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NIFU STEP Studies in Innovation, Research and Education

Oslo Innovation Scoreboard 2004

Revealed Regional Summary Innovation Index (RRSII) for the Oslo Region

NIFU STEP **Studies in Innovation, Research and Education**

Preface

This is the second Innovation Scoreboard for the Oslo Region, made by NIFU STEP for Oslo Teknopol. The scoreboard has been created and modified according to the method used by the European Innovation Scoreboard 2003 (EIS 2003) and the Regional Innovation Scoreboard (RIS 2003)[1] to generate a Revealed Regional Summary Innovation Index (RRSII) for the Oslo Region.

Since Norway is not included in European Commission ((Enterprise Directorate-General) efforts to make this regional index we have by following the EUROSTAT methodology been able to compare the Oslo Region with other regions throughout Europe (EU15).

I would like to thank Markus M. Bugge, Anders Ekeland, Eric Iversen and Tore Sandven at NIFU STEP Studies of innovation, research and education for generating data and for contributing to the accomplishment of the report, and Oslo Teknopol for the opportunity to be engaged in this project.

Oslo, December 2004

Morten Fraas

Project leader

[1] A report from the European Commision's 'European Trend Chart on Innovation'. www.cordis.lu

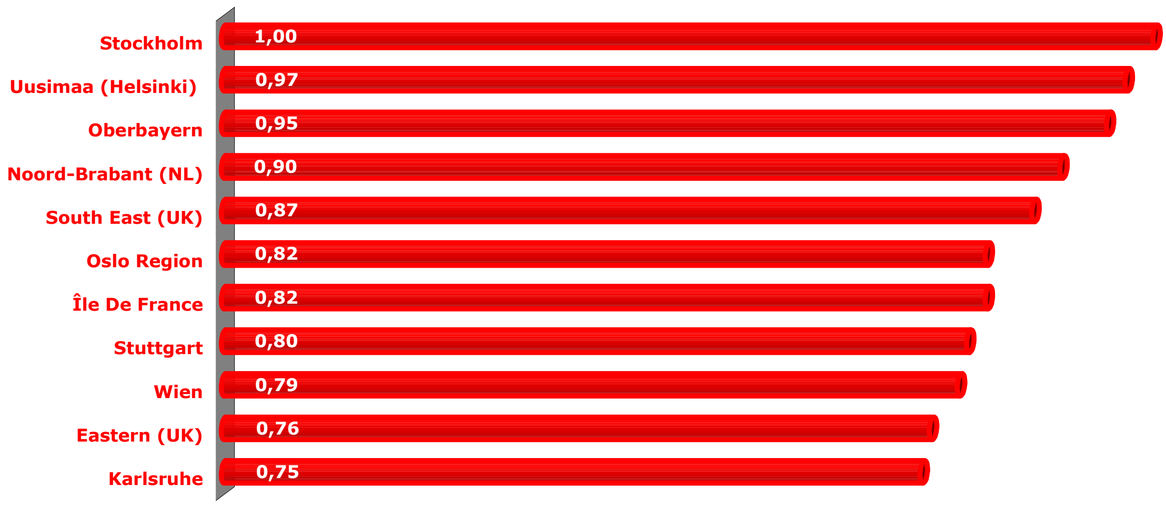
Executive summary

This is the second edition of the Oslo Innovation Scoreboard (OIS). The scoreboard for the Oslo Region (Oslo and Akershus) is specifically made by NIFU STEP for Oslo Teknopol to generate a Revealed Regional Summary Innovation Index (RRSII) for the Oslo Region. The index has been created and modified according to the method used by the European Innovation Scoreboard (EIS 2003) and the Regional Innovation Scoreboard (RIS 2003). This index locates local innovation leaders by taking into account both the region's relative performance within the EU and the region's relative performance within the country.

Since Norway is not included in EUROSTATs efforts to make this regional index, we have by following their approach been able to compare the Oslo Region with other regions throughout Europe (EU15).

In 2004 the RRSII score for the Oslo Region is 0.82. This is a high score and puts the Oslo Region at a 6th place on the ranking of 'local innovation leaders' among European regions. The RRSII is a normalised index, which ranges between 0 (last region) and 1 (first and best region). Compared to last year the Oslo Region has dropped two places from 4th to 6th place.

European top ten innovative regions



To compose the index we have used 13 Regional indicators at a NUTS 2 level within 5 main drivers and outputs of innovation: Human resources; Knowledge creation; Patenting; Knowledge diffusion and Innovation finance, output and markets.

Regarding 'Population with tertiary education' the Oslo Region (39.9 percent) is close to the result for the best region in EU (41.7 percent) and nearly twice as large as the average for EU (21.5 percent). When it comes to 'Employment in medium high-and high-tech manufacturing' the Oslo Region has 2.3 percent of its workforce within these sectors. This is far from the best region in EU (21.3 percent) and below the EU average (7.1 percent). Further, 6.8 percent of the workforce in the Oslo Region is within 'Employment in high-tech services'. The performance of the Oslo Region on this indicator is about twice as large as the EU average (3.6 percent), but below the best region in EU (8.8 percent).

'The public R&D expenditure' in the Oslo Region is 1.4 percent of the regional gross domestic product (GDPR). This score is about twice as large as the EU average (0.69 percent), but below the best region in EU (2.38 percent). 'Business expenditure on R&D' in percent of GDPR for the Oslo Region is 1.5 percent. The best region within EU on this indicator had a percentage of 5.3 and the average for EU15 was 1.3 percent.

The level of patenting in the Oslo Region is 388.3 'NPO patents application per million population' and 74.2 'NPO high-tech applications per million population'. The best EU regions have respectively 824.2 EPO patent applications and 824.2 EPO high-tech patent applications per million population. We must emphasis that this comparison is based on two different types of data (Norwegian domestic patents against EPO patenting) and should be interpreted with care.

'The share of innovative enterprises' in manufacturing and service in percent of all manufacturing and service enterprises in the Oslo Region is respectively 40.3 percent and 37.5 percent. The corresponding EU numbers varies from 0-92 percent within manufacturing, and from 0-100 percent within service. 'Total innovation expenditure in manufacturing and services' as a percentage of total turnover for the Oslo Region is respectively 2.4 percent in manufacturing (the best EU is 12.4 and the average is 3.45) and 1 percent in services (the best EU region is 23.5 percent and the EU average is 1.83).

CIS3 results for Norway and the Oslo Region show that in manufacturing 14.5 percent of total turnover stems from products which are 'new or improved to the firm'. In CIS3 for EU the average on this indicator is 28.6 percent and the best EU region is 66 percent.

The main objective of this report is to compose and calculate the RRSII index for the Oslo Region. The innovation scoreboard index is an indication of the potential for economic growth in this region, but doesn't say anything about the actual economic performance.

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1 Introduction

Innovation is a priority of all Member States of the European Commission. Throughout Europe, a large amount of policy measures and support schemes aimed at innovation have been implemented or are under preparation. In 1996 the 'First Action Plan for Innovation in Europe' was established by the European Commission in order to provide a common analytical and political framework for innovation policy in Europe. Building on the Action Plan and serving the 'open policy co-ordination approach' founded in the Lisbon Council in 2000, the Trend Chart on Innovation was established and has been running since January 2000. It delivers summarised and concise information and statistics on innovation policy, performances and trends in all Member States, Candidate Countries and Associate Countries including Norway. Due to data availability at the time it was decided by the European Commission (Enterprise Directorate-General) to only include the then EU15-members and Norway is therefore not integrated in the Regional innovation scoreboard.

The purpose of the project

This report compares the innovation performance of the Oslo Region with other EU regions at a NUTS 2 level. This is done for all the Member States in the publication from the '2003 European Innovation Scoreboard - Technical Paper No. 3: Regional innovation performances'. The ranking of local leaders are based on the RRSII index (Revealed Regional Summary Innovation Index).

Table 1: 'Local' innovation leaders per country[2]

Country	Leading regions (RRSII)		
Austria	Wien (.79)	Vorarlberg (.43)	Steiermark (.41)
Belgium	Brussels (.71)	Vlaams Gewest (.52)	Région Wallonne (.17)
Germany	Oberbayern (.95)	Stuttgart (.80)	Karlsruhe (.75)
Greece	Attiki (.61)	Kentriki Makedonia (.38)	Dytiki Ellada (.32)
Spain	Comunidad De Madrid (.72)	País Vasco (.58)	Comunidad Foral De Navarra(.57)
France	Île De France (.82)	Midi-Pyrénées (.58)	Rhône-Alpes (.55)
Finland	Uusimaa (suuralue) (.97)	Etelä-Suomi (.61)	Pohjois-Suomi (.55)
Ireland	Southern and Eastern (.74)	Border, Midland and Western (.15)	
Italy	Lombardia (.67)	Piemonte (.66)	Lazio (.63)
Norway	Oslo Region (.82)	Trøndelag (.50)	Agder og Rogaland (.45)
Netherlands	Noord-Brabant (.90)	Flevoland (.67)	Limburg (.55)
Portugal	Lisboa e Vale do Tejo (.60)	Centro (.33)	Norte (.23)
Sweden	Stockholm (1.00)	Västsverige (.71)	Sydsverige (.69)
UK	South East (.87)	Eastern (.76)	South West (.59)

[2] EIS 2003, Technical paper No 3. Regional innovation performance, p. 5.

The primary aim of this project is to develop a comparative set of indicators that are used in the Regional Innovation Scoreboard, consisting of the 13 indicators referred to below and which frame the RRSII index for the Oslo Region[3].

Human Resources

1. Population with tertiary education (percent of 25-64 years age classes)
2. Participation in life-long learning (percent of 25-64 years olds)
3. Employment in medium-high and high-tech manufacturing (percent of total workforce)
4. Employment in high-tech services (percent of total workforce)

Knowledge Creation

5. Public R&D expenditures (GERD - BERD) (percent of GDP)
6. Business expenditure on R&D (BERD) (percent of GDP)

Patenting

7. EPO high-tech patent applications (per million population)
8. EPO patent application (per million population)

Transmission and diffusion of knowledge

9. Share of innovative enterprises (percent of all manufacturing enterprises)
10. Share of innovative enterprises (percent of all services enterprises)
11. Innovation expenditures (percent of all turnover in manufacturing)
12. Innovation expenditures (percent of all turnover in service)

Innovation finance output and markets

13. Sales of 'new to the firm but not new to the market' products (percent of total turnover in manufacturing)

In addition to the methodology and definition of the existing indicators in the European Innovation Scoreboard (EIS) and the Regional Innovation Scoreboard (RIS)[4], we use Norwegian numbers instead of EUROSTAT numbers.

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[3] In 2002 this index consisted of 7 indicators. The index for 2003 consists of 13 indicators and as extended with indicator 8-13 in the list.

[4] Relevant documents are: 2003 European Innovation Scoreboard: Technical Paper No 3 Regional innovation performance, Technical Paper No 1 Indicators and Definitions, Technical Paper No 6 Mothododology report. All documents are available from the Cordis homepage: www.cordis.lu/trendchart

2 Method

Revealed Regional Summary Innovation Index (RRSII)[5]

The Revealed Regional Summary Innovation Index (RRSII) is a composite indicator, which tries to locate local leaders by taking into account both the region's relative performance within the EU and the region's relative performance within the country[6]. Two indexes are calculated of which the mean value is taken for the RRSII:

- RNSII (regional national summary innovation index) - The average of the re-scaled indicator values using only regional data for each specific country (where indicators 1-8 receive a weight of 1 and the five CIS-indicators (9-13) receive a weight of 0.5):

  $RNSII_{jk} = \sum_{j=1}^{m} x_{ijk}^{n}$, where $x_{ijk}^{n} = \dfrac{x_{ijk} - \min(x_{jik})}{\max(x_{ijk}) - \min(x_{ijk})}$ (1)

- RSII (regional summary innovation index)7 - The average of the re-scaled indicator values using data for all regions for all countries (where indicators 1-8 receive a weight of 1 and the five CIS-indicators (9-13) receive a weight of 0.5):

  $RSII_{jk} = \sum_{j=1}^{m} x_{ijk}^{eu}$, where $x_{ijk}^{eu} = \dfrac{x_{ijk} - \min(x_{ij})}{\max(x_{ij}) - \min(x_{ij})}$ (2)

Here *ijk* *X* is the value of indicator *i* for region *j* in country *k* and *m* is the number of indicators for which regional data are available. The RRSII is then calculated as the unweighted average of the rescaled values for RNSII and RSII. Appendix E presents detailed results for RNSII, Appendix F presents detailed results for RSII and Appendix G presents the results of RRSII[8].

Identifying local leaders reduces the influence of those indicators on which a country has an above average performance. Peaks for indicators on which a country performs well above the EU mean are thus adjusted downwards, peaks for indicators on which a country performs well below

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[5] This section is based upon 2003 European Innovation Scoreboard: Technical Paper No 3 Regional innovation performances

[6] The RRSII is designed to pinpoint 'local leaders'. Regions in high performing countries will always look more favourable when compared directly to regions from less performing countries.

[7] In RIS 2002 the regional summary innovation index (RRSI) was presented as a regional summary innovation index REUSII.

[8] For further information about the calculation see EIS 2003 Technical Paper No 6 Methodology Report.

the EU mean are thus adjusted upwards. The RRSII will thus increase the composite indicator value for leading regions in lagging countries: local leaders become more visible.

Regional level

The NUTS 2 classification has been used for determining the level of regional analysis[9]. The NUTS classification contains several problems for analyzing the innovative capabilities of regions. First there are large discrepancies in the size of regions (in terms of population and economic output), both within regions and between countries. This may create anomalies, such as a small region comparatively well on a given indicator because of a single innovative firm or public research institute being based there. Second, a few countries have very few regions. This places these regions at a serious disadvantage in analysis of leading regions. A country like France with 22 regions thus has a higher probability of turning out with a leading region for one or more indicators than a country such as Belgium with only 3 regions.

Year of reference

The RRSII result for the Oslo Region may also be biased due to comparison of data across different years and various sources for the Oslo Region and the EU15 regions. Our analysis is to a less extent based upon EUROSTAT data, but on Norwegian sources according to the method described in European Innovation Scoreboard 2003. Also, for some of the indicators we have used newer data for the Oslo Region than what has been done in the EU15 regions.

Besides composing and calculating the RRSII index for the Oslo Region, we have not analysed the results any further.

It needs to be emphasized that the innovation scoreboard index does not say anything about the economic performance of the Oslo Region as such, but is rather an indication of the potential for economic growth in this region.

Table 2: Years of reference for Norway and EU15

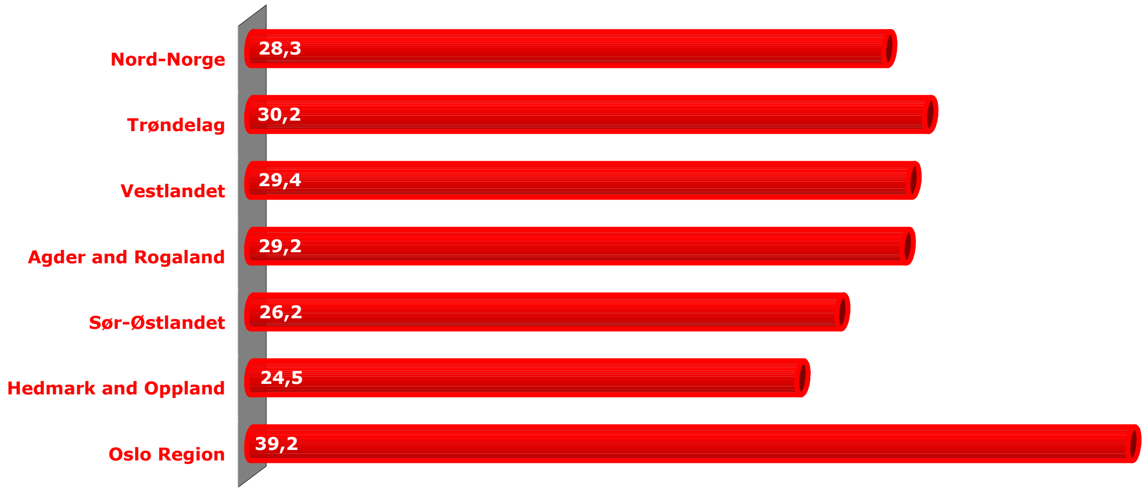
Year of reference	Tertiary education (%)	Lifelong learning (%)	Med/hi-tech employment in manufacturing (%)	High-tech employment in services (%)	Public R&D (%)	Business R&D	High-tech patent applications (per mill. pop)	Patent applications (per mill. pop)	Share of innovative manufacturing enterprises (%), CIS3	Share of innovative service enterprises (%), CIS3	Innovative expenditures manufactureing (%), CIS3	Innovative expenditures service (%), CIS3	Sales of 'new to the firm, but not new to the market' products (%), CIS
Norway	2003	2002	2003	2003	2001	2001	2002	2002	2001	2001	2001	2001	2001
EU15	2002	2002	2002	2002	2001	2001	2001	2001	2000	2000	2000	2000	2000

9 See www.europa.eu.int/comm.EUROSTAT/ramon/nuts/ for NUTS 2 level for the EU15. For Norway see Appendix C.

3 Oslo Innovation Scoreboard (OIS)

Human Resources

Figure 3-1: Population with tertiary education (percent of 25-64 years age classes), NUTS 2 level, Norway 2003



Source: Register data, NIFU STEP 2004

To find this indicator we have used register data for 2003. In 2003 the percentage of total age population (25-64 years age classes) with some form of post-secondary education (ISCED 5 and 6)[10] in the Oslo Region corresponded to 39.2 percent. The best region in EU 15 had a percentage of 41.7 and the average for EU15 was 21.5 percent (2003).

Participation in life-long learning (percent of 25-64 years olds)

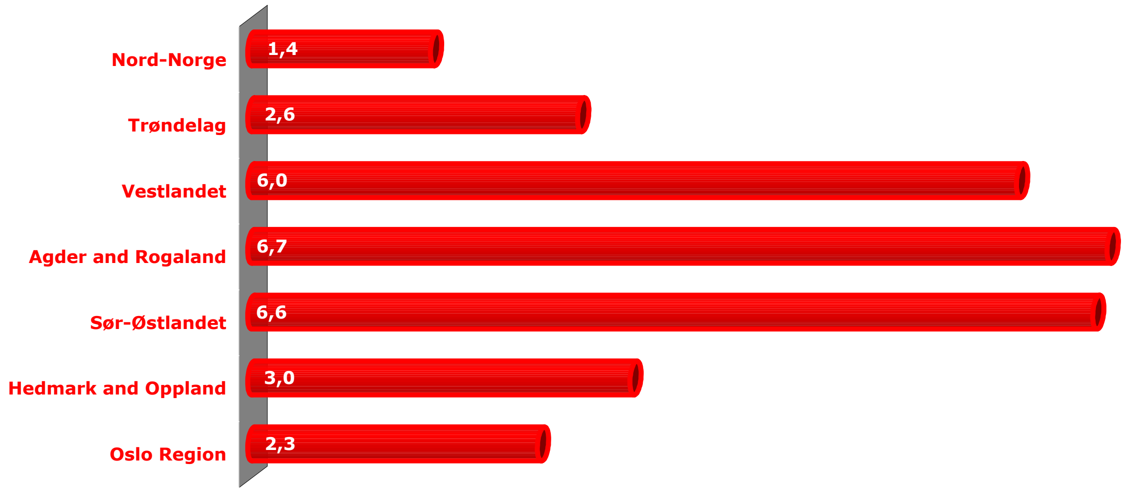
Due to a lack of easily accessible data on this specific indicator we have used the Norwegian average employed in the 2003 European Innovation Scoreboard[11]. The average for the Oslo Region is probably higher than 13.3 percent due to the fact that the Oslo Region is a dominating location for public and private services. The region is also enriched with substantial shares of manufacturing activities in some national industries, such as printing, publishing and the tobacco industry. We will not discuss this further, but simply point out that the figure presented here

[10] For comparison between the Norwegian standard and ISCED, see Appendix B.

[11] 2003 European Innovation Scoreboard – Technical paper No 1: Indicators and Definitions. Year used is 2002. Sources: EUROASTAT, Labour Force Survey.

may be biased. In 2002 the best region within EU was 25.2 percent and the average for EU15 was 8.4 percent (EIS 2003).

Figure 3-2: Employment in medium-high and high-tech manufacturing (percent of total workforce in Oslo Region), NUTS 2 level, Norway 2003

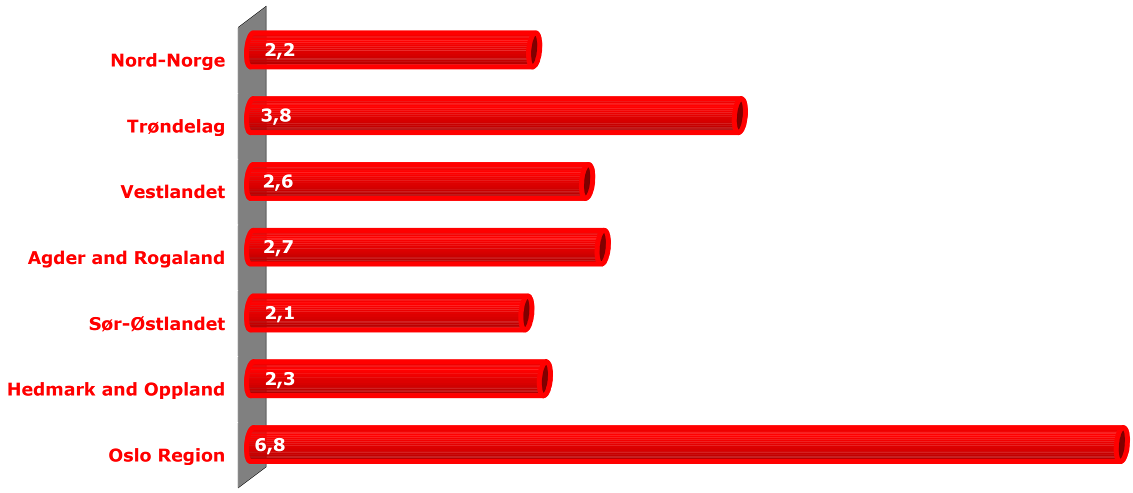


Source: Register data, NIFU STEP 2004

The employment in medium-high and high-tech manufacturing in percent of total workforce in the Oslo Region was, according to register data from 2003, 2.3 percent. The medium-high and high technology sectors include the following 2-digit NACE codes: chemicals (24), machinery (29) office equipment (30), electrical equipment (31), telecom equipment (32), precision instruments (33), automobiles (34), and aerospace and other transport (35).

Compared to the national figure (2.89 percent) and compared to other regions in Scandinavia, the Oslo Region has a rather low score on this indicator. Norway does not have a traditional strong medium-high and high-tech manufacturing sector. In recent years much of the manufacturing industry have also been moved out of the Oslo Region or have been closed down. In 2002 the best region within EU on this indicator was 21.2 percent and the average for EU15 was 7.1 percent (EIS 2003).

Figure 3-3: Employment in high-tech services (percent of total workforce in Oslo Region), NUTS level 2, Norway 2003



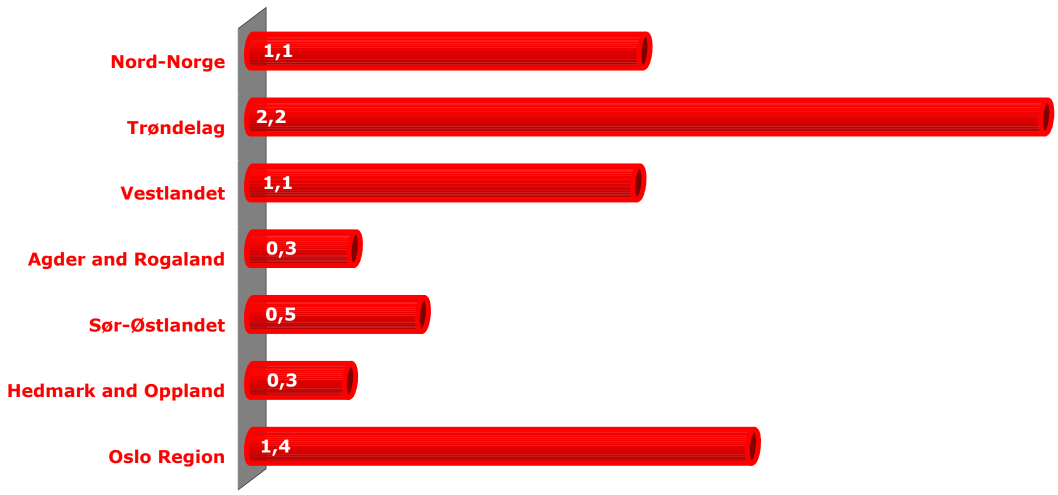
Source: Register data, NIFU STEP 2004

In 2003 employment in high-tech services as a share of total workforce in the Oslo Region was according to register data 6.8 percent.

This indicator focuses on three leading edge sectors that produce high technology services: post and telecommunications (NACE 64); information technology including software development (NACE 72); and R&D services (NACE 73). The performance of the Oslo Region on this indicator is about twice as large as the EU average (3.6 percent) and more than twice as large as the Norwegian average (2.52 percent). The best region in EU had a percentage of 8.78.

Knowledge Creation

Figure 3-4: Public R&D expenditures (GERDR - BERDR) (percent of GDPR)



Source: Science and Technology Indicators for Norway, 2003

Gross domestic expenditure on R&D (GERD) is "…total intramural expenditure on R&D performed on the national territory during a given period" (Frascati Manual 2002, p. 121). We have used a regional distribution (equal 2. digit NUTS-level) of R&D intramural expenditures. The indicator is disaggregated by source of finance rather than the sector carrying out the R&D expenditure. This is in line with how EIS will define this indicator in the future. Most of the institutions that are financing R&D in Norway are located in the Oslo Region and in Trøndelag.

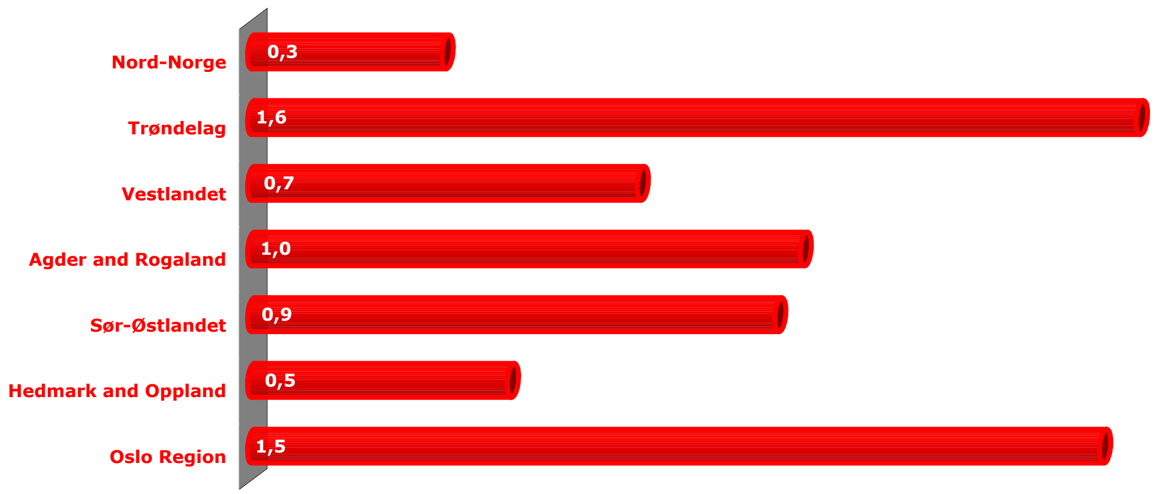
In international R&D statistical terms the institute sector includes units from governmental and private non-profit sectors, and also non-profit institutions performing R&D within the business enterprise sector. As the funding structure indicates, the institute sector serves both the private and the public sectors.

The GERD for the Oslo Region (GERDR) is 11 billion NOK (See Appendix D).

Business enterprise sector's financing of R&D (BERD) is defined as: "All firms, organisations and institutions whose primary activity in the market production of goods or services (other than higher education) for sale to the general public at an economically significant price [and] [t]he private non-profit institutions mainly serving them" (Frascati Manual 2002, p. 54).

The BERD for the Oslo Region (BERDR) is 5.7 billion NOK (see Appendix D) and GDPR for the Oslo Region is 378.3 billion NOK (see Appendix D). According to these figures public R&D expenditures in the Oslo Region amounts to 1.39 percent of the region's GDP (GDPR). In 2002 the EU region with the highest public R&D expenditure was 2.38 percent and the average for EU15 was 0.69 percent (EIS 2003).

Figure 3-5: Business expenditure on R&D (BERD) (percent of GDP)



Source: Science and Technology Indicators for Norway, 2003

Business expenditure on R&D (BERD) is defined as: "All firms, organisations and institutions whose primary activity in the market production of goods or services (other than higher education) for sale to the general public at an economically significant prise [and] the private non-profit institutions mainly serving them" (Frascati Manual 2002, p. 54).

For our purpose we use R&D expenditures disaggregated by source of finance and county carrying out R&D, and not by the sector financing the R&D. The main reason for this is the fact that the indicator was changed for the EIS in 2002, even though it was not taken into account in 2002 due to time constraints.

For this reason we use figures from the Science and Technology Indicators for Norway – 2003, and specially table A.2.6 (see the Appendix D). The BERD for the Oslo Region (BERDR) in percent of regional GDP (GDPR) can bee calculated as follows: Business R&D = (BERDR) = (Oslo county 3009,9 Mill NOK) + (Akershus county 2725,1 Mill. NOK)/(GDPR [year 2001] = 363 883 mill.kr) = 1.6 percent[12]. The best region within EU had a percentage of 5.3 percent and the average for EU15 was 1.3 percent (2002).

Patenting[13]

A notable aspect of the last Scoreboard exercise (2003) was that Norwegian patenting in high-technology sectors spiked against the EU average. Norwegian high-tech patenting as registered at the European Patenting Office shot up from under 70 applications in high tech sectors in 2000 to over 210 in 2001. This radical shift followed upon a decade of stable rise, and it corresponds to a shift from 15 high-tech applications per million population to about 50. The change entails that Norway went from well below the EU average to the well above it in a year.

The reason for the hop in this reported (EUROSTAT) data is not known. It is however safe to assume that the threefold change in a year (at the cusp of an economic conjuncture) does not correspond to a threefold increase in inventive activity. We expect there is a technical reason for the change. Furthermore, it has been pointed out (cf. last year's report) that there is also a more general reason to question the reliability of the picture that the EPO data gives of Norwegian inventive activity. This reason has to do with the fact that patent-applications filed with the European Patent Office (EPO) provide a fairly level basis on which to compare the patenting activity of EPC signatory states (26 in 2004), including all EU countries. As a result, the EPO increasingly acts as the natural channel for domestic applications in countries like Denmark, Finland and Sweden.

This does not go for Norway which is not an EPC contracting state. As a consequence, comparisons using EPO applications risk under-representing Norwegian patenting activity. The

[12] The figures for GERD (mill. NOK) and BERD (mill. NOK) are from Science and Technology Indicators for Norway – 2003, and the GDPR is from SSB- 2003 (http://www.ssb.no/emner/09/01/fnr/) See appendix D, table 8 and 9.

[13] This chapter is written by Eric Iversen, NIFU STEP

basis for comparison becomes somewhat biased because filing with the EPO is a different proposition for a Norwegian than for a national of an EPC state. This difference translates into a generally higher propensity for applicants within contracting states to use the EPC system than for applicants from outside jurisdictions. There are several reasons to expect a higher propensity within contracting states. A primary reason is that the applicant's home-market is within the EPC area. In this situation a basic EPO application is an immediate alternative to a domestic-application. The applicant will be inclined to file through the EPO (or Euro-PCT) routes especially in cases where he wants to extend the domestic application to other EPC states.

Norwegian applicants do not enjoy this home-court advantage. When the home-market is Norway, EPO does not represent an immediate alternative to the domestic application for the Norwegian applicant. In order show up in the EPO data, the applicant will basically have to apply at home and then seek an extension through the EPO (or the Euro-PCT), which is more expensive and more complicated than for EPC states. As a result, a greater proportion of a country's patenting activity will be reflected in the EPO data for a signatory state than for a non-signatory state like Norway.

Domestic Norwegian patenting

Since Norway is not an EPO member, it makes sense to use domestic patent data to get a better idea of high-tech patenting in Norway. The compatibility of this approach with EPO data is not optimal either, but it is expected to yield a more representative picture of the Norwegian high-tech patenting. In general the comparison is expected to overstate patent intensity in Norway in comparisons with the EPO levels of other countries. Any discrepancy is however expected to be lower than using Norwegian EPO patenting for reasons stated above.

In the following, the first two tables present the gross and per capita level of high tech and overall patenting in 2002 for Norway as a whole and for the Oslo Akershus area. The subsequent table compares the Oslo Akershus area against other Norwegian districts.

Table 3: Norwegian domestic high-tech patent applications per million (2001): fractional count based on inventors with Norwegian addresses.

High Tech Patent Applications: Domestic (No)			
	Applications	Population	Per million pop.
National level	148,72	4,552	32,67
Oslo Region	76,91	0,984	78,16

Source: NIFU STEP (Norwegian Patent Office data)

Provided that comparison with EPO patenting is accepted, this table puts the overall level of high-tech patent applications in Norway (32.7) just above the average of the EU15 (at 31.6) in 2001. According to the scoreboard, this places Norway just above the national level of France (30.3), Ireland (30.7) but below the UK (35.7). The levels for Denmark (42.1), Sweden (100.8), and Finland (136.1) are all higher.

The level of high tech patenting in Oslo Akershus is at 78 applications per million population in the moderate range for main cities. Oslo ranks above Southern European urban areas as well as main conurbations in Austria or Belgium. In these terms the Oslo area is in line with the French capital area (80), the British South East (74), as well as Dresden (76) and Övre Norrland (78). Meanwhile, several European areas far surpasses Oslo in intensity. Brabant in the Netherlands is four times as high (341), Finnish Uusimaa (Helsinki) (286) and Stockholm (245) three times. In all, four regions in Sweden, five in Germany, and three in Finland are well above the level of Oslo. Without considering factors that might affect patent intensity, the level of high tech patenting in Oslo Akershus can therefore be characterized as moderate.

Table 4: All Norwegian domestic patent applications (2001): fractional count based on inventors with Norwegian addresses.

All Domestic Applications			
	Applications	**Population**	**Per million pop.**
National level	1296,7	4 552 255	284,8
Oslo Region	412,3	984 000	419,0

Source: NIFU STEP (Norwegian Patent Office data)

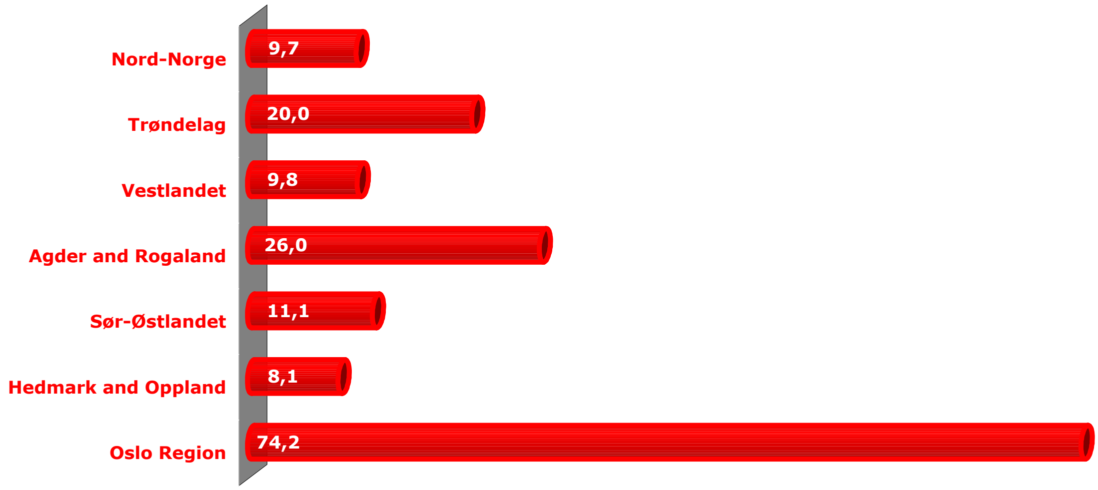
This measure puts the overall patenting level of Norway (284.9) significantly above the European average (EU15, 167.1). The Norwegian level is above the Netherlands, (242.7), Denmark (211.1) and Luxembourg (211.3), but below the exceptional levels of Sweden (366.6) and Finland (337.8).

The overall level of patenting in Oslo Akershus is on line with Southern Sweden and ranks among the top 13 areas in Europe in terms of patent intensity. It is worth repeating the caveat that this comparison is based on two different types of data (Norwegian domestic patents as against EPO patenting) and should be interpreted with care. The comparison is expected to overstate patent intensity in Norway, not least since we know that many of the Norwegian patents to the domestic Patent Office are applied by individuals, more than half of whom may later retract the application (Cf Iversen 2003).

Regional comparison

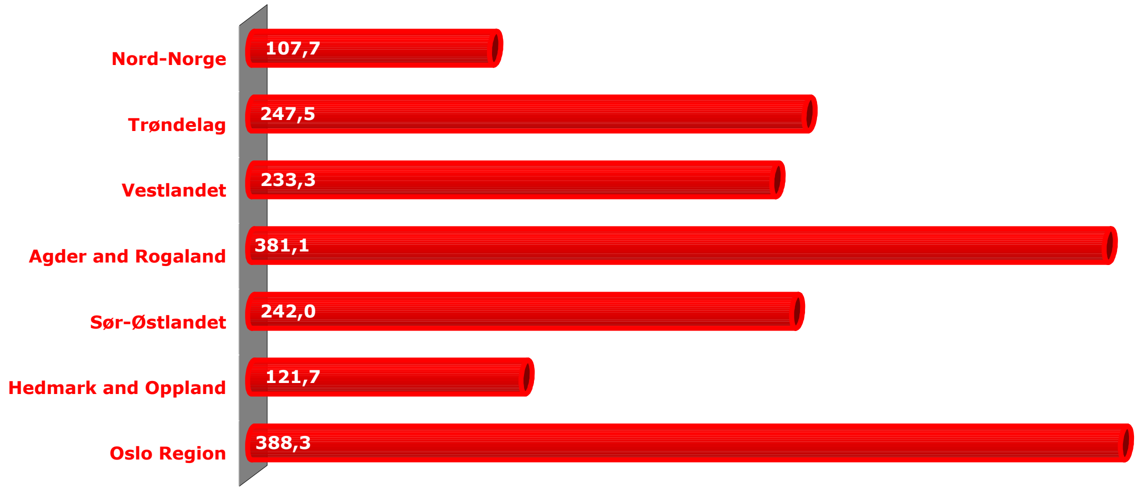
The level of patenting in the Oslo Region is 388.3 'NPO patents application per million population' and 74.2 'NPO high-tech applications per million population'. The best EU regions have respectively 824.2 EPO patent applications and 824.2 EPO high-tech patent application per million population (see figure below). We must emphasis that this comparison is based on two different types of data (Norwegian domestic patents against EPO patenting) and should be interpreted with care.

Figure 3-6: NPO high-tech patent applications (per million population), 2002



Source: NIFU STEP (Norwegian Patent Office data)

Figure 3-7: NPO patent applications (per million population), 2002



Source: NIFU STEP (Norwegian Patent Office data)

A comparison of Norwegian areas indicates that general patent intensity for Oslo Akershus (the general level of patent applications per million population for) was the country's highest in 2002, closely followed by Agder and Rogaland. In terms of high tech patenting, Oslo was the clear national centre according to this measure.

Table 5: Norwegian patent applications (high tech and all applications) at the NUTS2 level per million pop: fractional count (2002)

2002	Applications			Applications per million	
Regions	Hi-Tech	All	Pop (2002)	Hi-Tech	All
Oslo Region	74,25	388,55	1,00	74,20	388,28
Hedmark and Oppland	3,00	45,24	0,37	8,07	121,66
Sør-Østlandet	9,79	213,07	0,88	11,12	241,98
Agder and Rogaland	16,82	246,71	0,65	25,98	381,06
Vestlandet	7,75	185,02	0,79	9,77	233,25
Trøndelag	7,90	97,97	0,40	19,96	247,53
Nord-Norge	4,48	49,82	0,46	9,68	107,67
Mean	17,71	175,20	0,65	22,68	245,92

Source: NIFU STEP / Norwegian Patent Office data

Knowledge diffusion

The indicators under this chapter are based on the Community Innovation Survey (CIS3) for Norway in the period 1999-2001. This data is collected every fourth year and the preceding CIS1 and CIS2 surveys were carried out in respectively 1993 and 1997. In practice the Norwegian CIS3 survey is carried out by a stratified sample and the strata is made for 5 size classes and for each NACE Division (with Groups 74.2 and 74.3 as exceptions). The response rate for Norway was 94 percent. This high response rate is due to the fact that the data collection itself was done compulsory by postal surveys, with several reminders (3 postal, 1 telephone).

Innovation in the CIS3 survey is defined as a new or significantly improved product (goods or services) introduced to the market, or the introduction of a new or significantly improved process within an enterprise. Innovations are based on the results of new technological developments, new combinations of existing technology or the utilisation of other knowledge acquired by the enterprise. Innovations may be developed by the innovating enterprise or by another enterprise; however, purely selling innovative goods or services produced and developed by other enterprises is not included as an innovation activity. Innovations should be new to the enterprise concerned; for product innovations they do not necessarily have to be new to the market and for process innovations the enterprise does not necessarily have to be the first to have introduced the process.

The propensity to innovate is a ratio that measures the number of enterprises with some form of innovation activity (including enterprises with only on-going or abandoned innovation activity) compared to the total enterprise population. Successful innovators are defined as enterprises that completed at least one product or process innovation between 1999 and 2001.

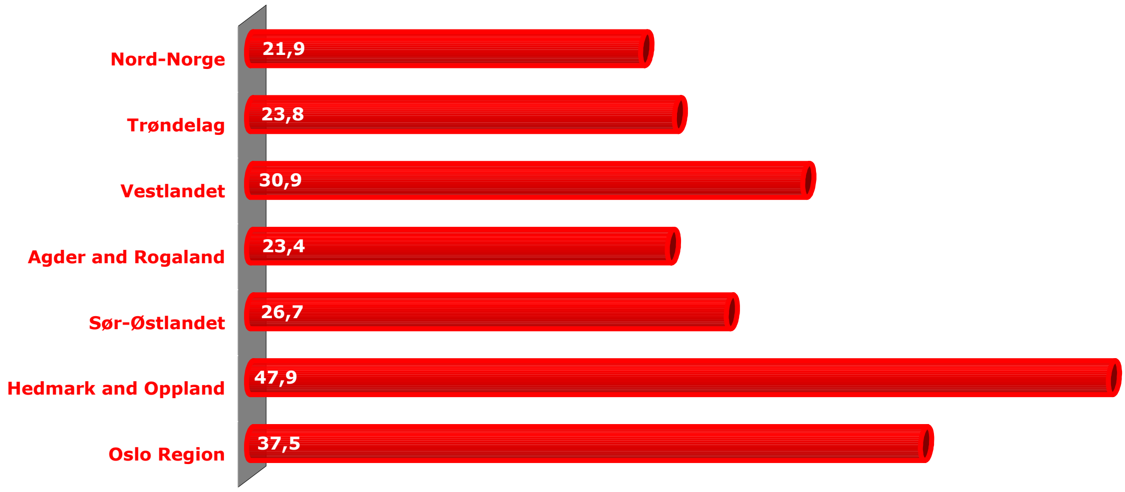
Successful innovators are divided by the CIS3 survey into three different groups according to the different types of innovation they carried out: product only innovators; process only innovators and both product and process innovators.

Figure 3-8: Share of innovative enterprises (percent of all manufacturing enterprises)

Source: SSB and NIFU STEP

The share of innovative enterprises in percent of all enterprises in manufacturing in the Oslo Region was according to CIS3 40 percent. The best region in EU15 had a share of 92 percent (EUROSTAT, CIS3).

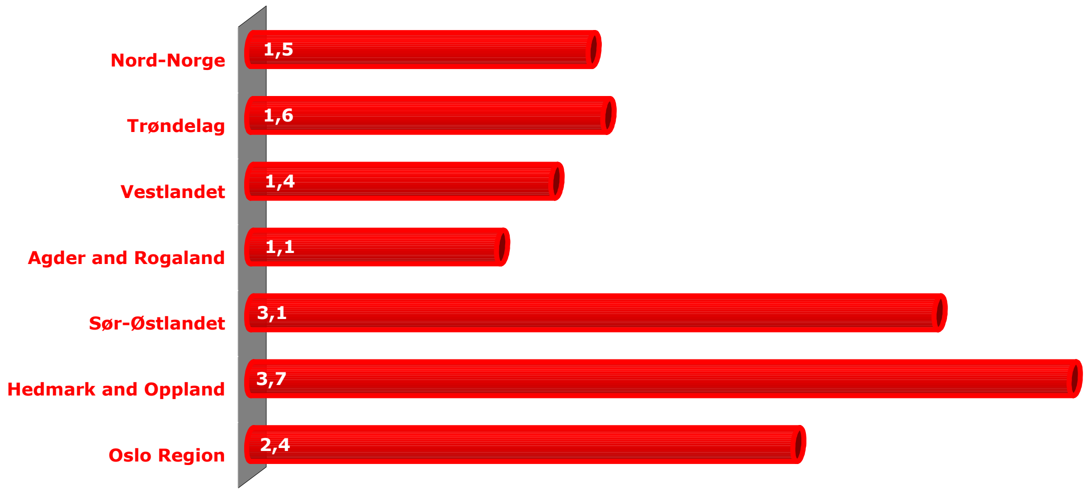
Figure 3-9: Share of innovative enterprises (percent of all service enterprises)



Source: SSB and NIFU STEP

Shares of services enterprises involved in innovation in the Oslo Region was according to CIS3 approximately 38 percent. In 2002 the best region had a share of innovative services enterprises at 100 percent (EUROSTAT, CIS3).

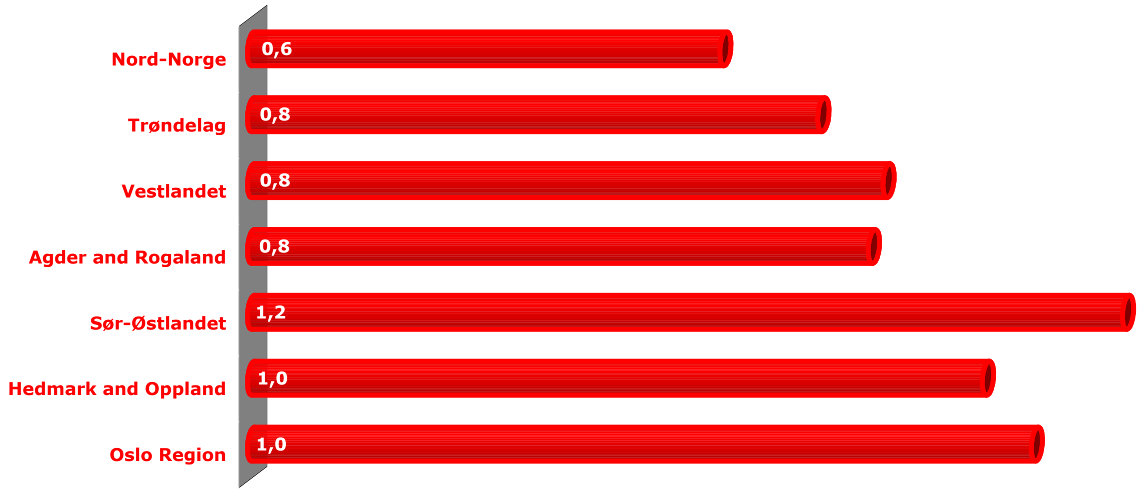
Figure 3-10: Innovative expenditures (percent of all turnover in manufacturing)



Source: SSB and NIFU STEP

Innovative expenditure as percent of total turnover in manufacturing for the Oslo Region was 2.4 percent (2003). In 2002 the best region in EU15 was 12.4 percent (EUROSTAT, CIS3) and the EU15 average was 3.45 percent (EIS 2003).

Figure 3-11: Innovative expenditures (percent of all turnover in services)

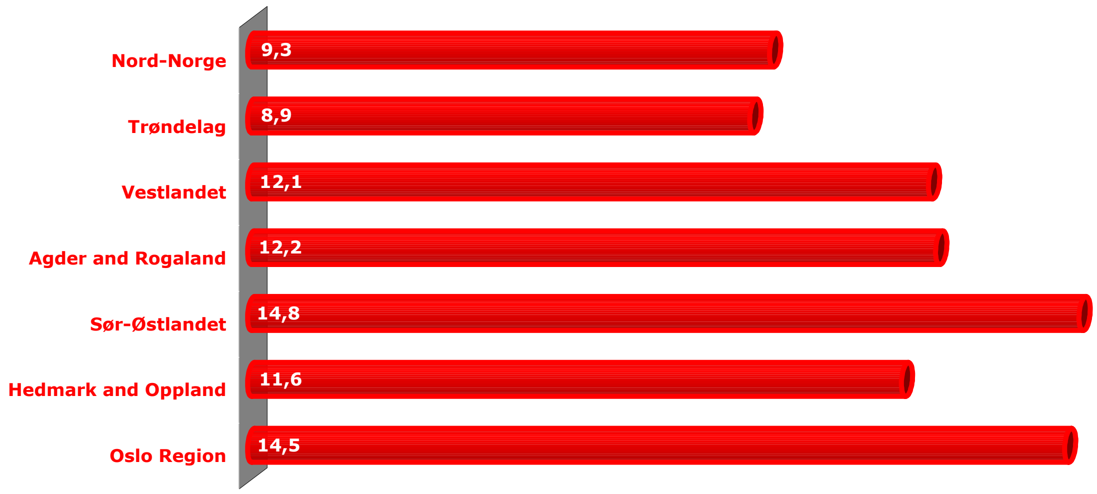


Source: SSB and NIFU STEP

Innovative expenditure in percent of total turnover in services for the Oslo Region was 1.0 percent according to CIS3 (2003). In 2002 the best region in EU15 was 23.5 percent (EUROSTAT, CIS3) and the EU15 average was 1.83 percent (EIS 2003).

Innovation, finance, output and markets

Figure 3-12: Sales of 'new to the firm but not new to the market' products (in percent of all turnover in manufacturing)



Source: SSB and NIFU STEP

CIS3 results for Norway and the Oslo Region show that in manufacturing 14.5 percent of total turnover stems from new or improved products to the firm. In CIS3 for EU15, the average was 28.6 percent and the best region was 66 percent.

4 Concluding remarks

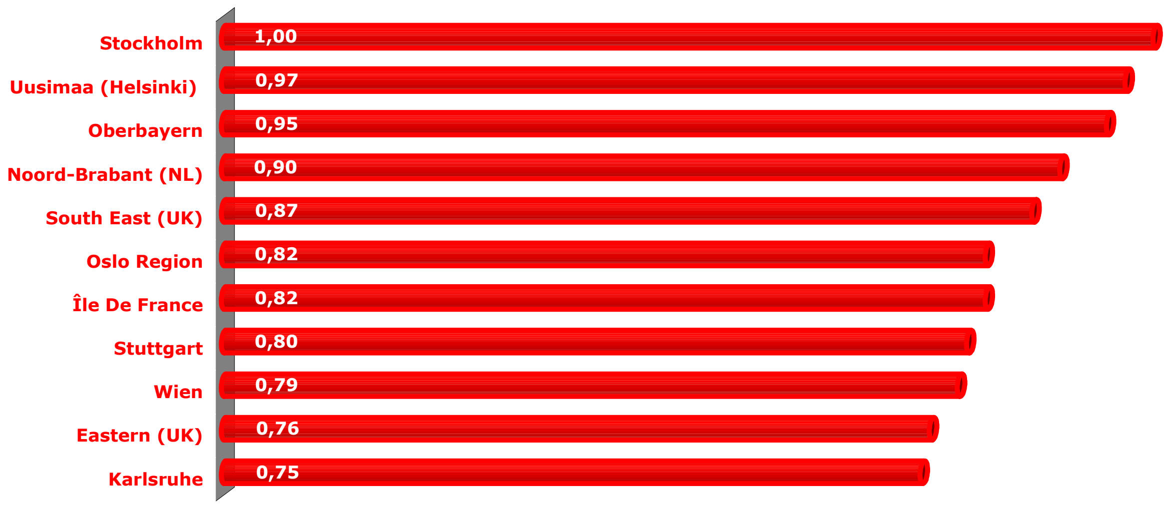
The Revealed Regional Summary Innovation Index for the Oslo Region (RRSII)

We have assembled all the indicators needed to calculate the RRSII (Revealed regional summary innovation index). The index is calculated according to the method described in '2003 European Innovation Scoreboard – Technical paper No 3: Regional innovation performances' and which is reproduced in chapter 2 (see also appendix E, F, G and H for more detailed calculation).

This index locates local leaders by taking into account both the region's relative performance within the EU and the region's relative performance within the country at a NUT 2 level. Since Norway is not included in EUROSTATs efforts to make this regional index we have by following their approach been able to compare the Oslo Region with other regions throughout Europe (EU15).

On the basis of our data, the RRSII-index for the Oslo Region is 0.82. This is a high score and puts the region on 6th place on the ranking over 'local innovation leaders' among European regions. Compared to last year the Oslo Region has dropped two places from 4th to 6th place.

Figure 4-1: European top ten innovative regions



Source: NIFU STEP / CIS / EUROSTAT / SSB

To compose the index we have used 13 Regional indicators at a NUTS 2 level within 5 main drivers and outputs of innovation: Human resources; Knowledge creation; Patenting; Knowledge diffusion and Innovation finance, output and markets.

Regarding 'Population with tertiary education' the Oslo Region (39.9 percent) is close to the result for the best region in EU (41.7 percent) and nearly twice as large as the average for EU (21.5 percent). When it comes to 'Employment in medium high-and high-tech manufacturing' the Oslo Region has 2.3 percent of its workforce within these sectors. This is far from the best region in EU (21.3 percent) and below the EU average (7.1 percent). Further, 6.8 percent of the workforce in the Oslo Region is within 'Employment in high-tech services'. The performance of the Oslo Region on this indicator is about twice as large as the EU average (3.6 percent), but below the best region in EU (8.8 percent).

'The public R&D expenditure' in the Oslo Region is 1.4 percent of the regional gross domestic product (GDPR). This score is about twice as large as the EU average (0.69 percent), but below the best region in EU (2.38 percent). 'Business expenditure on R&D' in percent of GDPR for the Oslo Region is 1.5 percent. The best region within EU on this indicator had a percentage of 5.3 and the average for EU15 was 1.3 percent.

The level of patenting in the Oslo Region is 388.3 'NPO patents application per million population' and 74.2 'NPO high-tech applications per million population'. The best EU regions have respectively 824.2 EPO patent applications and 824.2 EPO high-tech patent application per million population. We must emphasis that this comparison is based on two different types of data (Norwegian domestic patents against EPO patenting) and should be interpreted with care.

'The share of innovative enterprises' in manufacturing and service in percent of all manufacturing and service enterprises in the Oslo Region is respectively 40.3 percent and 37.5 percent. The corresponding EU numbers varies from 0-92 percent within manufacturing, and from 0-100 percent within service. 'Total innovation expenditure in manufacturing and services' as a percentage of total turnover for the Oslo Region is respectively 2.4 percent in manufacturing (the best EU is 12.4 and the average is 3.45) and 1 percent in services (the best EU region is 23.5 percent and the EU average is 1.83).

CIS3 results for Norway and the Oslo Region show that in manufacturing 14.5 percent of total turnover stems from products which are 'new or improved to the firm'. In CIS3 for EU the average on this indicator is 28.6 percent and the best EU region is 66 percent.

The NUTS 2 classification has been used for determining the level of regional analysis[14]. The NUTS classification contains several problems for analyzing the innovative capabilities of regions. First there are large discrepancies in the size of regions (in terms of population and economic output), both within regions and between countries. This may create anomalies, such as a small region comparatively well on a given indicator because of a single innovative firm or public research institute being based there. Second, a few countries have very few regions. This places these regions at a serious disadvantage in analysis of leading regions. A country like France with

14 See www.europa.eu.int/comm.EUROSTAT/ramon/nuts/ for NUTS 2 level for the EU15. For Norway see Appendix C.

22 regions thus has a higher probability of turning out with a leading region for one or more indicators than a country such as Belgium with only 3 regions.

The RRSII result for the Oslo Region may also be biased due to comparison of data across different years and various sources for the Oslo Region and the EU15 regions.

The main objective of this report has been to compose and calculate the RRSII index for the Oslo Region. The innovation scoreboard index is an indication of the potential for economic growth in this region, but doesn’t say anything about the actual economic performance.

Appendix A: European Innovation Scoreboard (EIS): Definitions

This appendix presents an overview of the definitions and interpretations used in the European Innovation Scoreboard (EIS), which is the basis for the production of the Oslo Innovation Scoreboard (OIS).

Population with tertiary education (percent of 25 - 64 years age class)

Definition

Numerator: Number of persons in age class with some form of post-secondary education (ISCED 5 and 6). Denominator: The reference population is all age classes between 25 and 64 years inclusive.

Source: EUROSTAT: Labour Force Survey.

Interpretation

This is a general indicator of the supply of advanced skills. It is not limited to science and technical fields because the adoption of innovations in many areas, particularly in the service sectors, depends on a wide range of skills. Furthermore, it includes the entire working age population, because future economic growth could require drawing on the non-active fraction of the population. International comparisons of educational levels however are notoriously difficult due to large discrepancies in educational systems, access, and the level of attainment that is required to receive a tertiary degree. Therefore, differences among countries should be interpreted cautiously.

Participation in life-long learning (percent of 25 - 64 years age class)

Definition

Numerator: Life-long learning is defined as participation in any type of education or training course during the four weeks prior to the survey. Education includes both courses of relevance to the respondent's employment and general interest courses, such as in languages or arts. It includes initial education, further education, continuing or further training, training within the company, apprenticeship, on-the-job training, seminars, distance learning, and evening classes.

Denominator: The reference population is all age classes between 25 and 64 years inclusive.

Source: EUROSTAT: Structural indicator
I.5.1.http://europa.eu.int/newcronos/suite/info/notmeth/en/theme1/strind/emploi_ll_sm.htm

Interpretation

A central characteristic of a knowledge economy is continual technical development and innovation. Under these conditions, individuals need to continually learn new ideas and skills - or to participate in life-long learning. All types of learning are valuable, since it prepares people for "learning to learn". The ability to learn can then be applied to new tasks with social or economic benefits. The limitation of the indicator to a brief window of four weeks could reduce comparability between countries due to differences in adult education systems. Little is known at this time about such differences, but differences in the timing of national holidays, preferred times for adult education courses, the average length of adult courses, and other unknown factors could influence the results and reduce comparability. Technical Paper No 5 of the 2002 EIS further elaborates on the issue of "Lifelong Learning for Innovation".

Employment in medium-high and high-tech manufacturing (percent of total workforce)

Definition

Numerator: Number of employed persons in the medium-high and high-technology manufacturing sectors. These include chemicals (NACE 24), machinery (NACE 29), office equipment (NACE 30), electrical equipment (NACE 31), telecommunications and related equipment (NACE 32), precision instruments (NACE 33), automobiles (NACE 34), and aerospace and other transport (NACE 35).

Denominator: The total workforce includes all manufacturing and service sectors.

Source: EUROSTAT: Labour Force Survey.

Interpretation

The percentage of employment in medium-high and high technology manufacturing sectors is an indicator of the share of the manufacturing economy that is based on continual innovation through creative, inventive activity. The use of total employment gives a better indicator than using the share of manufacturing employment alone, since the latter will be affected by the hollowing out of manufacturing in some countries.

Employment in high-tech services (percent of total workforce)

Definition

Numerator: Number of employed persons in the high-technology services sectors. These include post and telecommunications (NACE 64), information technology including software development (NACE 72), and R&D services (NACE 73).

Denominator: The total workforce includes all manufacturing and service sectors.

Source: EUROSTAT: Labour Force Survey.

Interpretation

The high technology services both provide services directly to consumers, such as telecommunications, and provide inputs to the innovative activities of other firms in all sectors of the economy. The latter can increase productivity throughout the economy and support the diffusion of a range of innovations, particularly those based on ICT.

Public R&D expenditures (GERD - BERD) (percent of GDP)

Definition

Numerator: Difference between GERD (Gross domestic expenditure on R&D) and BERD (Business enterprise expenditure on R&D). Both GERD and BERD according to Frascati-manual definitions, in national currency and current prices. This definition is a proxy of public R&D expenditures as it also includes the R&D expenditures from the Private Non Profit (PNP) sector.

Denominator: Gross domestic product as defined in the European System of Accounts (ESA 1995), in national currency and current prices.

Source: EUROSTAT: R&D Statistics. OECD: Main Science and Technology Indicators. Note: This indicator is identical to the difference between indicators 1 and 3 in "Investing in Research: an Action Plan for Europe" (SEC(2003): 489).

Interpretation

In addition to the production of basic and applied knowledge in universities and higher-education institutions, publicly funded research offers several other outputs of direct importance to private innovation: trained research staff and new instrumentation and prototypes.

Business expenditures on R&D (BERD) (percent of GDP)

Definition

Numerator: All R&D expenditures of the business sector (manufacturing and services), according to the Frascati-manual definitions, in national currency and current prices.

Denominator: Gross domestic product as defined in the European System of Accounts (ESA 1995), in national currency and current prices.

Source: EUROSTAT: R&D Statistics. OECD: Main Science and Technology Indicators. Note: This indicator is identical to indicator 3 in "Investing in Research: an Action Plan for Europe" (SEC(2003): 489).

Interpretation

The indicator captures the formal creation of new knowledge within firms. It is particularly important in the science-based sectors (pharmaceuticals, chemicals and some areas of electronics) where most new knowledge is created in or near R&D laboratories.

EPO high-tech patent applications (per million population)

Definition

Numerator: Number of patents applied for at the European Patent Office (EPO), by date of filing. The national (and regional) distribution of the patent applications is assigned according to the address of the inventor. The high technology patent classes include (see Annex A for a full list of IPC subclasses): 1) Computer and Automated Business Equipment: B41J, G06, G11C; 2) Micro-organism, genetic engineering: C12M, C12N, C12P, C12Q; 3) Aviation: B64; 4) Communications: H04; 5) Semiconductors: H01L; 6) Laser: H01S.

Denominator: Total population as defined in the European System of Accounts (ESA 1995).

Source: EUROSTAT. Note: This indicator is identical to indicator 13 in "Investing in Research: an Action Plan for Europe" (SEC(2003): 489).

Interpretation

This indicator complements indicator 2.2 on business R&D in that patenting captures new knowledge created anywhere within a firm and not just within a formal R&D laboratory. The indicator also measures specialisation of knowledge creation in fast-growing technologies. For some countries the absolute numbers of high-tech patent applications are so small, that the relative level of performance is both close to zero and highly unstable over time. For these countries overall patent performance (cf. indicator 2.4.1) might be a better proxy for relative performance.

The following IPC subclasses are included:

- B41J: typewriters; selective printing mechanisms, i.e. mechanisms printing otherwise than from a form; correction of typographical errors
- G06C: digital computers in which all the computation is effected mechanically
- G06D: digital fluid-pressure computing devices
- G06E: optical computing devices
- G06F: electric digital data processing
- G06G: analogue computers
- G06J: hybrid-computing arrangements
- G06K: recognition of data; presentation of data; record carriers; handling record carriers
- G06M: counting mechanisms; counting of objects not otherwise provided for
- G06N: computer systems based on specific computational models
- G06T: image data processing or generation, in general
- G11C: static stores
- B64B: lighter-than-air aircraft
- B64C: aeroplanes; helicopters
- B64D: equipment for fitting in or to aircraft; flying suits; parachutes; arrangements or mounting of power plants or propulsion transmissions
- B64F: ground or aircraft-carrier-deck installations
- B64G: cosmonautics; vehicles or equipment therefore
- C12M: apparatus for enzymology or microbiology
- C12N: micro-organisms or enzymes; compositions thereof; propagating, preserving, or maintaining micro-organisms; mutation or genetic engineering; culture media
- C12P: fermentation or enzyme-using processes to synthesize a desired chemical compound or composition or to separate optical isomers from a racemic mixture
- C12Q: measuring or testing processes involving enzymes or micro-organisms
- H01S: devices using stimulated emission
- H01L: semiconductor devices; electric solid state devices not otherwise provided for
- H04B: transmission
- H04H: broadcast communication
- H04J: multiplex communication
- H04K: secret communication; jamming of communication
- H04L: transmission of digital information, e.g. telegraphic communication
- H04M: telephonic communication
- H04N: pictorial communication, e.g. television
- H04Q: selecting

- H04R: loudspeakers, microphones, gramophone pick-ups or like acoustic electromechanical transducers; deaf-aid sets; public address systems
- H04S: stereophonic systems

EPO patent applications (per million population)

Definition

Numerator: Number of patents applied for at the European Patent Office (EPO), by date of filing. The national distribution of the patent applications is assigned according to the address of the inventor.

Denominator: Total population as defined in the European System of Accounts (ESA 1995).

Source: EUROSTAT: Structural indicator II.5.1.
http://europa.eu.int/newcronos/suite/info/notmeth/en/theme1/strind/innore_pat_sm.htm

Note: This indicator is identical to indicator 12 in "Investing in Research: an Action Plan for Europe" (SEC(2003): 489).

Interpretation

This indicator covers all patent applications at the EPO and complements indicator 2.3.1 on high-tech patenting.

Share of innovative enterprises (percent of all manufacturing/service enterprises)

Definition

Numerator: Sum of enterprises that have had any kind of innovation activity during

the survey period, i.e. have introduced or implemented new products and/or processes, had abandoned innovation activity, or had on-going innovation activity at the end of the reference

period.

Denominator: Number of innovative enterprises in percent for all enterprises in manufacturing/ service.

Innovation expenditures (percent of all turnover in manufacturing/services)

Definition

Numerator: Sum of total innovation expenditure for all manufacturing/services enterprises. Innovation expenditures includes the full range of innovation activities: in-house R&D, extramural R&D, machinery and equipment linked to product and process innovation, spending to acquire patents and licenses, industrial design, training, and the marketing of innovations.

Denominator: Total turnover for manufacturing/services. This includes firms that do not innovate, whose innovation expenditures are zero by definition. Manufacturing refers to section D of NACE, services to sections G+I+J+K of NACE.

Source: EUROSTAT: 3rd Community Innovation Survey (CIS-3). National sources. Note: All enterprises with 10 or more employees are included. As CIS-2 covered enterprises with 20 or more employees only, a direct comparison with the results in older Scoreboard publications is not possible (cf. 1st and 3rd graph below).

Interpretation

This indicator measures the total innovation expenditure as a percentage of total turnover. Several of the components of innovation expenditure, such as investment in equipment and machinery and the acquisition of patents and licenses, measure the diffusion of new production technology and ideas. Overall, the indicator measures total expenditures on many different activities of relevance to innovation. The indicator partly overlaps with indicator 2.2 on R&D expenditures. A better version would exclude R&D, but concerns over data reliability have prevented this option.

Sales of 'new to the firm but not new to the market' products (percent of turnover in manufacturing and percent of turnover in services)

Definition

Numerator: Sum of total turnover of new or significantly improved products to the firm but not to the market for all manufacturing/services enterprises.

Denominator: Total turnover for manufacturing/services. Manufacturing refers to section D of NACE, services to sections G+I+J+K of NACE.

Source: EUROSTAT: 3rd Community Innovation Survey (CIS-3). National sources. Note: All enterprises with 10 or more employees are included.

Interpretation

CIS-2 results have shown that, in manufacturing, 31percent of turnover is from products “new or improved for the firm”, while only 7percent is from products that were “new or improved to the market” (EUROSTAT, Community Innovation Survey 1997/1998: Innovating Enterprises. Statistics in Focus, Theme 9 - 2/1999). The difference of 24percent shows the importance of innovation as diffusion versus innovation as creation.

Appendix B: Norwegian R&D statistics and data sources

Norwegian R&D statistics[15]

In Norwegian R&D statistics, manpower and expenditure are classified in relation to three sectors of performance: (1) The industry sector, which includes companies, i.e. units producing goods or services for sale on the open market; (2) the higher education sector, which includes universities (and teaching hospitals), university colleges, and state colleges; and (3) the institute sector, which includes research institutes and other R&D-performing units not included in the two other sectors.

Most of the R&D in this sector is performed in units with R&D as their main activity, i.e. research institutes. The remaining units have other main objectives, R&D only make up a smaller share of their total activities. Examples of such units include administrative agencies, industry associations, and museums. Non-teaching hospitals are also classified as being part of the institute sector.

Of the total capital used for R&D in Norway in 2001 (NOK 24.5 bill.), the institute sector accounted for almost NOK 5.6 billion, or close to one fourth of the total, with an R&D staff of 9300 performing 7000 R&D full-time equivalents. R&D expenditure in the institute sector was slightly smaller than in the higher education sector (with NOK 6.3 billion or 26 percent). The industry sector is by a huge margin the largest R&D performing sector with expenditures of NOK 12.6 billion or 52 percent of the total.

Data sources

To examine the possibilities to develop comparable set of indicators to those used in the Regional Innovation Scoreboard, we will use some other data sources to those that has been employed by the Trend Chart on Innovation.

Register data

In Norway, each individual and each organisation (enterprise; establishment) has unique identification numbers, which is used in a variety of administrative and statistical registers. The

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15 The description of the institute sector is taken from NIFU STEPs homepage: http://www.nifu.no/instkat/enginst/enginst.html

main administrative registers used are population registers, taxation registers, social security registers, registers of building and dwellings, business and examination registers. Using the population registers one might either use work municipality or living municipality as the geographic variable. In this report we use work municipality, i.e. the municipality in which the persons are working, as the geographical variable. In this report we use other basic data than European Trend Chart on Innovation. In this paper we use register data and not Labour Force Survey (LFS), because of a better quality. This concerns indicator 1, 3 and 4 in this report (see chapter 1).

Educational classification

The basic classification is the international Standard classification of Education (ISCED). Norway has its own classification system that is more detailed but fully compatible with ISCED. In this report we have used the Norwegian Standard for practical reasons. The relation between ISCED and the Norwegian standard are roughly described in the table below:

Table 6: The International Standard Classification of Education roughly compared with the Norwegian Standard.

	From year	To year	Norway	ISCED
Primary school	1	6	100000	10000
Secondary school	7	9	200000	20000
High-school, level I	10	10	300000	30000
High-school, level II	11	12	400000	30000
University level I (one or two years)	13	14	500000	50000
University level II (three or four years)	15	16	600000	60000
University level III (more than four years)	17	18	700000	70000
Ph.D., research competence	18		800000	70000

The Norwegian standard is different from ISCED on high school level for reasons that are of no importance in this context, since we will concentrate on people with at least twelve years of formal education (ISCED 5 and 6). The Norwegian – as most national standards – in contrast to ISCED do differentiate people with Ph.D.'s from the highest "normal" academic degree. But for the purposes of this chapter, we do not need this level of detail[16]. The Norwegian classification code is 6-digit and ISIC is 5-digit, but in most analysis only the first digit – the level of education and the second digit – the main field of education is used. The classification allows analysis of very specific educational groups using all the digits (subdivisions).

[16] Since the "modern", Anglo-American Ph.D. became a part of our university education the last ten years, the number of Ph.D.s has "exploded" one has to do a more detailed analyses not to get misleading results when it comes to number of Ph.D.s in various branches etc.

Industrial classification

The level of detail of the NACE classification applied in this report is 2-digit NACE and is used for all selected sectors.

This paper brings accurate and recent statistics on employment in the Oslo Region. The region is defined as the two counties Oslo and Akershus. It is very important to note that it is the persons working in these two counties that constitute the population. This means that the numbers will only be roughly comparable to most other official statistics because they are normally made on the basis of the counties in which people live.

R&D-statistics

Statistics relating to Norwegian R&D are produced every second year, commissioned by the Research Council of Norway, and follow the statistical guidelines of the OECD. Statistical surveys are carried out for all the three sectors of R&D performance. Statistics Norway is responsible for compiling the R&D statistics for the Industry. NIFU STEP Studies of innovation, research and education is responsible for both the Higher Education sector and the Institute sector, as well as for merging the sectoral statistics into the national R&D statistics for Norway. The latest survey is from 2001 and we have used some of the results which are published in 'Science and Technology Indicators for Norway, 2003.

Norwegian Patent Application

Norway is not an EPO member and to get a better idea of patenting and high-tech patenting in Norway we will use domestic patent data for Norway, Norwegian Patent Office (NPO). The comparability between NPO and EPO is not optimal, but is expected to give a more representative picture of the Norwegian high-tech patenting, which we are going to use as an indicator (for a detailed discussion, see section on patenting in chapter 3).

Community Innovation Survey (CIS)

The community Innovation Survey (CIS) is the largest data collection exercise in the area of innovation in Europe, which provides comparable data gathered across more than 60 000 enterprises in the EU. The data is collected on a four-yearly basis. The CIS1 survey was carried out in 1993, the CIS2 survey was carried out in 1997/1998 and the latest CIS3 survey was implemented in 2000/2001. As with previous Community Innovation Surveys, CIS3 is based on the Oslo Manual (second edition from 1997) which gives methodological guidelines and defines the innovation concept. It should be mentioned that the CIS goes beyond the Technological product and process (TPP) innovation concept of the Oslo Manual and surveyed, for the first time, other kinds of innovation activity such as organisational innovation. The Oslo Manual is currently in the process of being revised.

Appendix C: NUTS 2 level for Norway

Table 7: NUTS 2 level for Norway

	NUTS 2 level	Norwegian Counties
NO01	Oslo og Akershus	Oslo, Akershus
NO02	Hedmark og Oppland	Hedmark, Oppland
NO03	Sør-Østlandet	Østfold, Buskerud, Vestfold, Telemark
NO04	Agder og Rogaland	Aust-Agder, Vest-Agder, Rogaland
NO05	Vestlandet	Hordaland, Sogn og Fjordane, Møre og Romsdal
NO06	Trøndelag	Sør-Trøndelag, Nord-Trøndelag
NO07	Nord-Norge	Nordland, Troms, Finnmark

Appendix D: R&D-expenditures by source of finance

Table 8: R&D-expenditures by source of finance, county and executing unit, 2001, mill NOK.

County	Grand Total	Businsess enterprise	Public funding	Other funding	Abroad
Østfold	651,2	406,0	98,2	10,4	136,6
Akershus	**4 260,9**	**2 725,1**	**1 081,7**	**88,8**	**365,1**
Oslo	**6 741,3**	**3 009,9**	**3 198,1**	**227,8**	**305,4**
Hedmark	134,6	89,1	44,3	0,6	0,7
Oppland	407,4	252,0	104,5	1,2	49,8
Buskerud	1 041,7	579,9	331,6	0,7	129,5
Vestfold	573,2	495,5	42,7	0,6	34,2
Telemark	399,6	288,3	75,9	3,8	31,7
Aust-Agder	605,7	594,1	10,3	0,2	1,1
Vest-Agder	230,7	126,0	92,2	7,5	5,0
Rogaland	1 157,9	825,5	182,1	14,8	135,5
Hordaland	2 711,2	857,6	1 646,0	69,7	137,8
Sogn og Fjordane	250,9	126,5	46,0	0,6	77,7
Møre og Romsdal	564,5	399,7	107,3	6,8	50,7
Sør-Trøndelag	3 211,2	1 296,1	1 613,8	78,1	223,2
Nord-Trøndelag	177,4	118,1	56,3	0,9	2,1
Nordland	296,4	180,5	110,0	1,6	4,3
Troms	968,7	129,1	760,3	24,3	55,2
Finnmark og Svalbard	84,9	15,5	56,2	1,1	12,3
Totalt	**24 469,4**	**12 514,5**	**9 657,6**	**539,3**	**1 758,0**

Source: Table A.2.6 in Science and Technology Indicators for Norway 2003, NIFU STEP, SSB

Table 9: Public R&D (GERD) and Business R&D in percent of Regional Gross Domestic product (GDPR), 2001.

		BERDR	GDPR (2001)	BERDR in % of GDPR	GERDR	GERD-BERD in percent of GDPR
NO01	Oslo og Akershus	5735	378265	1,52	11 002,2	1,39
NO02	Hedmark og Oppland	341,1	73793	0,46	542,0	0,27
NO03	Sør-Østlandet	1769,7	188675	0,94	2 665,7	0,47
NO04	Agder og Rogaland	1545,6	157161	0,98	1 994,3	0,29
NO05	Vestlandet	1383,8	199568	0,69	3 526,6	1,07
NO06	Trøndelag	1414,2	89424	1,58	3 388,6	2,21
NO07	Nord-Norge	325,1	93939	0,35	1 350,0	1,09

Appendix E: Regional indicators for the Oslo Region

Table 10: Regional indicators for the Oslo Region

Figures	NUTS 2 level	Tertiary education (%)	Lifelong learning (%)	Med/hi-tech employment in manufacturing (%)	High-tech employment in services (%)	Public R&D (%)	Business R&D	High-tech patent applications (per mill. pop)	Patent applications (per mill. pop)	Share of innovative manufacturing enterprises (%)	Share of innovative service enterprises (%)	Innovative expenditures manufactureing (%)	Innovative expenditures service (%)	Sales of 'new to the firm, but not new to the market' products (%)
No		1.2	1.3	1.4	1.5	2.1	2.2	2.3.1	2.4.1	Cis 1	Cis 2	Cis 3	Cis 4	Cis 5
Weight		1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	0,50	0,50	0,50	0,50	0,50
NO01	Oslo og Akershus	39,18 a	13,30 b	2,25 a	6,77 a	1,39 c	1,52 c	74,20 b	388,28 b	40,30 c	37,48 c	2,43 c	1,05 c	14,54 c
NO02	Hedmark og Oppland	24,47 a	13,30 b	2,97 a	2,28 a	0,27 c	0,46 c	8,07 b	121,66 b	38,54 c	47,93 c	3,66 c	0,98 c	11,64 c
NO03	Sør-Østlandet	26,24 a	13,30 b	6,58 a	2,14 a	0,47 c	0,94 c	11,12 b	241,98 b	39,05 c	26,68 c	3,06 c	1,17 c	14,79 c
NO04	Agder og Rogaland	29,15 a	13,30 b	6,69 a	2,73 a	0,29 c	0,98 c	25,98 b	381,06 b	37,81 c	23,40 c	1,11 c	0,83 c	12,25 c
NO05	Vestlandet	29,41 a	13,30 b	5,98 a	2,61 a	1,07 c	0,69 c	9,77 b	233,25 b	39,09 c	30,93 c	1,35 c	0,85 c	12,12 c
NO06	Trøndelag	30,15 a	13,30 b	2,57 a	3,80 a	2,21 c	1,58 c	19,96 b	247,53 b	29,72 c	23,79 c	1,58 c	0,76 c	8,94 c
NO07	Nord-Norge	28,33 a	13,30 b	1,42 a	2,20 a	1,09 c	0,35 c	9,68 b	107,67 b	24,36 c	21,92 c	1,52 c	0,63 c	9,29 c
Max EU15		41,66	25,20	21,24	8,78	2,38	5,27	341,90	824,20	92,00	100,00	12,40	23,50	66,00
Min EU15		4,84	0,13	0,10	0,29	0,00	0,00	0,10	0,70	0,00	0,00	0,00	0,00	0,00
Max EURSII	0,65													
Min EURSII	0,04													

Year of reference: a: 2003; b: 2002; c: 2001; d: 2000.

Appendix F: Detailed results of RNSII

Table 11: Detailed results of RNSII

RNSII	NUTS 2 level	Tertiary education	Lifelong learning	Med/hi-tech employment in manufacturing	High-tech employment in services	Public R&D	Business R&D	High-tech patent applications	Patent applications	Share of innovative manufacturing enterprises	Share of innovative service enterprises	Innovative expenditures manufactureing	Innovative expenditures service	Sales of 'new to the firm, but not new to the market' products	RNSII	RNSII-rescaled
No		1.2	1.3	1.4	1.5	2.1	2.2	2.3.1	2.4.1	Cis 1	Cis 2	Cis 3	Cis 4	Cis 5		
Weight		1,00	0,00	1,00	1,00	1,00	1,00	1,00	1,00	0,50	0,50	0,50	0,50	0,50		
NO01	Oslo og Akershus	1,00 a	0,00 b	0,16 a	1,00 a	0,58 c	0,95 c	1,00 b	1,00 b	1,00 c	0,60 c	0,52 c	0,77 c	0,96 c	0,80	1,00
NO02	Hedmark og Oppland	0,00 a	0,00 b	0,29 a	0,03 a	0,00 c	0,09 c	0,00 b	0,05 b	0,89 c	1,00 c	1,00 c	0,65 c	0,46 c	0,26	0,24
NO03	Sør-Østlandet	0,12 a	0,00 b	0,98 a	0,00 a	0,10 c	0,48 c	0,05 b	0,48 b	0,92 c	0,18 c	0,76 c	1,00 c	1,00 c	0,44	0,49
NO04	Agder og Rogaland	0,32 a	0,00 b	1,00 a	0,13 a	0,01 c	0,52 c	0,27 b	0,97 b	0,84 c	0,06 c	0,00 c	0,37 c	0,56 c	0,43	0,49
NO05	Vestlandet	0,34 a	0,00 b	0,87 a	0,10 a	0,41 c	0,28 c	0,03 b	0,45 b	0,92 c	0,35 c	0,09 c	0,41 c	0,54 c	0,38	0,41
NO06	Trøndelag	0,39 a	0,00 b	0,22 a	0,36 a	1,00 c	1,00 c	0,18 b	0,50 b	0,34 c	0,07 c	0,19 c	0,24 c	0,00 c	0,43	0,48
NO07	Nord-Norge	0,26 a	0,00 b	0,00 a	0,01 a	0,42 c	0,00 c	0,02 b	0,00 b	0,00 c	0,00 c	0,16 c	0,00 c	0,06 c	0,09	0,00

Year of reference: a: 2003; b: 2002; c: 2001; d: 2000.

Appendix G: Detailed results of RSII

Table 12: Detailed results of RSII

RSII	NUTS 2 level	Tertiary education	Lifelong learning	Med/hi-tech employment in manufacturing	High-tech employment in services	Public R&D	Business R&D	High-tech patent applications	Patent applications	Share of innovative manufacturing enterprises	Share of innovative service enterprises	Innovative expenditures manufactureing	Innovative expenditures service	Sales of 'new to the firm, but not new to the market' products	RSII	RSII-rescaled
No		1.2	1.3	1.4	1.5	2.1	2.2	2.3.1	2.4.1	Cis 1	Cis 2	Cis 3	Cis 4	Cis 5		
Weight		1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	0,50	0,50	0,50	0,50	0,50		
NO01	Oslo og Akershus	0,93 a	0,53 b	0,10 a	0,76 a	0,59 c	0,29 c	0,22 b	0,47 b	0,44 c	0,37 c	0,20 c	0,04 c	0,22 c	0,43	0,64
NO02	Hedmark og Oppland	0,53 a	0,53 b	0,14 a	0,23 a	0,11 c	0,09 c	0,02 b	0,15 b	0,42 c	0,48 c	0,29 c	0,04 c	0,18 c	0,24	0,32
NO03	Sør-Østlandet	0,58 a	0,53 b	0,31 a	0,22 a	0,20 c	0,18 c	0,03 b	0,29 b	0,42 c	0,27 c	0,25 c	0,05 c	0,22 c	0,28	0,39
NO04	Agder og Rogaland	0,66 a	0,53 b	0,31 a	0,29 a	0,12 c	0,19 c	0,08 b	0,46 b	0,41 c	0,23 c	0,09 c	0,04 c	0,19 c	0,30	0,42
NO05	Vestlandet	0,67 a	0,53 b	0,28 a	0,27 a	0,45 c	0,13 c	0,03 b	0,28 b	0,42 c	0,31 c	0,11 c	0,04 c	0,18 c	0,30	0,43
NO06	Trøndelag	0,69 a	0,53 b	0,12 a	0,41 a	0,93 c	0,30 c	0,06 b	0,30 b	0,32 c	0,24 c	0,13 c	0,03 c	0,14 c	0,36	0,52
NO07	Nord-Norge	0,64 a	0,53 b	0,06 a	0,22 a	0,46 c	0,07 c	0,03 b	0,13 b	0,26 c	0,22 c	0,12 c	0,03 c	0,14 c	0,24	0,33

Year of reference: a: 2003; b: 2002; c: 2001; d: 2000.

Appendix H: Results of RRSII

Table 13: Results of RRSII

Results	NUTS 2 level	RNSII	RSII	RNSII-rescaled	RSII-rescaledrs	RRSII
NO01	Oslo og Akershus	0,80	0,43	1,00	0,64	0,82
NO02	Hedmark og Oppland	0,26	0,24	0,24	0,32	0,28
NO03	Sør-Østlandet	0,44	0,28	0,49	0,39	0,44
NO04	Agder og Rogaland	0,43	0,30	0,49	0,42	0,45
NO05	Vestlandet	0,38	0,30	0,41	0,43	0,42
NO06	Trøndelag	0,43	0,36	0,48	0,52	0,50
NO07	Nord-Norge	0,09	0,24	0,00	0,33	0,16