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RCN in the Research and Higher Education Sector

Background report No 4 in the evaluation of the
Research Council of Norway

Erik Arnold
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Technopolis Group
December 2001

Reports in the evaluation of the Research Council of Norway

Synthesis report
Erik Arnold, Stefan Kuhlman and Barend van der Meulen, **A Singular Council? Evaluation of the Research Council of Norway**, Brighton: Technopolis, 2001

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Summary

About a quarter of Norway's R&D activity is done in the research institute sector and about the same proportion is undertaken in the universities and colleges. This report considers each in turn, although from somewhat different perspectives. RCN has strategic responsibility for much of the institute sector, while the universities and colleges need to be understood as more independent partners in research.

The 1992-93 white paper[1] on research defined the reform to create RCN and said that it should "take strategic responsibility for the research institute sector in Norway." This task was incorporated into paragraph 2 of RCN's statutes. The white paper emphasised the need for increased co-operation among R&D institutions, mobility, and merger and integration as means to improve the institutes' activities. The statutes define RCN's strategic responsibility as including the development of a more holistic policy for the institute sector, *inter alia* through its responsibility for providing core funding to the institutes and by providing advice to ministries funding institutes directly.

As about a quarter of Norway's R&D activity is done in the research institute sector, research institutes in Norway perform a proportion of total R&D, which is higher than in most other countries.[2] On a broad definition of 'institutes' there are now in excess of 200 in Norway. NIFU's catalogue of the institute sector[3] shows 133 – about a hundred of which have R&D as their main activity. The structure of the institute sector is little changed from the early 1990s, when its fragmentation was seen as one of the aspects that RCN should address.

In many respects, RCN's work with the institute sector has been strong. It has

- Brought increased transparency and clearer thinking to the question of base funding for the institutes
- Established a clear set of 'rules of the game' for state funding of research institutes

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1 St. meld. Nr. 43, *Et godt råd for forskning. Om endringer i forskningsrådsstrukturen*, 1991-92

2 There are no reliable international figures that allow comparison of different countries' R&D expenditures through research institutes. Research institute spending is an unidentified component of government research outside the higher education sector, in the OECD statistics, so it is mixed up with various other kinds of government R&D expenditure, including defence. A study of eight OECD countries based on 1987 data found that only Italy spent a greater part than Norway of its national R&D investment in the institutes. See Ole Wiig, *Forsknings og utviklingsarbeid i Norge og andre OECD-land*, 7/90, Oslo: NIFU, 1990

3 MIFU, *The Institute Sector in Norway: A Catalogue of Non-University Research Institutions*, Repoprt 21/98, Oslo: NIFU, 1998

- Established a mechanism for strategic influence over the development of the institutes, through the use of Stategic Institute Programmes
- Provided both base and project funding to the institutes, using processes which include quality checks and which test for links to user needs
- Established an improved set of indicators, making it more possible to understand the ongoing performance of the institute sector
- Improved the quality and consistency of research institute evaluations

However, RCN has been unable to

- Exert much influence over the structure and composition of the sector, for example through the rationalisation and encouragement of new types of institutes to appear. Thus, the problem of fragmentation remains little changed from 1990
- Extend its strategic role in relation to institutes closely managed by ministries (irrespective of whether these have been base funded through RCN or been among those institutes where RCN is supposed to play an advisory role only). Nor has it been able significantly to increase the proportion of institutes whose base funding is channelled through it. Unless and until these institutes are placed on a more independent footing, and required to seek more of their income in commercial and international markets, it is difficult to see how RCN can add value to these cases
- Become a respected partner of the institutes in the development of strategy
- Make evaluations of institutes have significant consequences, in terms of internal change or – eventually – altered funding levels
- Have a significant influence over the size of the research institute component of the research and innovation system, in different sectors
- Support a broadening of the scope of individual institutes by making available significant cross-divisional funding
- Persuade ministries to any significant degree to fund strategic initiatives beyond 'their' traditional institutes – for example, by taking a cross-sectoral approach to environmental questions
- Raise the international profile and publication rate of the sector

RCN has set in place most of the mechanisms it would need in order to achieve its institute goals. However, the amount of real change it has been able to cause in the sector is limited. The reason for this does not lie in RCN's performance but in the framework conditions. In practice, RCN does not have the power to cause major change because it lacks sufficient authority over institute budgets. The most hopeful area is the techno-industrial institutes, where RCN has freedom to alter the amount of funding it provides to individual institutes, and can itself decide how and where to allocate strategic resources. However, in this area, RCN's base funding provides a low share of the institutes' total income. The base funding issue is helpful, in that the institutes become market driven – and there is encouraging evidence that they are able to tackle international commercial markets, in addition to domestic ones. But the benefit of markets are inseparable from the market failures which drive market-led organisations towards short-term concerns. The tendency is that the role of the institutes as knowledge bearers and improvers of the national research and innovation system is negated. RCN needs sufficient leverage to counteract this

tendency. While it certainly has an influence over the techno-industrial institutes, which is disproportionate to the amount of money it provides, it is not clear that this influence is adequate.

Outside the techno-industrial area, RCN's real influence over what the institutes do with the money it provides tends to be weaker. In extreme cases, such as CMI, RCN does little more than act as a courier, taking base funding from the ministry to the institute. To a much greater extent than is reasonable, therefore, RCN has to try to exercise influence over the institute sector through persuasion rather than power. Unless a better balance is found it is difficult to see how RCN can achieve more rapid progress.

There has been very significant growth in the number of students attending university and college over the past 30 years. In recent years, university and college budgets have been strongly driven by student numbers. Staff have been recruited, who naturally have ambitions to conduct research, but the amount of research council money available to provide complementary funding has only very recently started to increase. In future, a new formula will be used which has separate components for infrastructure, research and student numbers. This appears likely to force more explicit management of these different income streams.

The universities' ability to modernise at the same pace as others in Europe has been constrained by their rather traditional governance models. These models make it hard to set priorities and develop strategies. Some of the universities are more flexible in this respect than others. All the universities operate with levels of commercial funding below European norms, partly reflecting the strength of the applied institutes but partly also reflecting choices made by some of the universities. The universities are much more active partners of the state than they are of industry.

RCN has been able to influence the development of university research capabilities to a certain extent through the use of strategic programmes, and the coming generation of RCN-funded centres of excellence will represent a useful continuation of this trend.

The university colleges, which were created by merging a large number of institutes of further and higher education in 1994, are slowly developing more research capabilities. There are wide differences within the population of university colleges in their ability to tackle research. RCN has done comparatively little to involve them in research funding and research policy.

There is a feeling in a number of the colleges that regional considerations should play a role in the allocation of research funds, so that these are allocated pro rata the number of inhabitants in the regions, rather than according to RCN's traditional research funding criteria. In our view, this is a dangerous confusion of regional and research policy. Decentralisation of the college infrastructure is a fully legitimate ambition of regional policy. However, reallocating research funding on regional policy principles will damage research environments in both central areas and the regions. The price of setting up a research-performing regionalised college infrastructure of a quality worth having necessarily includes the set-up costs involved in establishing research which is good enough to qualify for research

funding in competition with other research environments. The implication is that significant transitional funding is needed from regional policy budgets, where the benefits of the decentralised college infrastructure can be weighed against other potential uses of funds. To the extent that this is felt to be worthwhile, therefore, KRD could be a major research sponsor in a transitional period, using RCN as a means to obtain the needed quality control.

The RCN reform has meant comparatively little for the scientific colleges, which tend to have have close relationships with their ministry (and other) sponsors. Only if RCN can become more of an arena for deciding and implementing research policy will the 1993 reform mean much to them.

There are major policy challenges relating to the respective roles of the institutes and the higher education sector, which need urgently to be addressed. Elsewhere in this evaluation, we argue that there is a policy need to move the institutes significantly closer to the universities, and for some re-division of labour among the universities, institutes and industry. Mechanisms have not been put in place that would achieve this more drastic restructuring, but neither has this been one of RCN's goals. RCN itself clearly understands the need for change in the institute sector and is beginning to talk[4] in terms of merging institutes into larger entities, in order to reap the benefits provided by economies of scale and scope and to become more engaged in international research. Some of the institutes also understand the need to act and support these ideas.

A major review of the Norwegian institute structure is well overdue, and needs to be accompanied by measures which further de-couple the institutes from the ministries, if the sector is to evolve structures that can keep pace with accelerating change in knowledge production and in internationalisation. This means moving from the model of incrementalism into which RCN has been forced through lack of power to a mode where RCN and the institutes are empowered to make significant change.

Reform of governance in the universities should pave the way for a modernisation of that sector, not least in order to increase societal links. If the idea of a 'knowledge society' has any meaning at all, the comparative isolation of the Norwegian universities is not sustainable. This does not in any way mean that the universities have to give up long-term research and devote their entire efforts to helping small companies. Long- and shorter-term research issues are increasingly interrelated. Universities abroad have realised this and increased their engagement with shorter term issues, with interdisciplinary approaches, with problem-driven research and in partnerships with other knowledge producers in their national research and innovation systems. In order to compete in this changing situation, and in order to maintain their significance in knowledge production, the boundaries between the universities, the institutes and other knowledge producers and users need to become more flexible and more permeable. The governance structure of neither the universities nor RCN is sufficiently flexible to achieve this in a timely way. We recommend that this matter should be investigated as quickly as possible, so that adjustments can be made which will not only permit reform but also allow it to be implemented.

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[4] *Årsrapport 2000, Forskningsinstituttene Samplerapport*, Oslo: NFR

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RCN in the Research and Higher Education Sector

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1 Introduction

This background report to the evaluation of RCN explores the council's performance in relation to the research and higher education sector, which together conducts over half of Norway's R&D.

The 1992-92 white paper[5] on research defined the reform to create RCN and said that it should "take strategic responsibility for the research institute sector in Norway." This task was incorporated into paragraph 2 of RCN's statutes. The white paper emphasised the need for increased co-operation among R&D institutions, mobility, and merger and integration as means to improve the institutes' activities. The statutes define RCN's strategic responsibility as including the development of a more holistic policy for the institute sector, *inter alia* through its responsibility for providing core funding to the institutes and by providing advice to ministries funding institutes directly.

RCN itself set out its goals for the institute sector in its first strategy as

> The research institutes shall be efficient, competitive contract research organisations operating at high levels of professional quality, with sound finances and the capacity needed [to meet demand]. The institutes should co-operate actively with other institutes, universities and colleges, industry and government administration.

We have explored these questions using a mixture of background documentation and face to face interviews with research institutes, ministry and RCN personnel. We spoke with all the ministries except justice and defence, and to management at 21 Research Institutes inside and outside the RCN funding system.

RCN does not have strategic responsibility for the universities or the colleges. It has a general responsibility to help ensure that there is an appropriately sized and capable research community in Norway. It has a task (not embodied in the statutes) to help integrate the university colleges into the Norwegian research community, following the reform of 1994 (*Høyskolereformen*). This reform merged large numbers of small further and higher education colleges into 14 university colleges. The 14 university colleges are able to award degrees and have a mission to conduct research as well as to provide education. In order to understand RCN's role in the higher education sector, we interviewed members of the rectorates and university administration at all four universities, and rectors or senior administrators at three state colleges, six university colleges and one large private college.

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[5] St. meld. Nr. 43, *Et godt råd for forskning. Om endringer i forskningsrådsstrukturen*, 1991-92

2 The Research Institutes

2.1 Research Institutes in the Norwegian National Research and Innovation System

About a quarter of Norway's R&D activity is done in the research institute sector – about the same proportion as is undertaken in the university and college sector. Research institutes in Norway perform a proportion of total R&D, which is higher than in most other countries.[6]

Key institutes were established in agriculture and fisheries already in the nineteenth and early twentieth centuries, while a rich technology-based environment began to be established in Trondheim around the national polytechnic (NTH) from the early part of the twentieth century. However, the major growth in techno-industrial institutes came after World War II, as applied research institutes were founded in Oslo at and around the Central Institute (SI), and then in Trondheim, where NTH established SINTEF in competition with the Oslo-based activities. There was a rapid growth in institutes for applied social science in the 1960s and 1970s. Until the mid-1980s, these institutes were generally 'owned' directly by ministries or by ministries' own research councils. In the mid-1980s, however, as part of an international wave of separation between the customers for research and the research performers, NTNF was encouraged to divest itself of its techno-industrial institutes. The techno-industrial institutes became separate foundations.

Emblem et al[7] explain the extraordinary importance of institutes in the Norwegian research and innovation infrastructure in terms of

- Weak industrial R&D capability, which meant that the techno-industrial institutes could to a degree perform R&D **on behalf of** industry, especially since their focus was on **applied** research
- The multi-disciplinary capabilities of the institutes, which unlike the universities were able to tackle users' **problems**
- The sector principle, where research is seen as one policy instrument among others and where institutes associated with ministries are used as 'insiders' in policy development

On a broad definition of 'institutes' there are now in excess of 200 such institutions in Norway. NIFU's catalogue of the institute sector[8] shows 133 – about a hundred of which have R&D as their main activity. The structure of the institute sector is

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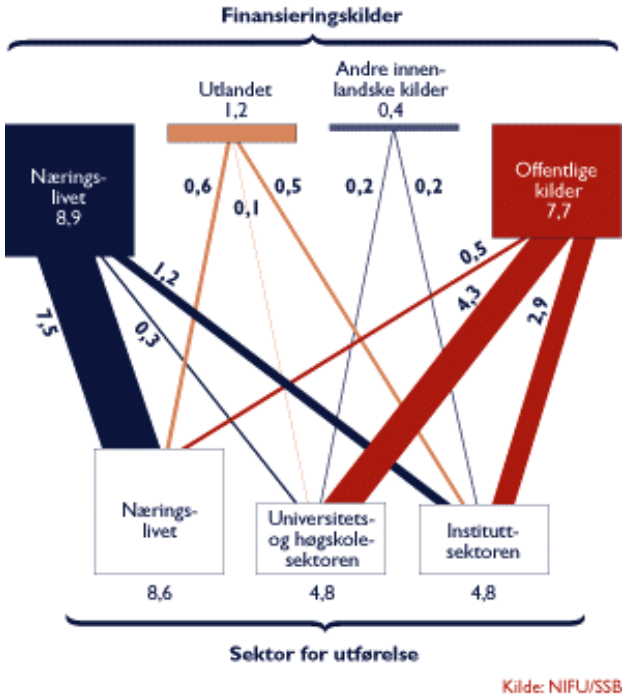
6 There are no reliable international figures that allow comparison of different countries' R&D expenditures through research institutes. Research institute spending is an unidentified component of government research outside the higher education sector, in the OECD statistics, so it is mixed up with various other kinds of government R&D expenditure, including defence. A study of eight OECD countries based on 1987 data found that only Italy spent a greater part than Norway of its national R&D investment in the institutes. See Ole Wiig, *Forsknings og utviklingsarbeid i Norge og andre OECD-land*, 7/90, Oslo: NIFU, 1990

7 Terje Emblem, *Strategi for instituttsektoren. Mål, struktur, organisering,* Rapport nr 3 fra prosjekt om instituttpolitikk I Norges forskningsråd, Oslo: NFR, 1995

8 NIFU, *The Institute Sector in Norway: A Catalogue of Non-University Research Institutions*, Repoprt 21/98, Oslo: NIFU, 1998

little changed from the early 1990s, when its fragmentation was seen as one of the aspects that RCN should address.

Exhibit 1 Main Sources and Recipients of R&D Funds in Norway (BNOK, 1999)



As **Exhibit 2** indicates, research in the institutes grew faster than that in higher education during the 1980s. However, since the end of the 1980s, the total volume of institute research has stagnated and been overtaken by the growth in the higher education sector. In 2000, 34 of the 68 institutes discussed in RCN's annual report were operating at a loss. Notably, however, all the techno-industrial institutes were in surplus. These institutes obtain about 40% of their income from state sources, while the remaining institutes – the majority of which are losing money - collectively get 75% of their income from the state.

Exhibit 2 Norwegian R&D by Performing Sector 1970-99 (1990 prices)

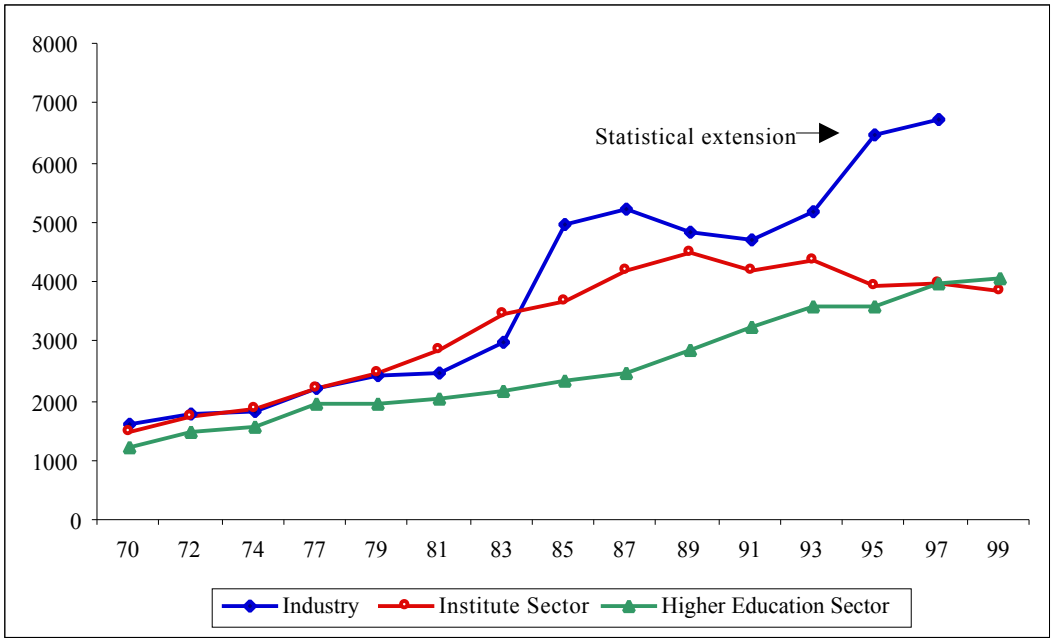
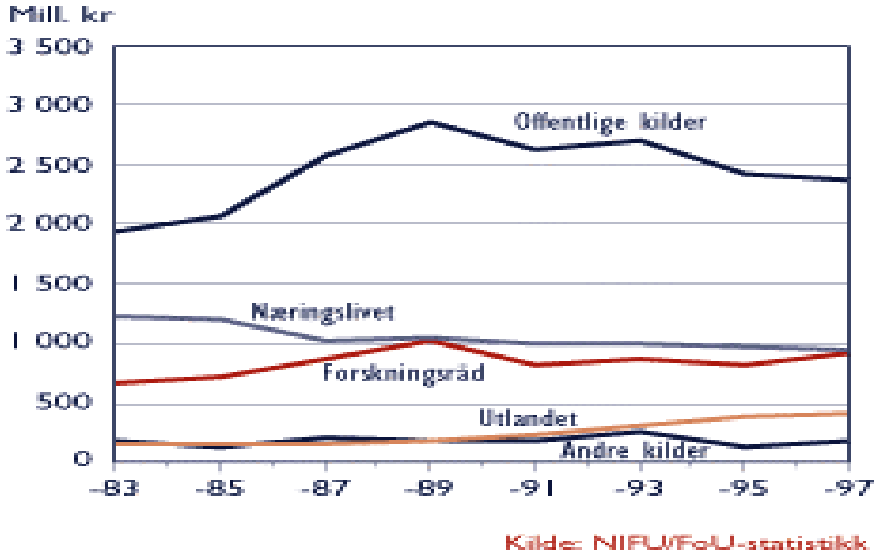


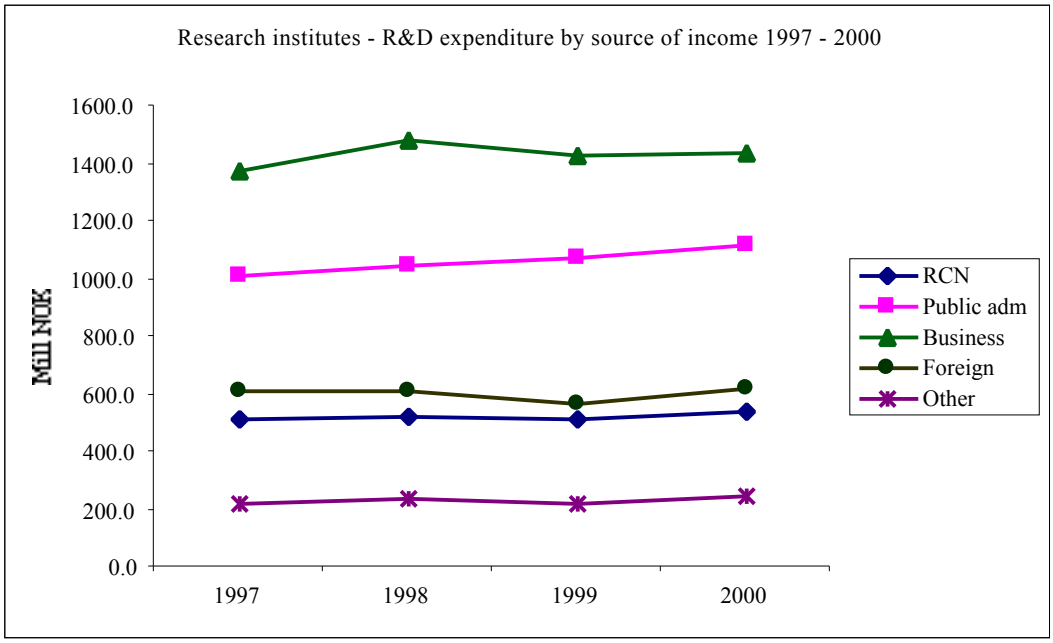
Exhibit 3 suggests that rising state expenditure drove growth in institute activity during the 1980s. Increased international funding over the period largely compensated for declining industrial income.

Exhibit 3 Total R&D Expenditure in the Institute Sector by Source of Funding (1983 – 1997, in fixed 1990 prices)



NIFU started a new survey in 1997, so the numbers in **Exhibit 4** are not fully consistent with those above. They are also expressed in current kroner, so the flat curves essentially represent a modest real decline.

Exhibit 4 Research Institute Funding by Source



Source: NIFU

With about 16% of income coming from abroad, the Norwegian institute system is clearly internationalised. The greatest contribution to foreign income comes, as might be expected, from the techno-industrial institutes, which account for over two thirds of this income. Since 1997, RCN's system of collecting key data from the research institutes via NIFU makes it possible to understand more closely what is happening in institute financing. As **Exhibit 5** indicates, institute income from international organisations has started to fall. While income from foreign industry has risen by a small amount (in current terms), this does not compensate sufficiently. The main decline is in the income of the techno-industrial institutes from the European Commission, possibly reflecting the longer term focus of the Fifth Framework Programme, compared with the Fourth, and from other international organisations. The total drop approached 45 MNOK in 1997 – 99, partly offset by a rise of 22 MNOK in income from foreign industry. The institutes are generally positive about EU-funded projects, which allow them to work with some of the best foreign groups, although the need in many cases to provide matching funds and the high cost and complexity of writing proposals are important disincentives. However, it is noteworthy that foreign industry is the biggest single source of foreign finance.

Exhibit 5 Research Institutes' Income from Abroad, 1997-99

	MNOK			Percent		
Source	**1997**	**1998**	**1999**	**1997**	**1998**	**1999**
EU Commission	139.4	133.6	110.9	24%	22%	20%
Nordic Council	17.5	17.7	15.0	3%	3%	3%
Other int. orgs	50.5	28.7	33.6	8%	8%	6%
Industry	248.5	257.5	274.1	42%	43%	49%
Other	137.4	163.9	123.4	22%	27%	22%
Total	593.3	601.5	556.8	100%	100%	100%

Source: NIFU. At current prices

Wiig et al[9] looked at several indicators of internationalisation together for the period 1997-99: international financing; the numbers of guest researchers coming from abroad to the institutes; the number of visits made as guest researchers to institutions abroad; and the number of publications in international peer-reviewed journals. Taken together, these suggest **a reduction of** internationalisation during this short period.

The institutes currently experience limited international competition, but expect national boundaries to become successively less important in contract research markets. This will require new competitive strategies. The institutes experience little competition from the universities and colleges today, but expect this to increase as universities seek growing external funds.

RCN currently has strategic responsibility for a total of 60 research institutes. It provides basic finance (*basisbevilgninger*) to 47 of them in three ways: core funding (*grunnbevilgninger*); Strategic Institute Programmes (SIPs); and other funds. The other 13 receive basic funding directly from their 'parent' ministries, but report annually to RCN, are periodically evaluated by RCN and may apply to RCN for project funding.

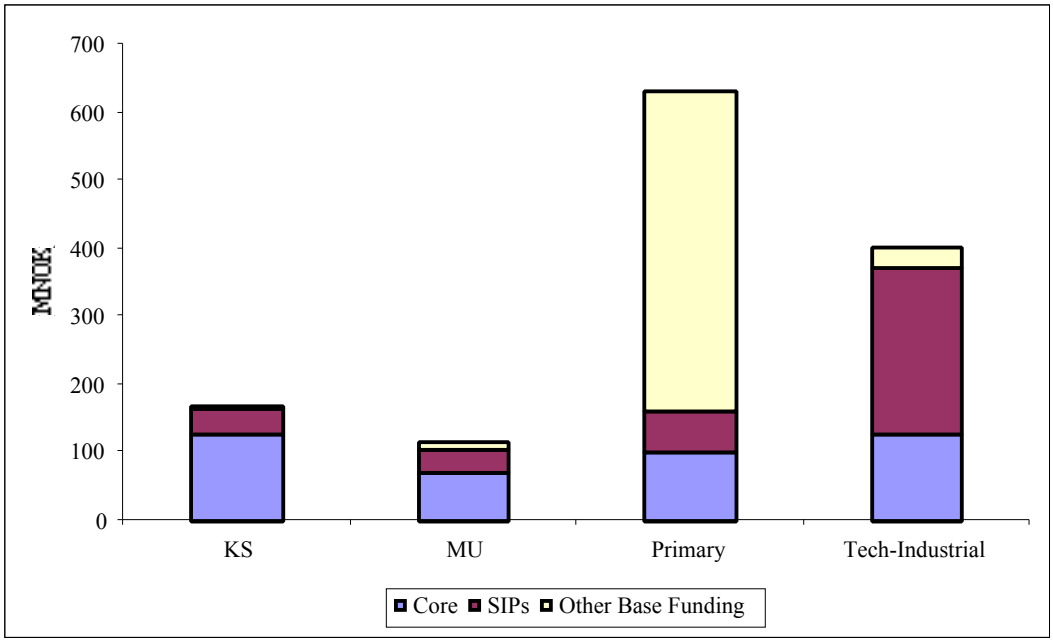
- Core funding is intended[10] to ensure scientific quality and exchange within the institute's core activities. This includes
  - Self-initiated research within this core area, and related equipment costs
  - Building interpersonal networks, developing capabilities and professional development of the research staff
  - Publishing and dissemination of results from self-initiated research within the institute's core activities
  - Developing capabilities, including doctoral training
- Strategic Institute Programmes are projects, lasting 3 – 6 years, intended to add new capabilities to one or more institutes. These should be planned in conjunction with potential users and should help develop a healthy division of labour within the overall research community
- Other funding includes funding of nationally important tasks, such as maintaining national collections, as well as long-term funding of certain types of programmatic research

[9] Ole Wiig, Stig Slipersæter and Bo Saprebakken, Instituttsektoren i norsk forskning, Report 4/2001, Oslo: NIFU, 2001

[10] *Retningslinjer for statlig finansiering av forskningsinstitutter*, set by KUF and paraphrased here from *Norges forskningsråd, Evaluering og finansiering*, Rapport nr 2 fra prosjekt om instituttpolitikk i Norges forskningsråd, Oslo: NFR, 1994

Exhibit 6 shows that there are rather different basic funding patterns across RCN, determined essentially by the desires of the respective funding ministries. The research institutes in the primary (agriculture and fishing) sectors handle a lot of long term programmatic activity and various national tasks, set by their respective ministries. The thrust of the basic funding of the techno-industrial research institutes is change, through the use of SIPs. In contrast, institutes in the social sciences, environment and development are under less change pressure via SIPs.

Exhibit 6 Groups of Research Institutes Base Funding via RCN, 2000



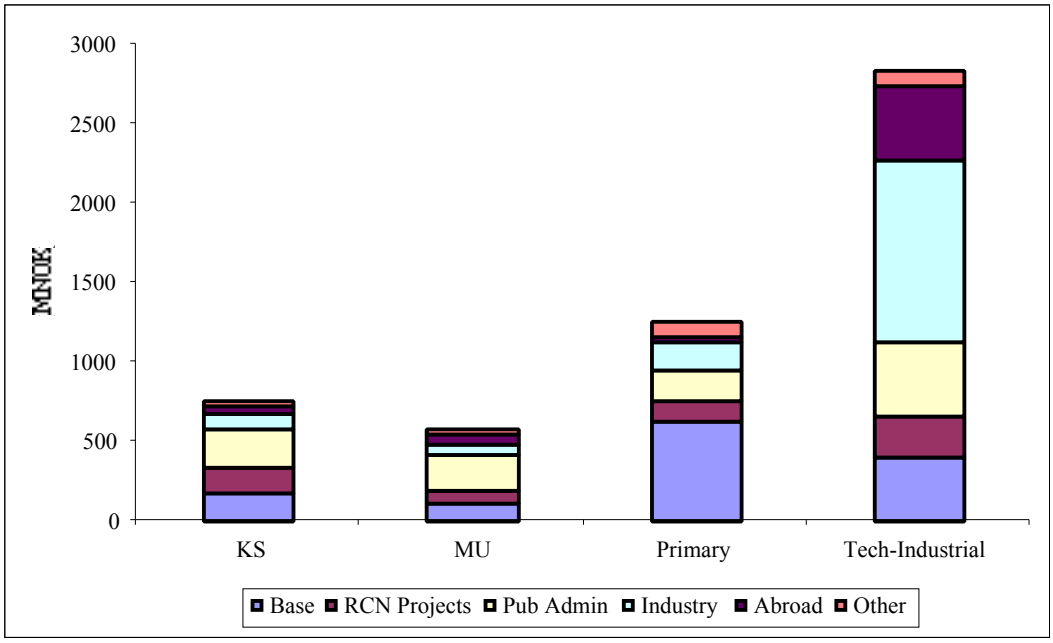
Source: NIFU data, Technopolis analysis

Until 1997, the Bioproduction and Processing (BF) division of RCN was responsible for the basic funding of only two primary institutes. As a consequence of new guidelines for public financing of research institutes set down by the Government in 1995 and the reorganisation of agricultural research in 1997, the ministry of agriculture transferred the responsibility for core funding of seven agricultural research institutions to the RCN from 1997. The entire public budget for these institutions was defined as base funding. However, the ministry of agriculture and the RCN agreed to reduce the basic funding of these institutes in the years that followed in favour of more emphasis on strategic programmes. The institutions were given a guarantee that the total amount of core funding should remain at a predictable level in a four-year period.

Exhibit 7 shows the overall sources of funding for those institutes for which RCN has strategic responsibility, separating basic funding from other (project based) RCN funds. The social science, environment and development institutes' main project customers are the state, while industry plays a greater role for the other institutes, especially the technical and industrial ones. The technical and industrial institutes are also the most internationalised.

RCN's spending on research institutes divides roughly 50/50 between base funding and project funding. Of the institutes for which RCN has strategic responsibility, 17 are legally parts of the government administration. The others are mostly foundations, though a minority has chosen to register as limited companies. Core funding of the state institutes is very high – typically in the range 60-80%. The other institutes average about 30% base funding, though as **Exhibit 7** suggests the proportion of base funding in RCN's spend varies a great deal among different types of institute.

Exhibit 7 Groups of Research Institutes, Total Funding, 2000



Source: NIFU data, Technopolis analysis

Overall, the techno-industrial institutes obtain the lowest proportion of base funding, though their average is held down my the fact that the largest – SINTEF, with a turnover of over one billion NOK – has base funding of only 7%. The techno-industrial institutes average 14% base funding, those for the humanities and social sciences managed by the KS division receive 22% base funding and those overseen by MU average 20% base funding. In marked contrast, the primary institutes under BF's tutelage obtain exactly half their income as base funds, the majority of which are earmarked general funds. This situation represents a hang-over from the period before 1997, when the institutes concerned were managed directly by the ministries of agriculture and fishing.

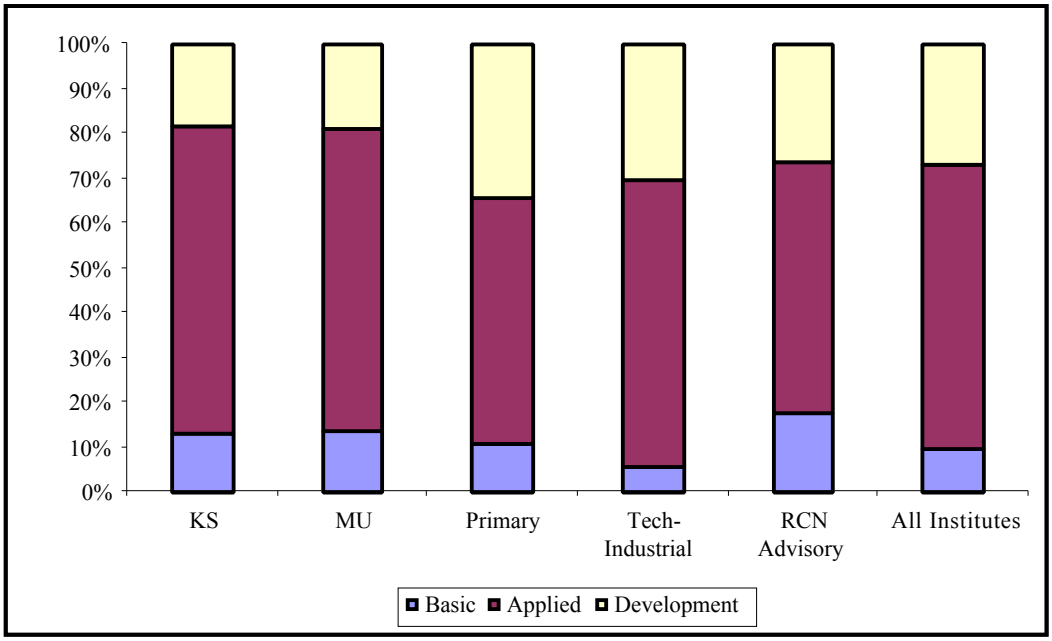
As **Exhibit 7** shows, the techno-industrial institutes are the major contact point between the institute sector and industry, as well as representing that part of the research institute system which is most internationalised.

In terms of the categories in which OECD R&D statistics are collected, the bulk of the institutes' work is applied research. Basic research accounted for 10%, applied research for 63% and development for 27% in 1999. Basic research has been rising overall, as a share of all institute research. That said, it should be noted that some of

the institute directors we interviewed were less than sure that the OECD R&D definitions via which the statistics are collected were coherent.

In the institutes whose base funding is provided by RCN, basic research has risen from 5% to 8% of total activity between 1993 and 1999. In the institutes base-funded directly by the ministries but for which RCN has an advisory responsibility, the share of basic research grew from 14% to 18% over the period. Development rose from 19% to 26%, so that the share of applied research fell.

Exhibit 8 Research Activities at Institutes for which RCN has Strategic Responsibility, 1999



Source: Ole Wiig, Stig Slipersæter and Bo Sarpebakken, *Instituttsektoren i norsk forskning*, Report 4/2001, Oslo: NIFU, 2001

2.2 RCN's Role in Managing the Research Institute Sector

As early as June 1993, the education ministry (KUF) asked RCN to initiate a project on the research institutes, aiming to develop an holistic national policy for the institutes. It began by mapping the sector and its financing, quickly producing a set of guidelines for state funding of research institutes. These were relevant for institutes where research made up over half of the total activity. The education ministry was to negotiate with others to establish case by case which institutes would be covered by the guidelines. (In practice, this was later done based on a suggestion from the project itself.)

The guidelines were strongly influenced by NTNF's practices in handling the techno-industrial institutes. The environment ministry had also followed a largely similar practice. The institutes associated with these organisations therefore had less difficulty in adjusting to the changed institute funding system.

- The guidelines separated institute base funding into core funding and SIPs (see above)
- Core funding should not be used to cross-subsidise contract research, nor to pay for overheads such as rent
- They defined RCN's strategic responsibility for the institutes as including
  - Nominating at least one member of the institutes' boards and two to any advisory body they may have
  - Assessing the institutes' budget proposals and strategies
  - Assessing the institutes' annual reports and accounts
  - Evaluating the professional activities of the institutes as well as their institutional situation
  - Ensuring transfers of experience between the individual institute and other research-performing environments

The project recommended that, within three to five years, all base funding for the institutes under RCN's tutelage should be channelled via RCN. State research institutes should be reconstituted as foundations or as limited-liability companies. These and other institutes tended to be short of working capital, which is an operating requirement for self-funding entities, as opposed to those funded by the state. Over time, the disparities between base funding levels for different institutes in the same sector should be reduced, and the project proposed a formula for core funding to help achieve this.

The project went on to define in some detail how the institutes were to report to RCN, setting up performance indicators, classifying institutes into groups performing similar tasks and establishing a six-year evaluation cycle for them. The evaluation criteria should be

- Quality, relevance, efficiency, flexibility and capability development
- Organisation, management, governance and financial performance
- Users' assessments of contract research

It was important that evaluations should have **consequences** for the institutes – in the short term by triggering improvement actions. In the longer term, inability to make improvements in response to a negative evaluation should trigger a reduction in base funding.

The ten industry research institutes (research associations) were denied state base funding, but should be encouraged to participate in user-directed R&D programmes, which would help them tune their strategies to the needs of their customers.

RCN's Executive Board asked the division boards to assess the appropriate size of the institute sector in their respective areas.

The project concluded that there was a need for increased co-operation between the institutes and the higher education sector. However, the division of labour between the universities as largely focused on basic research and the institutes as focused on the applied should be preserved, by increasing basic research resources for the higher education sector. Growth in the institute sector had, in many cases, led to a distortion of the ratio between base funding and contract work. RCN could contribute to rectifying this imbalance through increased SIP funding. Probably,

there was a need to reduce the number of separate institutes in Norway. Once this was achieved, it would also be possible to establish new institutes in new fields, but in the meantime RCN would follow a restrictive line in setting up new institutes, which would have to be justified to the Executive Board. Many of the new regional research institutes were under critical mass, and were beginning to operate in national arenas, rather than linking tightly to regional users, as had originally been envisaged. Restructuring could be helpful.

At the conclusion of the institutes project, in a letter to the education ministry dated 16 June 1997, RCN took responsibility for a total of 60 institutes – 47 to which it provided base funding and 13 to which ministries provided base funding directly, but for which RCN had advisory responsibility. Some 10 ministries funded the institutes involved, directly or via RCN. The defence ministry stays outside these arrangements, funding its own research institute (FFI). Of the 47 institutes to which RCN provides base funding, 33 were foundations and 9 were limited companies. Four were administrative agencies[11] and one (NORSAR) was directly linked to the research council. The 13 institutes advised by the council were largely parts of government, typically enjoying much higher levels of base funding (52%) and correspondingly less involved in research markets than the 47, whose base funding averaged 12%. In total, the 60 institutes under RCN tutelage covered about three quarters of total institute R&D activity.

2.3 Achievements

The institute project conducted interviews with numbers of ministries. It observed (in volume 1 of its report) that the ministries adopted different positions along a scale. At one extreme, they saw institutes as administrative agencies operating on the instructions of the ministry. At the other, they were seen as important but independent providers of research-based background documentation for ministry use. The spectrum of views in our own (2000-01) interviews with the ministries appears largely unchanged.

2.3.1 Early Achievements

NIFU conducted an initial study[12] of the effects of the changes in the management of the research institutes in 1998. It pointed to a number of achievements and limitations of the reform at the initial stage

- RCN's advisory responsibility for 13 institutes turned out to be operationally meaningless
- Defining base funding as a mixture of core funding and SIPs helped clarify strategic thinking in some ministries and institutes. In the techno-industrial institutes allocated to the Science and Technology (NT) division of RCN, these concepts were already familiar from the pre-RCN period. In other parts of the institute system, this was novel

[11] forvaltningsorganer med særskilte fullmakter

[12] Karl Erik Brofoss, Ole Wiig and Bo Sarpebakken, *Instituttsektoren i norsk forskning. Erfaringer med nytt finansieringssystem for forskningsinstitutter*, Ressurser. Finansieringsstruktur, Report 6/98, Oslo: NIFU, 1998

- The Culture and Society (KS) division of RCN received core funding from the education ministry for most of the institutes under its tutelage and was expected to complement these with SIP funds from sector ministries. However, such funds had not been provided. It was hard for KS to be a strategic actor when it had not been allocated the needed resources. The ministries involved continued to focus their funding on short-term knowledge needs
- It was problematic to distinguish between the short-term research and information needs which (according to the Langslett doctrine) ministries should themselves procure and those needs which should be satisfied through RCN. This suggests a deeper conflict between the administrative responsibilities of the ministries and the financing structure for the institutes
- The base funding RCN provided to the 47 institutes was a small fraction of their income. This led the institutes to question RCN's legitimacy as an organ which could evaluate them and to which they should report[13]
- RCN had no control over the amount of base funding it could allocate, and therefore no way to start equalising base funding levels within individual groups of institutes working in similar markets. As Brofoss *et al* caustically remarked, "It is hard to be strategic when the economic instruments available are marginal in relation to the object about which one is supposed to be strategic."
- While the principle, that core funding should not be used to cross-subsidise contract research was broadly accepted, a number of institutes claimed that this was difficult to implement in practice.[14] It appeared that institutes transferred from the ministry of agriculture had particular administrative deficits, notably a lack of project cost recording, which had to be corrected before progress could be made on this front
- Few institutes experienced co-ordination among RCN divisions as a problem, because, with very rare exceptions, there was none. They dealt with one (or in 6 cases, two) RCN divisions, and were not much involved with the others. The report pointed to a handful of cases where SIP applications fell 'between the stools' of the different divisions, and were hard to fund
- The reporting requirements imposed by RCN were seen as complex and bureaucratic, adding an additional and incompatible reporting process to those already existing

2.3.2 The Current Position

All four divisions significantly involved in strategy for the institutes (Culture and Society, Science and Technology, Environment and Development and Bioproduction and Processing – respectively KS, NT, MU and BF) have set up internal committees to allocate the base funding, though BF has since dispensed with this. In general, the RCN divisions meet individually with the institutes once a year to discuss strategy and budgets. However, different RCN divisions have evolved different practices concerning distribution of base funding, partly because their freedom to do so varies.

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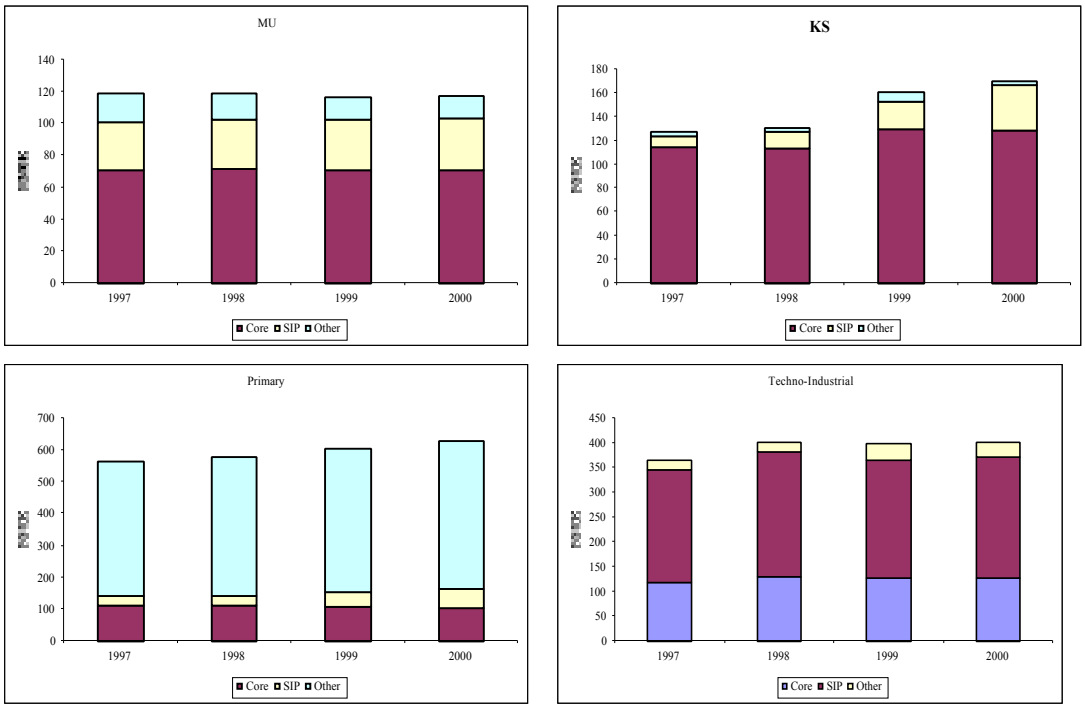
[13] This is, of course, a generic problem. For example, it crops up among the Danish GTS institutes, where the state contributes only 4 – 14% of turnover in the form of base funding. *GTS Network Evaluation Principles: Report to Erhvervsfremme Styrelsen*, Brighton: Technopolis, 1997

[14] We would not accept this argument. A minimal level of project accounting is all that is required to separate the two

Exhibit 9 shows the composition and development of institute base funding since 1997, when the new guidelines for institutes were introduced.

NT receives a lump sum from the industry ministry (NHD), which it can allocate across institute base funding and strategic programmes in the universities. It therefore has a committee for strategic programmes. The 'leverage' provided by its limited strategic resources to institutes under its tutelage are generally small, though our interviews suggest it can be decisive early the life of new institutions. Practice in allocating SIPs has moved from being based on an administrative discussion with each institute about strategy and needs, to a situation where scientific quality has become increasingly important. In the early years, institutes could rely on a comparatively stable total of base funding. Now, while the core funding remains stable, the SIP component is less predictable. Some of the institutes object that this changes the role of the SIPs from being instruments to steer the strategic development of the institute sector to being much more analogous to response-mode funding, and are therefore inherently **not** strategic.

Exhibit 9 Composition of Institute Base Funding by Division



MU has tried to take the position that core and SIP funds should be allocated in a 2:1 ratio and that base funding to individual institutes should not vary by more than 5% year on year. While the environment ministry, at least, in principle leaves MU a free hand to define and allocate SIPs, in practice, therefore, MU has few degrees of freedom in allocating either category. This limitation on its ability to change funding priorities makes it very hard to move SIP resources between institutes. Institutes closely tied to funding ministries effectively have their core and SIP funding set at ministry level. A glaring example is CMI, whose funding is set in negotiation between the institute and the foreign ministry. Neither body is prepared to involve

RCN in the negotiation, and neither body sees RCN as adding any value, since it has simply to rubber stamp the ministry's decisions. Equally, MU's efforts to encourage co-operation among institutes have met resistance.

In 1997, KS was hardly able to establish any SIPs, due to a lack of money. KS receives funds from the education ministry for institute base funding. But in 1997, KUF took the position that these amounts were so small that they could only cover core-funding needs. Additional money would be needed in order to run SIPs, and this was not available from KUF. Since then, a growing level of SIPs has been financed, but most of KS' base funding to institutes is in the form of core funding.

BF, like MU, has tried to introduce the principle that core funding and SIPs should be provided in the ratio 2:1. It has been trying to increase the amount of resources channelled to the institutes through strategic programmes, in part by reallocating programme funds. To a limited degree, BF also supports SIPs at institutes that are not under its tutelage.

2.3.3 The Institutes' Current Perceptions

As **Exhibit 10** indicates, we interviewed management at 21 research institutes. Thirteen were independent foundations, two were companies, and the remaining six were state institutes. Nineteen of the twenty-one were on the list of institutes to which the guidelines for state funding apply. Of these, RCN provided base funding to 16 but only advice to the other three. The two institutes to which the state funding rules do not apply, and which are therefore not under the tutelage of RCN, are government laboratories, performing a mixture of research and other technical tasks on behalf of their funding ministries.

Exhibit 10 Institutes Interviewed During this Evaluation

Institute	RCN Role	Source of Base Funding	Responible RCN Division	Legal Form
CMI	B	RCN	MU	Foundation
CMR	B	RCN	NT	Company
Fiskeridirektoratets Ernæringsinstitutt	-	FiD	(BF)	State
Havforskningsinstituttet	A	FiD	BF	State
Institutt for Energiteknik	B	RCN	NT	Foundation
ISF	B	RCN	KS	Foundation
NIBR	B	RCN	MU	Foundation
NINA	B	RCN	MU	Foundation
NIVA	B	RCN	MU	Foundation
Norges Byggforskningsinstitutt	B	RCN	NT	Foundation
Norsk Geotekniske Institutt	B	RCN	NT	Foundation
Norsk Regnesentral	B	RCN	NT	Foundation
NORUT IT	B	RCN	NT	Company
NOVA	A	KUF	KS	State
RF	B	RCN	NT, KS	Foundation
Statens Institutt for Folkehelse	-	SHD	(MH)	State
SINTEF Group	B	RCN	NT, KS, MH	Foundation
SNF	B	RCN	KS	Foundation
STAMI	A	KAD*	MH	State
TØI	B	RCN	KS	Foundation
Veterinærinstituttet	B	RCN	BF	State

*Transferred to AAD during 2001

Note: RCN roles are B = Base Funding. A = Advisory. – = None

Exhibit 11 helps us understand why strategic responsibility for certain institutes is transferred to RCN, while others remain closer to ministries. In the **Exhibit**, we have ranked the institutes by the proportion of base funding in their total income in 2000. This has the effect of separating the state institutes from the foundations[15] and companies. The state institutes are those over which ministries tend to need high leverage, and these are often bodies with few, or any, customers other than the state. At the low end of the base funding spectrum are techno-industrial institutes and an economics institute, all of which operate in larger and more international markets.

Exhibit 11 Institutes Interviewed: Source of Funds, 2000, Relation to RCN

	Base Funds MNOK				MNOK			
Institutes	**Core Funds**	**SIPs**	**Other General**	**Base Funds (%)**	**Total Income MNOK**	**Legal Form**	**RCN Role**	**RCN Division Responsible**
SINTEF Group	36	32	7	7%	1,068	Foundation	B	NT, KS, MH
Byggforsk	5	4	0	8%	110	Foundation	B	NT
SNF	4	2	0	9%	66	Foundation	B	KS
RF	2	1	0	9%	38	Foundation	B	NT, KS
Norsk Geotekniske Inst.	7	9	0	11%	139	Foundation	B	NT
Norsk Regnesentral	3	5	0	13%	62	Foundation	B	NT
NINA	13	9	0	17%	125	Foundation	B	MU
CMR	7	3	0	19%	54	Company	B	NT
NIBR	7	4	0	19%	58	Foundation	B	MU
TØI	6	5	0	20%	54	Foundation	B	KS
ISF	6	1	0	21%	34	Foundation	B	KS
NIVA	16	4	7	22%	117	Foundation	B	MU
CMI	8	1	1	24%	42	Foundation	B	MU
NORUT IT	2	3	0	26%	18	Company	B	NT
Institutt for Energiteknik	9	19	76	31%	339	Foundation	B	NT
NOVA	14	4	0	36%	51	State	A	KS
Havforskningsinstituttet	0	6	220	55%	410	State	A	BF
Fiskeri.Ernæringsinst.	0	2	16	56%	32	State	-	(BF)
Veterinærinstituttet	7	3	91	72%	142	State	B	BF
Folkehelsa*	0	0	309	77%	401	State	-	(MH)
STAMI*	0	0	55	84%	65	State	A	MH

* Estimate, based on annual accounts

Note: RCN roles are B = Base Funding. A = Advisory. – = none

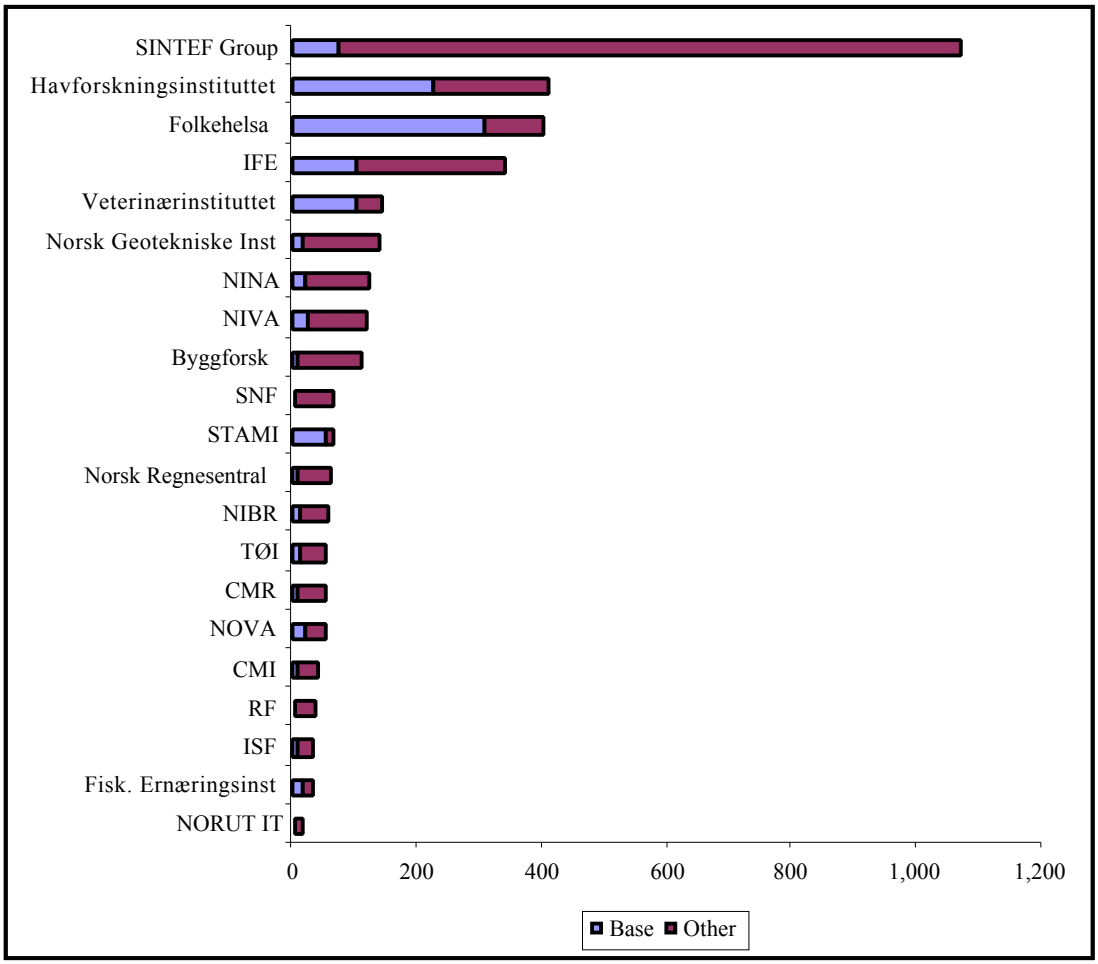
Institutes working on social policy and environmental questions inhabit the middle of the spectrum, together with two younger techno-industrial institutes (both companies) and the energy research institute, whose workload will tend to contain a higher proportion of policy-relevant work than that of other techno-industrial institutes. RCN's role is weak – advisory, or non-existent – at the high base funding end of the spectrum, but potentially stronger at lower levels of base funding. What the minimum level of base funding is, that gives RCN adequate leverage to help shape the strategic development of an institute, is not clear from this analysis. Some of the institutes at the bottom of the scale certainly indicated that RCN's base

[15] In this policy context, the distinction between foundations and companies is not especially significant

funding was insufficient either to make a big difference or to justify the reporting and evaluation load imposed upon them.

Exhibit 12 shows graphically the relative incomes of members of our institute sample and the proportion of base funding within that income. SINTEF stands out as a massive organisation, compared with the rest. Only Havforskningsinstituttet and Folkehelsa – both state laboratories – followed by the energy institute come anywhere near SINTEF's scale

Exhibit 12 Base Funding and Total Income, Institutes, 2000 (MNOK)



Source: RCN Annual report 2000; Technopolis analysis. Base funding values for Folkehelsa and STAMI are estimates, based on these institutes' annual reports

Our interviews largely confirmed the findings of the Brofoss et al 1998 NIFU study reported above. Since this was done, RCN's KS division has succeeded in increasing the amount of resources available for SIPs. The passage of time meant that there were now few discussions about the legitimacy of RCN's strategy and evaluation roles, and there were now few complaints about the need to report to RCN.

We were surprised in many cases at the strength of the institutes' links with the university sector. Over three-quarters of those we interviewed could point to

multiple people working across the university/institute boundary as Professor IIs or PhD students. There is no rigid rule about linkage such as that of the Fraunhofer Society, which requires that all institute directors simultaneously hold a university chair. Such a rule would be impractical given the small scale of the Norwegian university sector and the uneven pattern of specialisation among the universities.

Two kinds of change needs emerged as important in discussion with the institutes. First, about a third of the institutes saw increased internationalisation as a key need. These were techno-industrial and socio-economic institutes. State laboratories saw little need to internationalise. Those at the leading edge of international research argued that they needed funding to maintain their position by being able to attract postdoctoral researchers to enrich their existing competence. Second, those institutes with low base funding were anxious about their ability to renew their knowledge bases, and wanted more core funding in order to allow them to do so. Some expressed this in terms of needing to do more basic research (as institute researchers also did in the researcher survey conducted for this evaluation.) Others talked about longer term or seed corn funding. Finally, those with significant private sector funding argued that they need access to funding to allow them to continue to operate as Institutes rather than consultants. The needs that were voiced reflect a concern of all but the most cash-rich contract research organisations we know, and are products of the same market failure[16] that leads to under-investment in longer-term research by industry.

We discussed strategy development and the role of RCN with the institutes. Two thirds of the institutes told us that SIPs had been an important mechanism for them in entering new fields, in replacing a generation of specialists who were about to retire and in maintaining access to internal competence that distinguishes the institute from other service providers. Especially among the techno-industrial institutes, discussion with RCN had in the past been a valuable way to explore diversification opportunities. One director pointed out that SIPs had been vital in building his institute's core specialisms and another acknowledged the benefit from being forced to make strategic decisions to develop particular areas.

At the same time RCN seemed reluctant to help institutes stray far from their core capabilities, since it always worried about avoiding duplication. This was a barrier to development and to maintaining the relevance of institutes' current capabilities. Four of the institutes said they felt RCN was prepared to support incremental changes to their capabilities, but that it was unable to help fund the more radical shifts that were from time to time needed, for example by allowing institutes to participate in areas that are not covered by their parent division. In effect, RCN's concern to manage the division of labour in the institute sector conflicted with the needs for institutes to evolve and develop strategies.

The techno-industrial institutes felt there was now little discussion with RCN about the product/market coverage of the research institutes, how to keep the system abreast of changing needs and when to abandon certain research areas. One of the

[16] Ken Arrow , 'Economic Welfare and the Allocation of Resources for Invention,' in Richard Nelson (Ed.) *The Rate and Direction of Inventive Activity*, Princeton University Press, 1962; see also Richard Nelson, 'The simple economics of basic scientific research,' *Journal of Political Economy*, 1959, vol 67, pp 297-306

techno-economic institute directors observed that RCN handled the institutes via an 'applications bureaucracy' rather than through strategic 'concern thinking'. Another had "given up on RCN" as a strategic discussion and investment partner, and had decided to adopt an opportunistic policy with respect to base funding while pursuing an independent strategy. Others thought that RCN was too busy influencing ministries to engage institutes in strategic discussion. Finally, the lack of discussion and the perceived lack of competence for RCN staff to make scientific decisions prompted one institute director to comment that RCN was moving towards a system where it was simply acting as a post-office: processing letters and proposals but not adding value through any kind of advice.

Most of the techno-economic institutes, for which RCN's NT division is responsible, were unhappy that the criteria for allocating SIPs had shifted from strategic considerations to what they saw as a purely quality-based competition. Given their very low level of core funding, they felt this left them even more exposed to competitive markets than before, and therefore short of strategic resources. In effect, they felt their base funding was being reduced to the level of their core funding. This gradual transition has made research planning a more important but also a far riskier activity. Some institutes claimed that the risks of not getting SIPs was destabilising and reduced the likelihood of investing in new areas. This contrasted, for example, with the situation of CMI, which negotiates SIPs with its parent ministry, UD. It can therefore rely on obtaining a supply of projects, which allow it to enter new areas, bigger than most of the projects CMI can obtain on the open market, and provide a source of intellectual development and renewal.

Institutes tended to see SIPs as useful contributions to human resource development because they funded PhDs. However, RCN did not contribute to the need to develop and maintain the equipment infrastructure of the institutes**.** However, RCN strategy did not help the institutes develop their own strategies. Four institutes, which are exploring the possibility of merger in order to increase their strength and presence in national and international markets, felt they were not adequately supported in this by RCN even thought they were encouraged to increase their collaborative links (e.g. through SIPs).[17]

There were mixed responses to our questions about the value added by RCN in the funding process. Three said that RCN's involvement meant there was much better quality control of proposals than was the case when ministries bought directly. Overall, four complained that the RCN was adding an additional layer of bureaucracy without adding any benefit to the previous system and they questioned the competence of the RCN to make funding strategic decisions (some of these responses came from organisations with strong links to their funding ministries). Five others, however, said that RCN's constantly shifting priorities made it difficult to deal with[18], one of them pointing to the significant resources it had invested in a SIP proposal, only to be told that RCN no longer had money to fund this call for proposals.

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[17] In Sweden, IRECO – the institute holding company – the KK Foundation and NUTEK/VINNOVA have all been funding efforts by the Swedish research institutes to build critical mass, rationalise and merge over the past three years

[18] The current strategy in particular was singled out as being incomprehensible although this may simply be because it has not been in place very long

RCN's contribution as a guide to obtaining EU research funding was praised by five institutes and three others identified the importance of EU funding for their organisation. A general complaint however, was that it was difficult for Institutes to find the matching funds required to participate in these programmes and it was suggested that RCN could be more active in providing funding for EU participation.

Those institutes which discussed RCN's overall performance in the Norwegian system identified that it appeared to have limited ability to identify areas ripe for intervention and pointed to a number of important programmes which had been launched outside RCN. They painted a picture of an RCN unable to respond to the needs of institutes and of industry and lacked credible foresight mechanisms to generate programmes.

There was general agreement among the institutes that the value of the RCN-sponsored evaluations was limited by the fact that they have "no consequences." There were no rewards for those receiving positive evaluation, and no sanctions against those whose performance was judged to be poor. Here, as elsewhere, RCN seemed constrained by the rules laid down by the ministries. NT did have more possibility to establish such feedback loops, but had wasted this opportunity by focusing more on proposal quality, rather than using evaluation results to help develop longer term strategy for the techno-industrial institutes.

3 Universities and Colleges

The Norwegian higher education sector today consists of the following groups of institutions

- 4 universities
- 6 scientific colleges, which function at university level in relation to key professions
- 26 state colleges, which comprise a nation wide network of further and higher education institutions. The current structure results from a reform in 1994 (*Høyskolereformen*), which merged the 98 colleges then existing into larger entities. Some fourteen of the state colleges were set up as regional colleges from 1970 onwards, as part of a wider policy of countering centralisation and spreading higher education and research across the whole geography
- 2 music conservatories
- A small private sector, dominated by the business school BI

Having regard to their relative importance as research performers and 'customers' of RCN, in this study we interviewed several people at each university (including members of the rectorate and top administration), directors of three scientific colleges, six state colleges and BI.

A new law was enacted in 1996, which set out a common set of tasks for the universities and colleges

- Provide higher education based on the best available research, artistic development and experience
- Conduct research and professional development and/or artistic development
- Co-operate within a national network for higher education and research

This effectively extended the mandate of the colleges to perform research and created a requirement for research funding across the entire higher education sector. Strikingly, the law does not seem to have been accompanied by any significant resources to implement this intention. The main instrument was the creation of special PhD stipends by the education ministry, aiming to upgrade the research qualifications of college staff.

There has been very significant growth in the number of students attending university and college over the past 30 years, as the area diagram in **Exhibit 13** indicates. For demographic reasons, the number of applicants to universities and colleges peaked in 1994. The number[19] of new students accepted per year in the state university sector fell from the peak of 26,157 in 1997 to 22,040 in 1998, while the numbers accepted into other parts of the system have largely stagnated[20] since 1996. Within this overall flattening and decline in numbers, there continues to be some structural change. Some 2000 new student places were established in 1998.

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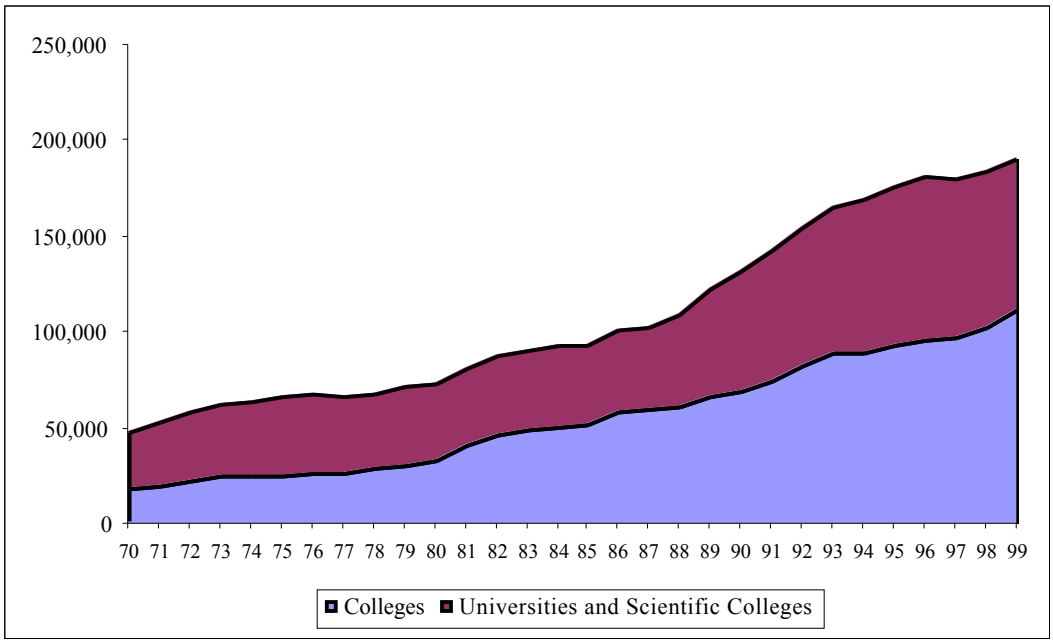
[19] NSD, *Statistikk om Høgre Utdanning*, Bergen: NSD, 2000

[20] This is also true of the private college sector, which has nearly 10,000 students

These provided new course options and an increase in the number of second degree (*hovedfag)* students.

Exhibit 13 Student numbers in further and higher education, 1970 – 1999



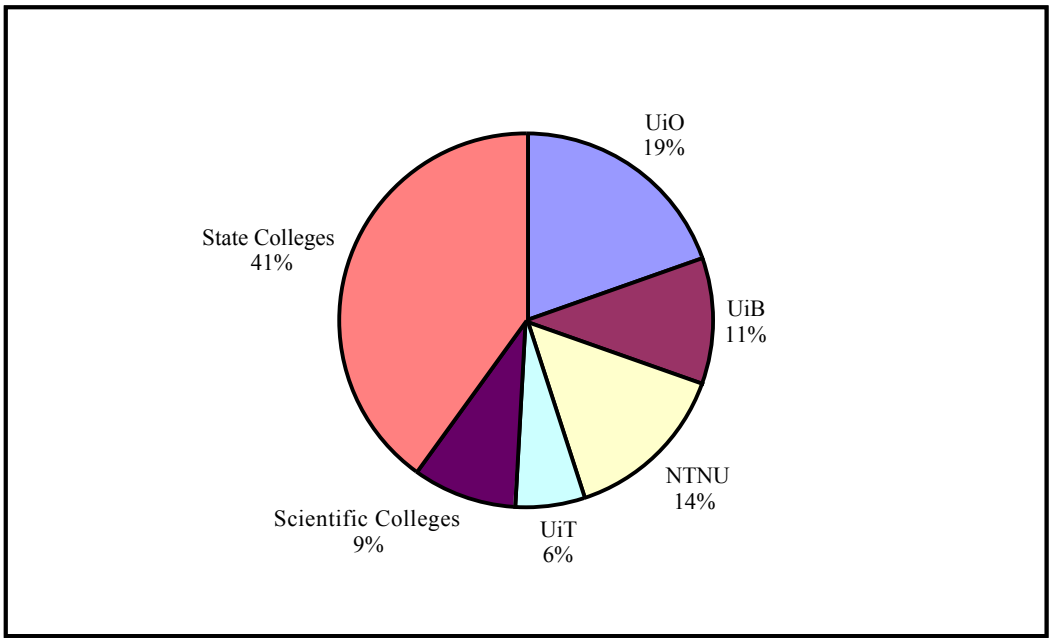
Source: NIFU

In recent years, university and college funding has been driven by a formula, which is largely based on student numbers. The bulk of the rapid growth in student numbers during the 1990s was driven by students in the 'soft' subjects. Universities spent the increased income on recruiting academics to teach the new students, leaving no slack for research provision from the block grant. Faculty in the 'hard' subjects found themselves squeezed, because they were unable to attract students, so external funding became increasingly important to them.

In future, a new formula will be used which has separate components for infrastructure, research and student numbers. This appears likely to force more explicit management of these different income streams.

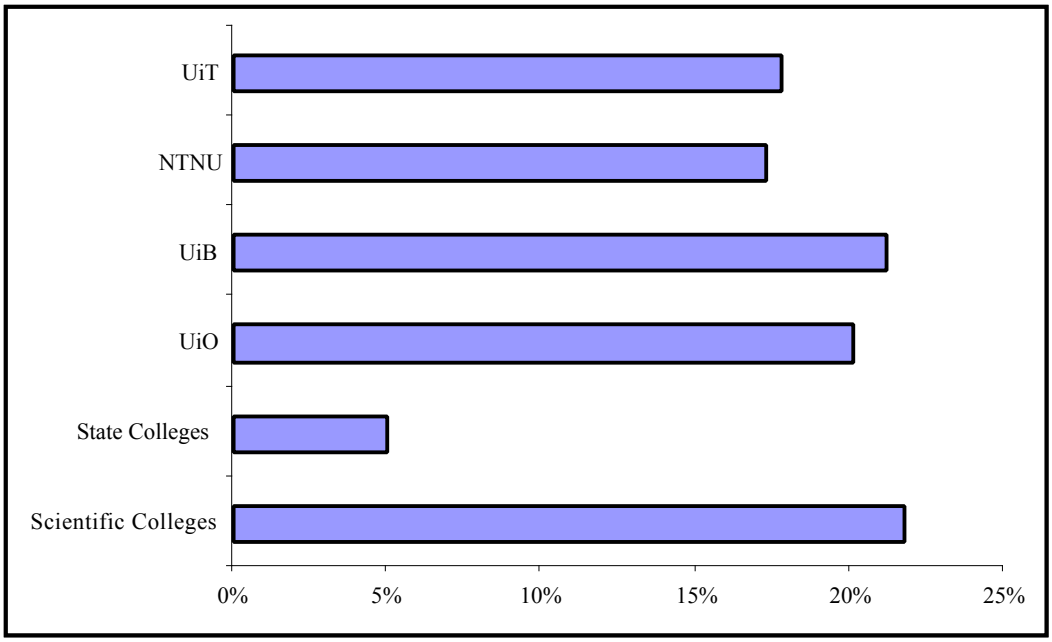
Exhibit 14 shows how the BNOK 13.6 allocated by the education ministry to the universities and colleges was divided in 1999. The universities together receive half the budget. Strikingly, there is a relationship between the individual universities' share of funding and their age. The University of Oslo (UiO) was founded in 1811 in what was then the capital, Christiania, after a long campaign to persuade the Danish rulers that it was not adequate for the University of Copenhagen to serve as a national university. A national polytechnic (Norges Tekniske Høyskole) was set up in Trondheim in 1910, and in 1996 was merged with the much newer University of Trondheim to become NTNU. The university in Bergen was set up in 1948 and that in Tromsø in 1972.

Exhibit 14 State University and College Budget Allocations, 1999



Source: NSD. The chart excludes money for building projects

Exhibit 15 Proportion of External Funds in Income, Higher Education Sector, 1999



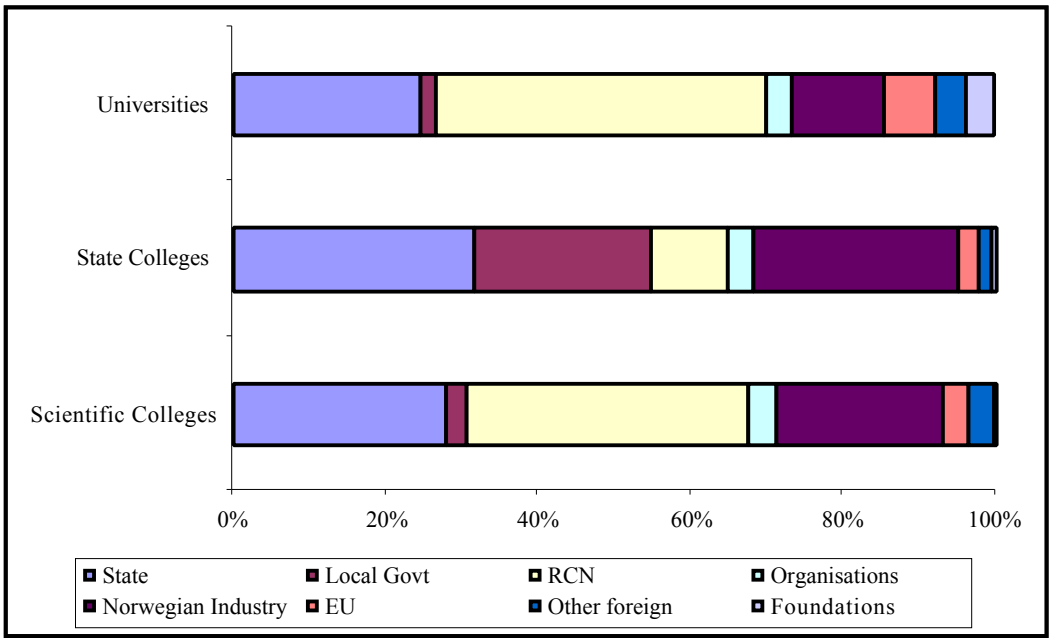
Source: NSD

External funding is an important indicator of what is going on in research in higher education institutions. **Exhibit 15** shows that most of the sector obtains in the region of between a fifth to a sixth of its income from outside, with the exception of the state colleges. These have primarily been teaching institutions, and while they are now increasingly expected to do research as well, they have had little time in which

to build up their research capabilities which is an important source of external income.

Exhibit 16 shows the sources of the external funding for the different groups of institutions. Each gets 20-30% of its external funds in payment for projects done for the state. The university colleges, which are generally rather regional in character, do additional work for local government. RCN is a rather small external funder for these colleges today, while it is the major external source of funds for the universities and scientific colleges. The universities are less oriented to business than the colleges, but obtain a greater proportion of their external funds from the EU.

Exhibit 16 Percent of External Funding Obtained from Different Sources, Universities and Colleges, 1999



Source: NSD

3.1.1 The Universities

The OECD has recently summarised many of the important international trends in university research, which are redefining the nature and role of the university in modern society. We think it is worth quoting these trends at some length, because much of the debate about the research funding in Norway goes on as if this the pressures they represent were unique to Norway, and as if they could be avoided by administrative decision. The trends identified in the OECD study are

- *Declining government R&D finance*. Government R&D budgets are being reduced in a number of OECD countries, often leading to a levelling of, or even a decline, in university research funding. Traditionally, 80 percent or more of university research was financed by governments as 'public good' but the share has been declining, with the result that universities are seeking new sources of support and a new basis for that support
- *Changing nature of academic finance*. Government funding for academic research is increasingly mission-oriented and contract-based and more dependent

on output and performance criteria. This can lead universities to perform more short-term and market-oriented research

- *Increasing industry R&D finance*. Private industry is funding an increasing share of research in universities. This support, in the form of joint projects, contract research, and financing of researchers, is also leading universities to perform research more directed to potential commercial applications
- *Growing demand for economic relevance*. Universities are under pressure to contribute more directly to the innovation systems of their national companies. However, they are often constrained by rigidities arising from the traditional disciplinary organisation of research. This causes considerable tensions in the university research environment
- *Increasing systemic linkages*. The institutional context of research is changing as universities are encouraged to enter into joint ventures and co-operative research with industry, government facilities, and other research institutions as a means of improving the effectiveness of networks and feedback loops in national innovation systems
- *Growing research personnel concerns*. An ageing scientific workforce, coupled with declining interest in some parts of science on the part of youth in some countries, raises concerns about the future availability of adequate numbers of well-trained researchers, at a time when the training of researchers is changing
- *Internationalisation of university research*. Globalisation, stemming partly from advances in information and communication technologies, is affecting the climate for research and the conduct of R&D. It is also making research more expensive and leading to specialisation
- *A changing role*. Universities are recognised as essential to the knowledge-based economy, and no country will willingly permit a serious, permanent decline in the research, training of knowledge-transfer capabilities of their national systems. In the early parts of the 21st century, however, university research and its relation to society are likely to be very different from today. OECD countries need to ensure that universities can continue to perform their functions to the benefit of society at local, national and global levels[21]

These changes reflect a changing understanding of the role of universities in knowledge production and use, and therefore of their contract with society, which pays for them. This is perhaps most marked in Sweden, where the university law was changed in the mid-1990s, to add a 'third task' of supporting and interacting with society to the universities' two traditional tasks of teaching and research. However, the trend is international, as is made clear by a global proliferation of linkage programmes and actions aimed at embedding universities into broader social and knowledge systems.

The universities in Norway have been sheltered to a considerable degree from many of the winds of change that have blown through the OECD higher education sector in the past twenty years. They operate with rather traditional governance structures, though some modernisation has been taking place. All the universities now have two external representatives on their governing bodies (the university Board in the

[21] OECD Group on the Science System, *University Research in Transition*, STI Report, Paris: OECD, 1998

case of Tromsø, the College in the other universities). These bodies have 13 members at UiB and UiO, 11 at UiT and 15 at NTNU, where a proposal to increase the number of external representatives to 4 is under discussion.

The universities have elected academic leadership structures and separate but parallel administrative hierarchies under a director, who reports to the rector. Unlike in the Anglo-American tradition, where a single leader has to resolve conflicts between institutional needs and the interests of various parts of the faculty, there is therefore almost no place at which strategic decisions can be made and linked to effective strategy deployment. As a result, decisions that are made reflect the interests of the existing academic body and are inherently conservative. It becomes easy to lobby for more money, but difficult to do anything except to share such money in an equal and 'fair' way among the existing faculties. It becomes very hard to have any sort of strategy and to respond to the trends outlined by the OECD. So far, there has been little movement towards setting up the type and scale of industrial liaison and commercialisation activities seen in successful universities abroad. The only example we could find of any scale is the UNIFOB organisation at UiB, which marshalls and markets the university' capabilities in external contract markets.

Etzkowitz and Leydesdorff[22] have used a 'Triple Helix' analogy to describe the complex interplay among academia, government and industry that characterises modern innovation systems. While the identification of the importance of this interplay is perhaps not entirely novel, it succeeds in representing the state of affairs pointed to by the OECD. But it reflects badly the situation of the Norwegian universities. Partly because the research institutes occupy a position where they are supposed to do research which focuses on user needs, the universities occupy more of a 'double helix' together with the state.[23] According to Bleiklie, Høstaker and Vabø, they suffer further from problems of self-reproduction, low inter-university mobility and "in-breeding". The researching population has been fragmented by the reform which allowed everyone qualified to hold to rank of professor to hold such a title, so that small groups may have multiple professors, each of whom may expect to lead a research agenda. (The implications of the reform for research practice are taken up at greater length in background report No 3 to the RCN evaluation, namely *RCN in the dynamics of research: A scientist's perspective* by Frank van der Most and Barend van der Meulen.)

The four universities have all published strategies, which illustrate rather well their concerns and the differences among them. The University of Oslo (UiO) strategy points out that, of course, the university has three main tasks: research; teaching; and disseminating results to the wider society. Under the banner "the main challenge is quality," the strategy sets out 5 main goals

- The University shall strengthen its position as a research university of a high international standard

[22] Henry Etzkowitz and Loet Leydesdorff, 'The dynamics of innovation: from National Systems and "Mode 2" to a Triple Helix of university-industry-government relations,' *Research Policy*, 29 (2), 2000

[23] for a discussion, see Ivar Bleiklie, Roar Høstaker and Agnete Vabø, *Policy and Practice in Higher Education: Reforming Norwegian Universities*, London: Jesica Kingsley, 2000

- The University shall represent an attractive learning community for students and staff on a level with the best European universities
- The University shall be an open partner full of initiative in any co-operation
- Management, government and personnel policy shall increase the flexibility, creativity and quality of the organisation
- The University areas shall increase the feeling of satisfaction among staff and students and be good meeting places for the University community and the citizens of Oslo, the public authorities and guests

The strategy sets out an ambition to establish an internal fund able to spend 100 MNOK per year on measures to promote quality and promote restructuring. During our evaluation, UiO had few such resources available to it.

Where UiO's strategy emphasises quality as a key internal value, that of the University of Bergen (UiB) emphasises academic democracy and freedom, in the context of changing social needs and a changing relationship between the *universitas*[24] and society. It stresses that the "precondition for tomorrow's university's ability to continue to be a university in line with its founding principles is that it is ready to tackle challenges in an offensive and future-oriented way, without falling victim to nostalgia for a past which will never return (and which, after all, perhaps was not quite so problem-free as the defenders of the old elite university would have it be)." Quality remains a central concern, in the context of the decisions to be made by the university. The major points of the strategy are

- UiB will continue to work for a national and international division of labour, focusing on current and future areas where it can play a leading role in research internationally
- UiB will undertake inter-disciplinary work, at the same time maintaining disciplinary capabilities, even in areas where it is not reasonable to expect to be world-leading. This includes areas for which it may be hard to get external financing.
- UiB will aim to work internationally, with both developed and developing countries. Considerations of international justice will influence institutional and disciplinary choices
- UiB will promote democracy in civil society through education in generic studies, rather than producing fragmented and sector-specific understanding
- UiB will exploit modern information technology in order to disseminate new knowledge to a wider audience and in a less sensational way than was the case in the 1990s

NTNU's strategy much more clearly engages with society and societal objectives

- NTNU will be an internationally leading university within its core area of science and technology research
- NTNU will encompass a wide range of disciplines at high levels of quality, defined in international terms

[24] *Strategisk plan 2000 – 2005 for Universitet i Bergen*, Bergen: UiB, 1999 (our translation)

- NTNU will be an exemplar among universities, with respect to interaction and co-operation among disciplines
- NTNU will be a critical and constructive contributor to society, with a considered and holistic approach to societal problems
- NTNU will actively make use of women's capabilities in its professional development[25]

Unlike Oslo and Bergen, NTNU has never been a general university, expecting to cover the full range of disciplines. It has chosen thematic priorities in areas where it believes it is strong and has opportunities to develop further

- Energy and environment
- Materials
- Medical technology
- Marine and maritime
- Information and communications technology

Each of these priority areas has an **external** steering committee, aiming to link it to societal needs and priorities. This has been controversial within the university, but represents a clear statement of societal intent.

The new university in Tromsø tends to characterise itself as the 'university of Northern Norway.' Important goals in setting up the university included the provision of university education to the region, so that young people were not encouraged to move away because they needed to move south for an education. The region accounts for only 5% of industrial R&D, while the university has a clear mission to interact with the regional economy and society. This poses important challenges. Goals for the university are to

- Develop, preserve and disseminate knowledge of high international quality
- Lead the world in research and education about the Arctic
- Look after basic research and create understanding of its role in society
- Develop inspiring learning environments
- Be the main knowledge institution for the region
- Meet its regional as well as its international responsibilities
- Develop further and continuing education within the framework of a national division of labour
- Be a socially critical institution
- Have a special task in spreading culture
- Respond to changing needs, while honouring long-term obligations
- Be a workplace which offers students and staff the best possible working conditions and environment[26]

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[25] NTNU, *Kreativ, konstruktiv, kritisk: Strategi for NTNF mot 2010,* passed by the College at NTNU, 17 December 1998

[26] UiT, *Strateginotat for Universitet i Tromsø for perioden fram til år 2010*, Tromsø: UiT, 1998

The strategy clarifies that the university will focus on areas of technological strength, based on comparative advantages. Increased external financing from RCN and industry are seen as likely and desirable.

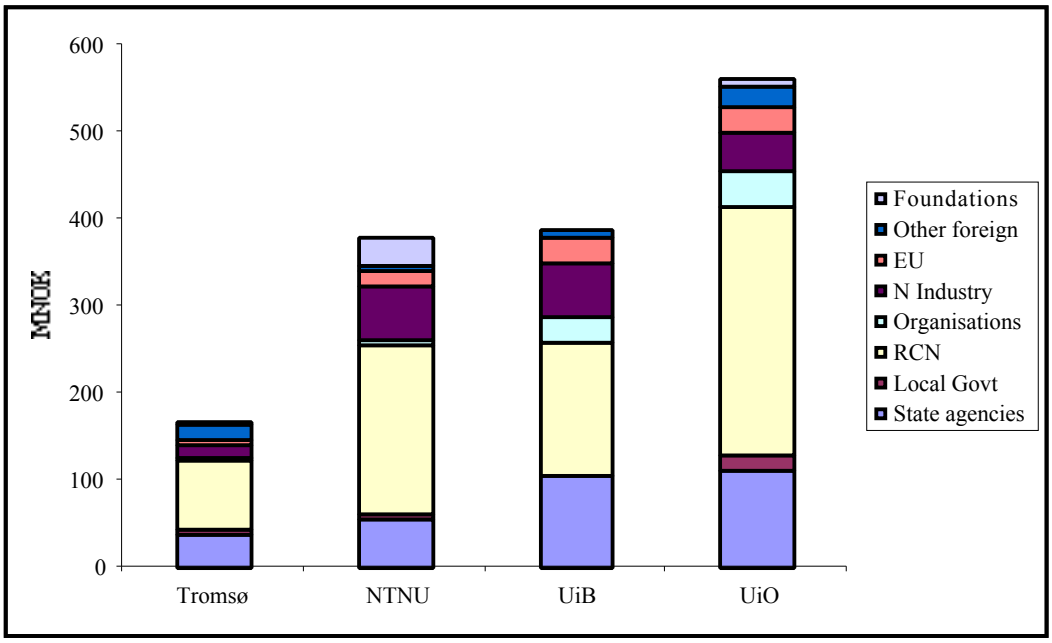
The strategies suggest a spectrum of positions, with Oslo clearly following the Humboldtian tradition of operating at a distance from society and social need, while the two Northern universities offer to engage more actively with society.

Within the block grants to the universities, funds for teaching and research are not currently separated . Block grants are allocated to faculties based on historical practice, and largely in proportion to student numbers. Senior administrators and members of the rectorates we interviewed consistently told us there was almost no way to change these principles. In effect, there is a stalemate built into the internal money distribution game, which prevents redistribution. Bergen has succeeded in implementing a mechanism for spending parts of the block grant on research in a strategic way. Five years ago, the university set up a research committee. This now has some 14 MNOK at its disposal (about 1% of the block grant), which it uses partly to strengthen good existing research groups and partly to establish new ones. Bergen University has a number of small internal funds, which can be used in a discretionary way for travel and so on, providing some small opportunities for steering change. NTNU has managed to retain central control of the 50 most recently awarded PhD stipends, and is selectively using these to build and extend research capabilities in areas of strategic importance. There is now a central pot of some 100 MNOK – 4% of the budget – which the university Board allocates for strategic purposes, based on recommendations from the rector.

Locked into their internal stalemate, the major option the universities have for change on the research front is to lobby for more money. Strategic University Programmes (SUPs) were helpful in a small way to cluster capabilities and counter the universities' internal fragmentation, and there was real potential for the coming Centres of Excellence programme to increase this clustering. For the moment, however, one rector summed up the university's strategy to us as "quality, and aggressively seeking more research money." In view of the perceived difficulty of extracting much more money from RCN, the universities – led, in no small degree, by Oslo – have adopted the tactic of bypassing the research council and approaching the government directly with specific proposals to increase research funding. FUGE – a national initiative in functional genomics – was the first such, followed by the FUNMAT programme for functional materials, with others (such as ethics) to be launched during 2001 and beyond. Senior university people we interviewed (rightly, in our view) saw these initiatives as implicit criticism of RCN's inability to function as an arena where such new initiatives could be discussed and launched. The corollary is that the initiatives also function as a criticism of the universities' own inability to set priorities, which means that almost their only option for change is to seek expansion.

Exhibit 17 shows the amounts and sources of external research funding the universities obtained during the financial year 2000, which we treat as a shorthand description of their societal engagement.

Exhibit 17 Norwegian Universities' Sources of External Funds, 2000



Source Universities' budget submissions, 2002

RCN is clearly the major source of external funds for all the universities. As **Exhibit 18** emphasises, the industrial component is in all four cases modest, as a proportion of total income. Tromsø's low percentage results from the fact that regional industry does little R&D. Oslo's similarly low percentage is more a matter of institutional choice.

Exhibit 18 Norwegian Universities' External and Industrial Funding, 2000

	Tromsø	NTNU	UiB	UiO
Turnover (total costs) in MNOK	987	2,221	1,737	2,970
External funding (%)	17%	17%	22%	19%
Industrial funding (%)	1.4%	2.7%	3.6%	1.5%

Source Universities' budget submissions, 2002; NSD

While the overall level of external funding for the Norwegian universities is roughly in line with that seen elsewhere in Europe, the proportion of industrial funds is low (**Exhibit 19**). The likely explanations are the low R&D intensity of Norwegian industry combined with the significant role of the techno-industrial institutes in serving companies' needs. Both university and college directors interested in increased industrial interaction remarked that they felt, to a certain degree, isolated from industrial needs and demands by the large role that the institutes play.

Exhibit 19 External Funding as Percent of University Income

Country	Total Contract Research	Industry
Netherlands (1999)	20% (excl Res Council)	4.9%
France (1997)	23%	5.6%
Germany (1997)	20%	5.9%
Switzerland (Federal Technical)	17%	7.6%
Switzerland (Cantonal)	42%	7.3%
Belgium (1999)	6%	?

Source: Heide Hackmann, Anne Klemperer, *University Research Funding: An International Comparison*, University of Twente, Centre for Studies of Science, Technology and Society, Report for the Netherlands Organisation for Scientific Research (NWO), February 2000

One of the main ways available to change research directions is through PhD stipends. Indeed, a great deal of RCN funding comes to the universities in this form. A recurring problem for the universities, however, is that the stipends rarely cover the full costs of a PhD candidate during the three years for which they are valid. Equally important, candidates tend to take four rather than three years to complete, leaving the universities with a further deficit. Consequently, the rectors told us that increases in externally funded stipends tended partly to be offset by a smaller reductions in the number of internal stipends and other internal resources in order to balance the books.

Like the Strategic Institute Programmes (SIPs), the Strategic University Programmes (SUPs) in the NT division are perceived as having changed their character over time. While earlier they were allocated based on a mixture of quality and strategic criteria, the focus is seen as having moved more towards quality. This can complicate the process of adaptation in the universities. NTNU specifically had found it difficult to build research capabilities in Information and Communications Technology following a rapid build-up in student numbers for this reason.

One of the rectors argued that the university leadership was under-involved in internal quality control. Simple performance indicators such as publication numbers are collected by the faculties, but give little real insight into developments. RCN's newer 'field' evaluations were a helpful point of entry here, as they provided a basis for discussing change within the universities.

With one exception, the universities generally suggested that their relations with RCN and the usefulness of RCN to them were improving. Several people warned against nostalgia for the pre-RCN days, which were far from problem-free, pointing especially to the contention caused by the extensive use of programming in NAVF's last years. Because of the slow pace of change in the universities, there was a long way to go before there could be much match between the RCN and national research priorities and the strategies of the universities.

3.1.2 The Colleges

The population of colleges contains a mixture of old and new institutions. At one end of the spectrum are regional colleges set up in the early 1970s. At the other are places like the teacher training part of *Høyskolen i Tromsø*, which dates back 175 years. The colleges mostly have their roots in professional education, and as they turn their attention to research, this means in part that they have interests in areas not

covered by the traditional academic disciplines – and not always considered to be respectable by them, either. Information management and librarianship, nursing and disciplines reated to social work were among those mentioned in this connection. Only in the very recent past has RCN been able to respond to this and establish a programme of research for professional education (*Kunnskapsutvikling i Profesjonsutdanning og Profesjonsutøving - KUPP*). This has a budget of 6 MNOK per year for the period 2000 – 2004, inclusive, and is aimed primarily at the colleges. Other RCN activities of specific interest to the university colleges fell under the BRO (Bridge) programme. These were the SMB-Høyskole project, which aims to bring networks of smaller companies into contact with the colleges, and the SMB-Kompetanse programme, which seeks to inject capabilities into small firms by placing graduates in the companies and providing them with project support and training.

Correspondingly, all the people we interviewed in the university college sector felt that their needs were under-served by RCN, that it was difficult to get on RCN's agenda and that they were in practice excluded from much of RCN's activity. The lack of people with doctorates was one reason for this, with RCN apparently unable to recognise that a PhD was not in practice a precondition for doing research. The college in Tromsø had a strategy of allying with the university on joint projects, in order to overcome this obstacle.

College people were rarely involved in RCN governance and were not on distribution lists for reviewing new, proposed programmes, so they had little influence over RCN's agenda. A particularly visible example was the failure to consult Stavanger over a proposed new research programme on tourism, despite the fact that it hosts the Norwegian School of Hotel Management. They felt that this was a factor contributing to a lack of correspondence between programme agendas and their own research agendas, and to the great difficulty they experienced in getting proposals accepted by RCN. Correspondingly, RCN was not seen as a useful discussion partner in relation to the colleges' own strategies

The university colleges are going through a process of upgrading their skills, in order to be able to take on the challenge of the research task they were allocated from 1994. Primarily, this involves putting staff members through PhD programmes. This is a drain on college resources, and not all staff are interested, so the process is comparatively slow. The university colleges with which we spoke tended to have a handful of PhDs in progress out of several hundred staff, though the situation was appreciably different in Stavanger, which has developed research competence in several fields and is able to award PhDs in a small number of areas. The opening up of Strategic University Programmes and instrument grants to the colleges was an important step forward for Stavanger, which has ambitions to become a university and has developed many of the capabilities needed.

The university colleges have allocated 20-25% of staff time to research activities. In some cases, they are still working to achieve this time allocation, and have plans covering the next few years in order to do so. Generally, the allocation of research time is expected to operate across the board, but some say they are now considering whether some division of labour should be established among people with a stronger research or teaching focus. Stavanger is an example, where some departments

allocate as much as 50% of staff time to research while others allocate less than 25%. With the exception of some transitional PhD stipends from the education ministry, which are a very important contribution, and two modest RCN programmes, there are few new resources available to the colleges to make the transition to research status. Crucially, the time existing staff spend on research has to be found from their existing teaching and administrative workload. Colleges aim to achieve this by rationalising teaching so as to reduce individual staff contact time, for example by raising the ratio of project to classroom work. However, colleges acknowledge that this is more feasible in some subject areas than in others. Those involving large amounts of practical work are difficult to rationalise.

The colleges vary in their ability to make strategic allocations to research and to generating a research strategy. The college in Sør Trøndelag has so far allocated 1% of its budget in this was, which is now centrally allocated within the college. The ambition is to bring this up to three percent. The *Høyskole* in Oslo uses 2% of its budget in a similar way, and the college in Bergen about one third of one percent. As in the universities, there are internal barriers in the colleges to establishing central research strategies. However, our impression from discussions with senior college people is that these barriers are somewhat easier to overcome in the college than the university sector, partly because the range of competing disciplines is not so great.

The university colleges – especially the *distriktshøyskoler* – have not only functions in education and research but also in regional development policy. The representation of external people on their boards is therefore higher than is found in the universities, and they tend to have strategies that, as far as possible, link them to the regional society and economy. (There are some important limits here, in that many of the colleges provide training for occupations in the state, such as teaching, nursing and social work.)

Colleges located in university cities found that their ability to retain research-capable staff could be reduced, as these were tempted to migrate to the university in search of more pay, status and better conditions. The presence of a university tended to reinforce the position of the college as a teaching institution. The university college in Tromsø is in the process of negotiating a merger with the university, in part to overcome this problem. The situation in Tromsø benefits from the limited amount of subject overlap between the university and the college, allowing both to benefit from a wider disciplinary range in the merged institution.

We interviewed the rectors of three of the scientific colleges, in agriculture (NLH), veterinary science (NVH) and business and economics (NHH). These are all well-established institutions, perhaps better thought of as specialised universities than as colleges. A primary impression from these was of **continuity** with the pre-RCN structures. As one of the rectors joked, "we used to relate to NAVF, NTNF and NORAS … and we still do!" With many of the same administrators in place and the same links through the research council to the ministries and their agendas, comparatively little has changed for the scientific colleges. To an important extent, this was a disappointment. The anticipated benefits of detaching RCN from detailed control by the ministries and achieving greater cross-disciplinary integration have not been realised. Detailed ministry influence was still clear, even at operational levels. For example, one of the colleges had found a proposal it had written at the

specific request of one ministry being turned down in mid-application, because the ministry had changed its mind about the need for that particular piece of research.

A strength of RCN compared with its predecessors was its growing internationalism – for example, its insistence in appraising proposals on the importance of international publications. This was an important contribution to quality in the applied disciplines, which tended to become too nationally focused, and to reinforcing the international competitiveness of the scientific colleges. However, RCN had difficulty in becoming the needed **arena**, where research ideas could be discussed and where researcher-initiated ideas could be put on the agenda. At least in the areas under the control of the agricultural and fisheries ministries, it was much more of a money-distributor than a research council. It was very difficult to raise interest from RCN for ideas that crossed division boundaries. RCN was not a useful discussion partner in developing college strategies. Overall, the reform had little to help the development of the scientific colleges. There was convergence between the colleges' strategies and that of RCN, but that was because all these strategies respond essentially to ministries' priorities. The growing concern with competition for resources in RCN meant that it was no longer very easy to align college and RCN strategy directly.

4 Conclusions

Most of our conclusions are specific either to the institutes or to the higher education sector. We return at the end to the question of the boundaries between them.

4.1 Conclusions for the Institute Sector

In many respects, RCN's work with the institute sector has been strong. It has

- Brought increased transparency and clearer thinking to the question of base funding for the institutes
- Established a clear set of 'rules of the game' for state funding of research institutes
- Established a mechanism for strategic influence over the development of the institutes, through the use of Strategic Institute Programmes
- Provided both base and project funding to the institutes, using processes which include quality checks and which test for links to user needs
- Established an improved set of indicators, making it more possible to understand the ongoing performance of the institute sector
- Provided assistance to Institutes to obtain EU funding
- Improved the quality and consistency of research institute evaluations

However, RCN has not been able to

- Have much influence over the structure and composition of the sector, for example through rationalisation and encouraging new types of institutes to appear. Thus, the problem of fragmentation remains little changed from 1990
- Extend its strategic role in relation to institutes closely managed by ministries (irrespective of whether these have been base funded through RCN or been among those institutes where RCN is supposed to play an advisory role only).

Nor has it been able to increase significantly the proportion of institutes whose base funding is channelled through it. Unless and until these institutes are placed on a more independent footing, and required to seek more of their income in commercial and international markets, it is difficult to see how RCN can add value to these cases

- Become a respected partner of the institutes in developing strategy
- Take an active role in developing major new programme initiatives
- Make evaluations of institutes have significant consequences, in terms of internal change or – eventually – altered funding levels
- Have a significant influence over the size of the research institute component of the research and innovation system, in different sectors
- Support a broadening of the scope of individual institutes by making available significant cross-divisional funding
- Persuade ministries in any significant degree to fund strategic initiatives beyond 'their' traditional institutes – for example, by taking a cross-sectoral approach to environmental questions
- Raise the international profile and publication rate of the sector

Improving staff qualification levels is an important objective through most of the Norwegian research and higher education system, so the RCN/NIFU reporting system incorporates analysis of the number of people in the institutes who hold PhDs. However, institute/university linkages are important in a broader sense. Data are collected on these, but not published in RCN's annual report. More attention should be devoted to creating and counting these kinds of relationships. RCN could usefully develop incentives to increase the amount of interlinkage.

RCN has set in place most of the mechanisms it would need in order to achieve its institute goals. However, the amount of real change it has been able to cause in the sector is limited. The reason for this does not lie in RCN's performance but in the framework conditions. In practice, RCN does not have the power to cause major change because it lacks sufficient authority over institute budgets. The most hopeful area is the techno-industrial institutes, where RCN has freedom to alter the amount of funding it provides to individual institutes, and can itself decide how and where to allocate strategic resources. However, in this area, RCN's base funding provides a low share of the institutes' total income. This is helpful, in that the institutes become market driven – and there is encouraging evidence that they are able to tackle international commercial markets, in addition to domestic ones. But the benefit of markets are inseparable from the market failures which drive market-led organisations towards short-term concerns, tending to negate the role of the institutes as knowledge bearers and improvers of the national research and innovation system. RCN needs sufficient leverage to counteract this tendency and while it certainly has an influence over the techno-industrial institutes, which is disproportionate to the amount of money it provides, it is not clear that this is adequate.

Outside the techno-industrial area, RCN's real influence over what the institutes do with the money it provides tends to be lower. In extreme cases, such as CMI, RCN does little more than act as a messenger, taking base funding from the ministry to the institute. To a much greater extent than is reasonable, therefore, RCN has to try to exercise influence over the institute sector through persuasion rather than power.

Unless a better balance is found between these, it is difficult to see how RCN can achieve more significant progress.

4.2 Conclusions about the Universities and Colleges

RCN does not have strategic responsibility for this sector. Clearly, however, its shape and performance are central to what RCN does.

The universities are lagging behind the wider pattern of change evident in the OECD more generally. They have been sheltered by the institute sector from the growing mission-orientation in funding that is evident in other countries and from the increasing industrial influence seen elsewhere. They have comparatively weak mechanisms for linking with industry and other societal producers and users of knowledge, such as industrial liaison and commercialisation functions. They are following the wider trend to internationalisation, but mostly in relation to the academic research community.

The peak in student numbers during the 1990s provided growth in the block grant and therefore an opportunity to make choices about how to allocate income between teaching and research and how to build distinctive research strategies. This was not taken up. As a result, the numbers of university faculty increased, without a corresponding increase in external research funding. Because of their governance structures, the universities continue to find it difficult to reallocate resources and therefore to define and implement research strategies. Significant reforms are needed before the universities can be said in any sense to have a research policy, either individually or collectively, or to have the amount of control needed over their internal structures to be able to negotiate such a policy with external funders.

RCN has done rather little to enable the university colleges to build research capabilities. Given RCN's stagnating budgets and the growing size of its 'customer base' in the universities, this is perhaps not surprising. With the exception of some very small programmes, RCN's *de facto* position has been that it will fund the colleges when they can win in the quality competition with others, and not before.

There is a feeling in a number of the colleges that regional considerations should play a role in the allocation of research funds, so that these are allocated pro rata the number of inhabitants in the regions, rather than according to RCN's traditional research funding criteria. In our view, this is a dangerous confusion of regional and research policy. Decentralisation of the college infrastructure is a fully legitimate ambition of regional policy. However, reallocating research funding on regional policy principles will damage research environments in both central areas and the regions. The price of setting up a research-performing regionalised college infrastructure of a quality worth having necessarily includes the set-up costs involved in establishing research which is good enough to qualify for research funding in competition with other research environments. The implication is that significant transitional funding is needed from regional policy budgets, where the benefits of the decentralised college infrastructure can be weighed against other potential uses of funds. To the extent that this is felt to be worthwhile, therefore, KRD could be a major research sponsor in a transitional period, using RCN as a means to obtain the needed quality control.

The RCN reform has meant comparatively little for the scientific colleges. Only if RCN can become more of an arena for deciding and implementing research policy will the 1993 reform mean much to them.

4.2.1 Conclusions for the Research and Higher Education Sectors

There are major policy challenges relating to the respective roles of the institutes and the higher education sector, which need urgently to be addressed. Elsewhere in this evaluation, we argue that there is a policy need to move the institutes significantly closer to the universities, and for some re-division of labour among the universities, institutes and industry. Mechanisms have not been put in place that would achieve this more drastic restructuring, but neither has this been one of RCN's goals. RCN itself clearly understands the need for change in the institute sector and is beginning to talk[27] in terms of merging institutes into larger entities, in order to reap economies of scale and scope and to become more engaged in international research. Some of the institutes also understand the need to act and support these ideas. (It is worth noting that the same discussion is in progress in Sweden, where four of the largest institutes – IVF, IVL, SIK and SP – have taken an initiative[28] to develop an alliance which could ultimately become a VTT-like structure.) RCN emphasises the need to increase base funding, if the institutes are to evolve new capabilities and in order to let them co-finance participation in EU Framework Programmes.

A major review of the Norwegian institute structure is well overdue, and needs to be accompanied by measures which further de-couple the institutes from the ministries, if the sector is to evolve structures that can keep pace with accelerating change in knowledge production and in internationalisation. This means moving from the incrementalism into which RCN has been forced through lack of power to a mode where RCN and the institutes are empowered to make significant change.

Reform of governance in the universities should pave the way for a modernisation of that sector, not least in order to increase societal links. If the idea of a 'knowledge society' has any meaning at all, the comparative isolation of the Norwegian universities is not sustainable. This does not in any way mean that the universities have to give up long-term research and devote their entire efforts to helping small companies. Long- and shorter-term research issues are increasingly interrelated. Universities abroad have realised this and increased their engagement with shorter term issues, with interdisciplinary approaches, with problem-driven research and in partnerships with other knowledge producers in their national research and innovation systems. In order to compete in this changing situation, and in order to maintain their significance in knowledge production, the boundaries between the universities, the institutes and other knowledge producers and users need to become more flexible and more permeable. The governance structure of neither the universities nor RCN is sufficiently flexible to achieve this in a timely way. We recommend that this matter should be investigated as quickly as possible, so that adjustments can be made which will not only permit reform but also allow it to be implemented.

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[27] *Årsrapport 2000, Forskningsinstituttene Samplerapport*, Oslo: NFR

[28] see Erik Arnold, Jari Kuusisto and Philip Sowden, *Building a World Class Research Institute System in Sweden: Report to IVF, IVL, SIK and SP*, Brighton: Technopolis, 2000