Chapter 3.

Developing excellent academic communities for innovation: The Norwegian higher education sector

This chapter discusses the state-of-the-art and potential of the higher education sector to develop excellent academic communities, which is one of the three overarching objectives of the government's Long-Term Plan. The first and second parts describe this sector and research performance. The third and fourth parts focus on the initiatives to improve research excellence via higher education institutions' external and internal structural changes and dedicated public interventions. The chapter concludes with a synthetis of the achievements to date and remaining challenges in achieving excellence and presents some high-level conclusions.

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.

"Developing excellent academic communities" is one of the three main objectives of the government's Long-Term Plan (LTP). Norway's higher education (HE) sector has been designated to play the key role in achieving this objective, with the help of underlying policy and public support mechanisms. The Higher education sector has performed and developed well in recent decades, but it lags behind the best comparable countries in its key outputs, its influence and the international ranking of its higher education institutes (HEIs). The government has set up a modern, quality-oriented legal framework and well-designed funding programmes. Many HEIs, however, have yet to turn these opportunities into stronger leadership, formation of critical mass and strategies for recruiting world-class expertise. Slow progress in moving in this direction, combined with increasing convergence between HEIs, is making it difficult for Norway's HEI sector to make the vital transition towards an even more sophisticated innovation system.

The higher education landscape in Norway

A relatively young sector with strong public engagement

Norway's HE sector is of relatively recent origin (OECD, 2008). The University of Oslo, founded in 1811, was the first university on Norwegian territory. A few other organisations followed, but the majority of HE institutions were created after World War II. The 1960s ushered in a proliferation of HEIs, resulting in more than 100 organisations, most of them small university colleges (UCs). This increase was driven by regional needs and the upgrading of upper-secondary professional schools, in addition to rapid growth in the numbers of students. The sustainability of many HEIs began to be called into question, including their financial viability, sufficient student enrolment over the long term and meaningful research output.

Norway's government has devised various strategies to consolidate the sector and to achieve greater standardisation and higher quality (Gulbrandsen and Nerdrum, 2009; Öquist and Benner, 2014, Kyvik and Stensaker, 2016). This process included some mandatory as well as many voluntary phases. More ambitious strategies tended to be watered down to conform with the dictates of Norway's prevailing "consensus principle" and also in response to successful (often regional) resistance, which involved heated debates with "reformers".[1] Attempts to reform the system took decades. Much has been achieved, but it is an open question whether Norway's HE system privileges equality over competition, both within and across organisations.

Norwegian universities are characterised as typically Nordic, with dominant state ownership, strong stakeholder involvement and early adoption of third-mission goals like technology transfer, and tensions between egalitarian and leadership visions. Like many higher education systems in Europe, Norwegian HEIs gradually acquired a pronounced degree of autonomy (Pinheiro et al., 2016; Estermann et al., 2011; Auranen and Nieminen, 2010; Elken et al., 2016).

In 2017, Norway has 21 public HEIs[2] with more than 270 000 students, significantly fewer than the total of 38 a few years ago. Both the private and the public Norwegian universities and university colleges (UCs) are governed under a common Legal Act.[3] Under this framework, UCs, which originally focused on their educational mission, are permitted to conduct research activities and to award, although with some restrictions, doctoral degrees like universities.[4] They have in general become more similar to universities over time. All HEIs have three main missions: higher education, research, and the dissemination and application of academic knowledge in various spheres of business and society. The HE Act stipulates that research and education reinforce each other and be conducted at a high international level. The law then lists in greater detail nine tasks, including commercial value creation, dissemination, co-operation with other HEIs and all kinds of actors as well as the participation of HEIs' staff and students in public debates. Students are seen as contractual partners of their HEI and have a number of rights and obligations, as well as representation in the main governing bodies of the HEI, namely the university board.

A few decades ago, Norway still had an overly diversified HE sector with many small UCs. After numerous HE mergers, the number and average size of its HEIs are now comparable to those in Sweden and Finland. Denmark stands out as having fewer HEIs of a greater size, as a result of the many mergers of the past ten years (Table 3.1). As this table and Table 3.4 show, Norway is not a strong outlier as far as the number and size of its universities (and UCs) are concerned.

Table 3.1. **Size of higher education institutions in the Nordic countries, 2014**

	Number of public universities and university colleges	Higher education researchers in full-time equivalent	Number of researchers per institution	Student enrolment, full-time (2014)	Students per higher education institution
Norway	21	10 296	490	264 207	12 581
Denmark	16	15 012	938	301 399	18 837
Finland	38	12 381	326	306 080	8 055
Sweden	33	19 616	594	429 444	13 013

Note: For purposes of comparison, art colleges and business academies have been excluded from the numbers of higher education institutions. The Police University College has also not been included.

Source: *OECD Education Database 2016* (accessed 9 October 2016), http://dx.doi.org/10.1787/edu-db-data-en and national homepages (for number of higher education institutions).

Research expenditure of higher education institutions

The Norwegian HE sector absorbs a large percentage of the gross domestic expenditure on research and development (GERD), comparable to that of other successful smaller European countries. The overview in Table 3.2 shows that all comparable countries lie within a range of 23% and 33%, above the OECD average of 17.9%. The size of the HE sector relative to the overall GERD is average for OECD countries.[5]

Table 3.2. **Percentage of GERD accounted for by higher education sector**

	2000	2010	2012	2014
Norway	…	32.3	31.3	31.0
Austria	…	25.8	24.6	24.3
Denmark	…	30.3	31.6	33.2
Finland	17.8	20.4	21.6	22.9
Netherlands	31.9	40.4	31.6	32.1
Sweden	…	26.3	27.1	29.0
Switzerland	22.9	…	28.1	…
OECD total	16.0	18.6	18.4	17.9

Source: OECD (2016a), *Main Science and Technology Indicators, Volume 2016 Issue 1*, http://dx.doi.org/10.1787/msti-v2016-1-en.

The share of HE researchers as a percentage of the national total (OECD, 2016a) is the third highest of the seven countries studied, at 35.2%. Here the range is from 28.8% (Netherlands) to 52.2% (Switzerland).

The relative input (higher education research and development, or HERD, as a percentage of GDP) into the HE system is lower than in the comparator countries (Table 3.3). Overall, Norway ranks 12th among OECD countries on this score and below all comparator countries.[6] However, as shown in Figure 2.11, Norway ranks much better (in fourth position in 2015) when the HERD per capita rather than per GDP is considered, due to the high level of GDP. The growth rate of HERD between 2014 was around the OECD median (OECD, 2016, at current prices). HE expenditures are high relative to the population. Norway ranks fourth among OECD countries, after Switzerland, Denmark and Sweden (MER, 2016).

Table 3.3. **Higher education research and development (HERD)**

As a percentage of GDP

	2000	2010	2012	2014
Norway	...	0.53	0.51	0.53
Austria	...	0.71	0.72	0.75
Denmark	0.43	0.89	0.95	1.01
Finland	0.58	0.76	0.74	0.73
Netherlands	0.58	0.70	0.62	0.64
Sweden	...	0.85	0.89	0.92
Switzerland	0.53	0.73	0.84	0.88
OECD total	0.34	0.43	0.43	0.43

Source: OECD (2016a), *Main Science and Technology Indicators, Volume 2016 Issue 1*, http://dx.doi.org/10.1787/msti-v2016-1-en.

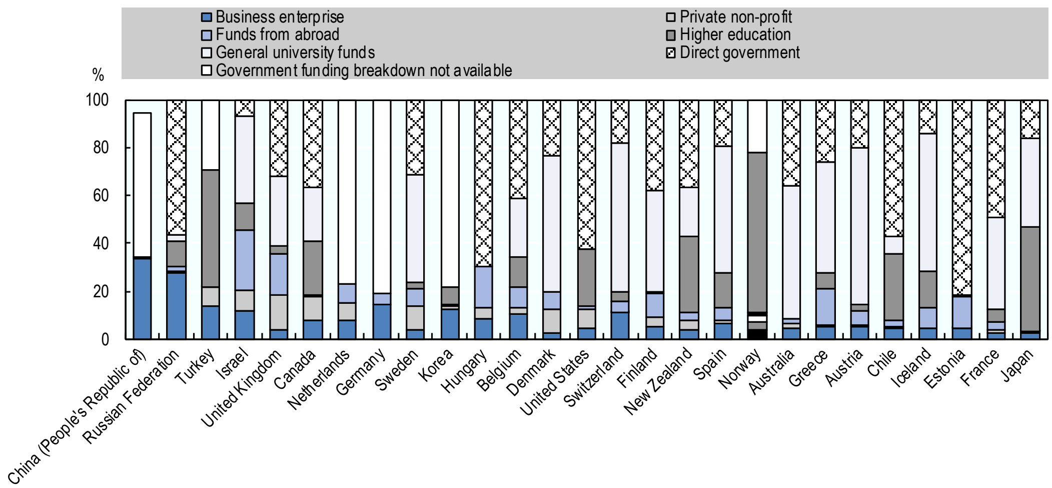
In Norway, as elsewhere, gaps in the data make it difficult to assess precisely the labour productivity of HEIs.[7] However, considering HERD relative to the number of HEI personnel, Norway appears to rank among the leaders and significantly above the median, showing a bias introduced by the high level of national wealth.

Research funding of higher education institutions

Norwegian HEIs are predominantly funded by public, i.e. central government, sources. Ninety percent of HEI income comes from block grants, Research Council of Norway (RCN) plans and other public actors, since there are no student fees to complement these sources. As in comparator countries, block grants dominate (see Figure 3.1). The percentage funded by industry is moderate by international comparison standards, at 3.1% of HERD (in 2015, down from 4.1% in 2013), partly because of the strong presence of an application-oriented public research institute (PRI) sector in Norway. The more recent shift of Norwegian HEIs towards applied and contract research has provoked discussion of the distribution of roles and functions between PRIs and universities in the public research sector.

Figure 3.1. **Funding of higher education research and development (HERD) by source, 2013**

As a percentage of HERD



Source: OECD (2015), *OECD Science, Technology and Industry Scoreboard 2015: Innovation for Growth and Society*, http://dx.doi.org/10.1787/sti_scoreboard-2015-en.

The share and absolute amount of private non-profit financing for academic research is also comparatively modest in Norway, for historical, societal and political reasons (see Box 3.1).

Box 3.1. **Philanthropic funding in Norway**

Due to the historic development of wealth in Norway, only a few private philanthropic sources fund research. This can be explained by the fact the country became independent relatively late, by its industrial structure, by the creation of the welfare state and the political decision to maintain power over societal allocations in the hands of the government. “Other national sources”, including private foundations, are scarce, accounting for 1.6% of GERD in Norway. This is comparable to Austria, Finland and Switzerland, for which the figures fall between 1% and 2% (OECD, 2016a). In Sweden, this sector (“other national sources”, i.e. mainly private non-profit) contributes 4.1% to GERD; in Denmark 4.3% and in the Netherlands 3.4%. Norway lacks large private sources of funding and has no Wallenberg Foundation (Sweden) or Novo Nordisk Foundation (Denmark) in place. This contrasts with the inception of Norwegian HE policy, given that the University of Oslo, for example, was set up on the basis of private donations. Thousands of private foundations in Norway today are devoted to different social causes, but even the largest are small by international standards. Sweden’s Wallenberg Foundation alone distributed more than the 50 largest foundations in Norway, according to a EUFORI study (Sivesind and Arnesen, 2015). Some foundations, however, do contribute to research and innovation, e.g. the Mohn foundation (Bergen Research Foundation) and other mid-sized philanthropic groups, as well as donor-based health funders like the Norwegian Cancer Society. The government supplements private donations of at least NOK 3 million (EUR 370 000) given to “long-term, basic research” at higher education institutions, or the Research Council of Norway, which accounts for 25% of the amount donated (Sivesind and Arnesen, 2015).

Sources: OECD (2016a), *Main Science and Technology Indicators, Volume 2016 Issue 1*, http://dx.doi.org/10.1787/msti-v2016-1-en.; Sivesind, K.-H. and D. Arnesen (2015), EUFORI Study: *European Foundations for Research and Innovation, Norway Country Report*.

In a recent comparison of European HE systems (EUA, 2015), Norway ranks as one that has enjoyed nominal and real budget growth between 2008 and 2014. In terms of real growth, only Germany and Sweden report increases as high as the Norwegian system, which grew in real terms by approximately 25% (EUA, 2015). Germany and Norway also experienced a rapid increase in the student population over this period.

Strong Norwegian universities have a financial base comparable to their foreign counterparts'. A seven-country overview of well-known comprehensive and technical universities shows that Norway's top HE actors are at no real comparative disadvantage (Table 3.4).[8]

Table 3.4. **Selected university budgets, 2015**

Country	University	Overall budget (EUR)	Students	EUR/student
Norway	University of Oslo	834 810 750	27 886	29 937
	NTNU	845 941 560	39 000	21 691
Austria	University of Vienna	544 386 000	94 000	5 791
	TU Vienna	347 360 217	29 919	11 610
Denmark	Univ. of Copenhagen	1 142 567 365	40 486	28 221
	TU Denmark	664 593 933	10 631	62 515
Finland	University of Helsinki	750 000 000	34 833	21 531
	Aalto University	384 000 000	12 326	31 154
Netherlands	Leiden University	588 000 000	25 800	22 791
	TU Delft	931 800 000	22 188	41 996
Sweden	Uppsala University	688 000 000	43 907	15 669
	KTH Stockholm	477 247 922	12 424	38 413
Switzerland	University of Zurich	1 273 505 000	25 358	50 221
	ETH Zurich	1 572 249 000	19 233	81 747

Sources: Websites of the individual universities; overall budget is the overall income, students include PhD students (author's calculations).

Research performance of higher education institutions

Norway's output of scientific papers is high and has grown rapidly in the past decade. Although it ranks among the countries with the highest scientific performance, it falls below the top-performing countries. These are nevertheless Norway's "natural" benchmarks, given its wealth, as well as its scientific potential.

High scientific productivity can go hand in hand with impressive results in technology transfer. One such example in Europe is the University of Leuven in Flanders/Belgium, which has more European Research Council (ERC) grants than all of Norway and many attractive licence agreements; as well as strong entrepreneurial and research spin-offs including the Interuniversity MicroElectronics Centre (IMEC) research centre (see Box 3.2).

Bibliometric performance

As noted in Chapter 2, scientific output in Norway's research institutions has grown in the past decade. In general terms, for most quantitative (publication outputs) and qualitative (various citation metrics) bibliometric indicators, Norway appears to occupy an elevated, but not top position, often ranking behind such countries as Sweden, Denmark, Netherlands and the United Kingdom.

Box 3.2. **KU Leuven, an example of a successful higher education institute**

Katholieke Universiteit (KU) Leuven is the oldest and largest university in Belgium. The autonomous university was founded in 1425 and has ranked among Europe's most renowned universities ever since. It is also a co-founder of the League of European Research Universities (LERU). KU Leuven is an internationally oriented, research-intensive university, with a strong focus on inter- and multidisciplinarity, both in fundamental and applied research. The university's various faculties and departments are organised into three groups: humanities and social sciences, biomedical sciences and science, engineering and technology. In total, KU Leuven has about 8 000 research and teaching staff. The increasingly international staff (about 20% of whom are not Belgian) educate a total of 57 000 students from about 150 countries.[1] Its overall revenues in 2014 were EUR 933 million.[2]

From the international perspective, KU Leuven can compete with the top universities worldwide. It ranks sixth among European universities, with 60 Horizon 2020 projects, with a total funding volume of EUR 28 million. Its high quality is also underlined by its rank of 40 in the Times Higher Education World University Ranking, making it the highest-ranked university in the Benelux countries. Its researchers have been awarded 92 ERC grants since the start of ERC funding in 2007, more than one-third of all ERC grants in Belgium.

In 1972, the university founded a knowledge technology transfer office, KU Leuven Research & Development (LRD). This has been dedicated to encouraging transfer activities between science and industry, and has resulted in close collaboration with industry ever since, creating more than 90 spin-offs and stimulating regional development by establishing hubs, several network initiatives, science parks and incubators. Between 2005 and 2014, industry contracts, licensing and patents generated nearly EUR 1.4 billion in revenue for the university (Edmondson, 2015). Among the most important outcomes is the Interuniversity MicroElectronics Centre (IMEC), the world-class R&D and innovation hub in nano-electronics and digital technologies, with 3 500 research staff and EUR 500 million in annual turnover.

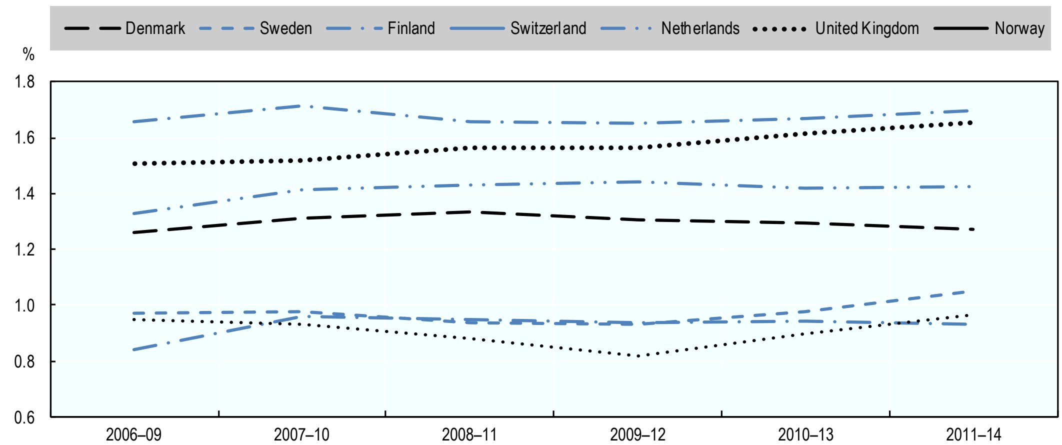
Notes: 1. www.kuleuven.be/about/communicatie/marketing/publicaties/infocus-uk.pdf.
2. www.kuleuven.be/about/communicatie/marketing/publicaties/infocus-uk.pdf, p.6, excluding the revenues of the university hospital. This is about the budget of a large Norwegian university.

Source: KU Leuven webpage, https://www.kuleuven.be/kuleuven.

Analysis of the scientific production of HEIs, which accounted for about 61% of this total scientific production during the period 2003-2012, compared to 11% for PRIs and 21% for the health sector, provides similar results (OECD and SCImago Research Group, 2016). For instance, when considering the share of the top 1% most cited articles from universities over the period 2006-14, countries like Switzerland, Denmark, the Netherlands and the United Kingdom still fare much better, as shown in Figure 3.2.[9] The gap is a little narrower when the top 10% most cited articles are considered, but Norwegian publications in the Top 10% are less often cited than Danish, Swiss, Dutch and also Swedish and Finnish publications (Figure 3.3). The overall relative citation index, however, has shown an upward trend in recent years (MER, 2014a).[10]

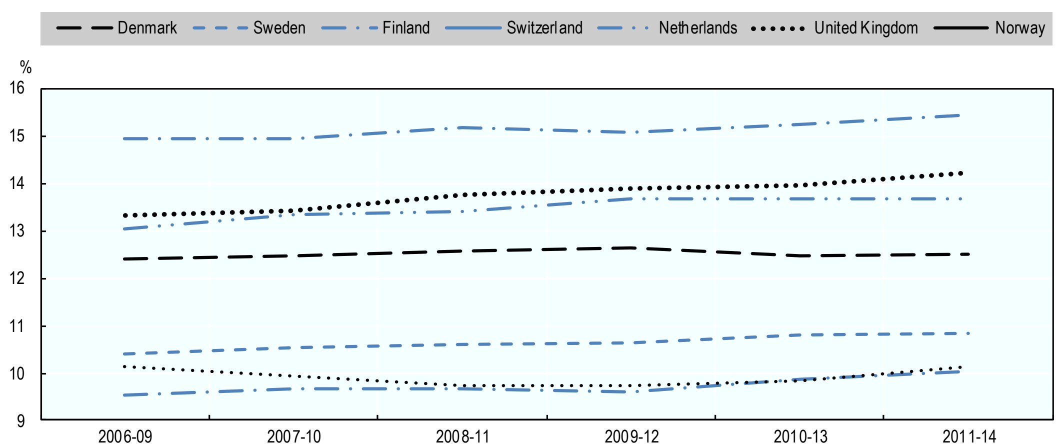
Analyses for each scientific field show similar results, even in life and earth sciences, in which Norway is reputed to have a strong scientific position. Even in Norway's successful engineering-based research and innovation clusters (for example, marine, maritime or oil and gas), only a few research groups are considered to have a world-class position in their field, as revealed in a recent evaluation (RCN, 2015a).

Figure 3.2. **Share of top 1% most frequently cited articles in their respective fields by the top publishing universities, selected countries, 2006-14 (all sciences, fractional count)**



Source: CWTS (2017), CWTS Leiden University, figures for 2016, www.leidenranking.com/downloads (accessed 4 April 2017).

Figure 3.3. **Share of top 10% most frequently cited articles in their respective fields by the top publishing universities, selected countries, 2006-14 (all sciences, fractional count)**



Source: CWTS (2017), CWTS Leiden University, figures for 2016, www.leidenranking.com/downloads (accessed 4 April 2017).

Position of Norwegian universities in university rankings

A comparative study of seven smaller European countries based on a wider set of indicators shows that Norway's university system is not ranked among the top universities.[11] Only one university is ranked between 100 and 200; 4 more make it into the top 500, and 3 are outside the score of the chosen Times Higher Education ranking (> 1 000).[12] This compares unfavourably with the Netherlands, Switzerland and Denmark, most of whose universities are included in the upper tiers of the ranking (see Table 3.5 and Figure 3.4).

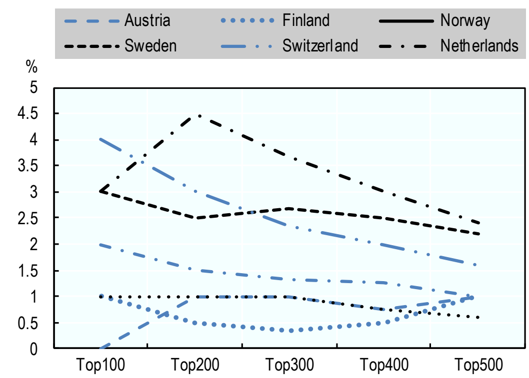
Table 3.5. **University rankings (Times Higher Education), selected countries**

	Top 10	Top 100	Top 200	Top 300	Top 400	Top 500+ and not ranked
Norway			•	••	•	••••
Netherlands		••••••••	•••••			•
Switzerland	•	••	••••	•	••	••
Austria			•	•	••	••••••••••••••••••
Denmark		•	••	•••		•••
Finland		•		•••	••	••••••
Sweden		•••	•••	•••	••	••••

Note: Each point marks a university; a total of 92 universities are included.

Source: THE (2016), Times Higher Education World University Ranking 2016-17 (compiled by the Vienna Science and Technology Fund, or WWTF).

Figure 3.4. **Country share in ARWU ranking of universities, 2016**

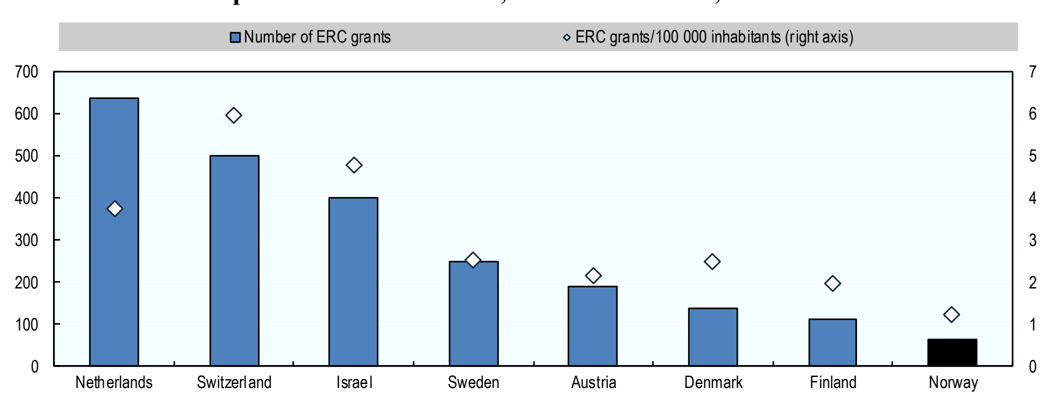


Source: ARWU (2016), Academic Ranking of World Universities 2016, www.shanghairanking.com/ARWU-Statistics-2016.html#2.

Performance of Norwegian universities in European Research Council calls

Within EU funding programmes, the European Research Council (ERC) has marked a dramatic change from co-operative to competitive funding and from multidimensional quality criteria to scientific excellence as the core dimension for evaluation (Nedeva and Wedlin, 2015). Its focus on competition has also made it an instructive quality benchmark system for countries and institutions, making it possible to link it to the structural properties of each system (Edler et al., 2014). From its creation in 2007, the ERC has thus quickly evolved into a much-used indicator for high-quality research across nations, regions and organisations in Europe. Since far more than 70% of ERC grants go to university-based researchers,[13] it is a useful instrument for comparing HEI positioning across Europe.[14]

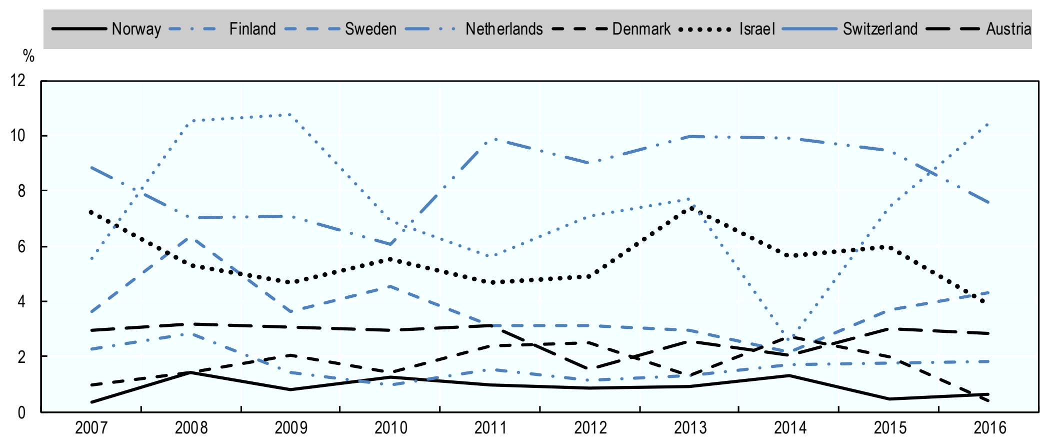
Figure 3.5. **European Research Council grants, absolute and relative numbers per 100 000 inhabitants, selected countries, 2007-16**



Source: ERC (2016), *European Research Council Statistics* (database), https://erc.europa.eu/projects-figures/statistics (accessed 4 April 2017).

In an eight-country comparison (Figure 3.5), Norway, as an Associated Country, has the lowest number of grants, while other countries have achieved strong success rates in ERC calls. This is especially true of the Netherlands and two other Associated Countries, Switzerland and Israel. When normalised per 100 000 inhabitants, these three nations still take the three top positions, but the success of Finland and Denmark as smaller countries becomes more visible. Norway again comes last, see also Figure 3.6. This is coupled with very low success rates.[15]

Figure 3.6. **Share of European Research Council grants, selected countries, 2007-16**



Source: ERC (2016), *European Research Council Statistics* (database), https://erc.europa.eu/projects-figures/statistics (accessed 28 March 2017).

Norway accounts for a lower share of all ERC grants per year than most of its benchmark countries over the period 2007-2016. The relative success rate of Norway in the ERC is way below the average of all participating countries. Norwegian research organisations thus appear to have structural problems in producing and hosting enough researchers who are awarded an ERC grant.

Degree of internationalisation in Norwegian higher education institutions

Among the primary sources for motivation towards international co-operation in research or researcher mobility, both in Norway and internationally, are personal preferences, local factors, diversity of institutional settings and general economic conditions (MER, 2014c). In general, it can be expected that foreign-born researchers improve the quality of research within a country. They bring cultural capital as well as expertise that has been developed abroad (MER, 2014c).

Norway is increasingly attracting foreign researchers. From 2007 to 2012, the number of researchers with foreign citizenship increased by 50% (while Norway's population grew by 6%), raising the share of non-Norwegians in the HE and research institute sector from 15% to 20% (MER, 2014d). The number of incoming researchers is thus higher than the number of outgoing researchers. The Netherlands, Sweden, Denmark and Belgium in particular have a much higher number of researchers who come to Norway than the reverse (MER, 2014d).

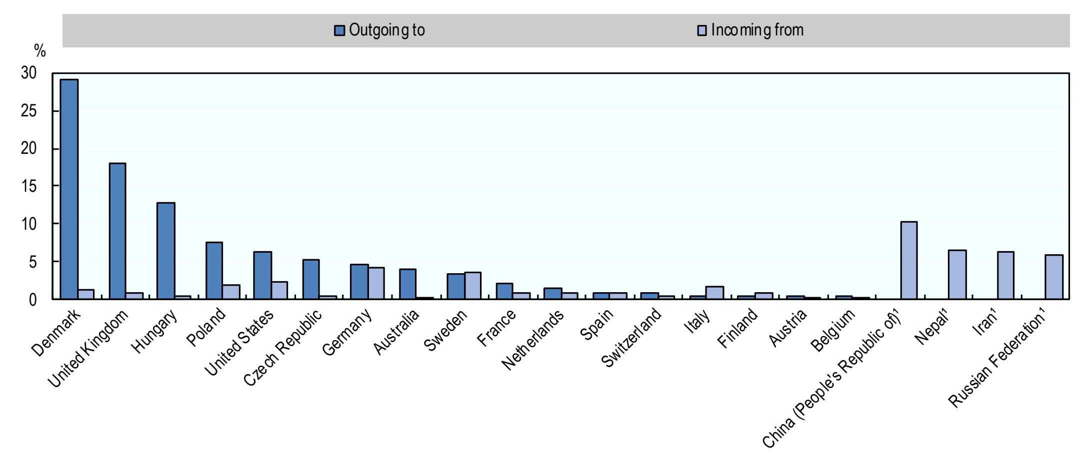
Researchers come to Norway from all over the world, but some patterns are worth noting. Those from Asia have the lowest average age (33 years) and the shortest average period of residency (4 years). Nationals from other European countries are an average of

38 years old, with an average period of residency of 7 years. Researchers from North America and other Nordic countries are on average older than 45 and have lived in Norway for 12 years or longer (MER, 2014c).

Norway's increased appeal as a research location may also reflect the growing number of PhDs and postdoctoral students globally (Stephan, 2012), and the challenges HE organisations and labour markets face in absorbing them.

The mobility of students at the master's and doctoral level is also an indicator of the attractiveness of the Norwegian university system. Of Norwegian citizens studying abroad, 29.2% are enrolled in master's and doctoral or equivalent programmes in Denmark, 18.1% in the United Kingdom and 12.7% in Hungary (Figure 3.7). High percentages of incoming master's or doctoral students originate from the People's Republic of China (10.3%), followed by Nepal (6.5%) and Iran (6.4%), (see also Gjengedal, 2014).

Figure 3.7. **Distribution of international and foreign students in master's and doctoral or equivalent programmes, by country of origin, 2014**



Note: 1. No data is available for the number of outgoing Norwegian students.

Source: OECD (2016f), *Education at a Glance 2016: OECD Indicators*, http://dx.doi.org/10.1787/eag-2016-en; author's calculations.

In Norway, 43% of postdoctoral researchers report having worked in higher education institutes in other countries for a period of more than three months at least once during their post-PhD career. This number is above the EU27 average (31%), and even slightly higher than the corresponding figures for Finland (42%) and Sweden (40%). However, the figure is much lower than for Switzerland and Denmark, both at 53% (MER, 2014c).

A growing number of PhD students come from abroad, another sign of the appeal both of Norway as a workplace and of Norwegian HEIs as research locations. The percentage of non-Norwegians working on their PhDs in Norway has been rising steeply, starting in the early 1990s. In 1990, the percentage was around 10%, growing to approximately 25% in 2005 and to more than 35% in 2015. Although the motivations of PhD candidates are often hard to identify in the absence of a dedicated survey, it is clear that Norway occupies a privileged position, at least partly because it offers generous employment contracts. However, taking into account the high level of R&D investment per student, Norway has a smaller share of international doctoral students than might be predicted by the linear relationship derived from observations for OECD and partner countries between R&D investment and the number of foreign students (OECD, 2016f).

While few students come in from other Nordic countries, many Asians and western/southern Europeans are working on their PhDs in Norway. In the natural sciences and in technology/engineering respectively, 48% and 63% of PhD students are non-Norwegian, and the respective percentages of the total number of researchers are 37% and 30%. Postdoctoral positions include an even higher share of non-Norwegians than PhD students, a figure that rose from 40% in 2007 to 48% in 2012. By contrast, the share of non-Norwegians among those with advanced careers (established researchers and professors) has grown more slowly (at less than 1% annually) (Sarpebakken, 2016; MER, 2014c).[16]

The majority of foreign PhD students or postdoctoral researchers arrived in Norway relatively soon before their recruitment, over 50% of them within the previous three years. The share of established researchers and professors who came within this period of time was much lower, only 16% and 8% respectively (MER, 2014c).

Education performance

More than 250 000 students were enrolled in HEIs in Norway in 2015, and more than 45 000 students graduated from universities and colleges in Norway, 61% of whom were female. Of Norway's population in the age group 25-64, 42% have tertiary education, compared to the OECD average of 33%. One in three people between the ages of 19 and 24 years was a student in 2015. This number has greatly increased in recent decades. In 1985, only one of every eight people in this age group was a student. With 43% of the population of age 25-64 with tertiary education, Norway is well above the OECD average but remains behind the levels of countries like Canada, the Russian Federation, Japan and Israel, and on a par with Finland (OECD, 2016f).

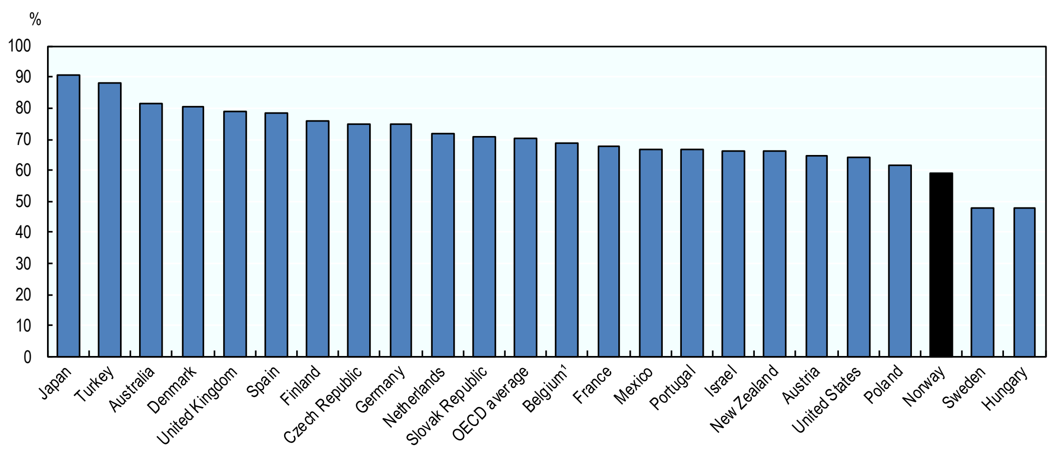
The percentage of students of between 19 and 24-years-old was 52% in 2015. The respective percentage for the group between 25 and 29 years of age was 20%; the percentage of students who were older than 30 was 25%, with a gradual trend towards a lowering of the age (Statistics Norway, 2016).

Norwegian HEIs are subject to a nationally co-ordinated admissions policy, based on a ranking within quotas. Half of all study places are distributed under the quota for students studying for their first diploma. Applicants meeting the requirements for admission in the quota for first-diploma applicants without being offered a place go on to compete in the ordinary quota. The ranking is based on their own priorities and competition points. The so-called "school points" are the main component of the competition points and depend on applicants' performance at school and which courses they attended. In the "first diploma quota", applicants only compete with the "school points". In the "ordinary quota", additional points for age and preliminary specialisations or completion of military or civil service are added (MER, 2007).

The HE system in Norway is described as being rather expensive, with public expenditures well above OECD average. One reason for this is the absence of tuition fees in the system, while stipends and grants for students are generous (OECD, 2016c). Another reason may be the relatively low student-to-teacher ratio, especially in the smaller HEIs. Also, the value of the Norwegian krone and the high wages play a role here. However, students' satisfaction levels with teachers' feedback and individual counselling are low (OECD, 2016c).

Among the other significant challenges of Norway's HE system are the long duration of studies, the high number of dropouts and the strong preferences for a limited number of disciplines, mainly the social sciences. In international comparative studies, completion rates in Norway are relatively low (below the OECD average, see Figure 3.8) and the time taken for completion relatively long. Only 48% of students taking bachelor degrees and 45% of master's students complete their studies within the planned three-year and five-year cycles (Statistics Norway, 2016). Many students stop after a bachelor degree, and the percentage of MSc graduates is slightly lower than the OECD average. The percentage of students who drop out if they have not completed their studies in five years is also relatively high, about 60%. The percentage of students who complete their studies within the expected period has, however, been increasing lately (OECD, 2016c).

Figure 3.8. **Completion rates in tertiary education, 2011**



Notes: Completion rates in tertiary-type A education, which represent the proportion of those who enter a tertiary-type A programme and who go on to graduate from at least a first tertiary-type A programme.

1. Figures for Belgium are for the Flemish Community.

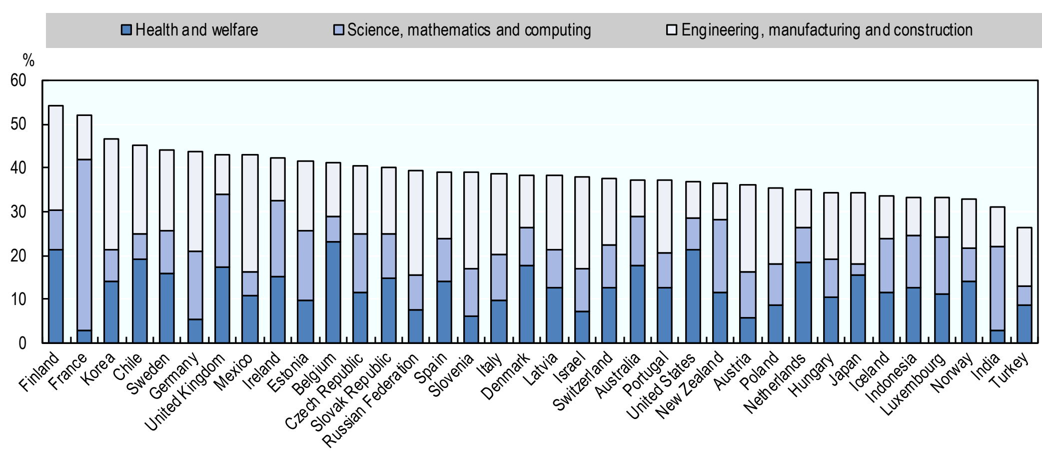
Source: OECD (2013), "Completion rates in tertiary education" Table A4.1, http://dx.doi.org/10.1787/eag-2013-table27-en.

Several factors contribute to the situation of late completions or dropouts. Insufficient academic preparation before enrolment and inadequate career guidance are two reasons. A principal cause may be the "low cost of trying and failing tertiary education" (OECD, 2016c), resulting in a flexible system. More than 10% of Norwegian students interrupt their studies for more than a year. The flexibility of the system also allows for changes in the choice of study. Another reason for dropouts or delays in completion may be the robust job market and the respective job commitments of students (Hovdhaugen, 2012). While this flexibility represents an opportunity for students, it raises the question of whether human and financial resources are efficiently used in the tertiary education sector. The Productivity Commission harshly criticises the low rates of study completion in Norway (NOU, 2016) and has made proposals to tighten up the tertiary education system in this respect.

The long average duration of individual studies also applies at the PhD level. The average completion age, of over 35 years in 2015, is remarkably high, another indicator that has provoked debate about research excellence. PhD graduations have risen steeply in the 1990s and 2000s, mainly thanks to the rise in female participation, with a consolidation in recent years. In 2015, a total of 1 436 doctoral degrees were awarded (Sarpebakken, 2016). At the doctoral degree level, the social sciences and humanities account for the greatest number of PhDs granted (469 in 2015), followed by medical and health sciences (431) and natural sciences (318). Technology sciences only accounted for 170 PhDs in 2015. This number stands in stark contrast to the significant shares of the Norwegian GDP accounted for by technologically intensive industries. In the 1980s, the highest number of doctoral degrees had been awarded in the medical and health sciences, followed by technology sciences and natural sciences (Sarpebakken, 2016).

A comparison of the numbers of PhD degrees awarded and the total number of students in tertiary education in Norway by field reveals that certain subjects, for example social sciences, law and business administration are extremely popular, and that mathematics, the natural sciences and computer sciences appear less so. Of students in Norway, 41% are pursuing a programme in the field of social sciences and the humanities, law or business administration, and 20% are studying in the field of health sciences and sports. Only 18% are studying the natural and technical sciences and 4% in the area of transport, communications, safety, security and other services (Statistics Norway, 2016). The number of new entrants to tertiary education in engineering and natural sciences is also rather low by international standards (see Figure 3.9).

Figure 3.9. **Percentage of entrants to tertiary education in engineering, science and health, 2014 or latest year available, as a percentage of total new entrants**



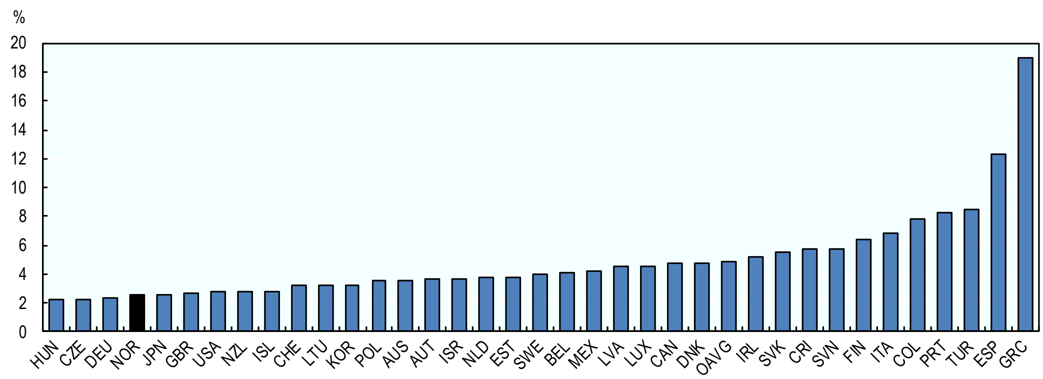
Source: OECD (2016f), *Education at a Glance 2016: OECD Indicators*, http://dx.doi.org/10.1787/eag-2016-en.

The consequences of students' preferences for the supply of the future labour market supply and demand are subject of much discussion. Some people consider that the overall supply of tertiary level graduates in Norway is by and large in line with labour market demands, but others note supply shortages, especially in the science, technology, engineering and mathematics (STEM) field, in which Norway's enrolment share is still below the OECD average (OECD, 2016c). The quality of tertiary education and its consequences for the employability of students is also called into question by the results of the Survey of Adult Skills, conducted in the framework of the OECD Programme for the International Assessment of Adult Competencies (PIAAC). Around 10% of 20- to 34-year-old tertiary graduates in Norway attain only low levels of literacy (Level 2 or below), which is a comparably low number in international comparison (OECD, 2014c).

The low rate of unemployment of people with tertiary raises a question regarding the match between tertiary degrees and the needs of the economy (Figure 3.10). While this indicates the effectiveness of lower educational degrees,[17] it shows that there is no systemic problem in the preparation of tertiary students for the labour market.

Figure 3.10. **Unemployment rates of population with tertiary education, 2015**

Percentage of population of aged 25-64



Note: OAVG: OECD Average.

Source: OECD (2017), "Unemployment rates by education level (indicator)", http://dx.doi.org/10.1787/6183d527-en (accessed 12 April 2017).

As regards how tertiary education prepares students for research careers, the results of the national student survey reveal that the two areas of learning that receive the lowest satisfaction score are the experience with research and development work and the "knowledge of scientific work methods and research" (OECD, 2016c).

A white paper on HE teaching quality is currently being discussed in the Storting. It contains a number of measures to improve the quality level, with more competitive funding elements and incentives for teaching, building on university autonomy and supporting initiatives of HEIs.

Structural changes in the higher education sector

Mergers and consolidation of higher education institutions

Traditionally, university colleges (UCs) have developed out of local upper-secondary specialised schools, and their main mission has been to offer educational programmes relevant to the regional context. In the post-war era and in the decades of HE expansion, their numbers grew rapidly, followed by successive periods of mergers and consolidation. In this period, a binary system of universities and UCs developed. As a result of this process, some UCs are currently among the largest Norwegian HEIs, each with more than 15 000 students.

University mergers are a common trend in Europe, in part due to concerns about efficiency and effectiveness, in part also to create critical mass, quality, higher visibility and to secure better positioning in international university rankings. Some processes are also driven by geographical motives. Mergers came in various forms (Bennetot Pruvot et al., 2015).

In Norway, most mergers have happened among UCs or between universities and UCs:

- Mergers among UCs, as in the case of mergers of regional colleges in 1994. This wave of consolidation reduced the nearly 100 regional colleges to roughly 25 state UCs. A recent series of mergers in 2016 and 2017 further reduced the number of UCs. These mergers can also involve public research institutes (PRIs), as in the case of the large Oslo and Akershus UC, which is the result of a merger of two UCs, plus the integration of social science public research organisations (PROs) (Mathisen and Pinheiro, 2016).
- Recent examples of mergers between universities and UCs, with the former in the driving seat, include the University of Tromsø – the Arctic University of Norway, which integrated a number of UCs (Arbo and Bull, 2016). The Norwegian University of Science and Technology (NTNU) in Trondheim also merged with a number of neighbouring and dislocated UCs.
- Mergers between universities include NTNU, which was the result of a merger between University of Trondheim, the Norwegian Institute of Technology and four other organisations in 1996 (Kyvik and Stensaker, 2016). Another example is the Norwegian University of Life Sciences (NMBU), resulting from a merger between two smaller universities.

Mergers in Norway have come in waves, and unlike in Denmark, not as the result of a single HE consolidation process (Aagaard et al., 2016).[18] In recent decades, the government has played a strong role in incentivising such mergers, e.g. through legal provisions for minimum HEI size. However, most mergers were (semi-) voluntary and took a long time to set up, after a process mixing bureaucratic and market logic involving rejections and strategic games (Kyvik and Stensaker, 2016).

Recently, a big wave of mergers has been taking place, based on the Ministry of Education and Research white paper (MER, 2014b) and a series of dialogues between the ministry and the HE sector. While the government played an important role in initiating these mergers, it was carried out by increasing the difficulty of the accreditation process, rather than by coercion (Elken et al., 2016). A number of incentives have also been instituted, including extra funding for mergers, and steps to include PRIs in these initiatives (Bennetot Pruvot et al., 2015; Kyvik and Stensaker, 2016). As a result of this incremental, negotiation-based approach, the number of public HEIs fell to 21 (from 33) in 2017. This process also suggests that the step-wise, negotiation-based approach of Norway's STI policy can be quite effective.

However, a by-product of this process has been a loss in the diversity of the profiles of HEIs. Starting in the 1990s, the Norwegian government progressively removed structural differences between universities and UCs. Both are subject to the same University Act and financial allocation process. UCs now can perform research and, since 1999, have been able to award doctoral degrees (Kyvik and Stensaker, 2016). This convergence was also a result of the UCs' ambitions to become full universities. Some merged among themselves or with an existing university (Kyvik and Stensaker, 2016, Elken et al., 2016). This led to the claim that as early as the mid-1990s, Norway's higher education system was "no longer a binary system" (Arbo and Bull, 2016). This common legal framework may have encouraged ambitious UCs to become universities or to merge with one, either by a merger of various colleges or by becoming part of an existing university. This has put the binary system under pressure from UCs with strong university ambitions (Kyvik and Stensaker, 2016, Elken et al., 2016). A number of countries have maintained such a binary system by nurturing a small number of excellent universities and/or by strengthening a number of regionally anchored, applied UCs (see conclusions).[19]

Improving strategic management within universities

The 2005 University Act and other regulations give Norwegian HEIs a high degree of autonomy. This allows them to decide on their internal organisation and on the distribution of the combined block funds for research and education. The Act mainly provides for a lean procedural and quality framework, with the Norwegian Agency for Quality Assurance in Education (NOKUT) as the responsible agency for quality assurance, including accreditation and evaluation. A structuring element is its staff members' status as civil servants and the strong role of unions. HEIs have the authority to determine individual salary levels (Estermann and Nokkala, 2009). Academic autonomy has been ranked by the European University Association (Estermann et al., 2011): Overall, Norway is rated in a "medium high" group for organisational and staffing autonomy. Financial autonomy is rated "medium low", chiefly given the absence of tuition fees.

The university board is the central collective decision-making body of each of Norway's HEIs. It is responsible for the students' learning environment, for appointments to academic and managerial posts, for maintaining a high standard of academic activity and for supervising management. It is also responsible for all major financial matters, including providing financial statements, for the budget for the following year and for the organisation's strategy and internal structure. The board has a mixed composition, typically including 11 members, including academic staff, employee representatives, students and a number of external members.

The rector, as the chief executive, may either be elected (by faculty, staff and students) or selected and appointed by the board itself. If elected, the rector is the chairman of the board; if appointed, MER can nominate an external board member as chairman. This structure has been in place since the mid-2000s. Traditionally, Norwegian HEIs have elected their rectors, and the potential leadership styles range from a CEO model to *primus inter pares* (see also Estermann and Nokkala, 2009). In future, the model with an appointed rector and an external board chair will become the default option[20] (if the board does not decide otherwise), and all external board members are to be appointed by the ministry MER, 2016), in an attempt to strengthen leadership. The impact of these changes has not yet become fully apparent (Elken et al., 2016). However, some universities, like Tromsø or the NTNU in Trondheim (see Box 3.3), have certain funds as a central budget, to introduce internal strategic funding schemes and mechanisms to create critical mass.

In recent years, a number of steps have been taken to position some of the strongest Norwegian universities as providers of world-class research and teaching. However, some critical issues are still preventing Norway's universities from realising their full potential. In particular, strategic actorship, bureaucratisation, lack of *ex ante* financial incentives and *ex post* bold "reallocation" actions, as well as the creation of critical mass, still appear to be underdeveloped, at least in a number of HEIs. These limitations have been the subject of criticism in several recent official reports and research papers (see Box 3.4).

Box 3.3. **Internal priority setting at the NTNU**

In the internal budget allocation model of the Norwegian University of Science and Technology (NTNU), its board withholds 15% of the block grant from the government for strategic purposes. Examples of how the strategic funds are being used include:

- The Onsager Fellowship Program to attract research talent from abroad (using the tenure track mechanism), the International Chairs Scheme to recruit professors from abroad and the Outstanding Academic Fellow programme to qualify NTNU's own young research talents for internationally leading researcher careers.
- Financial support for world-class research groups (for instance the Kavli Institute for Systems Neuroscience/Centre for Neural Computation which won the Nobel Prize in 2014).
- Building strategically important research labs, like the NTNU Nanolab, an investment of NOK 250 million.
- Developing a programme for excellence in teaching and education, strategically supporting a range of initiatives designed to strengthen teaching skills by developing innovative teaching, learning and assessment practices.

Source: NTNU official website, https://www.ntnu.edu.

Box 3.4. **The limits of strategic leadership in Norwegian universities in relevant reviews**

- Öquist and Benner argue that the research system within HEIs "seems to be composed of a relatively small number of 'flagships' amidst relatively weak environments", but where "the 'minimum level' has been raised" (Öquist and Benner, 2016). University leaderships could devote more focus to developing strong research environments through internal priority setting and reallocation. Instead, the universities, their leaders and policy makers rely on additional external impulses through RCN programmes to initiate change.[1] Centres of excellence (CoEs, or Sentre for fremragende forskning, SFF) and other RCN centres, however, are apparently useful instruments for creating specialisation on a larger scale (OECD, 2014a).
- Instead of creating strong environments and encouraging horizontal co-operation, the resources of the universities, with their ample block funding, seem to be "more or less fixed, with deans, department heads and rectors responding incrementally to the financial blockages" (Öquist and Benner, 2014). This is seen as even more critical, given the large numbers of relatively small research groups.
- The Engineering Science evaluation (RCN, 2015a) found "universities and university colleges had a relaxed attitude at the department level towards leadership and long-term planning. … Research is performed more on the basis of opportunities and personal expertise/interest rather than on a convincing strategy."
- The Productivity Commission found that governance in the HE sector "has not adequately promoted quality improvement, while it has resulted in more bureaucratisation". Government incentives have increased competition, but according to the commission, HEIs are not able or willing to translate this into internal planning and allocation mechanisms, given the absence of "mechanisms in place to ensure that study programmes with few applicants or weak research establishments are closed down. Nor would it appear that the governing bodies of educational institutions themselves are making use of the room for manoeuvre offered to them. … Public governance needs to be more focused on quality." (NOU, 2016).

Teaching appears to take precedence over research, particularly since the Bologna educational reforms, and despite government efforts to boost research within the universities: "It appears as if a majority of tenured staff emphasises education at the expense of competitive research aiming for ground-breaking results" (Öquist and Benner, 2014). If this holds true, the length of individual studies is a matter of concern, given that an average PhD across disciplines takes 9.5 years to complete (Sarpebakken, 2016).

Note: 1. A similar pattern can also be observed in Sweden (OECD, 2016b).

Recruitment in Norwegian universities

Recruitment of top university staff is one of the most powerful tools in HE management and performance. For the employers' part, it is important to attract academic talent to allow for a positive dynamics.[21] On the other hand, there is strong global competition for the highly mobile top candidates among the vast number of postdocs and young candidates for professorial posts. Many countries and HEIs successfully attract researchers by offering them a tenure track, with early independence, a starting package and the opportunity for a long-term career leading to full professorship after successfully passing a series of stringent evaluations.

In Norway, recruitment and career development structures have been improved, and much is being staked on the introduction of a new tenure track system. However, changes in recruitment policies have been only incremental over the last years.

Recruitment is still often described as "routine" and determined primarily by education-related considerations. In several Norwegian universities, disturbingly, recruitment issues do not yet rank high on university agendas (Öquist and Benner, 2014). A key evaluation study (RCN, 2015b) identified recruitment of academic staff as a major bottleneck. These limitations are related to the lack of strategic leadership and long-term strategic planning. The large number of small research environments is also detrimental in this context.

Although a tenure track system can be introduced in Norwegian HEIs, the old recruitment system often prevails, with in-house careers and non-strategic, overly decentralised procedures. Postings for professor positions are published internationally, and promotions are merit-based and peer-reviewed. However, the entry points are less attractive for top talent and less visible than they could be. This is exacerbated by the relatively low number of permanent positions in Norway's HE sector. Paradoxically, this coincides with the right to obtain a permanent position after a certain number of years, which again leads the HEIs mainly to offer fixed-term positions to young researchers. This results in a dilemma, since talented young people are not offered satisfying career opportunities (see also OECD, 2014a) and HEIs may recruit candidates with weaker profiles. Strong public sector status, labour legislation and the influence of unions form strong, and not always favourable, framework conditions in this context, and make lengthy negotiations necessary to fully roll out a tenure track.

The average age in Norway at which academics become a full professor is also quite high. It is often the result of being there long enough, as the preceding career steps often lack a clear quality-based track. Although many top-class recruitments are made both from abroad and within Norway, there is still a tradition of getting a permanent position after years of staying at the same university without proper evaluation, with incumbents building their own small research fiefdoms.

Experience shows that the rollout of a tenure track system can avoid the distortions of such a setting and allow for active, competitive recruitment of younger talent, mostly from outside. Such a system also has the effect of lowering the average age at which the rank of full professor is reached.

Strategies and policies to support research excellence in higher education

Steering and funding the higher education sector

The Norwegian HE sector has instituted many steering and performance-based mechanisms (Box 3.5). This puts mild pressure on HEIs, staff and students in various dimensions in order to support excellence. Another strategy to support excellence was described above: top-rank recruitment and career schemes attracting the best talent.

The Norwegian university funding model

Box 3.5. **A synthesis of the main features of the Norwegian university funding model**

The system for steering and funding Norwegian universities has several distinct characteristics:

- A single funding system for universities and university colleges regulates both sub-sectors under the same law. This Higher Education Act provides general rules in a lean and efficient way and includes also the Norwegian higher education quality and accreditation policy, including the Norwegian Agency for Quality Assurance in Education (NOKUT).
- Research and education funding come in a single stream, which increases room for the individual higher education institutions (HEIs) for internal allocations.
- There are no tuition fees, and financial support for students is comparatively generous.
- Access to higher education is managed by a national student allocation system according to their stated preferences and the capacity of the HEIs.
- The share of block funding is comparatively high in Norway (64% of total funding).
- Block grants include a performance-based funding component (representing 30% of total block funding), with a stronger teaching component consisting of four indicators, and a less prominent research component, also with four underlying indicators.
- Performance agreements (PAs) are being introduced step-wise in the HE system, starting in 2017, with five HEIs and gradually expanding. PAs will help to sharpen individual HEI profiles.

Overall block funding for HEIs includes teaching, as block funds come in one stream for research and teaching, unlike in Sweden or the United Kingdom, for example. No other institutional funding source for universities is in place. In Denmark and Norway, the share of public financial contributions to universities, including competitive funding, are highest in a multi-country comparison across Europe, with approximately 90% of overall HE income each (Bennetot Pruvot et al., 2015).

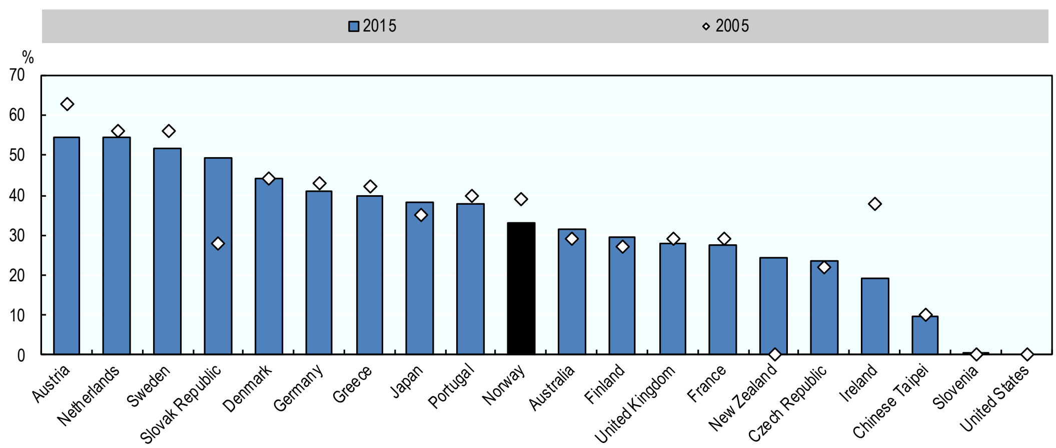
Block funding for R&D comes from MER, accounting for 64% of Norwegian higher education R&D funding in 2013 (Solberg, 2016), a comparatively high share. The rest consists of RCN schemes (17%), other public sources (8%), industry (5%), international (3%) and other private sources (3%). The block funding for teaching comes from MER. As there are no tuition fees in Norway, nearly all the funds for teaching come from public sources.

In advanced countries, HE financing systems for teaching and research vary based mainly on the balance between competitive and non-competitive funding. In OECD countries, a broad variety of methods are used, ranging from very low levels of block funding in a few countries (like the United States and Slovenia) to over 50% of government budget appropriations or outlays for R&D (GBAORD) in Austria, the Netherlands and Sweden.[22]

No clear international trend has emerged in the past decade regarding the evolution of this balance, and the share of block funding and non-competitive funding still represents a significant percentage of the total funds for research received by universities – between 30% and 50% in most advanced countries. Norway, with a share of general university funds of 33% of GBAORD in 2015 (39% in 2005), occupies an intermediate position.

Figure 3.11. **R&D financed from general university funds, select OECD countries**

As a % of government budget appropriations or outlays for R&D (GBAORD)



Sources: OECD (2016e), *Government budget appropriations or outlays for R&D* (database), https://stats.oecd.org/Index.aspx?DataSetCode=GBAORD_NABS2007.

Allocation of block funding in Norway

The Norwegian HE funding and steering approach is specific, but so is each national HE system, due to different combinations of instruments and their individual weight. No golden ratio obtains, and efforts to discover the "right mix" are not straightforward (for differences and changing patterns compare, for example, Whitley and Gläser, 2014; Paradeise et al., 2009). A 2010 study of the subject concluded that more competitive systems are no more efficient than those with higher and less conditional block funding (Auranen and Nieminen, 2010). In an eight-country comparison, Norway, with Finland and the Netherlands, represent a middle group: less competition-driven than the United Kingdom or Australia, but with more output-orientation than Sweden, Denmark and Germany.[23] The study offers evidence that less competitive systems can also be very efficient, measured on a HERD per publication scale. Norway, however, is described as not overly efficient.

The different mechanisms for issuing block grants are shown in Box 3.6, with different mixes between historically set and performance-based shares; as well as different forms of performance-based funding and steering elements.

Before 2002, the block funding was exclusively input-oriented, based on historical levels. Since 2002,[24] the overall block grant in Norway has had two components: one is a historical component, accounting for around 70% of the total amount. Since Norway has a state-financed and -owned HE system, HEIs rely on their recurrent income streams and have no large endowments, although they partly own their own premises.[25] About 30% of

HE financing is linked to performance-based funding (PBF) indicators, on an *ex post*, output-oriented approach. There are two sets of performance criteria:

- A dominating "open budget" PBF element incentivising HE teaching, based on which overall funding for the HE system may be increased if the universities or UCs are successful. Four sub-categories apply: the main bulk of PBF funding is measured against reported student performance (completed study credit points). This makes up for 64% of the overall 30% PBF HE block funding share. Another 15% of the overall PBF is tied to graduation rates and 5% to PhD graduates (formerly part of the "fixed-limit budget"), while 1.2% forms an incentive for student exchange. Around 85% of all PBF are in this open category.
- A much smaller "fixed-limit budget" element relates to research activities. Here, the overall amount for the HE system is fixed, with a ceiling, allowing only for reallocations between HEIs. From 2017 onwards, this element has accounted for a little more than 15% of the overall PBF HE block funding. This component now includes four smaller indicators, each between 2.8% and 5%: publication credits, funding from RCN, funding from EU and other public sources and the "BOA" indicator (*bidrags og oppdragfinansiert*, or contract research indicator) for private revenue, including contract research. The impact of these incentives and the "fixed-limit budget" might be limited, at least for research-intensive universities.

Box 3.6. **Models for allocating block funding in advanced economies**

Many countries still rely on historically fixed block grants, complemented by a more variable component using a funding formula based on input and, increasingly, performance indicators related to education and/or research performance. The indicators used vary considerably across countries.

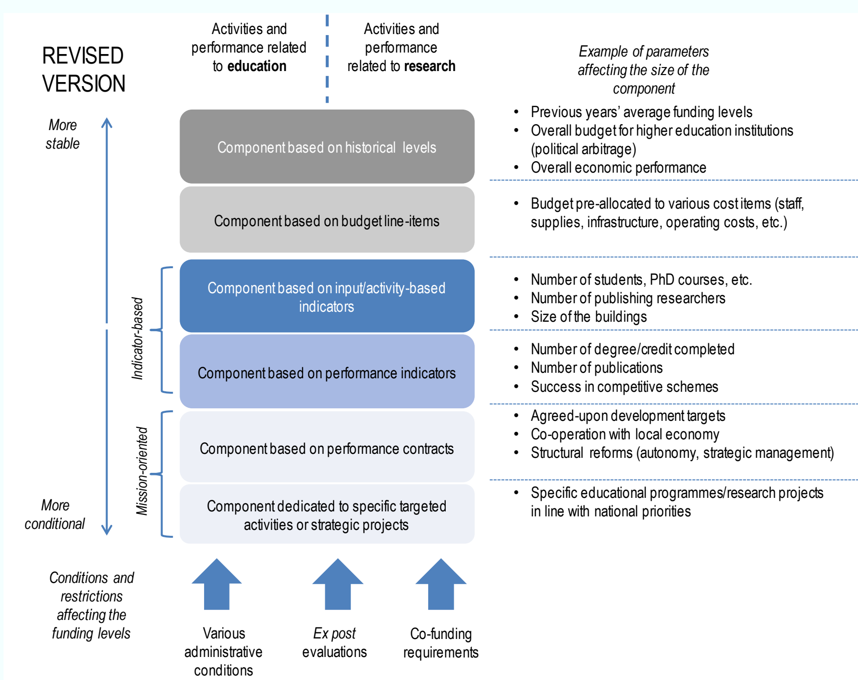
The performance-based component can account for a more or less significant share of the block grant (for comparing the research components, see Hicks, 2012; OECD, 2010) and be used as a primary (as in the United Kingdom) or secondary mechanism (as in Norway or Sweden). Other countries use performance agreements (PAs), either as a main steering instrument covering the whole block-funding appropriation (Austria) or negotiating the surplus for the next period (as in the Swiss federal system or Bavaria in Germany). Some countries use a full-fledged performance indicator system in their PAs (Luxembourg; OECD, 2016d), and others leave HEIs to select the indicators of their choice (Netherlands; OECD, 2014b). For an overview, see De Boer et al. (2015). PAs are always *ex ante* instruments, and they may, but need not necessarily, be coupled to performance indicators. Alternatively, or as a complement to these mechanisms, a system of *ex post* evaluation of universities at department or discipline levels can be used, as in the United Kingdom (see Hicks, 2012; Martin, 2011).

Performance indicators can thus be coupled with other steering and evaluation instruments like PAs or *ex post*-oriented peer reviews, or may also come as stand-alone instruments.

One common approach is to try to find "hybrid" solutions stable enough to provide a solid financial basis, while allowing for some strategic steering. This includes different ways to affect part of the block grant, or a top-up at the defined level for specific targeted activities, in line with national priorities. The Strategic Research Area initiative in Sweden falls into this category (OECD, 2016b).

The scope of the block funding is another important variable differentiating the different systems. The block funding can be comprehensive and cover both education and research activities (Austria, Norway), while other systems are dual, with two different funding streams (Sweden, the United Kingdom).

Figure 3.12. **Possible components in a university block grant**



Sources: Edler, J. et al. (2014); Paradeise, C., E. et al. (2009); Bennetot Pruvot, E, A.-L. Claeys-Kulik and T. Estermann (2015); Hicks, D. (2012); Jongbloed, B. (2009); De Boer, H. et al. (2015); EUA (2015); Martin, B. (2011); OECD (2016b)

The government appointed an expert committee to improve the Norwegian PBF component in HE funding and took on board some of its recommendations in its 2016 budget proposal. The main changes include the new indicator for completed degrees, in order to reduce the length of time students spend on their studies. Greater incentives for success in EU Framework Programmes (FP) and for contract research ("BOA") have also been added. It is still too early to assess the actual effect of these amendments on the funding and, ultimately, activities and performance of universities.

The different approaches to the "teaching" and "research" components are a characteristic feature of the Norwegian HE policy. The two indicator sets vary in size and dynamics, based on the belief that strong incentives are needed to change collective attitudes and patterns in education, and student behaviour in the long term.[26] The latter concept is popular in Norway because of the generous financial conditions for students, including loans and grants covering the cost of living (MER, 2016). The Productivity Commission (NOU, 2016) claimed that the current system has a negative effect on the allocations for different subject fields: In a country with many social sciences and humanities students, the performance-based funding system encourages the creation of many additional small and "cheap" study courses, which is not a good use of resources from the perspective of needs and efficiency.

Like many administrations in OECD countries, MER is also piloting institutional performance agreements (PAs) with a sample of five state-owned HEIs and has plans for a full rollout in 2019 (Elken et al., 2016). These *ex ante*-oriented steering instruments are contracts between the government and individual HEIs concerning specific quality, performance and "mission-based" objectives (for an overview, see De Boer et al., 2015). PAs in Norway shall contribute to the achievement of the two major HE sector goals, 1) excellence; and 2) clearer institutional profiles and better division of labour between the institutions, with individual performance goals for each HEI. PAs are thus potentially a response to concerns regarding the loss of diversity in the HE system alluded to earlier, as long as they are concise, coupled to indicators and action-oriented. The pilot universities are asked to include in their performance contracts a "local development strategy". However, PAs need a clear focus and meaningful indicators to help counteract the prevailing consensus principle and more "middle of the road" HEIs.

MER also uses regular co-ordination and meetings with individual HEIs and the sector, as a way of discussing the situation of HEIs, the agenda for change and the options for the future. These mechanisms are described as trust-building (Elken et al., 2016).

The Research Council of Norway's Centres of Excellence Programme

The Research Council of Norway's (RCN) centres of excellence (CoEs, or in Norwegian, SFF, for Sentre for fremragende forskning) are strong, selective and useful interventions in a university sector relying on equality rather than on hard competition to support research excellence. This ambitious and large RCN programme has created many centres able to leave their mark on university priority setting even after their ten-year running time. In providing multi-year funding to large, neighbouring clusters of researchers, this bottom-up instrument fulfils a crucial need in the Norwegian HE and PRO landscape, as it constitutes one of the very few opportunities for Norwegian research communities to attain real critical mass in more basic research-driven areas.

The programme was first proposed in a government white paper in 1999, based on a pilot scheme, and started in the early 2000s. The main selection criteria are scientific quality and high international standards. In the first round, applicability/social relevance was also a criterion. In 2005, the programme was split into two strands, with the more innovation-oriented Centres for Research-Based Innovation (SFI) scheme (see Chapter 4) as a second, more downstream, scheme (OECD, 2014a).

Box 3.7. **What are centres of excellence?**

Centres of excellence are popular instruments used across OECD countries to create critical mass and excellence within and between individual HEIs and public research institutes. They are usually funded by a research council or a public agency on the basis of competitive programmes with ambitious selection mechanisms. These centres usually obtain a substantial share of their budget from the research council or agency for a multiannual but fixed-term period. The host organisations and sometimes other partners are required to contribute a part of the overall budget, often through physical investment or other in-kind contributions. In most countries, such centres of excellence are not a distinct legal entity but are embedded in the host organisation. However, they often have the autonomy to recruit staff and design their research portfolio (see OECD, 2014a).

RCN has launched a number of funding calls (rounds) to create CoEs with its SFF programme. Currently, 21 centres from rounds two (2007) and three (2012) are operational, and 13 centres from round one (2002) ended in 2012; a fourth selection round has recently been closed.[27] The specialisation pattern of the first 34 centres emerging from the three generations of CoEs reflects the scientific strength of Norway. Geosciences are one asset, given due to the specific Norwegian geographic situation and social sciences and humanities because of the strong research groups existing in Norway in this field. Life sciences also emerge as a strength, while the natural sciences fare less well than in other countries.

Table 3.6. **Annual total funding of Norwegian centres of excellence, by field**

Field	Number of centres of excellence (CoEs) (rounds 1-4)	Total annual funding, million NOK (rounds 1-3)
Geosciences	7	79.3
Engineering	6	64.7
Life sciences/health (broad)	16	169.5
Humanities and social sciences	9	77.9
Natural sciences	6	54.6

Source: OECD (2014a) based on Nordic Institute for Studies in Innovation (NIFU) calculations, all three centres of excellence generations, budget years 2009 and 2013.

CoEs are led and hosted in general by universities and, in some cases, by PRIs. While the research groups forming a CoE are mostly located close together, a few may be multicentre or virtual entities. The average amount of annual RCN funding per centre is considerable, at EUR 1.6 million. The centres further attract, often in substantial amounts, cash and in-kind contributions (for instance in the form of infrastructure), mainly from the host organisation. While CoEs in the social sciences or in the institute sector mostly rely on RCN funding, larger centres, for example in the life sciences, have more partner contributions and staff numbers in three digits. All centres allow for close interaction and critical mass in universities, which often have many smaller stand-alone research groups, given the fact that departments are often small (Öquist and Benner, 2014). A strong correlation has been observed between these centres and top research quality. RCN reports that 60% of the (comparatively few) Norwegian ERC grants are awarded to researchers affiliated with SFF centres.[28]

CoEs organisationally are part of faculties and departments. While this embeddedness is conducive to learning, it also puts pressure on staff, due to the larger size and ambition of the centres and their low level of interaction with other departments, as well as the fixed-term funding of the CoE. Such an organisational setting is quite common in excellence-oriented programmes internationally, but alternative options do exist in other countries (Bennetot Pruvot et al., 2015): for instance, the German *Exzellenzinitiative*, or similar activities in Hungary and Spain, address universities as a whole.

Most CoEs have a board, and all have an academic as well as an administrative leader (OECD, 2014a). While the young researchers work full-time in the centre, more experienced research staff members devote only part of their time to it. Staff is formally employed in the departments, creating some organisational challenges for the CoE and university administration. The centres can recruit in a flexible way and attract talent and top researchers from abroad.

It is not possible to apply for a second consecutive SFF grant, which raises a number of challenges for the integration of "sunset" CoEs into faculty structures. Successful cases contribute to more critical mass and clearer research profiles of faculties. The post-CoE trajectories also differ according to the share of non-SFF funding in the centre.

The SFF evaluation in 2010 (Langfeldt et al., 2010) showed that the scheme has been particularly successful in attracting talent, funding interdisciplinary research and strengthening Norway's efforts towards internationalisation its research. The standards of research have been raised through the programme.

RCN's FRIPRO schemes and the RCN shift towards high-risk funding

RCN is increasingly funding academic, mainly bottom-up research projects through different Norwegian Scheme for Independent Research Projects (FRIPRO) schemes. FRIPRO is the main Norwegian source for scientific bottom-up research. It is divided into three sub-categories, MEDBIO for biomedical research, NATEK for engineering and science and HUMSAM for the humanities and social sciences. HEIs obtain between 80% and 90% of FRIPRO funding (Langfeldt et al., 2012). Funding for independent projects and basic research programmes has grown from NOK 860 million in 2011 to NOK 1 billion in 2015 (MER, 2016). Typical FRIPRO grants are similar to the bottom-up grants for academic research offered by many science-funding research councils across the OECD, including project, mobility and young researcher calls. These Norwegian programmes are all highly competitive, and have even been in this context described even as "elitist" (Langfeldt et al., 2012). Success rates have been falling in the millennium, and currently, around 10% of the applications are funded. This number is alarming, in the light of estimates that only 20% of tenured HE staff is applying for grants at RCN at all (Öquist and Benner, 2014).

The 2012 FRIPRO evaluation concluded that this kind of funding is very important for Norway and has yielded positive results for research quality. It has less impact on structural issues like priority setting or group structures (Langfeldt et al., 2012). FRIPRO projects are "door openers" to other, larger funding opportunities allowing for substantial scientific progress, but they are less useful in supporting interdisciplinary and high-risk research (Langfeldt et al., 2012).

This evaluation contributed to the decision to increase FRIPRO allocations. Growing budgets for bottom-up academic projects can also help achieve Norway's overall LTP goal of developing excellent research communities and raising the relatively low rates of basic research in Norway. In comparison, Danish and Swedish scientists have more and generous funding sources at hand, while the overall budget of the Swiss National Science Foundation is six to seven times higher than RCNs' FRIPRO, plus basic research programme budgets. This is a strong discrepancy, even when SFF and other specific RCN budgets are accounted for. In this context, it is also important to note that academic researchers are successful in most of the RCN funding programmes, including applied research.

In 2015, the Norwegian government and RCN introduced a new scheme, FRIPRO Toppforsk. These much larger grants run for four to five years, offering NOK 15 million to 20 million per project for strong, dynamic scientists and research groups to become international leaders. Toppforsk is embedded in a joint initiative between RCN and the HE sector to raise and concentrate funds on world-class research. The available budget is substantial. In the first round, NOK 1 billion was allocated to 46 such projects. Currently, a second round is under way, providing another NOK 500 million. The HEIs have a say in the final decision as to which of their institutes' highly ranked proposals should be funded. This is an interesting approach that, over the years, could prove instrumental in strengthening HE leadership and building critical mass. It is also an explicit goal of Toppforsk to increase the number of successful Norwegian ERC applicants.[29]

RCN in its current strategy (RCN, 2015c) announced an increase in the open budget lines for research funding and to strengthen investment in long-term, risky and transformative scientific research projects. To achieve this, new support mechanisms and selection procedures are being developed and tested. Five elements in the new procedures are key: 1) an explicit focus on disruptive and cross-disciplinary approaches in the funding criteria; 2) more diversified selection panels; 3) less fine-grained rating scales; 4) a shift away from the consensus principle in decision making; and 5) larger budgets (Warta and Dudenbostel, 2016; RCN, 2016). In contrast to these efforts, the recent RCN Spending Review (MER and MOF, 2017) focuses more on increasing the share of long-term, scientific (and bottom-up) research funding within the RCN portfolio.

Developing excellent research communities in the Long-Term Plan

Achieving excellence is one of the three pillars of the Long-Term Plan (LTP). The plan announces that the government will prioritise special efforts in world-class science (MER, 2014a). Such world-class research is seen as a necessary precondition and seedbed for the future Norwegian knowledge economy.

The LTP clearly acknowledges the gap between Norway and top countries. The objective "is for some institutions to attain a level where they can compete with the best Nordic institutions, and more research groups should be able to assert themselves with the world elite" (MER, 2014a). The LTP also notes: "Norwegian researchers are quoted less frequently. … Quality [of research] varies between disciplines and between institutions. … There are too many academic environments that do not conduct research of acceptable quality. … More research groups should be able to assert themselves with the world elite" (ibid.).

Starting from this assessment, the LTP then stipulates "predictable increase in efforts" (MER, 2014a), mentioning a number of activities, like the RCN SFF programme. More important, three additional funding lines are being introduced, all intended to increase the scientific quality of Norwegian research. These include the STIM-EU co-funding scheme, 500 additional positions for young researchers and investments in infrastructure (MER, 2014a) and further promises of resources for two larger scale research buildings. Much of the resources for these additional initiatives will be funded by the RCN.

More generally, the LTP includes plans to further increase and develop high-quality measures and environments. One rationale for this, as set out in the Plan, is that a small country cannot do everything in science and research, but that a "defensive" attitude would also harm the Norwegian economy and society (MER, 2014a). The LTP emphasises the need to increase the number of top-level scientists and environments to raise their level of ambition and to "take the quality commitment a step further" (MER, 2014a). Regarding recruitment and governance, the LTP aims to support HEI governance development.

The Norwegian government emphasised that an important next step after the introduction of the LTP is to further refine quality-promoting instruments already in place and to design instruments "towards cultivating high aspirations". The funding of top-level research is to be prioritised.[30] In addition, the next LTP 2018 is also to include an investment plan for buildings and infrastructure, on the grounds that world-class infrastructure is a prerequisite for excellent research.

In line with the LTP, RCN is trying to improve its processes and review mechanisms in a number of programmes, to increase the probability that unconventional, risky, often cross-disciplinary breakthrough research will be funded. Such efforts may partially replace traditional peer review with other mechanisms (RCN, 2016; Warta and Dudenbostel, 2016). Meanwhile, RCN has been increasing its funding for bottom-up research projects, as noted earlier. On the other hand, the recent RCN spending review (MER and MOF, 2017) argues that the council should put more emphasis on excellence through more excellence-oriented funding criteria and by reorienting budgets to favour open, high-quality research funding.

In the aftermath of the LTP, a number of follow-up activities took place at the government level, including high-level meetings chaired by the prime minister on issues like research excellence.

Conclusions on the higher education sector

Increasing competition for top-class research, talent and places, globally and across Europe (OECD, 2014a), has resulted in a stratification[31] of organisations, people and output beyond national borders. Norway is no exception to this trend. Raising the quality of the research and HE sector has been a concern in Norway for a long time, competing with other goals and a number of regional, institutional and cultural factors, and has increasingly become a major concern for the Norwegian government. The country nonetheless has some specific features that have influenced the debate over research excellence.

First, Norway is an academic late mover by comparison with other small countries in Europe. Its public research sector was created from the bottom up, involving numerous regional actors. This created a call for standardisation (Kyvik and Stensaker, 2016; Gulbrandsen and Nerdrum, 2009), for critical mass, mergers and high quality, to reposition Norway on the scientific map. Despite these early standardisation and consolidation efforts, it has been widely documented that many academic environments in Norway are deemed “too small” (MER, 2014b) and “too fragmented” (RCN, 2011) to conduct internationally competitive research.

Second, Norway, like Denmark, Sweden and Switzerland, has no basic research institute sector. Such a sector helps countries like Germany or France improve their output and scientific visibility, although it is not a necessary precondition for scientific visibility and success, as indicated specifically by the performance of Denmark and Switzerland.

Third, Norway has strong scientific traditions and visible success stories in applied, engineering-based, research and innovation clusters like marine, maritime industries and oil and gas, with HEIs and research institutes deeply integrated in these networks. Its universities have a strong portfolio of applied research. Norway also has highly developed fields of scientific expertise, in political science or climate research. Norway was even a pioneer in utilising science for practical purposes, such as in the mapping of natural resources and experiments related to fisheries and aquaculture (Gulbrandsen and Nerdrum, 2009).

By contrast, Norway has a much lower relative share of basic research in its R&D portfolio than other small countries. In Switzerland, basic research accounts for around 0.90% of GDP, but Austria, Denmark and the Netherlands all have a share of around 0.55%. Norway comes in last, with 0.29% (OECD, 2016, p. 25).32 This is reflected in the performance of the public research system, as measured by various bibliometric indicators (Table 3.7).

This relative weakness is all the more of a concern, because research excellence is particularly called for in the current Norwegian context (see Box 3.8).

Table 3.7. **Summary diagnostic of the Norwegian higher education sector**

Main elements of diagnostic
Higher education inputs
– High share of HEIs in total research expenditures
– High HE research expenditures relative to the population, to the number of students and HEI personnel (well above the OECD average)
– High share of institutional funding in total HEI funding
– Low share of basic research
Higher education outputs
– HEIs in Norway account for nearly two-thirds of its total scientific production.
– Norwegian universities rank below those of Sweden, Denmark, Netherlands and the United Kingdom, in terms of some key bibliometric indicators, although performance has improved.
– Norwegian universities do not feature prominently among the world’s top universities in most university rankings (while those of the Netherlands, Switzerland and Denmark do).
– Norway had a comparatively low success rate in the European Research Council (ERC) calls over the period 2007-16 (as opposed to all comparator countries, including Netherlands, Switzerland and Israel).
– Strong specialisation of HEIs in fisheries and aquaculture, arctic and Antarctic, climate change, maritime, marine biology and the environment
– Several of Norway’s fields of specialisation record above-average bibliometric performance and are relevant to strong industrial/service innovation clusters.
Education
– Increasing attractiveness of Norwegian HEIs (number of foreign students at various tertiary education levels)
– High public expenditures by tertiary students, due to the absence of tuition fees and the relatively low student-to-teacher ratio
– Long duration of studies (including PhDs; average completion age was 35 years in 2015)
– High degree of dropouts (completion rates below OECD average), in relation to a dynamic job market and the low cost of studies
– Strong preferences of students for a limited number of disciplines, mainly the social sciences – student shortage in the STEM fields
– Low rate of unemployment of people with tertiary degrees

Significant progress was achieved after the government made efforts to set up a more competitive, quality- and output-oriented policy framework. The reform agendas of the various governments met strong resistance in the 1990s and 2000s, and therefore took a long time to take effect (Öquist and Benner, 2014)[33] The various governments, however, succeeded in introducing well-designed funding programmes, as external incentives to raise the level of quality of Norwegian research, and supported structural changes in the HEI sector and internal reforms within universities. These step-wise, negotiated initiatives resulted in larger and fewer HEIs, increased co-operation between them, introduced new university board structures, strengthened executive leadership and made improvements in career structures. Such changes have created opportunities, particularly for the strongest universities to pursue a strategy towards enhanced quality of research, with some government nudging to support the necessary processes of change. However, a reluctance to take up opportunities and the persistence of traditional attitudes and structures in the majority of the HEIs remains a hurdle. Sectorial compartments and the consensus principle also play a role here, as they do in Norway's governance mechanisms overall.

Box 3.8. **Reasons for Norway to concentrate efforts on excellent research**

Why should Norway, as a successful small country, make the effort to further raise the number and level of top scientific outputs? The innovation system is strong, and some clusters have intense and successful collaboration patterns between HEIs, public research institutes and companies. Efforts to increase outstanding research can be justified in the following way:

- The increasing complexity of the Norwegian "innovation missions" requires top talent and excellent research. This is case of the oil and gas sectors' quest for efficiency, the health sector's adoption of precision medicine and big data. Other relevant examples include fish farming and the challenge of fast growth in the light of increasing environmental concerns and climate change.
- The next wave of radical innovations cannot be predicted, but most of the inventions they will involve are likely to come from top institutions. The ability to be competitive at the "research frontier" is crucial for Norway. While it has been able to create wealth through a number of techno-economic clusters, all of these now face sophisticated transition imperatives. Moreover, not all of them might in the future contribute to the nations' wealth in the same way as in the last decades.
- Excellent research generates strong spillovers and leads to significant increasing returns. "Star scientists" and organisations attract top people, forming clusters of excellence. These clusters – with research organisations at their core – can better spin-off young companies, as well as encourage established firms, including multinational enterprises, to open R&D branches nearby. Excellent HEIs produce top graduates, with positive effects on research, society and the economy, and see their PhD students as a top resource. However, top researchers deserve attention, as they are increasingly mobile and follow the best offers for career positions, often preferring and obtaining tenure track appointments at a relatively young age.
- Finally, high standards are a matter of efficiency and effectiveness. Less well-performing HE organisations are costly. Outstanding organisations cost more but yield disproportionally higher outputs.

The current, LTP-driven developments are in line with long-standing efforts of the Norwegian government to step-wise increase the level of quality in the Norwegian HE sector and to help create excellent research and teaching environments. A white paper on teaching quality is being issued, and another white paper (MER, 2014b) promised structural reforms in the HE sector, although it mostly translated into another wave of mergers, while focusing less on the issue of top quality. The LTP itself provides for a number of initiatives to increase the number of excellent performers. The question remains whether these will suffice, as the government faces two sets of challenges:

- The universities do not make full use of the existing legal framework regarding leadership, allocation processes, recruiting and creation of critical mass. The level of autonomy in universities is considerable, but has so far led to only mixed progress to go against traditional fiefdoms, equal distribution and small-scale environments.
- The waves of mergers have reduced the level of stratification in the Norwegian HE system, with many UCs striving to become universities. International experience shows, however, that some stratification of the HE system is valuable, with applied, regionally anchored UCs (as in Switzerland, Germany and Austria) and a few top universities able to compete in a European, or even world-class league (as suggested by the Swiss, German, Danish and Dutch examples). Performance agreements could help to some degree, but only if they do not degrade into another overly consensus-driven mechanism.

Table 3.8. **Developing excellent academic communities in the Norwegian higher education sector: Achievements and challenges**

Achievements and progress	Remaining challenges
External structural changes	
– Progressive, negotiated consolidation of the higher education (HE) sector	– Higher education instutions (HEIs) considered to be too small and fragmented to achieve world-class research – (Potential) loss of diversity in HEIs' profiles, as a result of the mergers and actions by the government to remove structural differences
Internal structural changes	
– HEIs granted substantial autonomy – Changes in governance (appointment of the rector, board chair and members) could strengthen leadership in the near future – New initiatives in some universities to retain a central budget at board level, for internal strategic funding schemes and mechanisms to create critical mass	– Persistent strategic HEI management weaknesses, in particular, reluctance to take strategic action, *ex ante* financial incentives and *ex post* "reallocation" actions, excessive bureaucratisation – Universities do not take sufficient advantage of the favourable legal framework regarding leadership, allocation processes, recruiting and creation of critical mass.
Recruitment and career management	
– Recent and ongoing improvement of recruitment and career development structures (new tenure track system)	– Recruitment is still often described as "routine-based" and dominated by teaching issues. – In-house and non-strategically managed careers, mean that it takes many years to advance to full professor
Funding of higher education instutitions	
– Greater reliance on performance-based components in the allocation of the integrated teaching and research block funding – Pilot institutional performance agreements have been introduced to enhance excellence and maintain distinct institutional profiles. – Strong scientific achievements of the RCN's SFF Centres of Excellence Programme constitute one of the few opportunities to create critical mass in basic research – Positive results in basic research of RCN FRIPRO programme – FRIPRO Toppforsk, a new initiative to provide generous, multi-year funding to top research groups	– Difficulties to support HE drive for excellence through indicator based steering – Weak European Research Council record – Low participation of HE tenured staff in RCN programmes, at the same time FRIPRO and other instruments highly competitive

Notes

1. Gudmund Hernes, a sociology professor and former research minister who chaired one of the many strategy commissions to overcome fragmentation and complacency in the Norwegian HEI sector, denounced what he called a "tradition of mediocrity" (Öquist and Benner, 2014).
2. In addition, there are also ten private HEIs and a number of specialised post-secondary education institutions.
3. Act relating to universities and university colleges, 1 April 2005 and subsequent amendments, hereafter referred to as the "HE Act".
4. Contrary to universities, UCs also have to accredit their study programmes through the Norwegian accreditation agency NOKUT.
5. The "average relative size", i.e. the relative percentages of higher education research and development (HERD) to gross domestic expenditure on R&D (GERD), also results from two other particularities of the Norwegian situation that cancel each other out: The public research institute (PRI) sector is comparatively large, while business enterprise R&D (BERD) is lower than in comparator countries.
6. Again, there are many specific effects, including the very small institute sector in Denmark and Switzerland.
7. For instance, data measuring how many hours a week university researchers devote to research.
8. The relatively low ratio of budgetary allocation per student relates to the recent mergers of a number of UCs.
9. This statement is valid for all sciences taken together, as well as for the main scientific fields (biomedical and health sciences; life and earth sciences, mathematics and computer science, physical sciences and engineering, social sciences and humanities).
10. Similar results were obtained using a normalised impact factor across 23 subject areas (Citation Impact Total) in 2016, using the Web of Science dataset (as provided in the University Ranking by Academic Performance or URAP, Research Laboratory) (URAP dataset, www.urapcenter.org, accessed 12 April 2017).
11. The Times HE ranking is based on five pillars, each informed by various indicators (teaching, research: volume, income and reputation, citations, industry income, international outlook; staff, students and research). See: https://www.timeshighereducation.com.
12. The QS ranking shows a similar positioning for Norway; the ARWU/Shanghai ranking rates Norwegian HEIs slightly higher.
13. Compilation based on European Commission (2015, Tab. 7.02), https://era.gv.at/object/document/1883/attach/ERC_funding_activities_2007_2013_pd .pdf. Around 75% of the ERC grant holders in EU FP7 (2007-13) are located at universities, when the top-100 ERC host institutions are taken as a basis for analysis.
14. Although ERC calls are open to research institutes as well as universities, almost all ERC grants have been to universities in Norway's case. Of the 65 grants awarded as

of March 2017, only 4 were awarded by non-university organisations (all between 2014 and 2016).

15. The success rate for ERC grants is also strikingly low in H2020. While the European average is 12.7%, only 6.8% of the Norwegian applicants have been successful (FFG, 2017, https://eupm.ffg.at/ui/login; via sitemap, queries for ERC and Norway). Norway had 20 ERC grants in the period from 2014 to early 2017, as compared to 54 for Denmark, 38 for Finland, 69 for Austria and 134 for Switzerland.

16. Norway appears to be a comparatively attractive place for foreign researchers. In 2006, 21.8% of all American HE scientists were foreign-born, a much lower percentage than in Norway (Stephan, 2012). A 16-country review that does not include Norway (Franzoni et al., 2012) compares the share of foreign-born scientists in different countries. However, the numbers listed above for Norway put the country in a group with Australia, the United States and Sweden. Each of these countries are very attractive to foreign-born scientists and PhD students, with approximately 40% of scientists having lived abroad at age 18. Norway's share of foreign-born scientists is comparable. Switzerland and Canada have even higher percentages.

17. Similar data for lower educational levels (below upper secondary, upper secondary or post-secondary non-tertiary) also reflect Norway's lower unemployment rate in international comparative studies.

18. In an international comparison over the last 15 years, made before the last wave of mergers, Norway, like Sweden and Finland, has occupied a middle rank in Europe (Bennetot Pruvot et al., 2015).

19. Switzerland, the Netherlands and Germany exemplify a two-tier approach actively promoting HE excellence and a strong UC sector. Austria is better known for building its UC sector, while Denmark maintains a strong focus on a few excellent universities.

20. The decision to opt for an appointed rector can now be taken by a simple majority in the board. Before, a two-thirds majority was required, and the default option was the election of the rector.

21. Faculty members of exceptional talent tend to attract and accept the best candidates, while mediocre environments often hire people who pose no threat to the incumbents.

22. These figures should be reviewed with caution, since block funding can be allocated in different ways. Slovenia, for instance, has a specific form of allocating HE research funds in a competitive way, sometimes referred to as "*de facto* basic funding" (OECD, 2012).

23. Germany, in fact, has 16 subsystems. Norway qualifies for the middle group because of its output-oriented but still limited, formula-based funding system.

24. Before 2002, block funding was based on historical allocations; changes to the allocation of funds to selected HEIs or to all HEIs were made through individual political decisions.

25. More than 50% of the university buildings are owned by the universities themselves, and the rest is rented from the government's property corporation and from private landlords. According to the Background Report (MER, 2016) rent, operating cost, maintenance and infrastructure cost amounted to nearly 30% of total HEI revenues.

26. As regards the research component, small signals in the incentive structure are seen as appropriate by Norwegian policy makers. They assume that it is sufficient to steer the

(mainly) individual behaviour in research with small incentives, since individuals follow them and act accordingly. Teaching is seen as a more institutional and collective exercise and is therefore considered to need stronger incentives. Some other funding formulae (as in Austria in the late 2000s) also gave greater weight to teaching indicators. These systems, however, vary widely.

27. www.forskningsradet.no/en/Newsarticle/Ten_new_Norwegian_Centres_of_Excellence/1254025588940.

28. www.forskningsradet.no/en/Newsarticle/Three_of_five_Norwegian_ERC_grants_go_to_Centres_of_Excellence/1254021775768/p1177315753918?WT.ac=forside_nyhet.

29. www.forskningsradet.no/prognett-fripro/Nyheter/NOK_500_million_available_for_FRIPRO_Toppforsk_projects/1254025877274/p1226994096494.

30. www.regjeringen.no/en/topics/research/innsiktsartikler/langtidsplan-for-forsking-og-hogare-utdanning/verdensledende-miljoer/id2353318.

31. This stratification is primarily driven by different levels of current performance; however, past performance, financial resources, reputation and other factors play a strong role and contribute to individual trajectories.

32. Norway’s low ranking can be explained by its industrial structure and the large institute sector, but may also involve the more application-oriented research portfolio at Norwegian HEIs.

33. Scores of reform commissions and white papers were needed to step-wise introduce governance reforms.

References

Aagaard, K., H. Foss Hansen and J. Gulddahl Rasmussen (2016), “Mergers in Danish higher education: An overview over the changing landscape”, in Pinheiro R., L. Geschwind and T. Aarrevaara (eds.), *Mergers in Higher Education. The Experience from Northern Europe*, Higher Education Dynamics Vol. 46, Springer International Publishing, Cham, Switzerland.

Arbo, P. and T. Bull (2016), “Mergers in the North: The making of the Arctic University in Norway”, in Pinheiro R., L. Geschwind and T. Aarrevaara (eds.), *Mergers in Higher Education. The Experience from Northern Europe*, Higher Education Dynamics, Vol. 46, Springer International Publishing, Cham, Switzerland.

ARWU (2016), Academic Ranking of World Universities 2016, www.shanghairanking.com/ARWU-Statistics-2016.html#2.

Auranen, O. and M. Nieminen (2010), “University research funding and publication performance: An international comparison”, *Research Policy*, Vol. 39/6, pp. 822-834.

Bennetot Pruvot, E, A.-L. Claeys-Kulik and T. Estermann (2015), "Designing strategies for efficient funding of universities in Europe", European University Association, Brussels.

CWTS (2017), CWTS Leiden University ranking, www.leidenranking.com/downloads (accessed 4 April 2017).

De Boer, H. et al. (2015), "Performance-based funding and Performance Agreements in fourteen higher education systems", report to the Ministry of Education, Culture and Science, CHEPS, Enschede, Netherlands.

Edler, J., D. Frischer, M. Glanz and M. Stampfer (2014), "Funding individuals – changing organizations: The impact of the ERC on Universities" in R. Whitley and J. Gläser (eds.), *Organizational Transformation and Scientific Change: The Impact of Institutional Restructuring on Universities and Intellectual Innovation*, Research in the Sociology of Organizations, Vol. 42, Emerald, pp. 77-110.

Edmondson, G. (2015), "Creating a virtuous circle in technology transfer: The case of KU Leuven", Science Business Publishing, www.sciencebusiness.net.

Elken, M., N. Frolich and I. Reymert (2016), "Steering approaches in higher education. Comparing Norway, Sweden, Finland, the Netherlands and UK (England)", NIFU, Report 2016:35, Nordic Institute for Studies in Innovation, Oslo.

ERC (2016), *European Research Council Statistics* (database), https://erc.europa.eu/projects-figures/statistics (accessed 4 April 2017).

Estermann, T. and T. Nokkala (2009), "University autonomy in Europe I", exploratory study, European University Association, Brussels.

Estermann, T., T. Nokkala and M. Steinel (2011), *University Autonomy in Europe II. The Scorecard*, European University Association, Brussels.

EUA (2015), *Public Funding Observatory 2015*, European University Association, Brussels, www.eua.be/Libraries/governance-autonomy-funding/november-2015.pdf?sfvrsn=0.

Franzoni, C., G. Scellato and P. Stephan (2012), "Foreign-Born Scientists: Mobility Patterns for Sixteen Countries", *NBER Working Papers*, No. 18067, www.nber.org/papers/w18067.pdf.

Gjengedal, K. (2014), "More international researchers, but unevenly distributed", Committee for Gender Balance and Diversity in Research (KIF), Oslo, http://kifinfo.no/en/2016/05/more-international-researchers-unevenly-distributed.

Gulbrandsen M. and L. Nerdrum (2009), "Public sector research and industrial innovation in Norway: A historical perspective", in J. Fagerberg, D.C. Mowery and B. Verspagen (eds.), *Innovation, Path Dependency and Policy: The Norwegian Case*, Oxford University Press, pp. 61-88.

Hicks, D. (2012), "Performance-based university research funding systems", *Research Policy,* Vol. 41/2, pp. 251-261.

Hovdhaugen, E. (2012), "Leaving early: Individual, institutional and system perspectives on why Norwegian students leave their higher education institution before degree completion", PhD dissertation, Sociology, Faculty of Social Science, University of Oslo.

Jongbloed, B. (2009), "Higher education funding systems: An overview covering five European jurisdictions and the Canadian Province Ontario", report prepared for the Hong Kong University Grants Committee, Enschede, Netherlands.

Kyvik, S. and B. Stensaker (2016), "Mergers in Norwegian Higher Education," in R. Pinheiro, L. Geschwind and T. Aarrevaara (eds.), *Mergers in Higher Education. The Experience from Northern Europe*, Springer International Publishing, Cham, Switzerland.

Langfeldt, L., S. Borlaug and M. Gulbrandsen (2010), "The Norwegian Centres of Excellence Scheme. Evaluation of added value and financial aspects", Nordic Institute for Studies in Innovation, NIFU STEP Report 29/2010, Oslo.

Langfeldt, L. et al. (2012), "Evaluation of the Norwegian scheme for independent research projects", FRIPRO, Oslo.

Martin, B. (2011), "The research excellence framework and the impact agenda: Are we creating a Frankenstein monster?", *Research Evaluation*, Vol. 20/3, pp. 247-254.

Mathisen, E. and R. Pinheiro (2016), "The anatomy of a merger process in the Greater Oslo Region", in Pinheiro R., L. Geschwind and T. Aarrevaara (eds.), *Mergers in Higher Education. The Experience from Northern Europe*, *Higher Education Dynamics*, Vol. 46, Springer International Publishing, Cham, Switzerland.

MER (2016), "Background report: OECD Innovation Policy Review of Norway", Ministry for Education and Research, Oslo, unpublished.

MER (2014a), "Long-Term Plan for research and higher education 2015-2024", Meld. St. 7 [2014-2015] Report to the Storting (white paper), Ministry for Education and Research, Oslo.

MER (2014b), "Concentration for Quality. Structural reform in the higher education sector", Meld. St. 18 [2014-2015] Report to the Storting (white paper), Ministry for Education and Research, Oslo.

MER (2014c), "International and Sector Mobility in Norway. A register-Data Approach", Working Paper 11/2014, Ministry for Education and Research, Oslo.

MER (2014d), *Research Barometer 2014* (*Forskningsbarometeret* 2014), Ministry for Education and Research, Oslo.

MER (2007), "Regulations concerning admission to higher education", Ministry for Education and Research, Oslo.

MER and MOF (2017), *Områdegjennomgang av Norges forskningsråd: Rapport fra ekspertgruppen* [*Review of the Research Council of Norway: Report from the Expert Group*], Ministry of Education and Research and Ministry of Finance, submitted by an expert group to the ministries, 7 February 2017.

OECD (2017), "Unemployment rates by education level (indicator)", http://dx.doi.org/10.1787/6183d527-en (accessed 12 April 2017).

OECD (2016a), *Main Science and Technology Indicators, Volume 2016 Issue 1*, OECD Publishing, Paris, http://dx.doi.org/10.1787/msti-v2016-1-en.

OECD (2016b), *OECD Reviews of Innovation Policy: Sweden 2016*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264250000-en.

OECD (2016c), *OECD Economic Survey: Norway 2016*, OECD Publishing, Paris, http://dx.doi.org/10.1787/eco_surveys-nor-2016-en.

OECD (2016d), *OECD Reviews of Innovation Policy: Luxembourg 2016*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264232297-en.

OECD (2016e), "Government budget appropriations or outlays for R&D" (database), https://stats.oecd.org/Index.aspx?DataSetCode=GBAORD_NABS2007.

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

OECD (2015), *OECD Science, Technology and Industry Scoreboard 2015: Innovation for Growth and Society*, http://dx.doi.org/10.1787/sti_scoreboard-2015-en.

OECD (2014a), *Promoting Research Excellence: New Approaches to Funding*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264207462-en.

OECD (2014b), *OECD Reviews of Innovation Policy: Netherlands 2014*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264213159-en.

OECD (2014c), *OECD Skills Strategy Diagnostic Report: Norway*, OECD Publishing, Paris www.oecd.org/skills/nationalskillsstrategies/Diagnostic-report-Norway.pdf.

OECD (2013), *Education at a Glance 2013: OECD Indicators*, OECD Publishing, Paris, http://dx.doi.org/10.1787/eag-2013-en.

OECD (2012), *OECD Reviews of Innovation Policy: Slovenia 2012*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264167407-en.

OECD (2010), *Performance-Based Funding for Public Research in Tertiary Education Institutions: Workshop Proceedings*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264094611-en.

OECD (2008), *OECD Reviews of Innovation Policy: Norway 2008*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264043749-en.

OECD and SCImago Research Group (CSIC) (2016), *Compendium of Bibliometric Science Indicators*, accessed at http://oe.cd/scientometrics.

NOU (2016), "At a turning point: From a resource-based economy to a knowledge economy", Official Norwegian Report of the Productivity Commission, 2016, Oslo, http://produktivitetskommisjonen.no/files/2013/11/summary_NOU2016_3.pdf.

Öquist, G. and M. Benner (2014), "Room for increased ambitions? Governing breakthrough research in Norway 1990-2013", report to the Research Council of Norway, Oslo.

Nedeva, M. and L. Wedlin (2015), "From 'science in Europe' to 'European science'", in M. Nedeva and L. Wedlin (eds.), *Towards European Science. Dynamics and Policy of an Evolving European Research Space*, Edward Elgar Publishing, Cheltenham, England.

Paradeise, C., E. Reale and G. Goastellec (2009), "A comparative approach to higher education reforms in Western European Countries", in C. Paradeise et al. (eds.), "University Governance: Western European Comparative Perspectives", pp. 197-226, Springer, International Publishing, Cham, Switzerland.

Pinheiro R., L. Geschwind and T. Aarrevaara (2016), "A world full of mergers: The Nordic countries in a global context", in Pinheiro R., L. Geschwind and T. Aarrevaara (eds.), *Mergers in Higher Education. The Experience from Northern Europe*, Higher Education Dynamics, Vol. 46, Springer International Publishing, Cham, Switzerland.

RCN, (2016), "Support for transformative research in the Research Council of Norway", PowerPoint presentation, Vienna, Christine Oxley, April 2016.

RCN (2015a), "Basic and long-term research within engineering science in Norway", report from the principal evaluation committee, Research Council of Norway, Oslo.

RCN (2015b), "Report on science and technology indicators for Norway", Research Council of Norway, Oslo.

RCN (2015c), *Research for Innovation and Sustainability*, Strategy for the Research Council of Norway 2015-2020, Oslo.

RCN (2011), "Evaluation of biology, medicine and health research in Norway", Research Council of Norway, Oslo.

Sarpebakken, B. (2016), "Doctoral degree statistics – Norway", Nordic Institute for Studies in Innovation (NIFU), Oslo, www.nifu.no/en/statistikk/doktorgrader.

Sivesind, K.-H. and D. Arnesen (2015), EUFORI Study: *European Foundations for Research and Innovation, Norway Country Report*, European Commission, Brussels.

Solberg, E. (2016), *RIO Country Report 2015: Norway*, Research and Innovation Observatory, Science for Policy Report, Joint Research Center, European Commission, https://rio.jrc.ec.europa.eu/en/library/rio-country-report-norway-2015.

Statistics Norway (2016), Education: Tertiary Education, Oslo https://www.ssb.no/en/utdanning?de=Tertiary+education.

Stephan, P. (2012), *How Economics Shapes Science*, Harvard University Press, Cambridge, Massachusetts.

THE (2016), Times Higher Education World University Ranking 2016-17, https://www.timeshighereducation.com/world-university-rankings.

Warta, K. and T. Dudenbostel (2016), *Radikale Innovationen – Mehr Freiraum für innovative und risikobehaftete Forschung*, Technopolis Vienna.

Whitley, R. and J. Gläser (2014), "The impact of institutional reforms on the nature of universities as organisations", in R. Whitley and J. Gläser (eds.), *Organizational Transformation and Scientific Change: The Impact of Institutional Restructuring on Universities and Intellectual Innovation*, Research in the Sociology of Organizations, No. 42, Emerald Group Publishing, Bradford, England, pp. 19-50.