



2013

Science and Technology Indicators

R&D statistics

NIFU

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Introduction

This booklet, containing tables and figures on R&D statistics and science and technology indicators, has been published annually since 1997. The web-edition can be found at www.nifu.no/en/statistics/. A broader coverage of S&T input and output data is also published annually in the Report on Science and Technology Indicators for Norway by The Research Council of Norway. The 2013-edition will be published in September, and by the end of 2013, an abridged english version. The internet version of the report is regularly updated. You may also find information at www.foustatistikkbanken.no. All expenditures are given in current prices, unless otherwise indicated. In 2011 1.00 PPP US\$ = 9.09 NOK (Main Science and Technology Indicators 2012-2, OECD). By April 2013 1 Euro = 7.6 NOK.

Who prepares the R&D statistics?

NIFU and Statistics Norway carry out the statistical surveys on resources devoted to R&D in Norway. NIFU is responsible for collecting, processing and disseminating statistics and indicators regarding the Institute sector (see classification on page four) and the higher education sector, while Statistics Norway is responsible for the Industrial sector. NIFU is also responsible for compiling the information into national totals for Norway. In the Industrial and Institute sectors, and the health trusts, annual statistical surveys are carried out. In the Higher education sector the survey is carried out every second year. For all sectors main figures are presented annually. Further information may be found at: www.nifu.no/en/statistics/.

How are R&D statistics compiled?

Norwegian R&D statistics are compiled in accordance with the international guidelines proposed by the OECD in the "Frascati Manual" (The Measurement of Scientific and Technological activities: Proposed Standard Practice for Surveys on Research and Experimental Development "Frascati Manual 2002", OECD 2002). R&D statistics for Norway are based on administrative registers and questionnaires sent to the R&D performing units in each sector.

The survey on R&D activity in ***the industrial sector*** covers all companies with 50 or more employees. In addition, the survey includes a sample of companies with a minimum of 10 employees. Prior to 1995, the survey only included companies with 50 or more employees. Statistics on the Industrial sector from 1995 onwards are therefore not comparable with previous years.

In ***the higher education sector*** each individual department or corresponding equivalent unit is surveyed. Supplementary sources of information include surveys on staff time distribution, information on personnel and expenditure from the institutions' central administration, information from the Research Council of Norway, and from medical foundations.

The institute sector is also fully covered by exhaustive surveys. Questionnaires are sent to research institutes and other institutions that are expected to perform R&D activities. R&D performed at museums is estimated.

Statistics on R&D resources in ***health trusts*** (university hospitals and other hospitals), are collected through a separate, national reporting system. Since the 2007 edition, the reporting system for health trusts has been integrated with that for national R&D statistics. In international R&D statistics, university hospitals are included in the higher education sector, while non-university hospitals are included in the government sector/Institute sector.

Basic definitions of Research and experimental development (R&D)

Research and experimental development (R&D) comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications.

Three types of R&D may be distinguished:

- **Basic research** is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any particular application or use in view.
- **Applied research** is also original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective.
- **Experimental development** is systematic work, drawing on existing knowledge gained from research and/or practical experience, which is directed to producing new materials, products or devices, to installing new processes, systems and services, or to improving substantially those already produced or installed.

Sector classification

Norwegian R&D statistics are generally presented divided into three sectors: industrial sector, institute sector and higher education sector. The higher education sector, university hospitals included, corresponds to the OECD higher education sector. For international comparisons business enterprise sector includes the industrial sector as well as non-profit research institutes serving enterprises. In national statistics, these business-oriented research institutes are included in the Institute sector, which also covers the Government sector and private non-profit sector (PNP). The PNP sector is relatively small in Norway, and is therefore merged into the Government sector in international statistics presentations.

In this publication, health trusts are sometimes presented as a specific unit.

Other data sources

Statistics on R&D personnel in the Higher education and Institute sectors are based on NIFU's Register of Research personnel. The register is updated annually. International R&D statistics are extracted from the OECD's Main Science and Technology Indicators and the OECD online database. Information about doctoral students and awarded doctoral degrees in the Nordic and Baltic countries is from NORBAL, a database operated by NIFU. The doctoral degree statistics are based on NIFU's Norwegian Doctoral degree register, which is updated biannually. Bibliometric data are extracted from the database National Science Indicators prepared by the Thomson Scientific in the U.S. This database contains world-wide publication and citation statistics. Patent data are from the Norwegian Industrial Property Office.

Highlights

- Total R&D expenditure in Norway amounted to 45.4 billion NOK in 2011. This is an approximately zero growth from 2009.
- R&D expenditure in 2011 amounted to 1.65 % of GDP, down from 1.76 % in 2009. In the OECD area the average R&D share of GDP was 2.4 %, corresponding to 2.0 % for the EU-25.
- Norway spent 9 193 NOK on R&D per capita in 2011. Denmark and Sweden spent 11 517 and 12 730 NOK, respectively.
- The Norwegian health trusts had R&D expenditure of 2.8 billion NOK in 2011 and accounted for slightly over 6 % of the total R&D expenditure this year.
- Almost 65 000 people participated in R&D in Norway in 2011. 45 800 were researchers/academic staff. 36 % were women, and the share of women was highest at health trusts and at universities/university colleges, with approx. 45 % women. 32 % of the total research staff were doctorates, in the institute sector this share was 46 %.
- 1 461 doctorates were awarded in Norway in 2012. This is an increase of 10 % from 2011 and is the highest number of doctoral degrees awarded ever. The share of women was 49 % in 2011.
- Norwegian scientists published slightly more than 10 300 articles in international journals in 2011. This represented an increase of 42 per cent compared to 2006. The corresponding increase for Denmark was 40 per cent, and for Finland and Sweden, 17 and 18 per cent respectively.
- The Norwegian articles have been cited about 25 per cent over world average, and the citation index shows an upward trend over the last ten years.
- The volume of patent applications received by the Norwegian Patent Office has fallen dramatically since Norway joined the EPC in 2008. This has first and foremost affected inflows of foreign applications, most dramatically in the pharmaceutical and related areas. The number of domestic applications surpassed those from abroad for the first time in 2010. However, other Nordic countries have had a higher increase in the citation index.
- The number of domestic applications is in line with its historical trend, although Norwegian firms have also reduced their domestic patenting since 2008.

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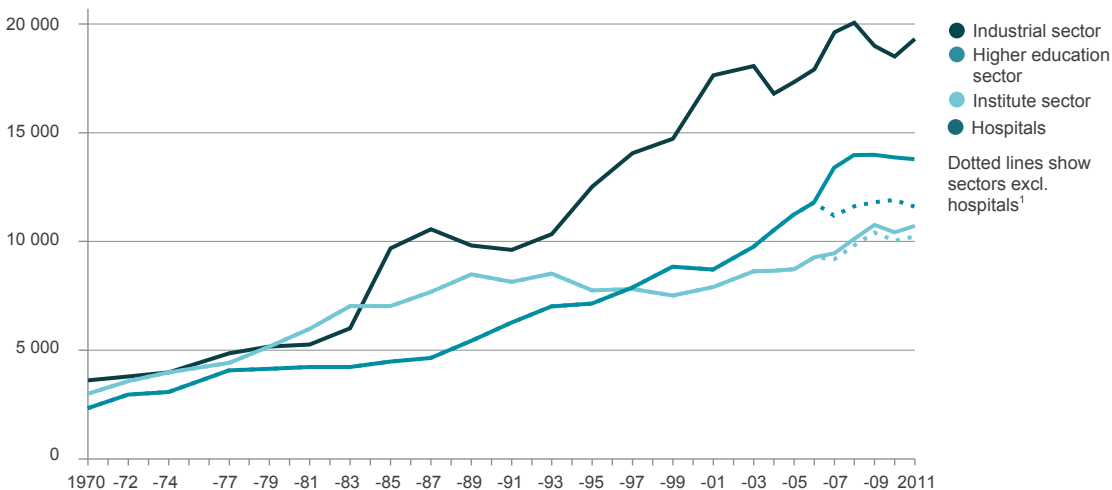
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1 R&D expenditure in Norway by sector of performance: 1970–2011. Fixed 2010-prices.

Mill. NOK



¹ Hospitals in the higher education sector (university hospitals) and institute sector (other health trusts and private, non-profit hospitals).
Source: NIFU/Statistics Norway, R&D statistics

2 R&D expenditure in Norway by type of institution and source of funds. 2011. Million NOK.

Type of institution	Total	Industry		Government		Other ¹	Abroad	
		Total	Of Which: oil-com- panies	Total	Of Which: Research council of Norway		Total	Of Which: EU- comm.
Industrial sector	20 065.9	16 635.1	..	772.2	335.5	532.1	2 126.5	80.4
Institute sector²	10 609.7	2 144.7	478.2	6 944.6	2 812.0	432.0	1 088.4	365.3
Of which: Research inst. serving enterprises	3 643.6	1 448.5	339.1	1 536.9	1 070.7	189.5	468.7	184.1
Government sector	6 966.1	696.2	139.1	5 407.7	1 741.3	242.5	619.7	181.2
Universities and colleges	11 988.8	533.3	86.1	10 690.7	2 354.6	463.5	301.5	209.2
Of which: Universities and spec. univ. inst.	10 807.9	500.2	86.0	9 670.2	2 246.9	445.9	285.6	194.9
State university colleges	1 180.9	33.1	0.1	1 114.5	107.6	17.5	15.9	14.3
Health trusts	2 776.0	53.6	-	2 539.8	173.2	160.9	21.7	16.7
Of Which: University hospitals	2 270.6	38.9	-	2 076.2	162.9	134.1	21.4	16.7
Health trusts and private, non-profit hospitals	505.4	14.7	-	463.6	10.3	26.8	0.3	0.0
Total	45 440.4	19 366.7	..	20 947.2	5 675.2	1 588.4	3 538.1	671.6

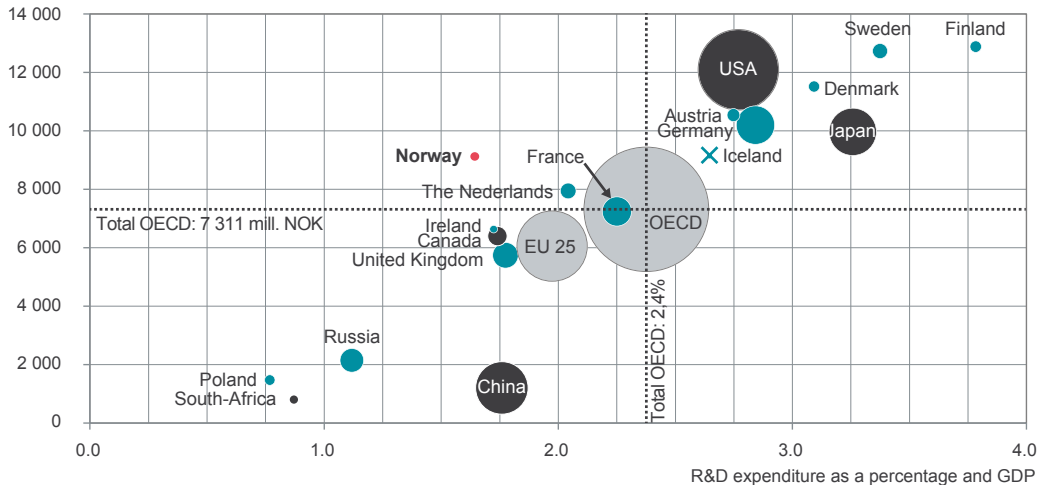
¹ Includes private funding, own funds and tax deduction fund "SkatteFunn" in Industrial sector.
Excluding hospitals.

Source: NIFU/Statistics Norway, R&D statistics

3

R&D expenditure per capita (NOK) and as a percentage of the Gross Domestic Product (GDP) in selected OECD countries: 2011 1. Size of circles reflects total R&D expenditure.

R&D expenditure per capita (mill. NOK)



¹ Where 2011 data is not available, data from 2008 (Iceland) 2009 (South Africa) or 2010 (Japan, China and OECD) is used.

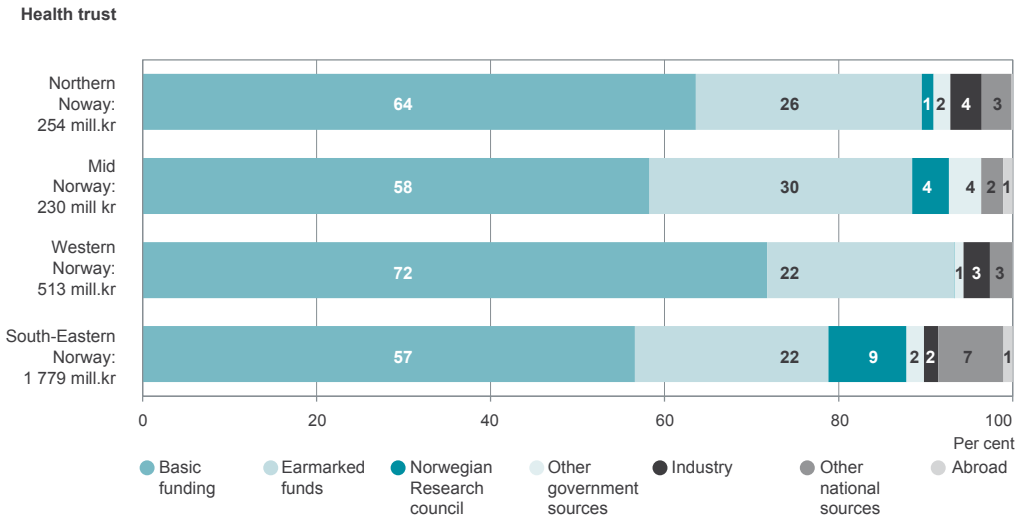
Source: OECD - Main Science and Technology Indicators 2012-2

4 R&D expenditure as a percentage of the Gross Domestic Product (GDP) by source of funds and sector of performance in 2010.

Country	Total	R&D expenditure as a percentage of GDP						R&D expenditure per capita NOK
		Sector of performance			Source of funds			
		Industrial sector ²	Higher ed. sector	Government sector	Government	Industry	Other	
Austria	2.7	1.9	0.7	0.2	1.0	1.3	0.5	10 543
Canada	1.8	0.9	0.7	0.2	0.7	0.8	0.3	6 542
China	1.8	1.3	0.1	0.3	0.4	1.3	0.1	1 204
Denmark	3.1	2.1	0.9	0.1	0.9	1.9	0.4	11 517
Finland	3.8	2.7	0.8	0.4	0.9	2.5	0.3	12 889
France	2.2	1.4	0.5	0.3	0.8	1.2	0.2	6 977
Germany	2.8	1.9	0.5	0.4	0.8	1.8	0.1	9 559
Iceland	2.6	1.4	0.7	0.5	1.0	1.3	0.3	8 754
Ireland	1.7	1.2	0.5	0.1	0.5	0.8	0.4	6 637
Japan	3.3	2.5	0.4	0.4	0.6	2.5	0.2	9 970
Norway	1.7	0.9	0.5	0.3	0.8	0.7	0.2	9 193
Russia	1.1	0.7	0.1	0.3	0.8	0.3	0.1	2 145
Sweden	3.4	2.3	0.9	0.2	0.9	2.0	0.5	12 730
United Kingdom	1.8	1.1	0.5	0.2	0.6	0.8	0.4	5 745
USA	2.8	1.9	0.4	0.5	0.9	1.7	0.2	12 101
Total OECD	2.4	1.6	0.4	0.3	0.7	1.4	0.2	7 311
EU – 25	2.0	1.2	0.5	0.3	0.7	1.0	0.2	5 803

¹Where 2009 data is not available, data from 2008 (Iceland) and 2010 (Canada, France, Japan, China, Germany, OECD, EU 25) is used.
Source: OECD - Main Science and Technology Indicators 2012-2

5 Total R&D expenditure in health trusts in 2011 by region and source of funds.¹
Mill. NOK and per cent.



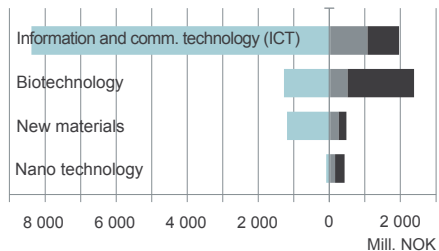
¹ R&D expenditure in the health trusts is presented by cash principle, according to international guidelines for R&D statistics.
Source: NIFU, R&D statistics

6 Current R&D expenditure in Norway by sector of performance, technology areas and thematic priorities in 2011. Mill. NOK.

Technology area

Industrial sector

Inst. sector/HES

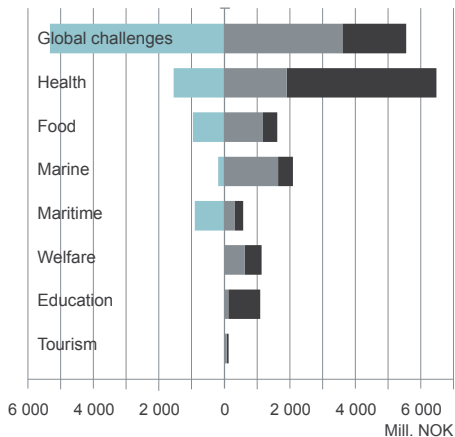


- Industrial sector
- Institute sector
- Higher education sector

Thematic priority

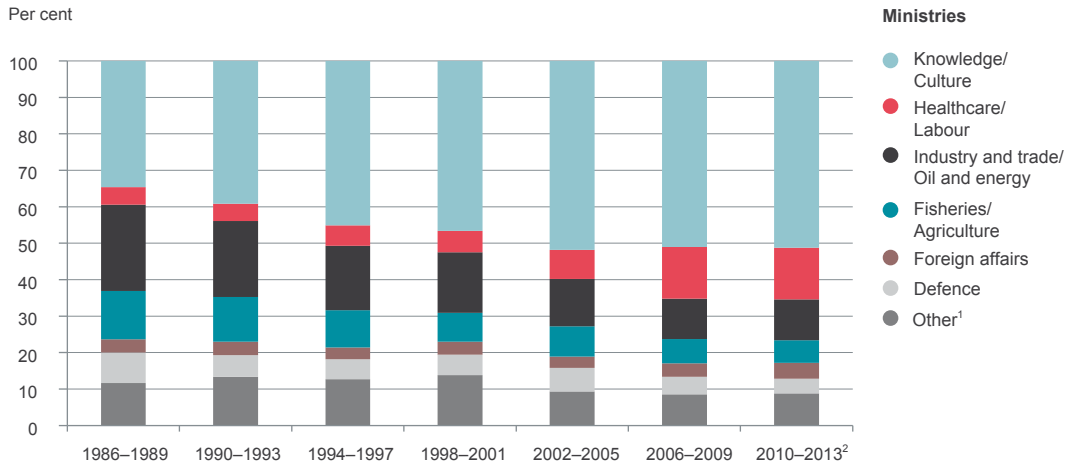
Industrial sector

Inst. sector/HES



Source: NIFU, R&D statistics

7 Government budget appropriations or outlays for R&D (GBAORD) in Norway by ministry and budget term. 1986–2013. Mill. NOK.



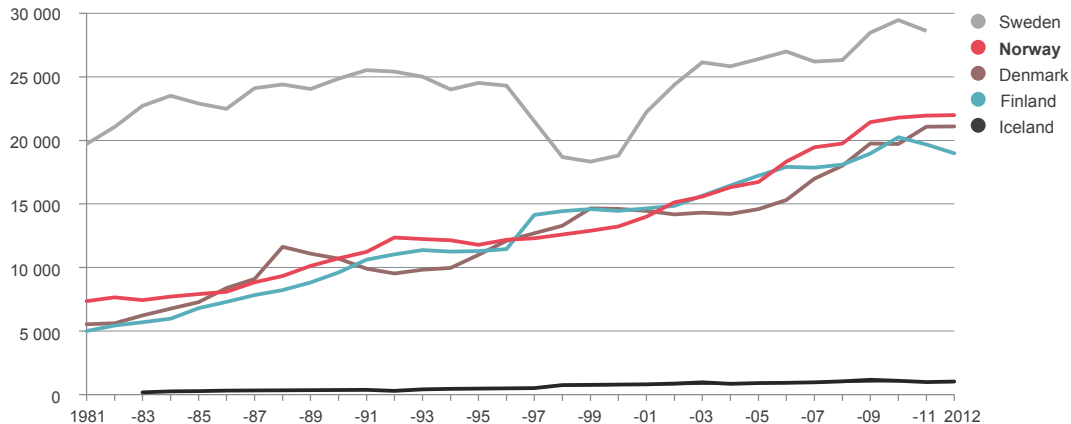
¹ Ministries of: Environment; Local government and regional development; Administration and reforms; Children, equality and social inclusion; State banks; Transport and comm; Finance; Justice.

² Preliminary result.

Source: NIFU

8 Government budget appropriations or outlays for R&D (GBAORD) in the Nordic countries. Mill. NOK in fixed prices. 2012.

Mill. NOK, fixed 2010-prices



Source: OECD - Main Science and Technology Indicators 2012-2

9 R&D personnel by type of institution in Norway. 2011.
Head count and full time equivalents.

Type of institution	Head count by 01.10.2011			Full time equivalents	
	Total R&D personnel	Of which:		Total	Of which:
		Researchers/ univ. graduates	Tech. & supp. staff		Researchers/ univ. graduates
Industrial sector	23 317	15 332	7 985	15 545	10 925
Institute sector¹	11 004	7 733	3 271	8 609	6 252
Of which: Research instit. serving enterprises	3 020	2 229	791	2 053	1 651
Government sector	7 984	5 504	2 480	6 556	4 601
Universities and univ. colleges	25 288	18 901	6 387	10 199	8 512
Of which: Universities	17 053	12 085	4 968	8 365	6 860
Spec. university institutions	2 156	1 775	381	787	701
State university colleges	6 079	5 041	1 038	1 047	952
Health trusts	5 108	3 612	1 496	2 597	1 539
Of which: University hospitals	4 006	2 911	1 095	2 084	1 248
Health trusts and private, non-profit hospitals	1 102	701	401	514	291
Total	64 717	45 578	19 139	36 950	27 228

¹ Excluding hospitals

Source: NIFU/Statistics Norway, R&D statistics

10 Researchers/university graduates (head count) in Norway by type of institution: 2011. Doctorates and women.

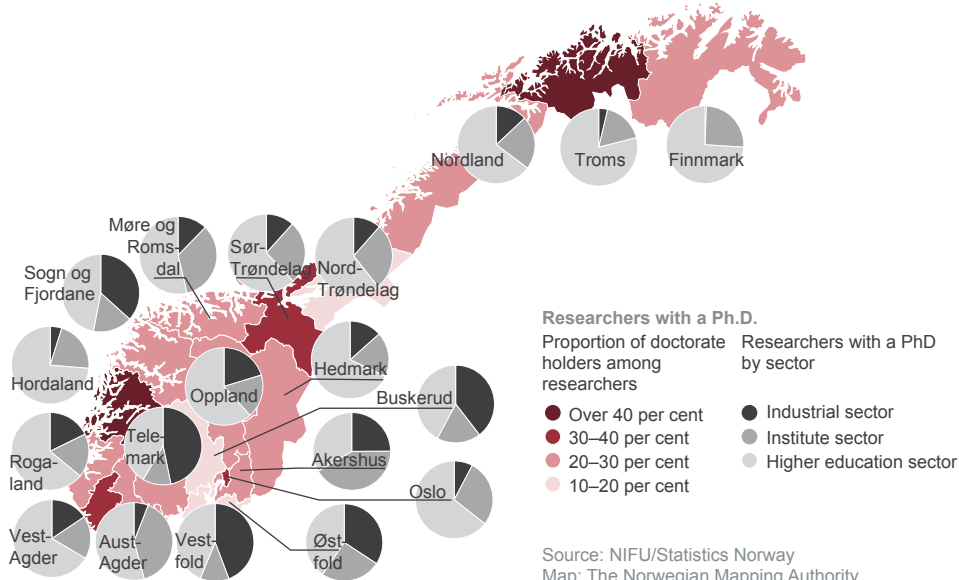
Type of institution	Totalt			Doctorate holders ¹			
	Total Number	Women Number	%	Total Number	%	Women Number	%
Industrial sector	15 332	3 304	22	1 710	11	377	11
Institute sector²	7 733	3 091	40	3 526	46	1 269	41
Of which: Research inst. serving enterprises	2 229	688	31	1 056	47	306	44
Government sector	5 504	2 403	44	2 470	45	963	40
Universities and univ. colleges	18 901	8 478	45	7 742	41	2 754	32
Of which: Universities	12 085	5 079	42	5 818	48	2 037	40
Spec. university institutions etc.	1 775	731	41	688	39	223	31
State university colleges	5 041	2 668	53	1 236	25	494	19
Health trusts	3 612	1 631	45	1 611	45	624	38
Of which: University hospitals	2 911	1 305	45	1 384	48	538	41
Health trusts and private, non-profit hospitals	701	326	47	227	32	86	26
Total	45 578	16 504	36	14 589	32	5 024	30

¹Also includes licenciates.

²Excluding hospitals.

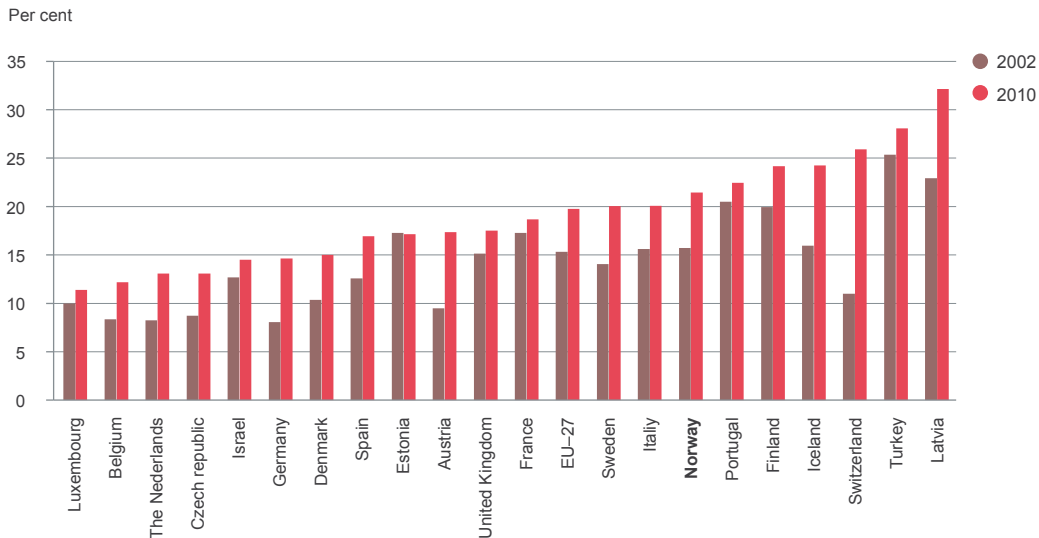
Source: NIFU/Statistics Norway

11 Researchers with a Ph.D in Norway by county in 2011. Proportion of researchers with a PhD (map) and distribution by sector of employment (circles).



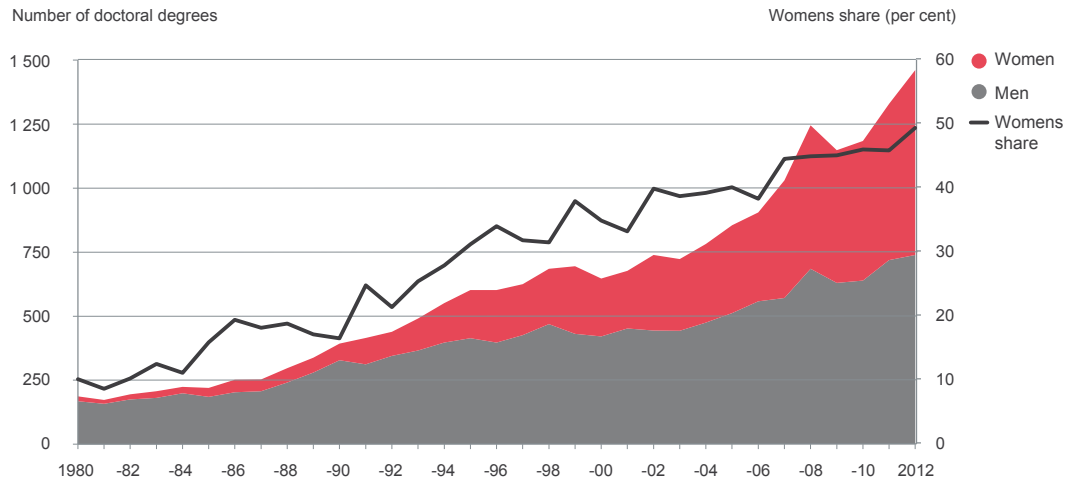
Source: NIFU/Statistics Norway
 Map: The Norwegian Mapping Authority

12 Proportion of women with grade A (professor) for selected countries. 2001 and 2011. Per cent.



Source: Women in Science database/She Figures 2012

13 Awarded doctoral degrees in Norway by sex. 1980–2012.

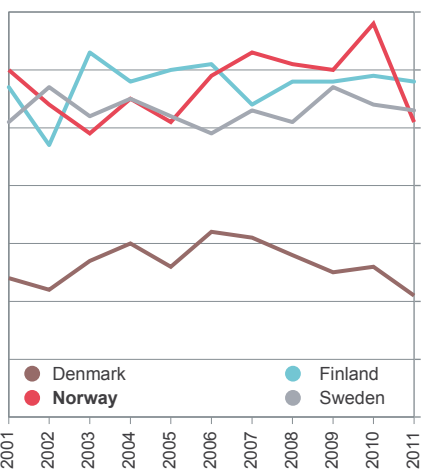


Source: NIFU/The Doctoral Degree Register

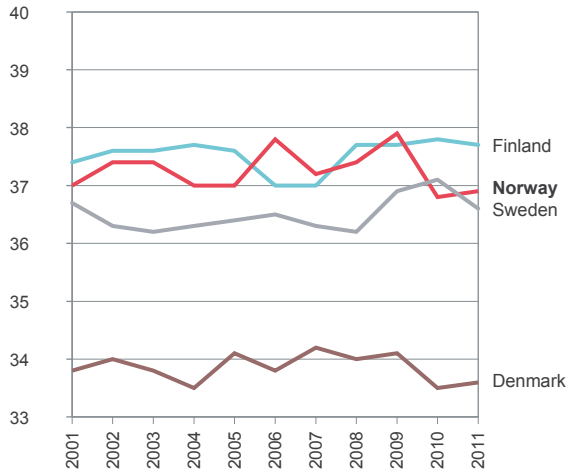
14 Average age at disputation by sex in four Nordic countries.
2001–2011.

Women

Average age of disputation



Men

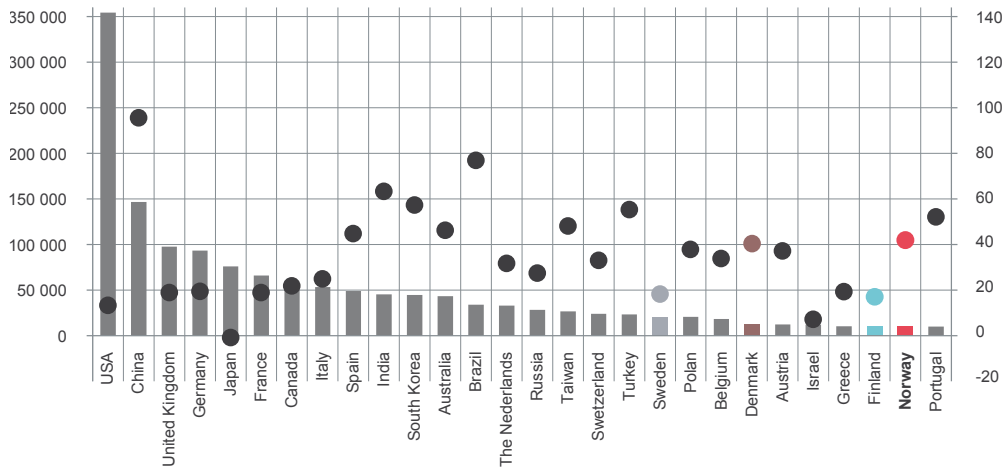


Source: NORBAL

15 Scientific articles for selected countries in 2011 and relative change. 2006–2011.

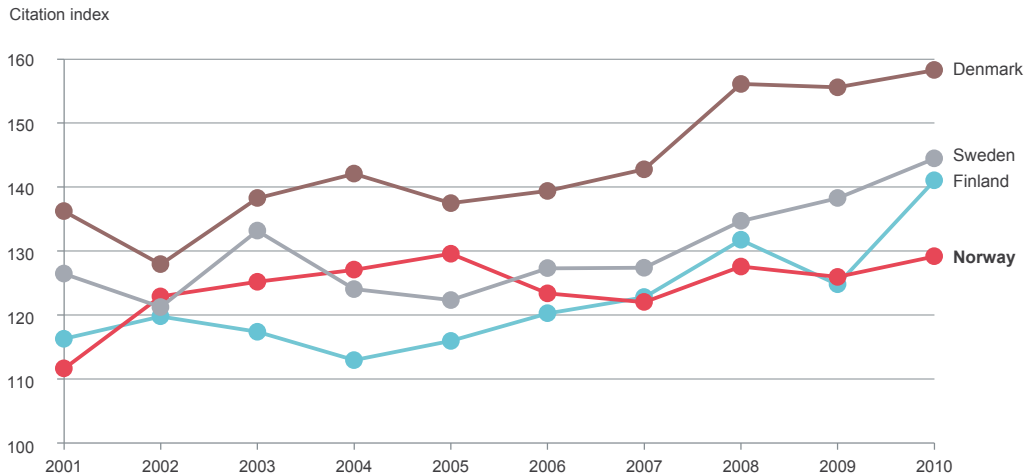
Number of articles (columns)

● Relative change in number of articles 2006–2011



Source: National Science Indicators/Thomson Reuters/NIFU

16 Citation index¹ for publications in four Nordic countries. 2001–2010

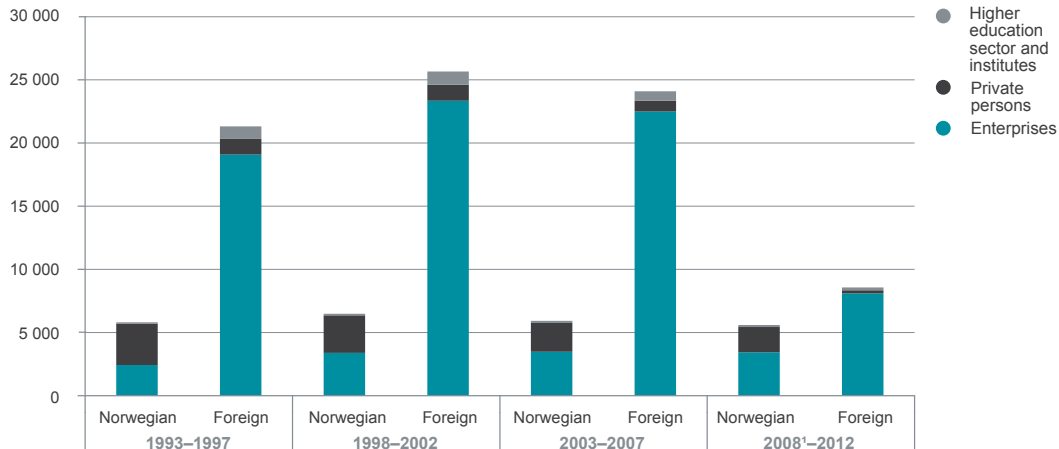


¹ Based on publication year and accumulated citations of publications through 2011. The national index is weighted by each country's relative distribution of articles by field of science.

Source: National Science Indicators/Thomson Reuters/NIFU

17 Patent applications in Norway by sector and origin of applicant. 1993–2012.

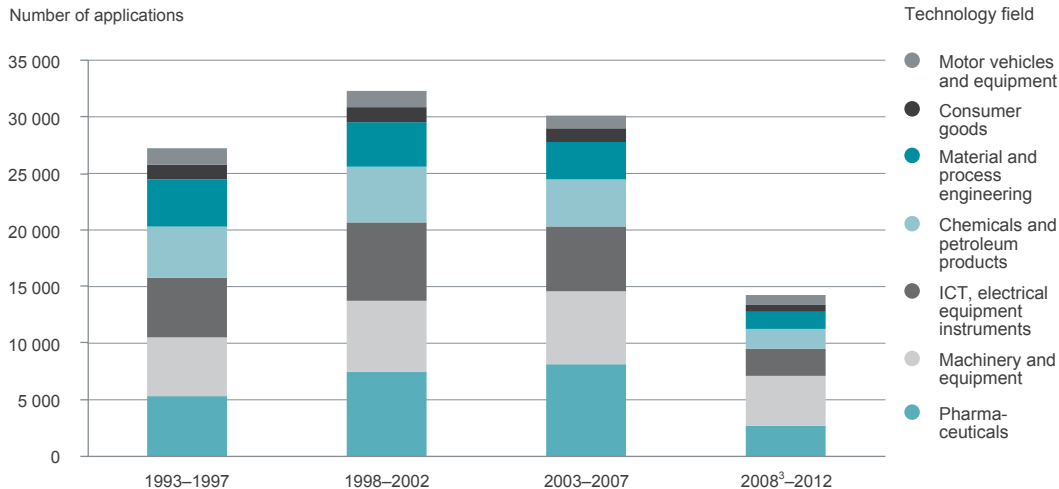
Number of applications



¹ Norway enters EPC in 2008. This affects demand of patent protection in Norway for foreign actors.

Source: NIFU/Norwegian Industrial Property Office

18 National patent applications by technology field¹: 1992–2012².



¹ Technology fields are based on a calculation from IPC to NACE industry (Schmooch 2003)

² Technology fields (IPC) is missing for 189 applications.

³ Norway enters EPC in 2008. This affects demand of patent protection in Norway for foreign actors.

Source: NIFU based on raw data from the Norwegian Industrial Property Office