



2011

Science and Technology Indicators

R&D statistics

NIFU

Published by Nordic Institute for Studies in
Innovation, Research and Education

Address PB 5183, Majorstuen NO-0302.
Visiting address: Wergelandsveien 7

ISBN 978-82-7218-765-0
ISSN 0805-8393

www.nifu.no

Science and Technology Indicators

R&D statistics

2011

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 under "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 2011-edition will be published in September. And in between, the internet version of the report is updated. You may also find information at www.foustatistikbanken.no. All expenditures are given in current prices, unless otherwise indicated. In 2009 1.00 PPP US\$ = 8.85 NOK (Main Science and Technology Indicators 2010-2, OECD). By May 2011 1 Euro = 7.8 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, under "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 employ-

ees. 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 R&D statistical presentations, and 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

In Norwegian R&D statistics, resources are classified in three performing sectors: the Industrial sector, the Higher education sector, and the Institute sector. The OECD's Higher education sector corresponds to the Norwegian definition. 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.

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. 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 worldwide publication and citation statistics.

Highlights

- Total R&D expenditure in Norway amounted to 41.9 billion NOK in 2009, compared to 37.4 billion in 2007. This accounted for 1.8 per cent of the GDP in 2009.
- Norway spent 8 870 NOK per capita on R&D in 2009, compared to 10 068 and 11 859 NOK in Denmark and Sweden respectively.
- Among selected OECD countries Norway, Portugal, Spain and Iceland had the highest shares of R&D expenditure financed by public sources in 2009, and Japan, Finland, Germany, United States and Sweden had the highest shares of funding from industry.
- Among countries with higher R&D expenditure per capita than the OECD average of 6 896 NOK, Norway is the only country with a lower share of R&D expenditure as a proportion of GDP than the OECD average of 2,3 per cent.
- In 2009 R&D expenditure by sector was: 18.2 billion NOK in the Industrial sector, 13.4 billion in the Higher education sector and 10.3 billion in the Institute sector.
- In total 64 126 persons performed R&D in Norway in 2009, accounting for 36 093 full time equivalents (FTE).
- In 2009 about 44 800 persons of all R&D personnel were researchers, and 35 per cent of them were women. The State university colleges had the highest share of female researchers (51 per cent) while Industrial sector's share was the lowest (21 per cent). Among the researchers, 29 per cent had a doctoral degree.
- In 2010 there were 1 184 doctoral degrees awarded in Norway (46 per cent of whom were women).
- Between 2000 and 2009 almost 60 000 patent applications were received: 21 per cent from Norwegian applicants.

Table of contents

R&D expenditure

- 1 In Norway by sector of performance: 1970–2009
- 2 By sector of performance and source of funds
- 3 Flow chart of government-financed R&D to performing sectors in Norway
- 4 By county and per capita.
- 5 As a percentage of the GDP by source of funds, sector of performance and per capita in selected OECD-countries
- 6 Per capita (NOK) and as a percentage of the GDP in selected OECD countries
- 7 Current expenditure on R&D in Norway by sector of performance, technology areas and thematic priorities
- 8 Current expenditure on R&D in Norwegian health trusts
- 9 By field of science in four Nordic countries

Government budget appropriations or outlays for R&D

- 10 GBAORD in the Nordic countries. 1981–2010

R&D personnel

- 11 By sector of performance in Norway: 2009. Head count and full time equivalents
- 12 Researchers in Norway by sector of performance: 2009. Women and doctorates. Head count
- 13 Researchers in Norway by sex and given age groups in the Higher education sector 2009
- 14 Awarded doctoral degrees in Norway by sex: 1980–2009
- 15 FTE performed by researchers at Universities etc.
- 16 Full time equivalents in the industrial sector in four Nordic countries

Innovation/patents

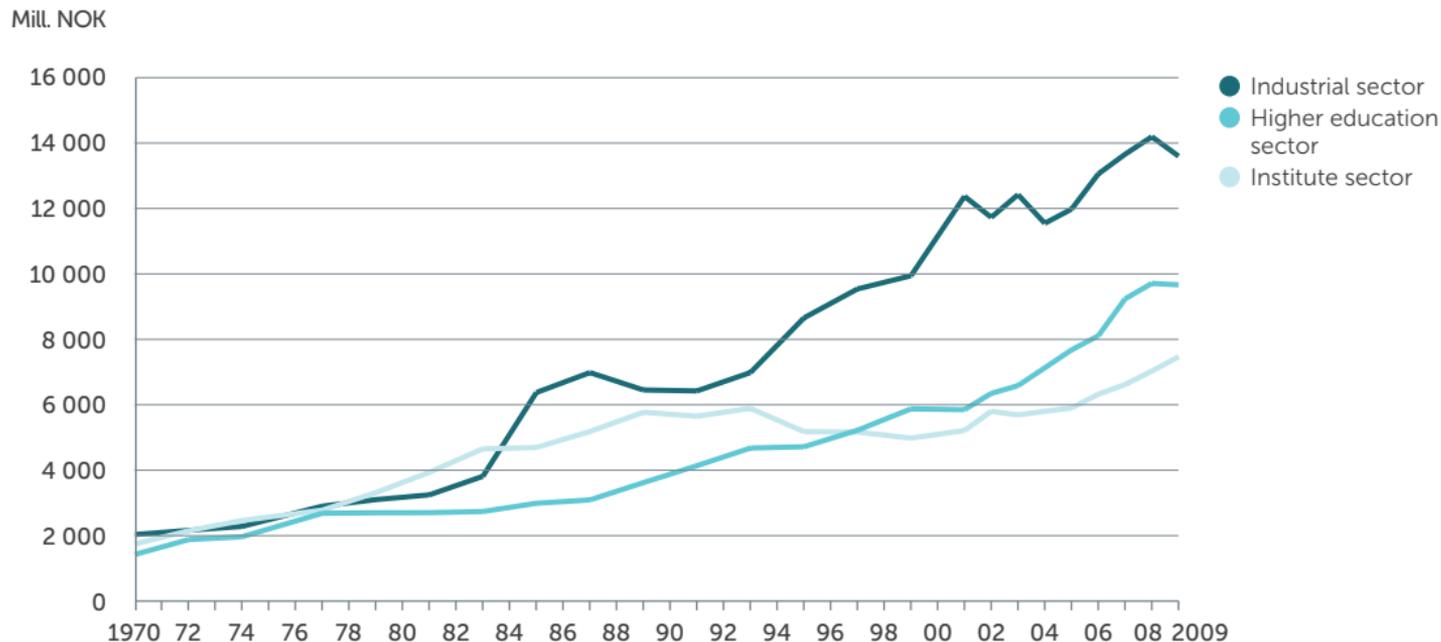
- 17 Patent applications in Norway by technology field 2000-2009

Bibliometrics

- 18 Relative index of citations for published articles for four Nordic countries 1981-2008

1 R&D expenditure in Norway by sector of performance: 1970–2009

Fixed 2000-prices



Source: R&D statistics, NIFU/Statistics Norway

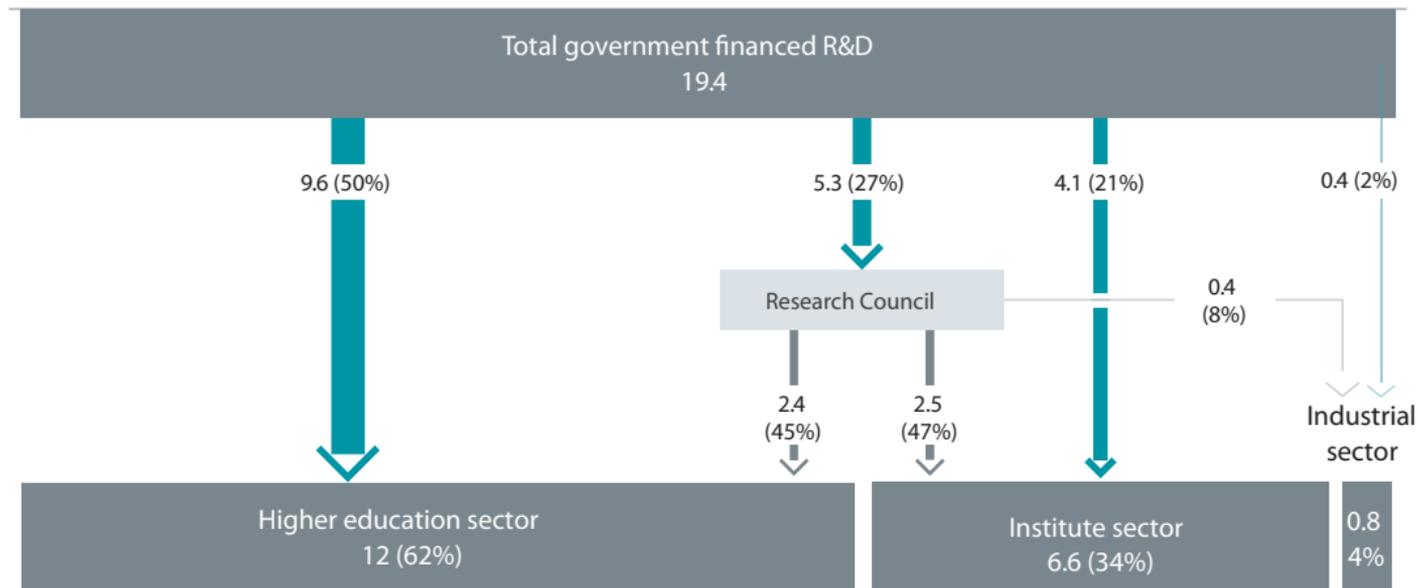
2 R&D expenditure in Norway by sector of performance and source of funds: 2009 (million NOK)

Sector of performance	Total	Industry		Government		Other ¹	Abroad	
		Total	Of which: Oil- companies	Total	Of which: Research Council of Norway	National sources	Total	Of which: EU- comm.
Industrial sector	18 201.9	14 902.3	1 401.2	754.1	403.7	542.2	2 003.3	52.1
Institute sector	10 262.4	2 134.8	504.2	6 631.5	2 535.7	393.9	1 102.2	332.6
Of which:								
- Research inst. serving enterprises	3 399.9	1 428.9	344.4	1 309.6	873.5	181.2	480.2	161.7
- Government sector	6 524.9	693.0	159.8	5 011.8	1 655.7	198.9	621.2	170.8
- Health trusts without university functions	337.7	12.9	-	310.1	6.5	13.8	0.9	-
Higher Education sector	13 420.2	511.3	98.9	12 042.4	2 366.3	537.6	328.9	203.6
Of which:								
- Universities and Spec. univ. inst.	10 104.3	429.9	98.4	8 984.8	2 102.8	411.4	278.2	175.6
- Health trusts with university functions	2 096.8	42.0	-	1 921.8	126.7	105.8	27.2	10.5
- State university colleges	1 219.1	39.4	0.5	1 135.8	136.8	20.4	23.5	17.5
Total	41 884.5	17 548.4	2 004.3	19 428.0	5 305.7	1 473.7	3 434.4	588.3

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

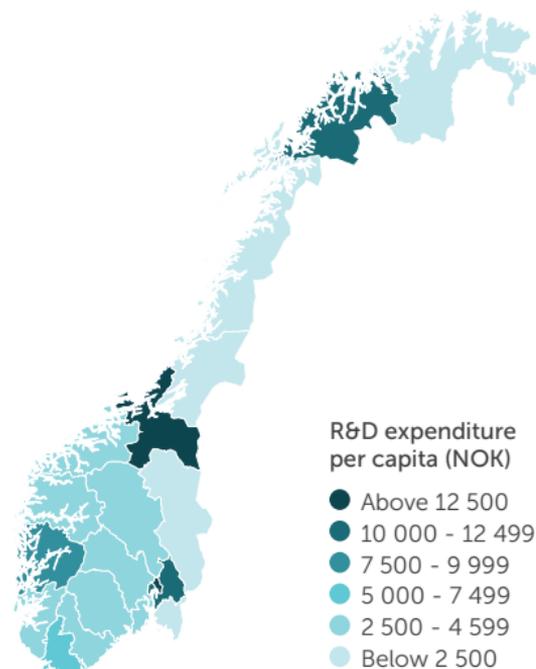
Source: R&D statistics, NIFU STEP/Statistics Norway

3 Flow chart of government financed R&D to performing sectors in Norway 2009 (billion NOK)



4 R&D in Norway by county in 2009. R&D expenditure in total and per capita and full time equivalents (FTE) per 1000 capita

County	R&D expenditure		FTE
	Mill. NOK	NOK per capita	Per 1 000 capita
Østfold	645.6	2 404	2.2
Akershus	5 939.4	11 257	8.6
Oslo	12 897.7	22 412	20.3
Hedmark	178.7	940	0.9
Oppland	465.6	2 526	2.7
Buskerud	1 222.1	4 799	4.0
Vestfold	1 043.3	4 553	4.2
Telemark	777.2	4 639	3.3
Aust-Agder	271.2	2 526.0	2.7
Vest-Agder	880.1	5 231.4	4.0
Rogaland	2 018.2	4 799	4.0
Hordaland	4 628.8	9 855	9.2
Sogn og Fjordane	276.7	2 599	2.2
Møre og Romsdal	871.2	3 503	3.2
Sør-Trøndelag	6 908.5	24 094	19.5
Nord-Trøndelag	245.1	1 875	1.9
Nordland	484.1	2 057	1.8
Troms	1 895.7	12 187	10.8
Finnmark	108.6	1 498	1.5
Svalbard	126.9	-	-
Total	41 884.6	8 727	7.5



Source: R&D statistics, NIFU/Statistics Norway / Map: Norwegian mapping authority

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

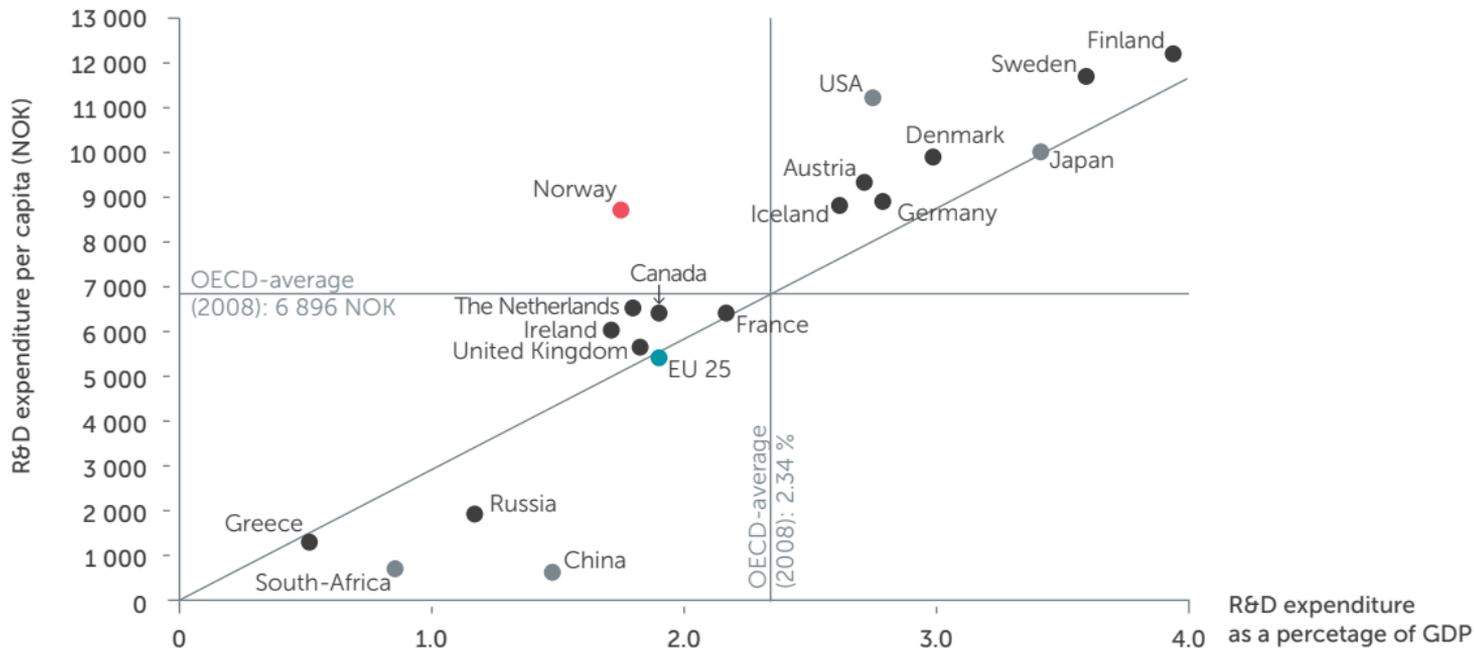
Country	Total	R&D expenditure as a percentage of GDP						R&D expenditure Per capita (NOK)
		Sector of performance			Source of funds ²			
		Business enterprise ¹	Higher ed. sect.	Government	Government	Industry	Abroad & other	
Austria	2.8	1.9	0.7	0.2	1.1	1.2	0.5	9 449
Canada	2.0	1.1	0.7	0.2	0.7	0.9	0.4	6 539
China	1.5	1.1	0.1	0.3	0.3	1.1	0.1	785
Denmark	3.0	2.0	0.9	0.1	0.9	1.8	0.3	10 068
Finland	4.0	2.8	0.8	0.4	1.0	2.7	0.3	12 359
France	2.2	1.4	0.4	0.4	0.9	1.1	0.2	6 578
Germany	2.8	1.9	0.5	0.4	0.8	1.9	0.1	9 074
Iceland	2.7	1.5	0.7	0.5	1.0	1.4	0.3	9 005
Ireland	1.8	1.2	0.5	0.1	0.6	0.9	0.3	6 182
Japan	3.4	2.7	0.4	0.3	0.5	2.7	0.2	10 153
Norway	1.8	0.9	0.6	0.3	0.8	0.8	0.2	8 870
Russia	1.2	0.7	0.1	0.4	0.8	0.3	0.1	2 080
Sweden	3.6	2.5	0.9	0.2	1.0	2.1	0.5	11 859
United Kingdom	1.9	1.2	0.5	0.2	0.6	0.9	0.4	5 815
USA	2.8	2.0	0.4	0.4	0.7	1.9	0.2	11 372
Average OECD	2.3	1.6	0.4	0.3	0.6	1.5	0.2	6 896
Average EU-25	2.0	1.2	0.5	0.3	0.7	1.1	0.2	5 586

¹ Includes Industrial sector and institutions serving enterprises.

² Where 2009 data is not available, 2008 data has been used (Iceland, Japan, Korea, USA and OECD).

Source: OECD - Main Science and Technology Indicators 2010-2

6 R&D expenditure per capita (NOK) and as a percentage of the Gross Domestic Product (GDP) in selected OECD countries: 2009¹



¹ Where 2009 data is not available, data from earlier years is used: 2007 (Greece) or 2008 (Iceland, Japan, China, USA and OECD).
Source: OECD - Main Science and Technology Indicators 2010-2

8 Current R&D expenditure in Norwegian health trusts by type of health trust and region¹ (mill. NOK)

Region	Health trust with university function			Health trust without university function		
	Total current expenditure ²	Current R&D expenditure ³	% R&D	Total current expenditure ²	Current R&D expenditure ³	% R&D
Mid Norway	6 691	180	2.7	7 254	40	0.5
Northern Norway	5 305	182	3.4	5 796	24	0.4
South-Eastern Norway	23 446	1 375	5.9	28 556	236	0.8
Western Norway	12 262	349	2.8	4 972	20	0.4
Total	47 704	2 085	4.4	46 578	320	0.7

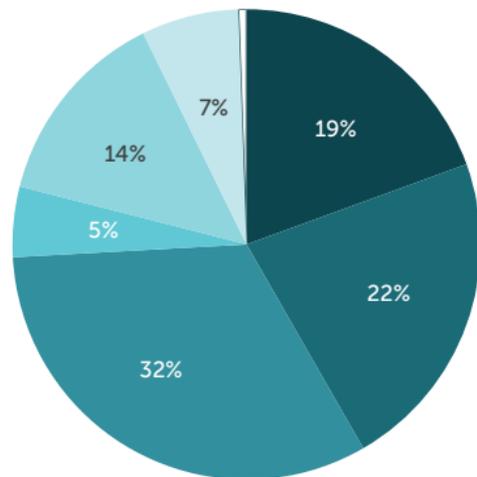
¹ According to the accountant principle, current expenditure includes depreciation.

² Source: Statistics Norway.

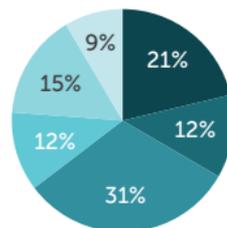
³ Source: NIFU.

9 R&D expenditure in the Higher education sector by field of science in 2007 in four Nordic countries (billion NOK)

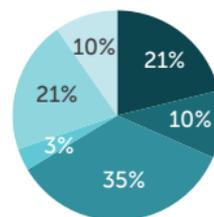
Sweden
23.2



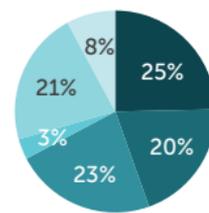
Denmark
12.3



Norway
11.7

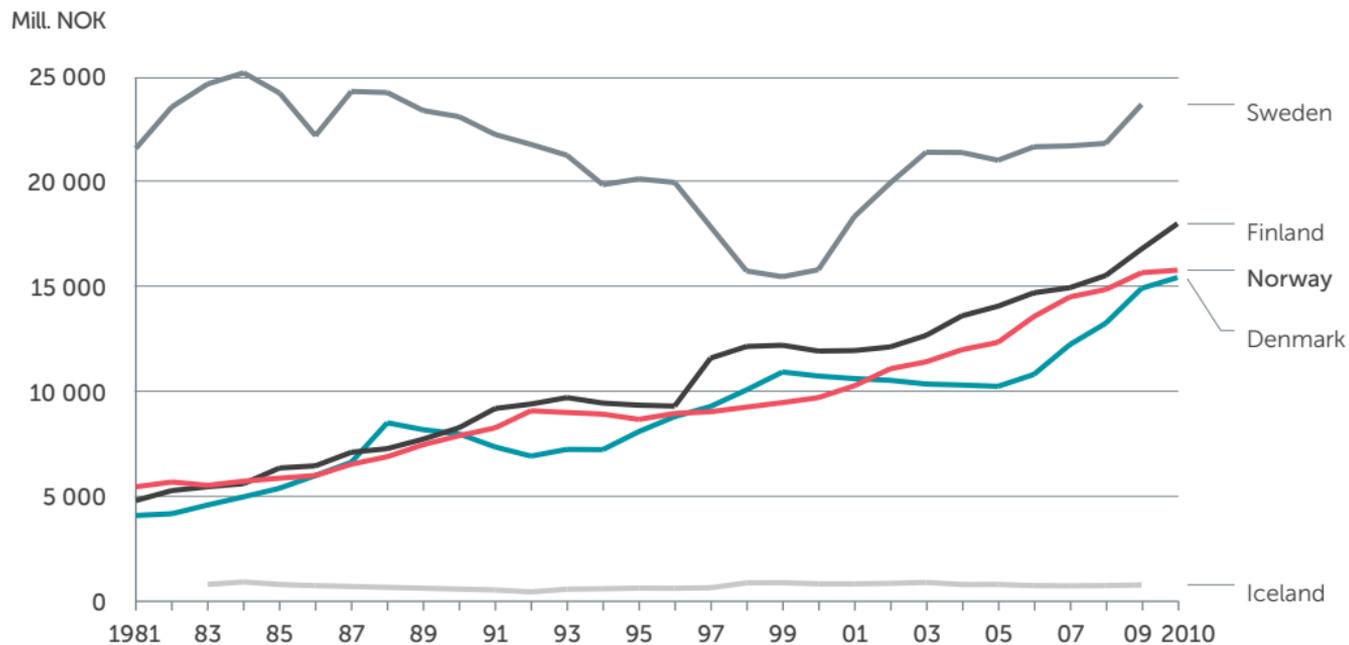


Finland
10.8



- Natural sciences
- Engineering
- Medical sciences
- Agricultural sciences
- Social sciences
- Humanities
- Other

10 Government budget appropriations or outlays for R&D (GBAORD) for the Nordic countries. 1981-2010. Fixed 2000-prices



Source: OECD - Main Science and Technology Indicators 2010-2

11 R&D personnel (head count and FTE) in Norway by sector of performance 2009

Sector of performance	R&D personnel as of 01.10.2009			FTE	
	Total R&D personnel	Of which: researchers/univ. graduates	Tech. & supp. staff	Total	Of which: researchers/univ. graduates
Industrial sector	23 468	15 249	8 219	15 673	10 783
Institute sector	11 716	8 198	3 518	8 763	6 328
Of which:					
- Research institutes serving enterprises	2 999	2 216	783	2 493	1 878
- Government sector	8 717	5 982	2 735	5 942	4 235
- Health trusts without university functions	771	482	289	328	215
Higher education sector	28 942	21 315	7 627	11 657	9 163
Of which:					
- Universities	16 246	11 520	4 726	7 806	6 339
- Specialised university institutions	2 027	1 662	365	760	651
- State university colleges	6 293	5 146	1 147	1 103	998
- Health trusts with university functions	4 376	2 987	1 389	1 988	1 174
Total	64 126	44 762	19 364	36 093	26 274

Source: R&D statistics, NIFU/Statistics Norway

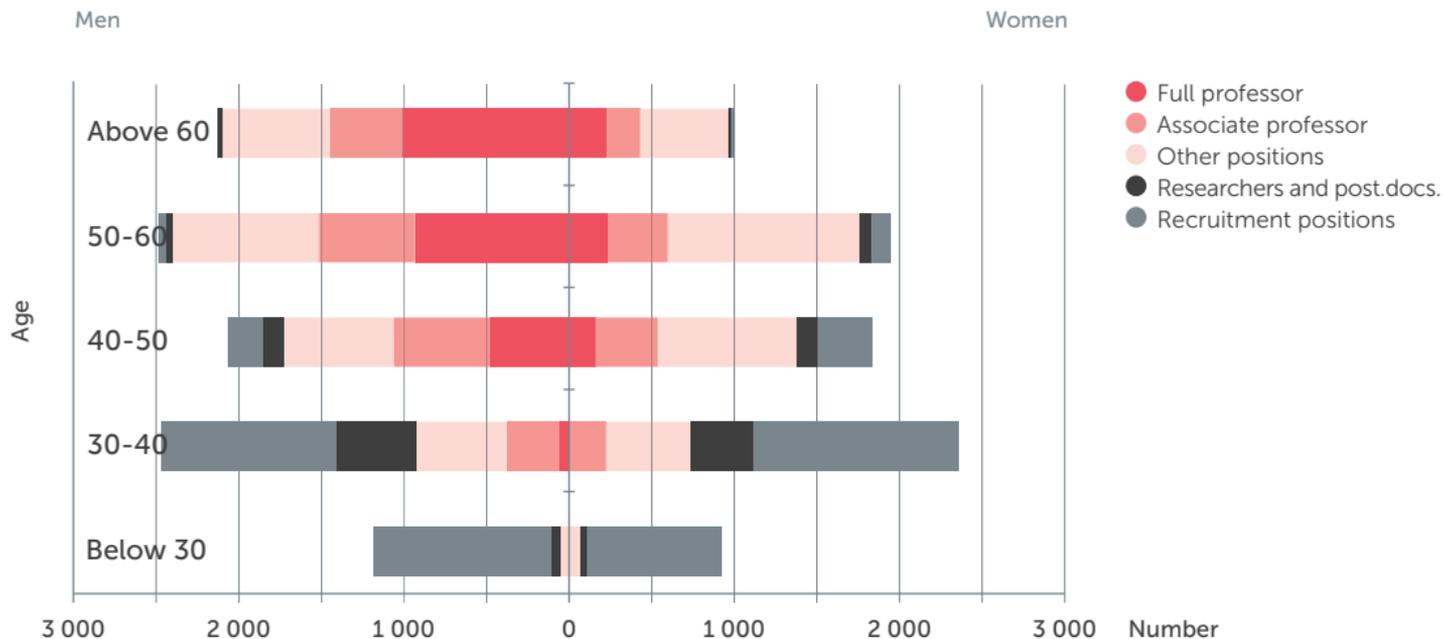
12 Researchers/university graduates (head count) in Norway by sector of performance: 2009. Doctorates and women

Sector of performance	Total			Doctorates ¹			
	Total Number	Women Number	%	Total Number	%	Women Number	%
Higher education sector	21 315	9 392	44	8 310	39	2 842	30
Of which:							
- Universities	11 520	4 710	41	5 307	46	1 772	38
- Specialised university institutions	1 662	673	40	590	35	191	28
- State university colleges	5 146	2 641	51	1 138	22	432	16
- Health trusts with university functions	2 987	1 368	46	1 275	43	447	33
Institute sector	8 198	3 187	39	3 364	41	1 175	37
Of which:							
- Research institutes serving enterprises	2 216	676	31	984	44	286	42
- Government sector	5 500	2 305	42	2 277	41	858	37
- Health trusts without university funct.	482	206	43	103	21	31	15
Industrial sector	15 249	3 191	21	1 593	10	317	10
Total	44 762	15 770	35	13 267	30	4 334	27

¹ Licenciates are also included.

Source: R&D statistics, NIFU/Statistics Norway

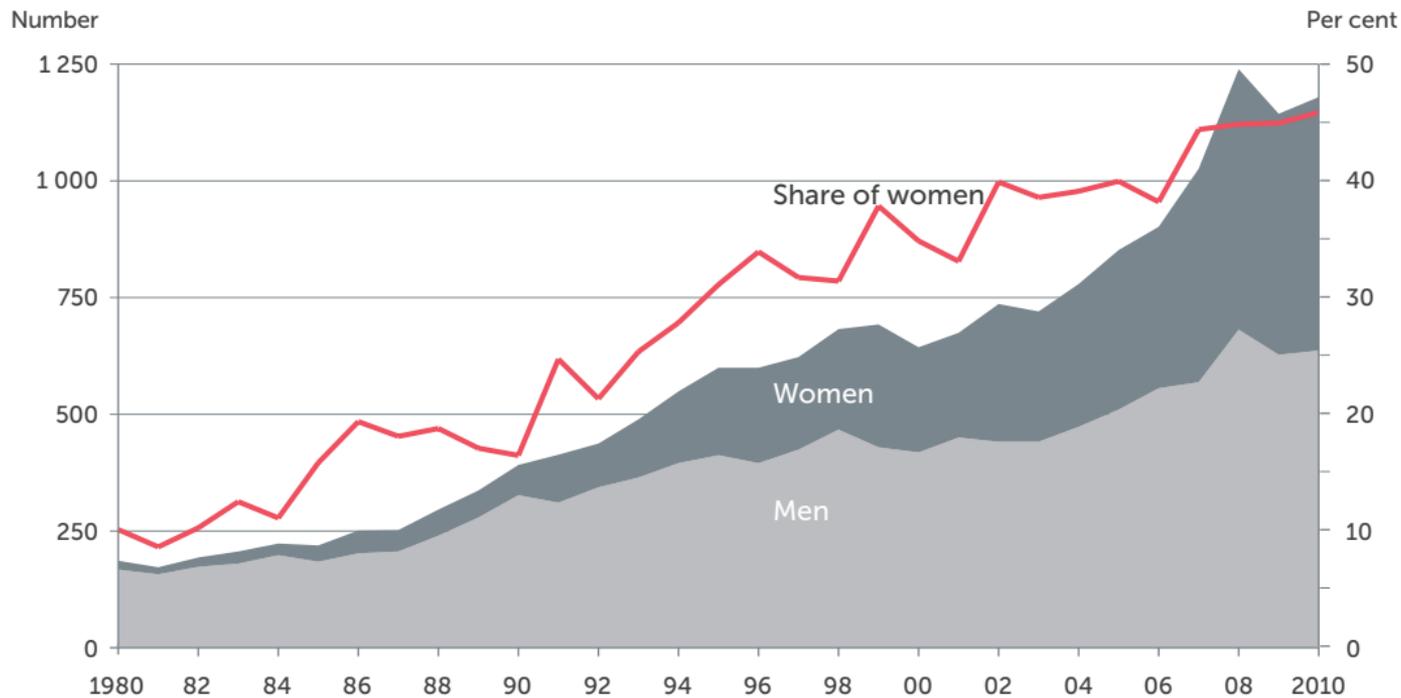
13 Researchers in the Higher education sector¹ by scientific position, age and sex



¹ Personnel at the Health trusts are not included.

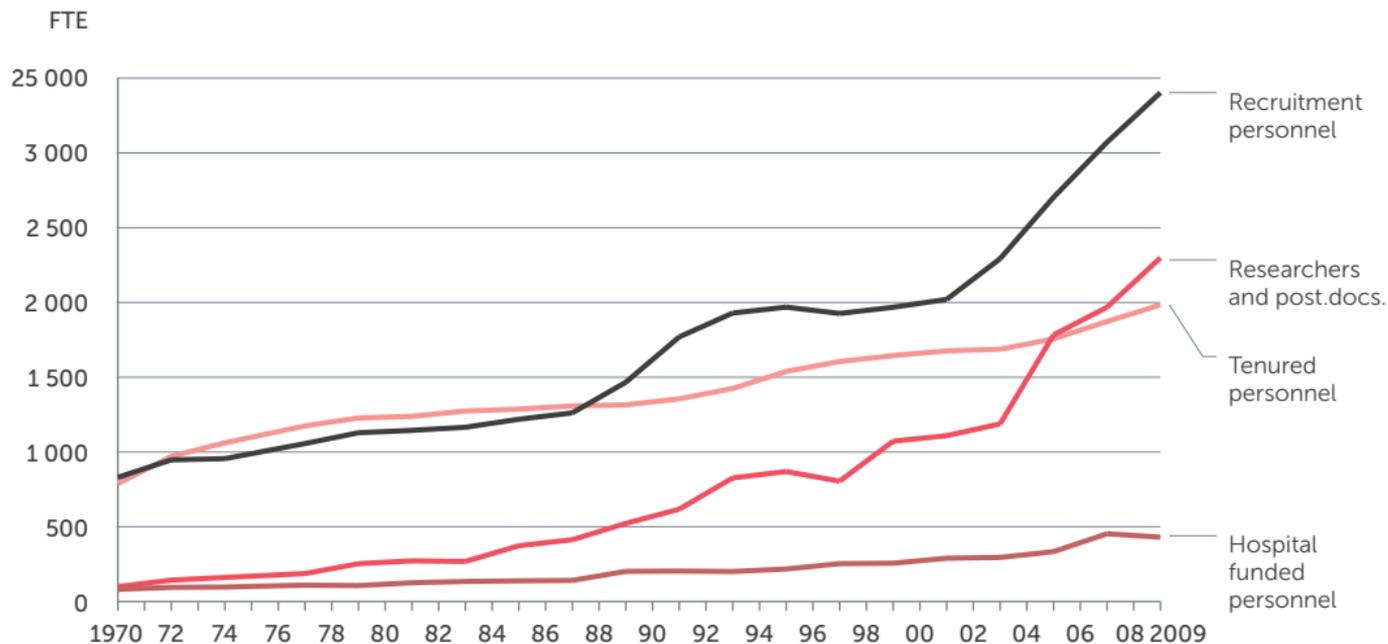
Source: NIFU/Register of Research personnel

14 Awarded doctoral degrees in Norway by sex 1980–2010



Source: NIFU/The Doctoral Degree Register

15 Number of full time equivalents (FTE) performed by researchers at Universities¹ and Specialised University institutions by category 1970-2009

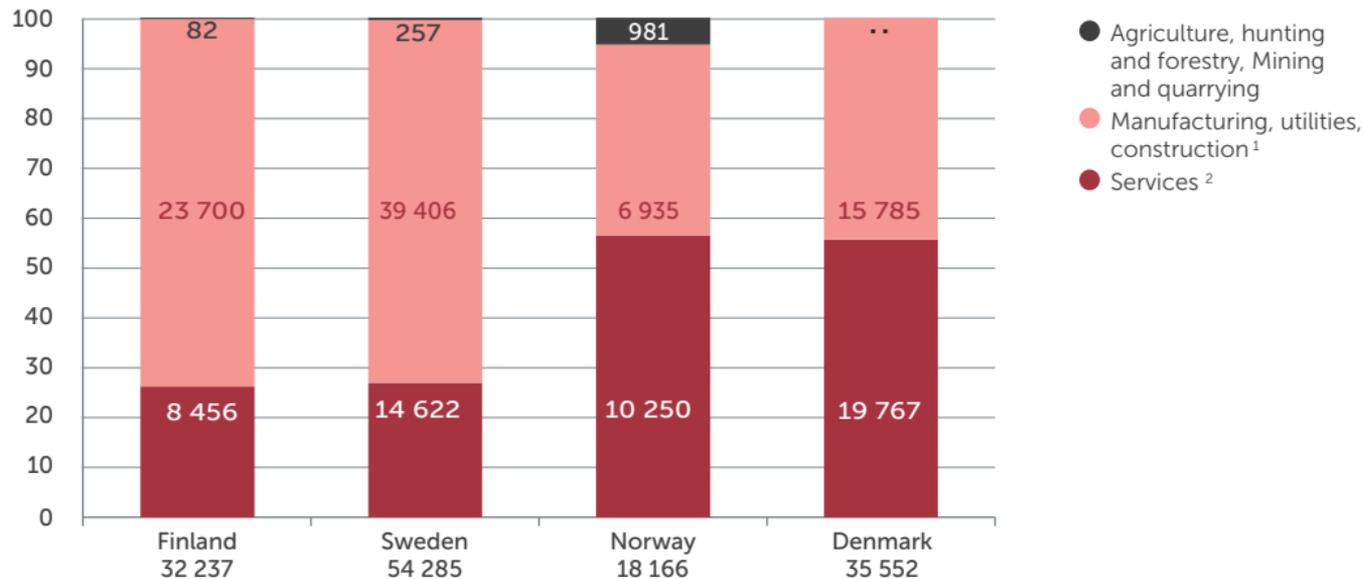


¹ Incl. University hospitals.

Source: NIFU/Register of Research personnel

16 Full time equivalents in the business enterprise sector by industry in four Nordic countries in 2009

Per cent

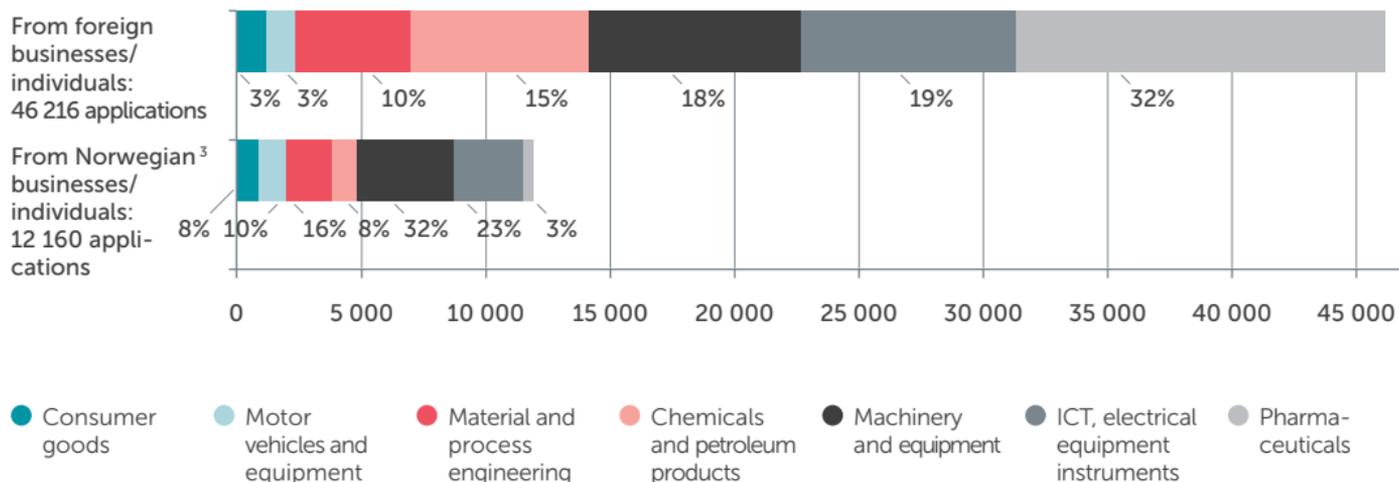


¹ NACE section C-F. Denmark: includes A-B.

² NACE section G-S.

Source: Statistics Finland, Statistics Sweden, Statistics Norway and Statistics Denmark

17 Patent applications¹ in Norway by technology field² and origin of applicant 2000-2009



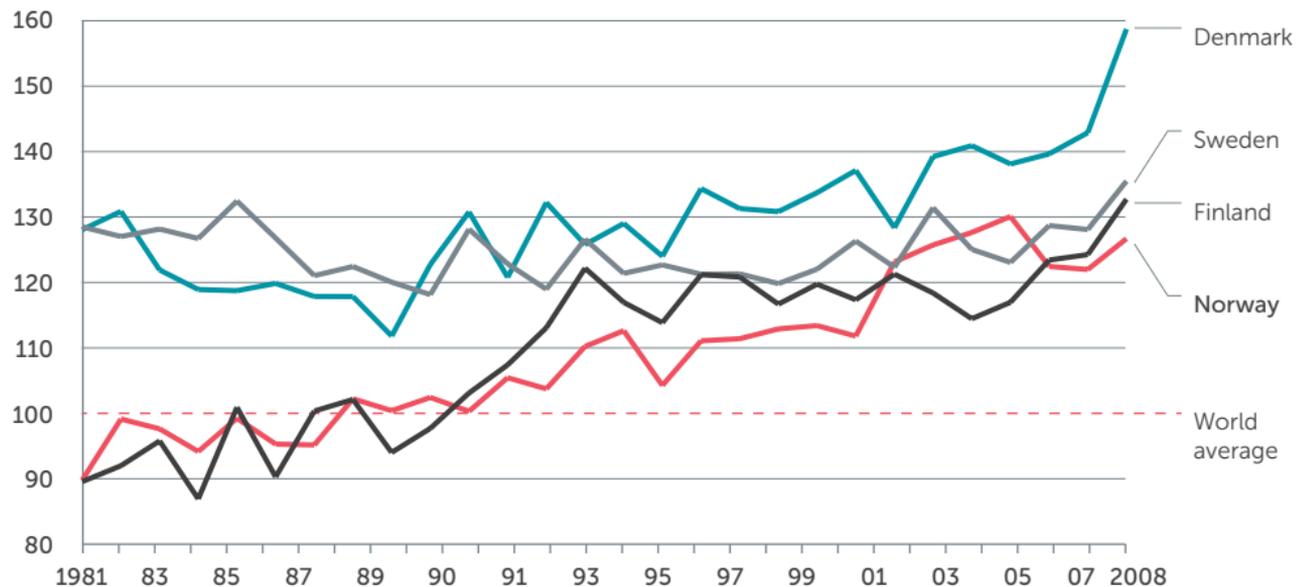
¹ Includes patent applications received by Norwegian Industrial Property Office which lacks information on field of technology (235).

² Field of technology is based on a link between patent classification and their industrial application in accordance with NACE.

³ National affiliation is based on applicant address (Fraction count).

Source: NIFU/Norwegian Industrial Property Office

18 Relative index of citations for published articles for four Nordic countries: 1981-2008¹



¹ Based on annual publication windows and accumulated citations to these publications. The index for each country has been weighted according to the countries' relative field distribution of articles. The index for 2008 is more uncertain than for the other years due to a short citation period.

Source: NIFU / Thomson Reuters, National Science Indicators.

