education, and engineering, have a long tradition of collaboration with employers by integrating practice periods into the curriculum. In contrast, work-based learning is particularly low in the humanities fields of study (Thune and Støren, 2015[135]).

Evidence shows that participation in work-based learning helps students transition effectively to the labour market and obtain good labour market outcomes. In Norway, work-based learning is especially effective in supporting good labour market outcomes in those fields of study where it is less common, such as the arts and humanities, and the social sciences (Thune and Støren, 2015[135]). Despite being shown to be an effective higher education technique, currently, there are no explicit policy initiatives to encourage work-based learning in the Norwegian higher education system. The Government of Norway, however, plans to present a White Paper on higher education and labour market co-operation and relevance in late 2020 or early 2021. It has been suggested that alumni). In addition, new programmes proposed by higher education institutions must receive a positive assessment on their overall fit within the higher education and economic system if they want to receive public funding (a similar assessment is required in the Flemish Community). A committee set up by the government carries out this assessment by looking at existing programmes offered by other higher education institutions; evaluating the statistical projections of labour demand in sectors relevant to the programme; and interviewing representatives of the social partners on the match between the expected learning outcomes and current trends in the world of work. The goal is to ensure that the programme is a valuable addition to the existing offer of higher education programmes, and that it fills a regional or national labour market need. The Dutch government and other higher education stakeholders are drawing plans to expand the scope of this assessment to all existing higher education programmes in public institutions.

In Norway, four out of eleven members of the executive board of higher education institutions must come from outside the higher education sector, for example from employers, cultural organisations or public institutions. In addition, all higher education institutions must have Councils for Co-operation with Working Life, which work with academic staff to help ensure the relevance of education to the needs of the labour market.

The Norwegian White Paper on Quality Culture in Higher Education, released in January 2017, emphasises the need for higher education institutions to develop study programmes relevant to the labour market while also accounting for student needs goal (Norwegian Ministry of Education and Research, 2017[69]). The main venue to encourage collaboration between individual higher education institutions and social partners in Norway are the Councils for Co-operation with Working Life (RSA). The RSAs were created by the Norwegian government in 2011 to facilitate a more structured and binding collaboration between higher education and the world of work and ensure programmes and subjects delivered through continuing education have greater labour market relevance. All public higher education institutions are required to have an RSA. RSAs have played a generally positive role in bringing social partners and higher education institutions together to share information, promote strategies for collaboration, and inform programme content and development at a strategic level (OECD, 2018[14]).

While the formation of RSAs is an important first step, proper implementation is required to ensure effectiveness. A survey found that a majority RSA committee members from outside the higher education institution felt that their work on the committee did not result in concrete actions to improve the interaction between institutions and employers, nor did their work influence institutions' strategies, enhance the labour market relevance of existing programmes, or lead to the creation of new programmes (Tellmann et al., 2017[129]). In order to have a more meaningful impact, a recent OECD report recommended that higher education institutions establish RSA sub-committees at the operational level and suggested that Norway develop a mechanism for sharing best practices between RSAs (OECD, 2018[14]).

Work-based learning in higher education

One of the most widely-recognised practices to enhance labour market relevance and outcomes is the use of work-based learning. Work-based learning integrates learning in a workplace or practice setting with a student's academic programme. There are various types of work-based learning in higher education. These include field experience, Quality assurance processes, including institutional and programme accreditation, can play a role in ensuring the relevance of higher education programmes to the labour market. Quality assurance can require or encourage the involvement of social partners (employers and trade unions) in the design and development of curriculum that is relevant to the labour market, and in the decision-making process around programme offerings. Social partners can also help through the provision of reliable information on skill needs. Social partners and external stakeholders are required to participate in external quality assurance processes in all four participating jurisdictions.

Including labour market relevance in accreditation and programme design

Consultation with social partners is a way for higher education institutions to gain up-to-date insight into labour market competence, knowledge and skill needs. For example, higher education institutions are required to consult with employers in the Czech Republic, Denmark, Latvia and Poland (OECD, 2017[86]).

In Estonia, higher education institutions are required to take account of the needs of the labour market when designing new study programmes under the Standard of Higher Education (Estonia, 2009[126]). They also must ensure that the objectives and learning outcomes of new programmes align with their respective professional standards, and take into account graduate and employer satisfaction surveys (EKKA, 2011[127]).

The graduate employment rate is also included among the criteria for the quality assessment of study programme groups (Chapter 2) in Estonia. Institutional accreditation reviews evaluate the extent to which higher education programmes (and the number of student places) are in line with the expected labour market and social needs. Estonia also uses surveys to monitor graduate and employment satisfaction.

In the Netherlands and the Flemish Community, an important rationale for the introduction of short-cycle tertiary programmes has been to respond to a perceived labour market need for short, occupationally-specific higher education programmes. In the Flemish Community, short-cycle tertiary programmes will be delivered by professional HEIs from 2019, but they are currently offered by other institutions (Section 5.2.2). The learning outcomes of short-cycle tertiary programmes need to be based on professional qualification standards developed by representatives of the labour market and recognised by the Flemish government. In addition, one-third of the work load in short-cycle tertiary programmes must consist of work-based learning.

Professional HEIs in the Flemish Community and the Netherlands emphasise the connection between study programmes and the professional field. Common practices across institutions include the establishment of a professional field advisory board at the institution, and of domain-specific learning outcomes, in collaboration with representatives of the professional field (Kolster and Westerheijden, 2014[128]). Professional HEIs in these jurisdictions also recruit teachers with professional experience in the field, and in some cases involve professionals in the assessment of project work and final theses.

In the Netherlands, all programmes applying for accreditation have to demonstrate the alignment between the intended learning outcomes and the current needs of the labour market or the academic community. The alignment with the labour market is particularly important for programmes offered at professional HEIs. The accreditation panel ascertains the existence of this alignment based on labour market indicators and meetings with representatives of study programmes, social partners and other stakeholders (e.g.

In 2016, the Estonian government launched OSKA, a forecasting tool developed with the support of the EU Structural Funds. The tool is used to anticipate labour market and skills needs and provides information and recommendations based on expert panels comprised of representatives from social partners, education institutions and the public sector. Economic activity is divided into 24 economic sectors, and each of them is analysed in-depth once every five or six years, with monitoring in the following years. A general report on changes in labour requirements, labour market developments and trends over the next 10 years is prepared annually (see http://oska.kutsekoda.ee/en/) (European Commission, 2017[125]). This tool is expected to help achieve the national targets for graduate employment (e.g. an employment rate of 88% for 20-34 year-old graduates by 2020). Estonia has been using administrative data to track higher education and VET graduates since 2013.

The public employment service of Flanders, in collaboration with the Ministry of Education, annually publishes information on the employment rates of recent graduates by programme rather than institution. In the Netherlands, Study Choice 123, a web-based student advice tool (Sections 5.6 and 5.7), provides information on labour market prospects by higher education programme.

Norway develops a wide range of labour market relevant information that can be used in higher education, including the government website (www.utdanning.no). This website provides potential higher education students with information on entry requirements, the types of jobs in which graduates from a certain field of study typically work, the number of people working in those occupations, the anticipated number of jobs in the future (based on projections of Statistics Norway), and the median earnings for a given occupation. The website also provides students with short videos of workers from different professions in order to give them an indication of the type of work that they do. A 2013 evaluation of the career guidance services in Norway found that while three-quarters of surveyed students were aware of this website, only one-half have actually used it (IPSOS MMI, 2013).

Table 5.15. Labour market data sources available in the participating jurisdictions (2016)

	Employer surveys	Surveys of workers or graduates	Quantitative forecasting models	Sector studies	Qualitative methods	Labour market information system	Other
The Flemish Community		X	X	X	X	X	
Estonia	X	X	X	X	X		
The Netherlands	X		X	X	X	X	
Norway	X	X	X	X	X	X	X

Source: OECD (2016[120]), *Getting Skills Right: Assessing and Anticipating Changing Skill Needs*, http://dx.doi.org/10.1787/9789264252073-en: information provided by the participating jurisdictions. See the reader's guide for further information.

Policies to improve labour market relevance

Changing skill needs are challenging labour market and education and training policies, and contributing to skills mismatch and shortages across OECD countries. While employers often complain that they cannot find workers with the required skills, large numbers of higher education graduates face difficulties in finding job opportunities matching their qualifications (OECD, 2016[120]).