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Evaluation of the Research Council of Norway

Background Report No 10. Internationalisation

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Manchester Institute of Innovation Research, technopolis [|group|](#), July 2012

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Summary

The Report

1. This report is the Internationalisation Study, one part of the major review of the Research Council of Norway (RCN) undertaken by an international team, led by the Technopolis Group, for the Ministry of Education and Research, Norway. The report was completed by a research team at the Manchester Institute of Innovation Research of the University of Manchester, and by a member of staff from Technopolis.. Technopolis staff also prepared a number of background reports on which this Study is based. NIFU also prepared a report of surveys it conducted, which has also been used in the preparation of this report.
2. The Report is organised into two parts. Part One presents the findings of the Internationalisation Study. Chapter One examines the Internationalisation Strategy of the Council, Chapter Two presents our findings on the Implementation of the Internationalisation Strategy, Chapter Three presents our findings on the Impact of the Internationalisation Strategy. Chapter Four presents our recommendations on the Internationalisation Strategy. Part Two presents the relevant data, and analysis of the data we have collected on which we based our findings and recommendations. Part Two is provided mainly for reference purposes.
3. In broad terms, the questions probed in this study are:
 - i) What form does the Internationalisation Strategy of the RCN take?
 - ii) What does the Internationalisation Strategy of the RCN lead to in terms of scope, coverage within the context of Norway and compared with other relevant countries?
 - iii) What is the impact of the internationalisation activities of the RCN? How do these compare with benchmarks?
 - iv) How in the light of these findings should the Internationalisation Strategy now operate and how should it be supported?

The Internationalisation Strategy

1. The Internationalisation Strategy of the RCN (Research Council of Norway 2010) seeks to capitalize upon and realize the benefits for Norway of greater international cooperation in research. The Strategy has five main objectives and five main action points to help realize Norway's Visions for 2020 as outlined in the Strategy document. Those objectives are to: :
 - o help to address global challenges to society;
 - o enhance the quality and capacity of Norwegian research;
 - o secure Norway access to international knowledge production;
 - o boost the competitiveness of Norwegian trade and industry;
 - o promote Norway as a leading research and innovation nation in selected research areas.

The main action points for the Internationalisation Strategy are:

- o All of the Research Council's activities, -programmes, open competitive arenas, special initiatives, institution-oriented measures and other forms

- of support- must include clearly-defined objectives and plans for international cooperation;
- The Research Council will encourage Norwegian participation in joint programmes across national boundaries when this is crucial to addressing common challenges or strengthening Norwegian research and knowledge-based industry
 - The Research Council will develop financial instruments to support the establishment of long-term cooperation between Norwegian institutions and corresponding institutions in other countries.
 - The Research Council will refine and strengthen stimulation measures to encourage Norwegian researchers, companies and research institutions to participate more actively in international collaborative and competitive arenas.
 - The Research Council will focus greater attention on international cooperation and researcher mobility in its internal grant application review processes
2. An essential feature, or principle of the Strategy, which has been adopted is the *mainstreaming* of the principle of internationalisation. This means that the Research Council now requires virtually all its funding instruments and programmes to have targets for international engagement, and that the Council's funding instruments will seek, wherever possible, to facilitate international engagement with researchers and organisations, including companies, outside Norway, and reimburse their cost, subject to certain limits.
 3. The work of the Study Team focuses on those action points of the Strategy as these are the mechanisms by which the Strategy is implemented. The key action points of the Strategy cover these major areas:
 - The mainstreaming and prioritization of internationalisation (Points 1 and 2)
 - Creation of financial structures and enabling of long term cooperation (Point 3)
 - Promotion of and stimulation of measures to encourage international cooperation including research mobility (Points 4 and 5)

The Approach

1. Our approach in this study has been to examine the RCN's Internationalisation Strategy by looking at the implementation of the Strategy and then at the outputs, outcomes and impacts of the international research which the RCN funds. Our Internationalisation report therefore considers both summative and formative aspects of the RCN performance.
2. Our proposal offered to review the Council's activities that promote internationalisation and to address the question of how internationalisation priorities for research and cooperation partners are chosen, and how complementarities found between such options are then implemented. Our approach has been to consider these questions within the key framework of the Internationalisation Strategy of the Council so that our report addresses the main policy statement of the Council on internationalisation. We have nevertheless maintained focus on specific questions of internationalisation policy that our proposal outlined.

3. Since the Strategy is recent, our findings are indicative, where they relate to outputs, outcomes and impacts of RCN activity, rather than judgemental and final. On the implementation process, however, we are more certain and present more concrete findings.
4. Our sources of information have been as follows:
 - International Comparative Review of Funding Organisations
 - Bibliometric Data on Scientific Performance and Scope of Internationalisation
 - Review of Framework Programme Participation
 - Documentary Review of Research Instrument Database - Composition Analysis
 - Researcher and Leader Survey and Company Survey
 - Interviews with 34 individuals representing Ministries, RCN, Industrial organisations, HEIs, and Institutes.
 - Consultations with a Focus Group of key stakeholders and Workshop with the Ministry of Education and Research, other ministries, the Council and other key stakeholders.
5. Below we give our findings and the corresponding recommendations.

A. Overall importance of internationalisation and the internationalisation strategy

Finding

The Norwegian research system is highly internationalised and internationalisation is a key goal for Norwegian science policy. Through various strategic means, the RCN has strongly increased the meaning of internationalisation in its funding and support activities. The share of international actors that are funded has sharply risen, offering broader cooperation opportunities for Norwegian researchers and firms.

Finding

All research and policy actors involved clearly see the net benefits of international activities. Internationalisation increases the impact of Norway's science, raises the likelihood of excellence, gives access to knowledge and supports innovation activities.

Recommendation 1

The strong focus on internationalisation in the RCN strategy should be upheld given the preferences of the actors, the overall political goals of Norwegian policy and the overall positive net benefit of international research and innovation activities. The policy of opening up of programmes should be continued.

Recommendation 2

The Council should examine quickly what administrative burdens will arise from greater internationalisation. As we have shown in Section 8, at the current rate of growth of foreign partners in RCN funded schemes, one third of all of the Council's project participation will be with foreign partners by 2015. This is likely to have major impacts upon administration of schemes and cost implications.

B. Mainstreaming and prioritisation

Finding

While the current RCN strategy can potentially reap the maximum benefit out of internationalisation for the Norwegian system, it needs careful implementation and entails two risks: (1) certain internationalisation activities may become sub-critical especially within small programmes or initiatives and (2) there is a consequent strong requirement for transparency and coordination of all these mainstreamed international activities, without which, efforts will become fragmented and suffer from duplication or gaps.

Recommendation 3

Making internationalisation a central feature of the science system through mainstreaming is essential and should be continued. However, mainstreaming should be coupled to a clear set of principles to determine what internationalisation contributes to the various goals and programmes of the RCN and which forms and levels of internationalisation are sensible and realistic, given organisational and budget constraints. Also, it needs transparency and coordination in order to avoid duplicated efforts and sub-critical, costly activity.

Finding

Opening programmes up to international participation introduces a new dimension to decide Norway's priorities for research. Because no country has unlimited resources with which to fund research, choices must be made about which countries to work with and why Norway's own programmes should work with them. This is more important because Norway is a small country and has limited scientific coverage. Norway's interests must drive this process and choices will need to be made. Our view is that in this new framework for research policy prioritization of partners, research topics and resources need far greater attention. The current position is an "emergent strategy", where there is uncertainty at all levels on the question of how open and at what levels Norway should be. Criteria for the added value of international cooperation are not fully developed.

Recommendation 4

The Council should formulate a clearer process for determining where internationalisation is in the national interest, so that all actors in the research system understand the scale and scope with which internationalisation should be pursued in the various programme areas, and to what limit. There is a strong need for the development of internationalisation priorities – e.g. collaborating with China needs to be focused on key themes and areas where Norway can benefit (rather than just collaborating to keep an eye on a competitor) – similarly, collaborating at such a broad and general level with the EU programmes (just to gain a "seat at the table") is an inefficient strategy.

Finding

The existing spread of countries and country links which Norway possesses is a strong platform to be exploited further. Norwegian scientists are often working on topics of interest to other funding bodies outside Norway. However, there appears to be some gap in offering collaboration opportunities with countries outside Europe and North America.

Recommendation 5

Some additional attempt should be made to broaden the opportunities to collaborate with actors outside the EU and North America should be explored and systematically implemented. In addition, the EU/Nordic/3rd country balance needs an in depth investigation and study – it should form the focus of either/both of the two bodies suggested below (see recommendation 13 below). Nordic collaboration on infrastructures may be possible.

Finding

In relation to the FP and Norwegian involvement, our view is that the Council has a strong and effective process for aligning its priorities with that of the FP. However, a consequence of this is that other opportunities including bilateral links have as yet insufficient emphasis when choices are made about the topics for internationalisation and which countries should become partners.

Recommendation 6

Greater resource should be allocated to promoting the bilateral links with other countries on the basis of strategic processes to select topics and partners for optimal cooperation – rather than broadening without strategic focus.

Recommendation 7

The Council should play a greater role in defining the scientific benefits for Norway that emerge out of bilateral links and then support to create those bilateral links with selected countries. This will become a very high priority as the Norway begins to attempt to exploit the ERA based frameworks for research, especially the JPIs.

C. Support mechanisms, including mobility support

Finding

The study found that RNC funding schemes play a strong role in supporting internationalisation and are widely accepted in the system. The support the RCN offers to internationalise is valued, especially when it comes to EU preparation and mobility. However, supporting schemes are not known broadly enough and a majority of researchers indicates that the supporting schemes are not adequate. There are concerns of declining mobility of doctoral students from Norway.

Recommendation 8

The visibility of internationalisation support schemes should be increased through awareness and information campaigns, with a focus on early stage career researchers. Doing so would also enable the RCN to be more responsive to specific needs of researchers. Further investigation of doctoral and post-doctoral mobility should be undertaken to investigate the extent of problems and propose policy responses.

Finding

Measured by the acknowledgements in published articles to EU funding, the influence of the EU as funding source is less pronounced in Norway than in benchmark countries (Sweden, Denmark). The success rates of Norwegian researchers are slightly lower than with most benchmarking countries, while Norwegian SME do comparatively better.

Recommendation 9

A very detailed analysis as to the nature and quality of participants in EU programmes vs. other national and international funding schemes should be undertaken in order to understand if the lower success rate of Norway is due to a bias in participation, given the generous funding conditions of Norway, or lower quality of Norwegian researchers.

Finding

Compared to other supporting systems, the RCN support, through NCPs, is functioning well, even if slightly less staffed. However, there is no strong emphasis in the advice to advise strategic leaders in organisations and the EU support in NCPs does get less prominence than in other comparator countries.

Recommendation 10

The NCP system should focus more on advising strategic leaders and should – in case Norway decides to put more emphasis on EU research – play a stronger role in linking to the discourse at EU level.

Finding

There is a high awareness of the benefit of inward mobility, but less propensity to see the advantages of outward mobility. The attractiveness of Norway as a place to work supports one part of the internationalisation policy: it brings non-Norwegian researchers of high calibre to Norway to study, mainly to build their scientific careers. But not enough Norwegian researchers are moving abroad to develop their careers and not enough high calibre researchers remain within the Norwegian system. There is insufficient movement out of and back into the Norwegian research system of scientists of the high calibre needed to maintain and strengthen Norway's scientific strength.

Recommendation 11

The Council's offering of opportunities abroad for its researchers should broaden in scope. Currently there is too much emphasis placed on long term stays in other countries. Researchers wishing to have research stays at foreign institutions should be able to stay abroad for shorter periods as well as for longer periods.

D. Strategic intelligence

Finding

In general there is not enough understanding in the system as to the nature, scale and scope of internationalisation and thus on the impact and gaps of international activities and the necessary modifications in support and financing.

Recommendation 12

There is a need for RCN to develop a more robust and routine process for the identification of strengths and weaknesses of the position of Norwegian S&T – either in house, or from specific commissioned studies. This should be supported by a routine bottleneck analysis to understand how support should be modified. Equally, greater monitoring and more frequent and tailored evaluations of the implementation

of internationalisation and its impact, particularly on country coverage, quality and the contribution to Norway's national interest should be undertaken.

E. Implementing the strategy – within RCN

Finding

Giving complete discretion to grant awarding committees and programme boards to set the limits to internationalisation involves some risks of missing synergies between programmes, and reaping the full benefit for the RCN remit more broadly. However, driving internationalisation top down with indicators based on the count of foreign personnel or count of outside countries involved, or through a set budget, is not a better option.

Recommendation 13

The RCN should introduce an internal high level, multi-domain advisory body which could represent the views of both top-down considerations and bottom-up (researcher driven) demands. This would also enable better integration and consideration of industry needs within the science portfolio. It would also lead to an enhanced ability to influence ministries when it comes to internationalisation.

F. Cross System Interaction and Discourse

Finding

While, in many respects, the cooperation between the RCN and ministries is working fine, not all ministries follow a transparent and strategic approach when it comes to prioritising partner countries and supporting activities. This causes inconsistencies and is a potential for inefficiencies across the system.

Recommendation 14

When defining international activities, Ministries should attempt to engage with the RCN, and the RCN should be more pro-active in explaining the RCN strategy and support ministerial strategies.

Finding

There is a lack of a broader, cross-system debate about the merit and form of internationalisation. The dual role of the Council as (1) advising the system (other ministries etc.) and 2) being a strategic player with budget decisions and priority setting cannot be without tension. A systematic, informed cross-system debate on internationalisation is missing

Recommendation 15

In order to build a systematic and informed cross system discourse, and to enable the RCN to better listen to and respond to the needs of the Norwegian research community, a *Forum* on internationalisation should be established with key ministries, the RCN, representatives of large research organisations and researchers. This should allow for an open and transparent debate about what the policies are, and also be the locus of reporting about monitoring and evaluation of internationalisation activities.

This Report

This report is based on the Internationalisation Study, which forms one part of the major review of the Research Council of Norway (RCN), undertaken by an international team led by the Technopolis Group for the Ministry of Education and Research, Norway. The work on internationalisation has been undertaken by the Manchester Institute of Innovation Research at the University of Manchester, an organisation working as a subcontractor to Technopolis. A member of staff from Technopolis has been involved directly in this study as a member of the interview team, and reports by Technopolis and NIFU have also been used as a basis for this report.

The Internationalisation Study examined the Internationalisation Strategy of RCN and a number of related strategies. The Internationalisation Strategy of the RCN (Research Council of Norway 2010) seeks to capitalize upon and realize the benefits for Norway of greater international cooperation in research. The Strategy has five main objectives and five main action points. The action points are steps, which the RCN has undertaken to realize the benefits outlined in the Strategy. These steps, the Council states, should help Norway to realize the Vision for 2020, also outlined in the Strategy document.

The key impacts envisaged by the Strategy are that a) Norwegian research will contribute to the solution of global challenges; b) that Norwegian research will achieve greater scientific impact (in certain areas); c) that Norwegian research will increase the competitiveness of Norwegian trade and industry; d) that it will increase Norway's access to knowledge production; and that e) Norway's human capital will be developed.

The study reviews the scope of internationalisation of Norwegian science and the impact of internationalisation. Against this background, it analyses the Internationalisation strategy of the RCN, its appropriateness and its implementation. On that basis, the study formulates recommendations as to what could be done better to realize the aims of the strategy or adjust the strategy.

The Study Team presents this report on internationalisation in two parts. The first part is the presentation of the findings from the internationalisation study. It is a synthesis of a number of forms of evidence. The second part of the report contains a series of empirical chapters, some of them including considerable detail. These chapters present a detailed investigation of certain aspects of internationalisation of Norwegian science. The empirical chapters are presented to provide the evidence on which the findings have been based.

Our approach in this study has been to examine the RCN's internationalisation strategy by looking at the outputs, outcomes and impacts of the research which the RCN funds but also at the processes involved in supporting this research. Our Internationalisation report therefore considers both the summative and formative aspects of the RCN performance.

We realize that it is only recently that major changes have occurred within the organisation of the RCN and that it will not be possible to assume that the performance we observe is wholly related to the mission, operation and implementation of RCN's strategy and programme as they stand at present. We therefore present our findings as indicative where they relate to outputs, outcomes and impacts of the current RCN strategy rather than as judgemental and final. However, the study assesses the implementation of the strategy and formulates implementation recommendations.

We should also note that internationalisation has been an important aspect of the Norwegian science system and part of RCN strategy since at least 2005. There is consequently a significant body of evidence on how Norway has exploited internationalisation opportunities, through its own national programmes, membership of the EU's Framework Programmes, and bilateral cooperation activities and its Nordic cooperation. This body of evidence provides important insights into how Norway's international cooperation operates which can help understand the operation of the current Strategy for Internationalisation.

PART ONE.
Synthesis of Findings and
Recommendations

1. Objectives and the Study Design of the Internationalisation Work Package

1.1 Aims of the Study

The Internationalisation Study aims to determine the role of the internationalisation activities of the Council. In particular, we examine the Internationalisation Strategy as the key statement of intent of Norway's new approach to scientific and research engagement internationally.

In broad terms, the questions we have asked are these:

1. What form does the Internationalisation Strategy of the RCN take?
2. What is the scope of internationalisation, how do actors assess the opportunities they are offered to internationalise?
3. Against this background what does the Strategy of the RCN lead to in terms of scope, coverage and support within the context of Norway and compared with other relevant countries? What is the impact of the internationalisation activities of the RCN?
4. How well is the Strategy implemented?
5. How, in the light of these findings, should the internationalisation strategy now operate and how should it be supported?

The work of the Study Team has been focused on how the RCN seeks to realize its objectives and therefore addresses the action points to implement the Strategy. The five key action points of the Strategy cover three main activities:

1. The mainstreaming and prioritization of internationalisation (Points 1 and 2)
2. Creation of Financial Structures and Enabling of Long Term Cooperation (Point 3)
3. Promotion of, and stimulation of measures to encourage international cooperation including research mobility (Points 4 and 5)

1.2 Methods Used

1.2.1 Method Mix

We have used a wide range of methods and sources of information to investigate how the Council supports implementation. We have not though conducted a specific foresight activity.

Our sources of information have been as follows:

- Comparative international review of other Funding Organisations
- Bibliometric data analysis of scientific performance and scope of internationalisation
- Review of framework programme participation
- Documentary review of research instrument database - composition analysis
- Researcher and leader survey, and company survey
- Interview programme
- Consultations with focus - and workshop group

The specific steps in more detail are defined below.

1.2.2 Comparative Review of Funding Organisations

We have reviewed the operation of a number of other research councils and research priority setting organisations in other countries to learn lessons that may help us understand whether the Council is achieving its objectives and what alternative approaches to the realization of the Council's objectives might be appropriate.

1.2.3 Bibliometric Data on Scientific Performance and Scope of Internationalisation

Our bibliometric analysis was undertaken to give us insight into the impact of publications supported by the RCN and comparison data. The bibliometrics analysis also identified the countries where cooperation (co-publication) was occurring. Our data provided us with comparisons with other countries, and other funding organisations. The bibliometric data also provides an understanding of what level of internationalisation Norway currently achieves, and therefore what foundation it has for future internationalisation activity.

1.2.4 Review of Framework Programme Participation

The analysis of E-CORDA data presents comparisons of Norwegian engagement with, and performance within the various instruments of Framework Programme Seven (FP7). Comparisons are made with the average of all FP engagements (the Global) and with the following countries – Belgium, Switzerland, Denmark, Finland, the Netherlands and Sweden.

The following issues are addressed: a) how does Norway use the FP in terms of levels of proposals submitted, the level of successes of proposals and the actual levels of involvement; b) variations in involvement by activity area; and c) the engagement with international partners through the FP itself.

1.2.5 Documentary Review of Research Instrument Database - Composition Analysis

Documentary analysis of the research instruments and funding was undertaken by Technopolis to identify key areas of activity and resource use between programmes. A review of the role of internationalisation activities was included in this analysis to help assess the level of resource used in internationalisation and the number of foreign organisations involved in the RCN's activities as recipients of funding.

The full composition analysis will be provided as a separate document by the leader of the main Study, Technopolis. We include a summary of key findings in our empirical section.

1.2.6 Researcher and Leader Survey and Company Survey

Four survey instruments were operated during the main study in which internationalisation questions were included. Surveys aimed to determine the views of researchers in public (researchers, leaders and meeting place attendees) and private organisations (the company survey) of the internationalisation activities.

The full report (Users' experiences of, and interaction with the Research Council of Norway Results from surveys of researchers, research institution leaders and participants in RCN meeting places (Evaluation of RCN 2012) by NIFU will be provided as a separate document by the leader of the main Study, Technopolis. We include a summary of key findings in our empirical section.

1.2.7 Interview Programme

The Interview programme sought to determine how well Norway uses the Framework Programme and other mechanisms for international collaboration. It also focused on the mobilisation of the EU framework programme instruments through the researcher

community and the way the RCN influences and coordinates the European level activities and level of international cooperation in R&D. We also sought to understand the way the internationalisation strategy is defined and implemented by RCN. The interviews also covered questions on the Nordic involvement, how RCN set its strategic goals, its interaction with other stakeholders both in taking and providing advice and how it performed as a forum for researchers in Norway.

The interview programme involved 34 individuals representing Ministries, RCN, Industrial organisations, HEIs, and Institutes.

1.2.8 Consultations with Focus Group and Workshop

In order to receive feedback on early research findings, and to make sure that these were understood by key stakeholders and the client, we undertook two consultations. The first was a Focus Group meeting with key organisations, research performers and industry representatives. This gave the Study Team the opportunity to obtain early feedback on findings and identify gaps. A second meeting took place in June around 5 weeks after the Focus Group, bringing together representatives from Ministries and the Council. This was again an opportunity to verify certain findings from the research and to identify any outstanding questions, which needed further investigation. Both meetings were successful in that they provided some questions for further investigation but mainly supported the conclusions and findings of the Study Team.

1.2.9 The Iteration Process of the Study

Our research approach is to continually review our data, synthesize and then use the synthesis as a basis to incorporate findings into further questions to fine tune and make more precise our enquiry into key issues. This ensures that as we move through the research process, subsequent research steps address the issues that need the more detailed enquiry, either because we have contrasting findings or because the issues have been indicated to be of greater importance than previously understood.

We employ the PDSA (plan, do, study, act) approach to preparing our research instruments, particularly as we move into later stages of the study (Interview Programme, Consultation Phase) but it is also possible to review data collected at an earlier stage (Bibliometrics and – E-CORDA data) to investigate important issues that have arisen during the Study.

1.3 Mapping Methods to Questions

1.3.1 Mapping Methods and Analysis to Key Issues

The following table indicates the mapping we have used between the methods used above and the key questions of the evaluation. Where data and analyses used have been particularly important, this is emphasised with two crosses.

Table 1 Mapping Key Issues for the Research and Empirical Data

Key Issues Empirical Data	Implementation Focus			Impact Focus				
	Partners and Prioritization	Financial Structures and Enabling and Enabling Instruments	International Mobility in Grant Application Procedures	Global Challenges	Scientific Impact	Competitiveness of Trade and Industry	Access to Knowledge Production	Human Capital
Comparative Review of Organisations	XX	X	X	X		X		
Review of Research Scope and Bibliometric Performance				X	X	X	X	
Review of EU FP Participation		X	X	X	X	X	X	X
Documentary Review of Research Instrument Database – Composition Analysis	X	X	X			X		
Researcher and Leader Survey and Company Survey	X	X	X		X	XX		X
Interview Programme	XX	X	X		X	X		X
Consultation: Focus Group and Workshop	X	X	X		X	X	X	X

2. Internationalisation: the Strategy and its Implementation

2.1 Internationalisation and the Overall Strategy of the RCN

This section of the report examines the internationalisation strategy of the Council. The internationalisation strategy of the Council has been launched recently, in 2010. It is not however the first recognition of the importance of internationalisation of research for Norway nor the first statement of policy in this area. Initiatives to link Norwegian research to other countries have been in existence for many years, the North America Foundation (non-governmental) has existed since 1919¹, and internationalisation has been a continuous aim of research policy in Norway for many decades. The current internationalisation approach however places new emphasis upon internationalisation and encourages the systematic use of international links – mainstreaming - through virtually the whole portfolio of Research Council funding instruments.

The Internationalisation Strategy (Research Council of Norway 2010) (the Strategy) fits within an overall strategy of the Council and associated thematic and subject strategies (Research Council of Norway 2007) and also draws from other related government of Norway statements on the internationalisation of research, notably the North America Strategy, developed by the Research Council's parent department the Ministry of Education nearly a decade ago (Ministry of Education and Research 2004), and other more recent policies from the Ministry of Foreign Affairs relating to China (Ministry of Foreign Affairs 2007) and India (Ministry of Foreign Affairs 2009) and the White Paper on research (Ministry of Education and Research 2009) which states that Norway's participation in the Framework Programme of the European Union and in the development of the ERA are important priorities.

The *main strategy* has the following objectives:

- To ensure adequate capacity and quality. There must be greater investment in research activity and the overall quality must be enhanced to help researchers, trade and industry and society at large to develop and compete in an increasingly globalised world.
- To meet the changing needs of society. Research must seek to respond more directly to specific social and industrial challenges, especially in relation to welfare and industrial development, as well as global climate and energy problems.
- To create a sounder structure. The structure of the Norwegian research system, its national partnerships and its international participation must be upgraded to achieve optimum utilisation of Norway's overall R&D.
- To promote new learning. Research must generate results that can be applied by the private and public sectors alike, as well as provide a framework for learning that will benefit the national knowledge culture.

The third main objective is the only objective to mention explicitly the role of internationalisation although the first objective implies that only by international participation will Norway acquire the knowledge it needs to compete with other nations. This objective is common to many research councils across the developed world. The third objective is similar in its overall aim in that it considers that internationalisation will increase the relevance of Norway's research – to other countries – and that internationalisation should be undertaken to allow Norway to exploit fully its research and development (and capability). This third objective suggests that the realization of this aim requires a resource requirement to “upgrade”

¹ The Norway-America Fund was in fact the founding organisation.

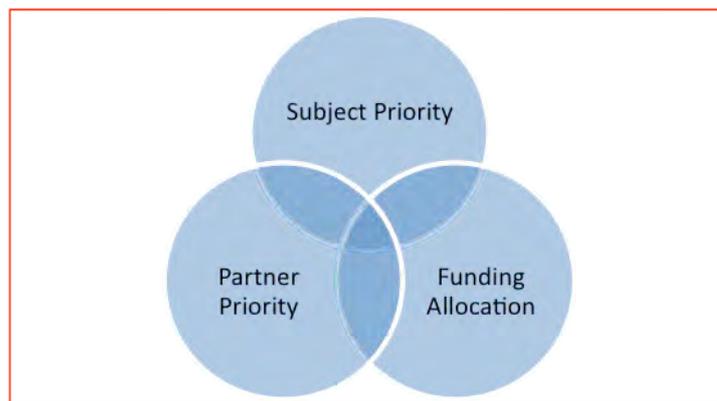
the international participation, and implies that previous efforts have been insufficient to achieve the level of internationalisation that is in Norway's interest. The Council's organisation plan and role definitions document (Research Council of Norway 2011) and most recent report of the Executive Board (Research Council of Norway 2011) elaborate some of the goals of the Internationalisation Strategy and place the additional requirement on the Council that "all ... of its activities - programmes, open competitive arenas, institution-oriented measures and other forms of support- must include clearly-defined objectives and plans for international cooperation" (page 2). The report also reports on a number of key developments taking place in the area of internationalisation, including bilateral research cooperation with China, participation in the Framework Programmes, and membership of the JIITs.

2.2 Setting Research and Partner Priorities

2.2.1 Introduction

Any organisation with responsibility for research funding has three main aspects to consider. Which topics should be funded, who will be the partners for cooperation and collaboration, and what level of funding is available, and will be appropriate to realize the aims and objectives consistent with the mission of the organization. These three degrees of freedom or aspects of research funding policy are represented in the diagram below.

Figure 1 Three Dimensions of Research Strategy



The choice of partner for research can be made at a number of levels, depending upon how partner is defined. Partners can be defined as countries, i.e. national governments, nationally (or internationally based) funding bodies, research organisations, such as universities, or particular researchers. We see that there are four levels. Partners can be selected in the "indicative" sense as preferential; but they can also be compulsory. The right of choice can also be made at different levels down the hierarchy of the research system, beginning with the country, then moving to the funding body, then to its agents, who might be researchers vetting and assessing grant applications, and then to the recipient of the grant.

This review of internationalisation has not intended to look closely at the issue of the balance between top down or bottom up funding, the so-called targeted versus response mode funding; however, it is not possible to consider internationalisation and partner and priority setting without taking account of this issue. The reason for that is that within targeted funding programmes there is usually an explicit or implied targeting of particular regions or countries, while with response mode funding, there in principle greater freedom left to researchers or to research boards to decide, on the basis of the research they wish to do (or to fund), the choice of partner country. Thus, in systems with greater targeting, there is a higher level of control of international choices than within research systems that have more response mode funding.

Where choices of cooperation countries are made on the basis of political considerations, the choice of country is a “given” for the research funding body. Thus, once a partner country is chosen it is then for the research funding body to work out how best to identify subjects and funding that will serve the national interest. More often though, the research funding body must determine all these issues in one optimization, deciding its priorities, its partner countries, and its funding allocation processes all at the same time. Most of the choices the RCN faces are choices where all three issues must be considered together.

2.2.2 Principles of prioritization and instrumentation

Compared to other funding organisations in comparator countries, the RCN has the most explicit, overarching strategic approach to internationalisation. In Norway we see a combination of a top down and a bottom up strategy. Partner *countries* are only in a limited sense politically chosen: the majority of the countries which are chosen to be partners for research are chosen on the basis of how they contribute to the Norwegian research interests. Priorities for research and for partnering are partly defined by RCN acting on the advice of other ministries and other actors and also on the basis of what research boards, that support the specific programme instruments, believe is in the Norwegian interest. The Norwegian strategy embodies therefore a top down approach to priority and partner setting in a relatively loose sense combined with an approach that sees programme boards applying the criterion of scientific excellence to research proposals and then internationalisation as a general criterion by which to determine if a grant application should be funded.

2.2.3 Key Actors Involved

2.2.3.1 Ministries

Ministries in Norway have sectoral research responsibilities and are key actors in driving internationalisation strategies within the RCN, but vary greatly in their efforts as some are more internationally seeking than others. Overall responsibility for bilateral links is taken by the Ministry of Education and Research, although the ministry of Foreign Affairs made the agreement with China. Other priorities for research areas, international links and particular research instruments (all three dimensions of priority setting combined) flow in from across the various ministries, of which there could in principle be 16, each individually identifying priorities.

In some instances research fields are funded by several ministries. Our interviews with RCN staff suggest that the downside of this arrangement is firstly: difficulty for RCN to prioritise demands from different ministries and secondly, that targeted areas are not the result of “objective” evaluations and decisions, but rather the result of successful competition between the ministries.

It was noted that some ministries have preferences for particular forms of instrument, Centres of Excellence for example being favoured by some ministries over other types of funding instruments. Much of the Ministries’ prioritisation is built on tradition which drives a specific formation of funding instruments and internationalisation.

This is not to say that the ministries are overly forceful as RCN is reported to have the freedom to work with priorities and is not micro managed by ministries. Two examples of different ministries who focus differently on internationalisation would be the Ministry of Fisheries and Coastal Affairs (FKD) and Ministry of Health (HOD). Likewise, some ministries favour particular funding instruments and countries, the HOD apparently preferring more EU participation.

Our evidence from interviews with the staff of ministries and outside the Internationalisation Team provided some evidence of concern that ministries did not always decide research priorities and countries following a strategic approach, even when being advised from the Council. It was noted that in a number of cases, certain topics had been extensively resourced and doctoral students trained, but in the medium term these areas had not grown, and it was now clear money had been

wasted. Some greater levels of interaction between researchers, RCN and ministries might avoid these risks in future. It was noted that RCN's role in such decisions about the funding of resources was too passive. RCN was felt simply to readily accept the suggestions of ministries. Such suggestions were de facto decisions, rather than choices that RCN might inform. Interviews also suggested that ministries were funding international research outside of the RCN and therefore recognition of their influence internationally should be made. They further suggested that the funding of social sciences and humanities by ministries was less international or was not international at all because ministry clients often emphasized a local focus for the research in order to solve specific problems for Norway.

2.2.3.2 RCN

Interviewing staff of the Council, along with executive, division and programme board members about internationalisation suggests that relations between the three levels are in some instances not very formal and that they differ depending on programme and division. The relationships were presented as mostly advisory (between Division Boards and Programme Boards) but slightly more directive (between Executive board and Division boards). Below we present perceptions of each level and the potential role it now plays in internationalisation efforts:

The *Executive Board* makes decisions on the overall budget and the RCN internationalisation strategy, based on priorities received from Ministries and the government. Concerning internationalisation they send instructions to Division Boards with regard to priority countries. Decisions regarding Large Programmes are also taken at this level.

The *Division Boards*, take responsibility for their allocated area of science. Priorities are identified in the following manner: firstly the research needs of Norway are considered and secondly which funding instruments are most suitable. Then decisions are taken about what level of internationalisation will be most helpful within that area and which priority countries should form the basis of the cooperation. The decision making process differs between division boards, reflecting the character and needs of different scientific fields and key stakeholders. These decisions are then relayed down to the programme board level.

Programme boards function in a dialogue with division boards and take advice on internationalisation priorities. However, at the programme board level the priority for internationalisation choice of partner is reported to be scientific excellence rather than adhering strictly to the priorities that are passed down from executive and division boards. Some doubts were voiced over whether programme boards are not being receptive enough to signals from above with reference to which countries to prioritise in their internationalisation efforts.

Internationalisation in the RCN programmes is not operationalized through any kind of indicator system rewarding proposals who are international. Once applications to RCN programmes are received, review panels assess the scientific quality of applications, with the need for internationalisation then assessed on a scientific basis rather than a bias towards international participation. This is also true for the industry related programmes such as BIA, as, compared with other research councils (for example FWF) the area of responsibility of the RCN is wider as the Council must cover a number of user oriented research areas.

2.2.3.3 Scientists

Our interviews with scientists, discussion at the focus group and our survey suggest that scientists on the whole are very focused on internationalisation. Scientists already have a long tradition of working across borders within their respective fields. Interviews show that scientists have a preference for working with longstanding partners and reported that scientific excellence and familiarity governed their choice of partners to a greater degree than priority setting at the RCN level.

In the focus group the question was raised whether internationalisation was something that RCN needed to involve explicitly in their strategy as it was now a part of everyday life for scientists and happened at most levels in society. Academics work individually with partners from wherever where they can find the expertise and they are not driven by these incentives.

2.2.3.4 Priority Countries

The Ministry of Foreign Affairs makes the bilateral agreements, once a choice of priority countries has been made by the government. Currently Norway has agreements with US, China, India, Japan, South Africa, Argentina, Brazil, Canada, Russia and Chile.

There is great consideration given to the question of whether these were the right countries and if the agreement is set at too high a level. The following questions were raised about the bilateral agreements:

- Are these particular countries the right choice for Norway and national research interests? The concern was voiced by some interviewees that the choice of countries had been made for political reasons and research cooperation had been an afterthought. In some instances the common research interests were clear, for example in the case of Russia (oil, gas and polar research) but in other instances, (China) the common grounds for research collaboration were less clear.
- Is RCN independent enough to select priority partner countries, as similar bodies in comparator countries have more degrees of freedom in this regard?
- Are the bilateral agreements made at too high a level, between governments or ministries, rather than between scientists and research institutes, or even at the level of research councils, like RCN?
- Are the bilateral agreements of the Council or ministries really underpinned with concrete activities?

2.2.3.5 Nordic Countries

Interviewees gave different accounts when asked about the importance of Nordic cooperation. In general, Nordic cooperation seems to be less active, according to respondents, for two reasons:

- The growth of EU participation, within which most Nordic collaboration and competition now happens. The other Nordic countries are full members of the EU and have focused their cooperation efforts there. In terms of EU grants applications the other Nordic countries may be competitors rather than collaborators.
- Nordic Cooperation happens mostly below the radar of the Council and is not necessarily measured. There is a strong tradition for Nordic cooperation and it happens very organically rather than through established strategies.

It was also noted that Nordic cooperation tended to be very bureaucratic and thus deterring. However, there are some attempts to revive Nordic research cooperation, for example through Nordforsk, which offers funding for Nordic research cooperation. It is possible that more could be achieved from Norway's existing Nordic partnerships and that the bilateral strategy should engage more with other regional Northern European research actors. Of the initiatives in Europe where Nordic interest could be common, one of the most prominent may be the European Strategy Forum on Research Infrastructures. Our review of FP involvement by Norway and other Nordic partners does not suggest that there is any lack of Nordic involvement in research by Norway.

2.2.3.6 EU Framework Programme as a priority

It was recognised by most of our interviewees outside the Council that the Council give a high priority to EU research initiatives and have been doing for some time, providing

support for participation (see below). There was no consensus about whether the importance and attention and funding given to EU activities was too high or too low. In terms of participation, the only area where Norway is not making good use of the FP is through ERC programmes, where success rates are low, consistent with the view that Norwegian research is not yet reaching the very high levels of quality required. Norway has a high success rate in EU participation; it is reported to be slightly higher in 6th Framework Programmes than the 7th. The EU is seen by many as a chance to not only liaise with EU countries but also Nordic and third countries. Norway puts a lot of weight on the EU. While some interviewees perceive the Framework Programme involvement to be driven by foreign and European policy consideration, there is nevertheless a broad endorsement by researchers. The survey indicates that almost two thirds of researchers agree or strongly agree that participation in the EU Framework Programme is important for the internationalisation of Norwegian research.

There is some growth in EU participation but not as much as the cost of participation and the benefit-cost ratio seems to have diminished. There is some concern over this gap, which was expressed in interviews as well as in the focus group. There is a feeling that the Council needs to better analyse its participation in the EU research agenda against national capacity and strengths. Also, the Council needs to better align national strengths with that of the EU research and focus and prioritise these subjects. For example interviewees recognised Norway as being strong in ICT and Health research nationally but this is not perceived as reflected in EU research participation. Norway is member of all JPIs, many interviewees felt that this was too much (in terms of the eventual resource requirements it implied) and was indicative of the lack of an ability to prioritize. Involvement in the JPIs is not solely RCN responsibility.

Researchers and staff in research initiatives would like to see more opportunities to be involved in EU meetings, especially now that Horizon 2020 is under development. They feel they do not have an opportunity to influence the Council's EU agenda and strategy. The Council and the representatives of Ministries in Norway are represented in committees and board steering committees for these new initiatives, but they do not discuss the specific programmes or themes or research needs with the research community in Norway.

EU participation is seen to be increasing the quality of Norwegian Research, which is a clear benefit. There is also the issue that even in applied research topics high levels of quality standards are required. The EC's quality assurance processes are very good for applied projects, and are seen as better than those used by the Council for national funds.

The Framework Programmes are seen to dictate some of the strategy for the Council, which may be beneficial, as it aligns national interests with international ones to a degree. But researchers would like to see more independent strategies and more blue sky research instruments rather than an overemphasis on thematic research.

The system also rewards collaboration from the EU – if a researcher receives funding from the EU, some institutions make awards to the individual researcher. This is an incentive for seeking EU funding rather than international collaboration.

The priority *EU participation* is also illustrated by the supporting schemes to increase participation. The share of funds and the variety of instruments dedicated to supporting internationalisation and above all EU FP participation since 2004 is astonishing (see section 8). Even more importantly, since 2004 there is a co-funding of participation in projects of the EU, first mainly for research institutes, later this was broadened to firms (SMEs, EURROSTAR programme). This latter development is in line with a stronger focus to support technical disciplines in their internationalisation efforts. Consequently, international participation of industry has grown most in recent years.

Recent developments within the EU to develop and offer flexible participation in research (such as the Joint Programming Initiatives in which Norway is involved in

significant way with the OCEAN JPI) give Norway, in common with full members of the EU and other affiliated countries, the opportunity to focus its research resources on topics of common interest and to work with the most relevant partners. These new initiatives provide opportunities for bilateral links (as the OCEAN JPI has done) and research agendas to develop. This new approach to research policy formulation in Europe presents opportunities but it also presents significant challenges. The new approach present opportunities for bilateral links and gives more choice, at a price, of topics to research. There will be a greater likelihood of finding research partners that meet national needs more effectively than might be possible within the FP. However, there are some drawbacks that Norway should be aware of. The availability of greater choice presents Norway, as it will present Member States and other affiliated countries with, a need to prioritize. Furthermore, as JPIs develop, they will identify new opportunities for research and give rise to further demands for research resources making prioritization even more urgent and challenging for JPI members. Countries that do not have effective means based on a strategic view of deciding where their national interest lies will find the greater availability of these ERA inspired research frameworks constitute as much of an opportunity as a challenge. The Strategy for International Cooperation (Research Council of Norway 2010 page 12) suggests that these concerns are recognized, but the urgent need is for the Council to develop a process and mechanisms to choose between funding priorities and between the use of internal or external scientific resources and therefore which funding schemes (national, FP, JPI, other bilateral) are appropriate.

2.2.4 Conclusion on prioritization

The overall feeling of stakeholders, the Council staff and Ministries is that Norway needs to prioritise. But this must be based on a much more developed and comprehensive evidence base which indicates Norway's areas of S&T strength, weakness and opportunities. While prioritisation is visible in white papers and discussions, it is not reflected in the programmes which suggest an unrealistic commitment to be involved in all areas.

Further prioritisation would need a strong coordination with other funding bodies. The Council though does not control all Norwegian research activity or priority setting. Much of this is done by other ministries and through core funding of institutions.

Interview responses also suggest concern over the need to implement urgently a priority setting exercise in terms of areas of research priorities from which the choice of international partners will follow. It was suggested that a longer term vision should be developed for the period 20-25 years ahead.

2.3 Supporting Frameworks and Enabling Instruments

The previous section discussed prioritisation for internationalisation in terms of scientific content and partners and how those are resourced. Here we consider the Council funding instruments that are under development in order (in the words of the strategy) "to support the establishment of long-term cooperation between Norwegian institutions.." and the refinement and strengthening of "stimulation measures to encourage Norwegian research [institutions] to participate more actively in international collaborative and competitive arenas...".

2.3.1 Internationalisation within RCN programmes

A feature of the Norwegian system for some years now, starting before the current strategy set in, has been the increase in participation of foreign actors in programmes funded by the RCN. The main characteristics and trends identified by the Composition Analysis (section 8 of this report) point towards a strong and continuous increase of foreign actors, not only in schemes that are specifically designed to foster internationalisation. From 2008 to 2010 the share of international participants in basic research / bottom up programmes grew from 5% to 32% (with variations between science areas), in R&D programmes that share rose from 14% to 24%, in innovation

programmes it was 11% in 2010. If we project this rate of increase in 2008 to 2010, of foreign participants and Norwegian participants in all programmes, into 2015, more than one third of participants will be foreign, with corresponding budgetary implications (administration etc.).

2.3.2 General assessment of RCN support

Norwegian researchers by and large assess the RCN support for internationalisation as positive. The majority of respondents confirmed that RCN

- Support for *international mobility* helps the *career development of individual researchers* (difference between the group agreeing to the group not agreeing 28.5%),
- Provides adequate support for international mobility (diff 18.7%),
- Schemes are useful in terms of attracting foreign talent to Norway (diff 18.1%),
- Provides *adequate support for international research collaboration* (diff. 16.9%)
- Internationalisation policies *support research excellence* in Norway (diff 16.1%)
- Provides adequate support for access to, and coordination of, international research infrastructures (diff 6.9%)

However, a slight the majority of researchers is *negative* as regards

- The accessibility of *information* on how various RCN schemes may be used for internationalisation purposes (diff: -2.4%),
- The adequacy of the *concrete schemes* that are developed to support their needs
- The adequacy of support for collaboration with *partners outside the EU* (diff: -8.0)

Across the board, more senior researchers, leaders of research organisation, are more positive than researchers.

2.3.3 New Instruments for Long-Term Cooperation

The Strategy has indicated that the Council is obligated to develop financial instruments to support long term cooperation. At the present time, such instruments are very much in the start-up phase and only three programme boards have developed such arrangements. Currently there are discussions about how such instruments would function and whether the cost of internationalisation of research needs to be addressed by a separate funding instrument/ funding line.

The choice which is currently under discussion is between the allocation of funding for internationalisation within the responsibility of programme boards who can allocate resources within their budget if they see fit, (including the designation of a particular country) and allocation of funding through a separate mechanism within the Council for the internationalisation.

2.3.4 NCP Support for the Framework Programme

The FP support system in RCN seems to be well organised and connected to the other core programmes in RCN. In comparison to the centralised support units in countries such as Austria and The Netherlands, RCN has relatively modest human resources for this activity. If Norway should decide that a bigger exposure to the European research activities is necessary it should strengthen the central coordination and Brussels connections of the NCP system – and therefore the human resources - within RCN and develop a stronger link between Norwegian (research) policy agendas and the activities of the Norwegian research and innovation communities.

2.3.5 Stimulation Measures

The Council already has a range of measures that can be used to promote internationalisation and we have received a large range of responses and information about their operation. The schemes which we have examined and on which we have evidence are these:

- Project Establishment Support
- Top-up funding for Marie-Curie grants
- Funding of Starting Grant Applications
- Grant Schemes for Collaboration with US Africa Asia South and Central America

All schemes broadly seek to make it easier for Norwegian researchers to apply for funding from international bodies. These mechanisms are the most important in the Norwegian system but there are others outside the control although not outside the influence of the Research Council.

Survey responses and interviews suggest that these mechanisms were operating with some success; they were professionally administered and well supported by the Council. However, there were some limitations in that researchers believed that such measures were not well enough promoted by the Council. In particular measures to promote links with countries outside Europe were very little known (63% of all respondents did not know them), and very little used and not rated as being overly useful. This should be of some concern.

Given the importance of the Framework Programme, it is important to determine why there are some researchers who find the visibility of attempts to promote engagement with the EU insufficiently strong, despite the resources the Council has directed at it. One explanation may be that the NCPs, having broad areas of responsibility for funding with EU funding being only one area of international involvement, are not always so familiar with the EU FP involvement. As our review of other research funding bodies notes, the comparator countries are in this respect better resourced than those in Norway, often having dedicated units. Whether as a result of organisational differences or greater resourcing, these other countries' services are able to deliver more training sessions across the board including those related to management and financial and legal issues (see Chapter 5 Comparative Review of Research Funding Organisations).

As our analysis makes clear, there is no best practice model to which the Council could converge. Significant change therefore to the structuring of the stimulation measures appears, in our view, unnecessary for the younger researchers, but changes to the emphasis and resourcing may be justified. For the post-doc researchers, greater variety of length of stay abroad may be appropriate to deal with the demands of those forming families, and those with responsibilities for older relatives.

Our review has also considered whether such resources be provided at all. In some countries there have been windfall effects and in the medium term, we believe that such support should be monitored more closely to assess effectiveness. However, we have observed that in Norway, where there is a proportion of researchers who believe that international collaboration weakens intra-national collaboration incentives of the kind the Council is offering should be retained.

Interviews suggest that one group that may be particularly difficult to encourage into these kinds of schemes are researchers from the institute sector, although it was indicated that staff of the institute sector are becoming increasingly international.

Interviews confirmed the lack of stimulation measures from the Council that could be used by mid-career researchers and academics, although we understand that Council efforts to promote bilateral and other links have been limited so far.

2.3.6 International Mobility in Grant Awarding

It is one of the key aims of the Council's Strategy to encourage mobility within grants of the Council both into and out of Norway, whereby the emphasis is upon the latter and to cover the cost of research performed at a foreign institutions or foreign company.

2.3.6.1 Mobility of People

Norway provides a wide range of opportunities for mobility through specific schemes, and as noted above, enabling instruments to facilitate applications to these schemes are available through the Council. Through Norwegian membership of EURAXESS, an effective link is made to the available funding instruments worldwide. The Norwegian national portal lists all available exchange schemes, both for incoming and outgoing researchers. These are the Council schemes, EU schemes, not for profit schemes and schemes funded by business. The Council's International Scholarship Section offers scholarships for both studies and research in Norway and has schemes in Europe, North and South America, Asia and Africa, i.e. across the 10 priority countries currently covered by bilateral agreements.

The Report by NIFU on the surveys of researchers, leaders and meeting places examines this question and combining the results of this analysis with observations in our interview material, the following can be concluded: there is strong belief in research system (amongst leaders and researchers) that the principle of mobility is good for career development support. There is also strong support for what is being done generally to promote internationalisation, but we note that there is less strong support for what is being done to promote international mobility outside the EU. It is probable in our view that Norwegian researchers are well networked within the Nordic area and within the EU, where there has been significant resources and opportunity. Recent bilateral agreements are not seen as yet promising to improve mobility of researchers beyond the early stage of their careers.

There was a general consensus amongst our interviewees that overall Norway is successful in recruiting overseas PhD students, post-docs and researchers through the Council funded schemes. Some Centres of Excellence are internationally very successful in that they attract researchers from abroad and the financial incentives are very strong. Hence there are increasing proportions of foreign PhDs students in Norway.

However, when it comes to attracting Norwegian researchers to participate in exchange schemes with countries outside Norway a somewhat different picture emerges, according to our interviewees. Detailed information about the mobility of Norwegian researchers through the Marie-Curie scheme suggests that for Norway mobility is less important than it is for researcher communities in other countries (within the EU). Marie Curie schemes are typically attractive for, and awarded to, early career researchers. Norway has a low number of Marie Curie applications (see below), reflecting the small size of the country, but also a relatively low rate of success in its applications. A number of interviewees explained the low mobility and the low application rate in Marie Curie as reflecting national characteristics including the generous provision for researchers within Norway and a relatively high standard of living and satisfaction in Norway.

The study by The Norwegian Centre for International Cooperation in Higher Education (Norwegian Centre for International Cooperation in Higher Education 2011) reports evidence from NIFU and RCN of declining international mobility at the level of doctoral studies for Norway although this work does not include comparisons with other countries. Other recent policy work on mobility (Rindicat) does not include Norway (IDEA CONSULT (Coordinator) 2011). The Norwegian Centre Study does however suggest that examination of doctoral research student mobility patterns does reveal factors that affect behaviour and this could lead to action to improve international mobility of Norwegian researchers.

A greater variety of short stay funded options would go some way to tackle the Norwegian cultural and sociological barriers that seem to exist to Norwegian Researchers taking up the option of going abroad as part of their work or studies.

2.3.6.2 Mobility of Grant Funding

The Strategy of the Council also foresees that its grant money will flow overseas to non-Norwegian research actors. The extent to which Norwegian financial resources flow overseas is closely related to the issue of access to knowledge, which we cover in the next section. In this section we are concerned with the presence of measures to promote such internationalisation and their implementation. Grants can include foreign individuals and organisations where the action would support Norwegian science and access scientific resources that are not available elsewhere in Norway. It is however not clear what the criteria and limits of this practice are although scientific excellence is intended to be the main criterion.

It was suggested that it was not always easy to know exactly how much of any budget could be used for overseas funding and whether there were limits. It was suggested that some boards used rules of thumb to determine how much money to allocate: “two postdocs for two years” for one type of grant was a comment we received. We therefore see some difficulties here in that the extent of internationalisation of research is very dependent upon decisions made at many levels of the research funding process. We also foresee that not only is there scope for inconsistency between levels, there is the likelihood of conflict at any level of the system over how international research should be. Difficulties could arise where any Norwegian applicant for funds sought research partners outside Norway, in preference to a Norwegian-based collaborator.

3. Internationalisation: Profile and Impacts

This section of the report presents our analysis of the international profile and impacts of Norwegian research activities and outputs. We examine the characteristics of internationalised research associated with the Research Council of Norway in the context of all Norwegian research and in comparison with selected benchmark countries. The analysis draws on and combines evidence from bibliometric investigation of research publication outputs, interviews with researchers and other stakeholders, our surveys and review of other available secondary data.

3.1 Norway's International Research Profile

We have examined a range of topics related to Norway's research performance in international context, including identifying patterns of collaboration by Norwegian research with international partners, the role of the Research Council of Norway in sponsoring international research co-authorship, and the subject focus and citation quality of Norway's internationally co-authored publications.

3.1.1 *The Council's Influence on Norwegian Science*

Our bibliometric analysis identifies more than 34,500 research papers published between 2008 and 2011 with at least one author from Norway.² Our analysis of funding and co-funding shows that the Council is the leading sponsor of Norwegian research paper output. Of the Norwegian papers in our set, 41% are funded by the Norwegian Research Council, placing the Council in a powerful position of not only support but also influence in the orientation of the research landscape in Norway. Our data show clearly that the Council funds broadly across disciplines: publications which acknowledge sponsorship from the Norwegian Research Council in science are more widely distributed across research subject fields than publications receiving support from other funding bodies in Norway or from outside of the country including from the European Union. This is not so surprising in itself, given the Council's comprehensive research mission. It does suggest that the Council is not excluding potential areas for funding based on discipline and is supporting Norwegian researchers to undertake work on a range of basic and applied scientific topics. Our interviews confirm that there is flexibility in the Council's approach to the topic selection of sponsored research projects.

At the same time, there are important asymmetries in the distribution of the Council's research sponsorship, as measured by acknowledgements to funding in scientific papers. While three Norwegian research institutions (the University of Oslo, the Norwegian University of Science and Technology, and the University of Bergen) account for more than two-thirds of Norwegian papers acknowledging support from the Research Council, these three leading research institutions rely less on sponsorship from the Council (because they also attract significant funding from other sources) than other Norwegian institutions. More importantly for this study, international co-authorship in papers sponsored by the Norwegian Research Council is slightly lower (at around 40%) than for papers sponsored by other Norwegian public research sponsors (at around 45%). However, the Research Council adds particular value in supporting the internationalisation of Norwegian research in two important respects. First, researchers acknowledge the importance of the Council funding to contribute to international standing and excellence. Out of 15 project outcomes we

² Derived from our analysis of publication records in Thomson Reuters Web of Science including papers in science, social science, and the arts and humanities. For full details, see A. Gök and P. Shapira, *The Role of the Research Council of Norway in International Cooperation: A Bibliometric Analysis*, Background paper prepared for the Evaluation of the Research Council of Norway, Manchester Institute of Innovation Research, April 2012.

asked in the survey, international standing was rated the fourth most important. Second, Council funding is more geographically spread than other Norwegian national funding. For all Norwegian sponsors, the leading locations for international research collaboration are the United States and Europe (particularly the UK, Sweden, Germany and France). Yet, compared with other Norwegian national research sponsors, the Research Council of Norway sponsors a greater share of papers collaborated with BRICs countries (Brazil, Russia, India, and China), other parts of Asia and Australasia.

3.1.2 European Research Orientation

While we observe that the Council sponsors research across a wide range of scientific disciplines, it is relevant to probe the distribution and prioritization of sponsored research across and within domains of science. Such probing is important not only due to limitations of research resources but to ensure that available research resources are focused on key scientific and societal challenges and opportunities.

In our interviews, we identified a widespread perception by respondents that there was a very close relationship between the Council's priority setting and that of the European Union's Framework Programmes, and this is not surprising given the commitment expressed in Climate for Research (Ministry of Education and Research 2009) to strengthen internationalization through FP and ERA involvement. There appeared to be several reasons why concern was expressed that this relationship might in some cases not work to Norway's advantage. We were told that the budget cycle of the Council tracks the European processes for topic selection. Norwegian priorities are then formulated in relation to the priorities of the Framework Programme itself rather than the other way round. The Framework Programme is itself the result of negotiation. The adopted programme thrusts reflect the amalgamated interests of the 27 European member countries plus other country affiliates (including Norway), with larger European countries and the Commission itself having particular influence. These thrusts may not necessarily coincide with Norwegian needs, although opportunities for Norwegian researchers to procure European funding are advanced if they ally with Framework priorities. Since Norway contributes directly to European Union research programmes, it makes sense to undertake research within in the Framework Programme so that Norway can recoup benefits to offset the costs of its Framework Programme membership fee. However, survey respondents did suggest to us that Norwegian priorities are not pushed hard enough in the Framework process and that too often Norwegian research priorities appear to be defined by the Framework Programme.

Nevertheless, notwithstanding survey respondents' perceptions of European Union dominance in research prioritization, paradoxically the available evidence suggests that the influence of the European Union on Norwegian research is not as strong as in other benchmark countries and that a balance does exist. For example, measured by funding acknowledgements, Denmark and Sweden have rates of European Union funding twice that found in Norway. Possibly Norwegian researchers may be more sensitive to concerns about European Union influence than their counterparts in some other European countries. Moreover, it may be the case that while European Union Framework Priorities are given significant weight in the Research Council's deliberations on research priorities, there remains flexibility and room for manoeuvre in actual funding practice and in project implementation such that a wide variety of international research partners are also engaged in Norwegian projects.

3.1.3 Comparing international and RCN funding conditions

Finally, we can assess the quality and impact of RCN funding vs. international funding sources. A clear majority of respondents assessed EU funding as being much better suited to create opportunities for international networking, and, more surprising, a clear majority also indicated that EU funding is more important for the build up of prestige and career of the project leader. A (small) majority also indicated that EU

funding is more suited to address inter-disciplinary and high risk research, to broaden the field of research and that it offers more generous funding. In contrast, RCN was assessed to be better suited to support young researchers and to allow flexible use of funds.

3.2 Characteristics and Impacts of Research Internationalisation

3.2.1 Scope and Scale of International Co-publication

In our survey we found that 42 % of all project collaborations of Norwegian researchers is international, and that 71% of researchers indicate to have been involved in international collaboration within the last three years. The survey demonstrates that the EU countries (beyond Nordic) are the most important partners (41% of all collaborations are with EU countries other than Nordic countries, 24% with Nordic countries and 17% with North America). All survey and interview data suggests that internationalisation is seen to strengthen Norway, the benefits associated with it exceed the costs. Internationalisation is also an important motive for applying for RCN grants. Out of 15 motives respondents were asked, the three that related to internationalisation (creating new international networks, strengthen existing international networks, conducting research with key international institutions) were number rated very high, only the money and the recruitment motive were rated higher than those three.

Our bibliometric benchmark analysis confirms and further specifies this picture. We compared Norway with five other benchmark countries: Belgium, Denmark, the Netherlands, Sweden, and Switzerland. We found that Norway's 55% level of international co-authorship of research papers is similar to the Netherlands, Denmark, and Sweden. Higher levels of internationalisation were achieved in Belgium (61%) and particularly in Switzerland (67%).

3.2.2 Leveraging of international research funding

Our analysis of funding acknowledgements suggests that the role of European Union funding is lower in Norway than in other comparison countries. Nonetheless, Norwegian researchers, through their international collaborations, are able to leverage funding from other international research sponsors: about 17% of all Norwegian internationally collaborated papers acknowledge sponsorship from other country funders (not counting the European Union). Even where Norwegian research papers are not internationally co-authored (when all the authors are from Norway), there is a considerable level of international funding.

3.2.3 Citation Impacts Associated with Internationalisation

Citations by other researchers to the knowledge and results produced and presented in scientific research papers is a widely recognized measure of research impact (although we readily agree that this indicator has to be interpreted carefully and in relationship to other quantitative and qualitative measures of research quality).

We examined the relationships of international co-authorship and sponsorship by the Research Council of Norway with research paper citations. About 55% of all Norwegian papers published between 2008 and 2011 are co-authored with international researchers based outside of Norway. Among papers that acknowledge sponsorship from the Research Council of Norway, the rate of international co-authorship is lower (at about two-fifths). While there are some variations by field, our bibliometric review finds overall that internationally co-authored research conducted by Norwegian authors is more highly cited than research which is authored only by Norwegian authors. This finding also holds for internationally co-authored research sponsored by the Research Council of Norway.

3.2.4 Comparing outcomes of international and RCN funding

Our survey allowed us to compare the reported outcomes of research funded by RCN and by FP 6³. Here we see that the FP is assessed to lead to more innovation, but is assessed worse than RCN funded project in terms of research capabilities, research and innovation management skills, publication output and start of new areas. This result should not be over-estimated as it compared scales between two surveys, still, it points towards the more application oriented nature of FP funded research.

3.3 Internationalisation, innovation and industry

3.3.1 General

The policy of the Council as regards companies and internationalisation is that companies should be able to engage in collaboration activities with other organisations including those in other countries. However, Norwegian companies have other options to use in which to obtain support for research with organisations outside Norway, the most important being the FP, then EUREKA, then the Nordisk InnovasjonsCenter. The company survey indicates that the FP receives extensive use by Norwegian companies and strong level of support from a significant proportion of companies.

Companies' reactions to the FP suggest that, compared with the Council's programmes, the FP is considered to be inflexible in that it does not allow projects to be adapted to changing circumstances, but a small number of comments suggest that the Council funding for internationalisation is not as generous as the FP: in the FP companies might get up to 70% of their costs, but the Council will only cover 30-40%. Indirect costs are also funded more generously by the FP than the Council.

3.3.2 Firms' assessments

In a telephone survey, 100 companies gave their views on internationalisation support. It appears that firms, small or large, do not really make a difference between national and European partners when they seek complementary assets for R&D and innovation, while cooperation with non EU partners is not of a broader interest yet. The European Framework Programme is a key source for R&D funding, for SME with international activities it is more attractive than RCN funding. The support to apply for EU Framework Programme is very positively assessed and seen to be important. Problems the firms see have to do with a feeling that sometimes there is a push for choosing national institute partners over international ones and some concerns if Norwegian funds are spent for foreign partners and thus potential competitors.

3.3.3 Sectoral Requirements and Alignments

In terms of research, interview evidence confirmed a view of differentiation in terms of the needs and achievements of different sectors of the economy. Interviews also showed up differences of opinion in what Norway should do to support sectors. On the one hand there were views that targeted areas of science should be supported in order to draw in commercial interest from the outside; but this view was opposed by others who did not believe that it was realistic for the Council to develop new industrial sectors by investing in basic science that would then attract foreign firms or indeed Norwegian firms to invest. A difficult and related question arises for the Council when there is national science capability but where the only industrial capacity is located overseas: how much resource should then be allocated to the internationalisation in these areas, where beneficiary firms are likely to be outside Norway, at least in the short term.

³ Here the Nifu survey compared with data from a 2009 survey.

It was observed that locally, Sweden and Denmark had cutting edge industry research in many areas that was of a higher standard than Norway, although Norway's expertise in petroleum, geoscience and the organisational aspects of oil extraction were of a high quality and well internationalized. The area of minerals was thought to be closely related to petroleum and likely to be an area where Norwegian scientific expertise and industrial capacity could develop together, with scope for international collaboration.

3.3.4 Research Programmes

The BIA Programme seeks to provide assistance to commercial / industry innovation and research for those ideas. It funds projects that are not suitable for funding under other forms of research support, including the SkatteFUNN tax credit scheme or the Council's other funding instruments such as the Store Programme which have industrial / commercial membership. Internationalisation is, within this programme, a secondary objective: "Encourage greater cooperation between companies and R&D institutions and among companies, both nationally and internationally;" (Research Council of Norway 2008).

Success of the scheme, which comprises two types of instruments, is measured against this objective by the Research Council. While as a secondary objective the importance of internationalisation is generally less emphasized the Council nevertheless identifies a need for internationalisation within this area to which the KMB programmes are specifically directed. Our interview evidence suggests that there is significant internationalisation of the project both in the use of (international) experts in the review of proposals and in terms of participation. Our composition analysis provides a consistent picture with international partners rising significantly within the BIA. Recent review of the BIA provides further evidence of internationalisation (Research Council of Norway 2011) with 93% of projects now having foreign partners. We note continuing discussions within the Council concerning the rebate for foreign firms without a Norwegian address that participate in the BIA/BIONÆR. Currently these firms do not receive reimbursement but the matter is remains open.

The BIA programme provides an entry to the Framework Programmes for the target group of R&D performing firms. The FP is considered to provide a significant opportunity for BIA participants in Norway to extend their reach into new networks and into new projects to acquire new knowledge and develop new technology. The recent report on the BIA suggests that the Council is ready to increase the use of the BIA as a mechanism by which Norwegian firms can enter schemes such as EUROSTARS. This will further enhance internationalisation of the user-oriented research.

We obtained evidence in our interview programme that budget setting for the BIA programme may prevent long term planning by the Council for this instrument and therefore to a limited degree for its other instruments because NHD agreement on its allocation for the BIA is on an annual basis.

An evaluation from 2005 indicates that internationalisation of the BIA projects is not a determinant as to whether the proposal is likely to receive funding (Research Council of Norway 2005). We regard this as not necessarily an undesirable outcome as the result of this analysis suggests that by itself internationalisation is not a predictor of the quality of BIA proposals (not project outcomes).

This implies that internationalisation in this programme is not a measure or indicator of quality, i.e. has no relationship to quality. This indicates that internationalisation as such is not an end in itself. Mainstreaming, thus, is not about maximising international participation, but allowing internationalisation where it serves specific purposes in projects and programmes and adds benefit

3.3.5 Framework Programme Engagement

Framework Programme evidence on industrial participation shows Norway has greater proportion of private firms in its FP projects than comparator countries, but

this is likely to be related to the characteristics of the Norwegian economy in which there is a greater number of smaller firms, and therefore a higher number of applicant firms and participant firms.

3.3.6 Intellectual Property

Interview and focus group evidence suggests that Norwegian industry, while clearly wishing to be engaged internationally, is nevertheless concerned to a significant level by the risk of the loss of key intellectual property through leakage of ideas or actual espionage. The costs of working with foreign collaborators should not be underestimated. Norwegian companies are taking measures including the imposition of restrictions on the nationality of employees working on projects. The extent of the risk of loss of intellectual property is a major barrier to the scope of internationalisation: clearly, however much encouragement the Council gives to Norwegian firms to work cooperatively and internationally, there will be some work that is simply too risky to undertake in this way.

3.3.7 Incoming Initiatives

Industrial partnerships with the US are welcomed but generally they are US initiated (if there is a US interest). There may be a Norwegian tendency to join up too readily without sufficient due diligence of the long term effects or how long the investment will last.

3.3.8 Innovation Norway

The view was expressed that the Council international strategy did not have sufficient continuity with the work of Innovation Norway (IN) which also has funding initiatives (similar to SBIR). Currently IN does not have an internationalisation strategy that matches that of the Council, and it was thought that because Innovation Norway was under the control of MTI and regional authorities, they would not wish to develop such an open and internationalized strategy as the Council had done.

3.4 Promotion of Norway as a Leading Research and Innovation Nation

3.4.1 Strategy and Goal Identification

The promotion of Norway as a leading research and innovation nation in selected areas is a high level goal of the Strategy. If Norway can achieve research excellence and innovation performance in certain areas that have been designated by the Council as important, then the Strategy will have achieved this objective. The Strategy must therefore define a set of research areas and innovation priorities that it will resource, and will need to monitor the outputs, outcomes and impacts.

This poses a number of dangers and difficulties. The present funding regime spreads the financial resources of the Council quite widely across subject areas in the interests of capability preservation, capability development and in the interests of balance and fairness. As we have noted above, the evidence of the Bibliometrics Review is that the Council publications show a very even distribution across areas in terms of volume. On present performance, the Council appears to be ensuring that the balance of research output in terms of papers is relatively evenly distributed across subject areas. It is private funding that is more focussed or targeted at particular sectors. Unless the Strategy begins to make clear what areas are priorities for Norway, it is not clear how the priorities will be pursued. It is not also clear how the link to innovation policy is to be implemented and priorities for innovation are to be identified.

3.4.2 Lack of cross system dialogue

It is essential for Norway to improve the process by which the goals of the Strategy are identified and how the link with innovation should be made. Focus groups and interviews made clear that there is a lack of a systematic and informed cross system

discourse about the merit and form of internationalisation, and also about choices and support mechanisms. An open and transparent debate about what the policies are is missing, and there is no clear locus of monitoring and evaluation of internationalisation activities. This lack has to do with the dual role of the Council as (1) advising the system (other ministries etc.) and (2) being a strategic player with budget decisions and priority setting, while a higher order forum, beyond the CNR itself, is missing. There was strong support within our focus groups and interviews for establishing a higher level discourse forum.

4. Internationalisation: Recommendations

Finally, we can formulate the key recommendations that are based on the preceding analysis.

A. Overall importance of internationalisation and the internationalisation strategy

Recommendation 1

The strong focus on internationalisation in the RCN strategy should be upheld given the preferences of the actors, the overall political goals of Norwegian policy and the overall positive net benefit of international research and innovation activities. The policy of opening up of programmes should be continued.

Recommendation 2

The Council should examine quickly what administrative burdens will arise from greater internationalisation. As we have shown in Section 8, at the current rate of growth of foreign partners in RCN funded schemes, one third of all of the Council's project participation will be with foreign partners by 2015. This is likely to have major impacts upon administration of schemes and cost implications.

B. Mainstreaming and prioritisation

Recommendation 3

Making internationalisation a central feature of the science system through mainstreaming is essential and should be continued. However, mainstreaming should be coupled to a clear set of principles to determine what internationalisation contributes to the various goals and programmes of the RCN and which forms and levels of internationalisation are sensible and realistic, given organisational and budget constraints. Also, it needs transparency and coordination in order to avoid duplicated efforts and sub-critical, costly activity.

Recommendation 4

The Council should formulate a clearer process for determining where internationalisation is in the national interest so that all actors in the research system understand the scale and scope with which internationalisation should be pursued in the various programme areas, and to what limit. There is a strong need for the development of internationalisation priorities – e.g. collaborating with China needs to be focused on key themes and areas where Norway can benefit (rather than just collaborating to keep an eye on a competitor) – similarly, collaborating at such a broad and general level with the EU programmes (just to gain a “seat at the table”) is an inefficient strategy.

Recommendation 5

Some additional attempt should be made to broaden the opportunities to collaborate with actors outside the EU and North America should be explored and systematically implemented. In addition, the EU/Nordic/3rd country balance needs an in depth investigation and study – it should form the focus of either/both of the two bodies suggested below (see recommendation 13 below). Possible Nordic collaboration on infrastructures may be possible.

Recommendation 6

Greater resource should be allocated to promoting the bilateral links with other countries on the basis of strategic processes to select topics and partners for optimal cooperation – rather than broadening without strategic focus.

Recommendation 7

The Council should play a greater role in defining the scientific benefits for Norway that emerges out of bilateral links and then support to create those bilateral links with selected countries. This will become a very high priority as the Norway begins to attempt to exploit the ERA based frameworks for research, especially the JPIs.

C. Support mechanisms, including mobility support

Recommendation 8

The visibility of internationalisation support schemes should be increased through awareness and information campaigns, with a focus on early stage career researchers. Doing so would also enable the RCN to be more responsive to specific needs of researchers. Further investigation of doctoral and post-doctoral mobility should be undertaken to investigate the extent of problems and propose policy responses.

Recommendation 9

A very detailed analysis as to the nature and quality of participants in EU programmes vs. other national and international funding schemes should be undertaken in order to understand if the lower success rate of Norway is due to a bias in participation, given the generous funding conditions of Norway, or lower quality of Norwegian researchers.

Recommendation 10

The NCP system should focus more on advising strategic leaders and should – in case Norway decides to put more emphasis on EU research – play a stronger role in linking to the discourse at EU level.

Recommendation 11

The Council's offering of opportunities abroad for its researchers should broaden in scope. Currently there is too much emphasis placed on long term stays in other countries. Researchers wishing to have research stays at foreign institutions should be able to stay abroad for shorter periods as well as for longer periods.

D. Strategic intelligence

Recommendation 12

There is a need for RCN to develop a more robust and routine process for the identification of strengths and weaknesses of the position of Norwegian S&T – either in house or from specific commissioned studies. This should be supported by a routine bottleneck analysis to understand how support should be modified. Equally, greater monitoring and more frequent and tailored evaluations of the implementation of internationalisation and its impact, particularly on country coverage, quality and the contribution to Norway's national interest should be undertaken.

E. Implementing the strategy – within RCN

Recommendation 13

The RCN should introduce an internal high level, multi-domain advisory body which could represent the views of both top-down considerations and bottom-up (researcher driven) demands. This would also enable to better integrate and consider industry needs within the science portfolio. It would also lead to an enhanced ability and role in influencing ministries when it comes to internationalisation.

F. Cross System Interaction and Discourse

Recommendation 14

When defining international activities, Ministries should attempt to engage with the RCN, and the RCN should be more pro-active in explaining the RCN strategy and support ministerial strategies.

Recommendation 15

In order to a systematic and informed cross system discourse and to enable the RCN to better listen to respond to the needs of the Norwegian research community, a *Forum* on internationalisation should be established with key ministries, the RCN, representatives of large research organisations and researchers should be established. This should allow for an open and transparent debate about what the policies are and also be the locus of reporting about monitoring and evaluation of internationalisation activities.

PART TWO.
Specific Supporting In Depth Analyses

5. Comparative Review of Research Funding Organisations

5.1 Internationalisation Strategies in Comparator Organisations

5.1.1 Description of strategy and strategy processes

The Council has a relatively broad remit in the Norwegian research and innovation system, - including basic and applied research domains, innovation and policy oriented research activities - an international comparison would ideally be made with research funding institutions that have the same remit and position in their national systems. Of course there is no perfect match of an the Council type research funding agency that also operates in a research and innovation system that has similar characteristics as Norway. Nevertheless we can make some comparisons with other research funding agencies and their strategies for international cooperation. A second element of comparison is whether there is an overarching strategy for internationalisation at the government level that forms a steer for the research funding agency.

In the comparison with other organisation and countries we have to keep in mind that there is a difference between a science and technology internationalisation strategy, (which includes issues such as attracting foreign researchers, knowledge related direct foreign investments) and a strategy for international cooperation – which in principle covers a sub-set of the internationalisation topic, ie modalities to work together with entities and organisations abroad. the Council's strategy is labelled as a strategy for international cooperation, not as one for the internationalisation of the Norwegian research and innovation system. The latter would be outside their mandate as they do not have the responsibility for instance for visa applications for foreign researchers.

In The Netherlands the equivalent to the Council would be the Netherlands Organisation for Scientific Research (NWO). NWO's most recent overall strategy paper 2011-214 (Growing with Knowledge) has one short section on internationalisation. NWO does not have a dedicated internationalisation strategy nor a separate international department. The NWO strategy document has a section 'international collaboration in and outside Europe'. The key objective for NWO is to support the competitiveness of the Netherlands and maintaining its position in the global scientific top. It refers to its efforts together with ESF and Eurohorcs to open up national programmes and to improve the access of foreign researchers to these programmes. Improving the selection procedures to make international participation easier is key to that process. In addition it has incentives to support researchers to access ERC grants. NWO also aims to intensify its investments in emerging science countries in particular China and India. Together with other actors (the Ministries, the Royal Academy) NWO is ensuring a coordinated approach to influencing policy decision making in Europe, for instance in ESFRI and the EIT. In addition NWO has a role to support research capabilities in less developed countries. The core of the NCP function and staff is however not placed in NWO, but in a separate department of Agency NL: the Expertise Centre Research and Innovation which combines EU and Eureka support services.

There is no overarching internationalisation strategy in the Netherlands. The only strategy paper from a Dutch Ministry (Education, Culture and Science) dates from 2008 and is mostly focused on stimulating the individual Higher Education Institutions to become better at marketing themselves abroad and attracting students and researchers from abroad. Thus NWOs strategy is hardly steered by the ministries.

In Finland we would need to make a comparison combining the international strategies from both Tekes and the Academy Finland. Tekes focuses on internationalisation of R&D and innovation activities. Similarly to the Council internationalisation is mainstreamed across the entire TEKES organisation. There is no separate international collaboration strategy comparable to the Council strategy

paper, it is a cross-cutting goal linked to the overall mission to support companies with international growth ambitions. The main way for Tekes to promote internationalisation is through the projects it funds. International cooperation is stimulated through Tekes' funding criteria and by providing higher funding levels within existing programmes. Tekes has a number of bilateral R&D collaboration agreements outside the EU from which it can fund R&D collaborations with Finnish partners. So the strategy is mostly bottom-up and depends on the needs of the customers (ie companies, universities and research centres). In addition, Tekes operates offices abroad (in Washington, D.C., Silicon Valley, Shanghai, Tokyo and Brussels) that help Tekes clients to network either directly or indirectly. The Academy of Finland on the other hand does have a dedicated STI collaboration strategy. The strategic outline for The Academy's international research cooperation is outlined in their International Strategy for 2007-2015. According to the vision stated in the strategy, *"The Academy aims at close international funding cooperation with leading science countries both within and outside Europe, and its cooperation with emerging science countries is seen as mutually beneficial"*. The Academy has defined six means for this strategy:

- Evaluation and monitoring of scientific quality by international experts
- Attractive research environments (eg centres of excellence)
- Internationalisation of research programmes
- Supporting international research career paths
- Increase visibility of Finnish research
- Taking an active role in science policy

As in the Council the within the Academy separate scientific Research Councils each develop their own internationalisation strategies and programmes, depending on the scientific domain. In addition bilateral cooperation exists with India, Japan, China, Latin America and of course the Nordic Countries.

Summing up in Finland the two main funding agencies each have a quite bottom-up strategy for international collaboration, which is hardly steered by an overarching national strategy for RTDI internationalisation. Similar to the Council the function is mostly mainstreamed in the organisations.

In Austria two organisations together could be compared with the Council The Austrian Research Promotion Agency (FFG) and the Austrian Science Fund (FWF). As Austria does not have an overarching national strategy for RTDI internationalisation these agencies' strategies are mostly developed within the organisation itself. FFG has a dedicated department for European and International Affairs that employs approximately 50ftes.

The international strategy of FFG is part of its multiannual programme (the latest published is the plan 2009-2011). A majority of the strategic focus and activities of FFG is related to the European Research Area and getting researchers involved in the various European programmes and ERA-NETS. Concerning ERA-NETS FFG states that it wants to become more critical in choosing ERA-NETS that have an added value for Austria. In addition its wants to position itself more strongly in Europe through Joint Programming. FFG sees the ERC as the flagship for promoting European excellence and will put an emphasis on helping individual researchers to be successful in ERC but also on stimulating universities to approach the ERC more strategically. FFG states in its programme that a clear strategy or prioritisation of collaboration outside Europe is not yet developed and is a task that FFG will perform starting with developing criteria to make these decisions.

The FWF has a multi-annual (2011-2015) work programme, which contains their international activities. The document states that the key objective is to position Austria as an internationally visible and attractive country to do research. The biggest part of the strategy is focused on the European Research Area. Its internationalisation

activities are driven by excellence. FWF driven by the excellence objective, has a number of bilateral agreements with third countries (e.g. China, India, Korea, Russia), implements an open-programme policy (i.e. participation of and even funding for researchers coming from abroad and/or working abroad) and runs a number of internationally oriented (pre-dominantly outgoing) oriented research support measures, out of which the USA is still most in demand. Thus the geographic focus is very much determined by bottom-up demand.

Generically of utmost importance is FWF's principle to have all projects submitted to FWF internationally evaluated, including evaluators from Switzerland, USA and other third countries. According to FWF's general approach internationalisation activities should be organised in a bottom-up manner by researchers themselves rather than defined top-down.

5.1.2 Observations

Summing up how RCN international cooperation strategy compares with similar organisations abroad some conclusions we can observe the following:

RCN is rather unique in having a dedicated international cooperation strategy paper for its own organisation.

Most research funding agencies (FFG, FWF, Academy Finland and NWO) have dedicated efforts to make their selection processes more international (international peer reviewers) and open to foreign researchers as a cornerstone of the internationalisation strategy. The RCN evaluation shows that RCN has also made considerable progress on this.

In broad terms the main objectives in the strategy are in line with the benchmark organisations, however with some different emphasis:

Improving Research Excellence is the key objective for all organisations although less so for the innovation oriented agencies such as Tekes where international business opportunities are more important.

The benchmark organisations are more explicit than RCN about the importance of research excellence in relation to competitiveness and attracting foreign investments. The RCN strategy is more modest about this objective

There is less focus on grand challenges in most benchmark organisations.

The benchmark research agencies do not have a similarly strong development research angle that RCN has.

None of the benchmark countries aim to establish structural long term relationships on behalf of research institutions.

All agencies have a similar geographic focus for their non-European collaborations with a strong focus on the emerging science countries (China and India) and the USA.

In Austria and The Netherlands dedicated stand-alone departments and units exist for European and international collaboration with 40+ ftes involved with this on a full time basis.

FFG and NWO are more explicit about using ERC and European platforms as strategic mechanisms to improve the position of individual researchers and universities.

None of the benchmark seems to handle their advisory task on the topic of internationalisation more effectively than RCN. However, they do have a larger degree of independence in making choices regarding geographical focus and use of instruments than RCN has.

None of the benchmark countries have an overarching national strategy for international science that steers their own strategy. The fact that priority countries are chosen at a higher level than RCN is unique. In the benchmark countries a combination of own bilateral agreements and bottom-up choices is more common.

5.2 RCN's support structure for EU participation in comparison with other countries

5.2.1 Description of EU support at RCN

The support for the Norwegian Research Community to access EU programmes is partly organised as information and service provision, partly delivered through subsidies for the preparation of FP proposals.

The IKU / NCP offers:

- A general FP info meeting once a year
- Information visits to university cities in the regions, sometimes on request.
- Dependent on the science domain: feedback to proposals from the research community
- FP proposal-preparation subsidy, which are assessed by the NCPs. They assess the budget they need for the preparation and check whether the ideas are adequate for the call. The subsidy is for a partner is 100,000 NOK and for a coordinator 300,000 (NOK). The scheme was said to be too popular and is time consuming for the RCN staff. It was indicated by RCN that it is difficult to assess whether the funding has added value and whether proposals would have been written anyway even without the subsidy. For big institutions RCN provides a framework contract for support (around 2 million NOKs). There is also a reference group for the support scheme.

How does the structure of the Norwegian FP support system compare to those available in other smaller R&D intensive countries? The structure of FP and international R&D collaboration support systems, vary considerably across countries. The support systems are embedded in national research and innovation systems, and operated by existing national organisations. There are a number of typical patterns.

At first we can identify countries with a predominantly centralised system, where one organisation is the dominant National Contact Point. The Netherlands and Austria are predominantly centralised, although Austria does also have a regional network of information points as well. Finland, Ireland, Switzerland and Sweden have a more decentralised structure, albeit that in Finland a large part of the NCP system is organised within Tekes. The following provides a short description of how these small countries have organised their support structures.⁴

The most comprehensive support system can be found in **Austria**. At the operational support level, a substantial support system at the national and the regional level has been set up by the ministries responsible for R&D issues in Austria. The main organisations involved are:

- At the national level, FFG-EIP: the department for European and International Programmes at FFG, formerly an independent organisation known as BIT, Bureau for International Research and Technology Cooperation (Büro für internationale Forschungs- und Technologiekoooperation) and a unit of FFG since its foundation in 2004; FFG-EIP hosts all National Contact Points (NCP) for FP7.

⁴ See for the information in this chapter a number of studies: Technopolis, Evaluation of Austrian Support Structures for FP7 and Impact Analysis of EU Research Initiatives on Austrian Research and Innovation System (2010), Technopolis & Manchester Institute of Innovation Research, International Audit of Research, Development and Innovation in the Czech Republic, (2011), Technopolis, Evaluation of TEKES, 2012.

- At the regional level, five Regional Contact Points (RKS, Regionale Kontaktstellen⁵) which provide information services in the Austrian provinces
- At the institutional level, organisational contact points, such as research service units at Austrian universities and other research performers, which have become partners in the Austrian support network.

Moreover, the Austrian ministries have also set up a specific support system in order to continuously monitor Austrian participation in the European Framework Programmes: the PROVISO project, which serves mainly the programme delegates and policy makers by providing data and analyses.

The *Finnish* support structure is decentralised rather than centralised and National Contact Points (NCPs) reside in a number of Finnish organisations. Tekes has always been a key organisation in this network with a responsibility to coordinate the whole Finnish network that is called EUTI (previously the Finnish Secretariat for EU R&D).

The organisations in the EUTI network are responsible for promoting information on the EU Framework Programmes. In addition, the National Contact Points (NCPs) and officials at universities and research institutes are working on communication in this field. Although Tekes is coordinating the Finnish network of NCPs it only has 13 NCP-experts within Tekes in a network of 37 NCPs in the whole of Finland. The Academy of Finland has 14 NCPs at the moment. Where Tekes has the NCP role in more applied fields, the Academy looks after the more academic fields. In many domains (environment, health, space, and ICT) both organisations have one NCP. In addition there are NCPs at various Ministries, specific agencies and institutes, and regional centres.

The central EUTI, which is located at Tekes, offers services to all stakeholders in companies, universities, research institutes, governmental agencies and municipalities free of charge. The EUTI has a staff of three people full time. One of these staff members is a financial expert, another a legal expert at TEKES. One of their main functions is to give general information and advice on EU R&D Framework Programmes. The office also coordinates the Finnish NCP system and monitors Finnish participation in the EU R&D programmes.

Although a network of 37 NCPs for relative a small country as Finland seems large, most of them work part-time (typically 5-10% of their time) on EU matters and in the rest of their time deal with national programmes and policies. There is a representative joint office of TEKES and the Academy of Finland in Brussels. They can offer support work for the FP network in Finland.

Both the EUTI and the NCPs provide services and training. While there was a stronger need for practical advice at the start of FP7, today the need for advice is shifting towards more strategic questions: how to influence the work programmes, how to shape the agenda of FP8.

The support structure in Ireland to promote and provide help in establishing involvement in the Framework Programmes is highly decentralised, consisting of a network – the National Support Network (NSN) – led by Enterprise Ireland and involving all of the national funding agencies. The National Support Network was introduced for FP7.6 This new support system has been designed to overcome a number of recognised weaknesses in the old network with the organisation and management of FP6 support, including a lack of coherence as to the involvement and roles of the different national agencies, the limited amounts of training for National Contact Points, and insufficiently clear links between national research funding and

⁵ The RKS are also called 'Regionale Beratungs- und Betreuungszentren, RBBZ' (Regional Consulting and Support Centres) in some documents. We stick to the term Regional Contact Point / RKS in our report.

⁶ *ibid.*

Framework participation. In addition, the new NSN has sought to strengthen the range of financial supports on offer to assist both academics and industry in becoming involved in FP7 proposals and projects.

Dissemination of information and raising awareness of FP7 is achieved via a dedicated National Support Network website⁷, and through the work of the National Contact Points (NCPs) – dedicated professionals from the major funding bodies in Ireland who are part of the NSN and attached to specific areas of the programme. There is at least one NCP per thematic priority area, and one for each of the other parts of the programme, such as the Marie Curie Actions, Research Infrastructures, Research for the benefit of SMEs, Research Potential, Science in Society, and Activities of International Cooperation.

While more than one organisation exists for the support for international STI collaboration in The Netherlands, in essence the Dutch support system is centralised. Responsibility for support is located in NL Agency. The specific unit for support for the European Framework Programmes is called the Centre of Expertise for International Research and Innovation or EiOI (previously called EG Liaison).

EiOI deals with matters concerning the European Commission (FP but also CIP), the EUREKA office. The EiOI, employs over 40 people (and 30+ ftes). The Unit is mostly organised around specific FP thematic areas with 1-3 advisors per area. The advisors are domain experts who know the research communities in a particular field. The Netherlands has a relatively strong position in EUREKA and therefore this part of the support structure is larger than many other EUREKA teams in the reviewed countries.

There is no central budget for EiOI. Budget information on the entire activity is not made public. EiOI works on the basis of specific assignments from different ministries. Thus EiOI has to serve various ‘masters’ and consequently has to report to each of these separately. For some programmes such as the Marie Curie programmes, EiOI works together with the Research Council NWO to manage the support actions. The NL Innovation Agency and Dutch Research Council do not have an office in Brussels.

The Swedish international R&D collaboration support system has a central core coordinated by Vinnova and eight other organisations that fulfil a support role: the Swedish Research Council Formas (Environment & Bio), Swedish Energy Agency, Swedish Civil Contingencies Agency (crisis management), Environmental Protection Agency, Swedish Defence Research Agency, Swedish Radiation Safety Authority, Swedish Agency for Economic and Regional Growth and the Swedish Research Council. While Vinnova does most of the first line support work, the representatives of the Agencies provide expertise from their fields, for instance to brief the programme delegates from the Ministries. VINNOVA has the national responsibility for providing information and advice on EU's Framework Programme for Research and Technical Development, is the national co-ordinator (NCC) for COST, is the Swedish co-ordinator for both EUREKA and Eurostars and runs the national EUREKA office. In general the Vinnova NCP's are the primary contacts for the potential participants, the Agency members are secondary contacts. The Swedish programme delegates (PD) are officials from the Swedish ministries.

Switzerland has established a support structure under the brand of ‘Euresearch’. Euresearch is organised under the legal form of an association.⁸ Euresearch is quite a young support structure. It has been delivering support for the FP and COST since 2001⁹ and was enacted in the current form as an association in 2004.¹⁰ At the

⁷ <http://www.fp7ireland.com/Page.aspx?SP=216>

⁸ Interface, *Evaluation Euresearch – report to the hands of the State Secretariat for Education and Research SER*, 2010.

⁹ Interface, *Evaluation Euresearch – report to the hands of the State Secretariat for Education and Research SER*, 2010.

operational level, the outstanding feature of the Euresearch support structure is its organisation as a network. The organisational mode combines elements of centralisation and decentralisation. Services are provided at three geographical levels:

Head office: The central component is the head office located in Berne. The head office assembles all national contact points (NCPs) in one place and provides important services centrally (such as the website/intranet, customer relation management, etc.). The NCPs are the experts for detailed questions and advice on COST and FP7. The head office hosts as well the innovation part of the EEN.

Regional offices: The regional offices act as regional contact points (RCPs). For well defined geographic areas, regional offices are to act as a first drop-in centre for advice and information for researchers. There are currently ten such regional offices.

SwissCore: SwissCore is the third element of the Swiss support structure. It is the Swiss contact office of the Swiss National Science Foundation for all matters related to European research and innovation in Brussels. SwissCore offers its services also to the network Euresearch. The following Table shows the key components of the EU support structures in the reviewed countries.

Table 2 Key components of the EU support structures in the reviewed countries

	Mandate comes mostly from one Ministry	Mandate comes from multiple Ministries	NCP mostly centralised in one organisation	Distributed network	NCP does FP	NCP unit does COST	NCP unit does Eureka
Austria		X	X	(x)	X		X
Czech R	X		X	(x)	X	-	-
Finland		X		X	X	X	X
Ireland		X		X	X		(x)
Netherlands		X	X		X		X
Norway		X	X		X	X	X
Sweden		X		X	X	X	X
Switzerland		X		X	X	X	-

Source: adapted from International Audit Czech Republic (2011)

In terms of services provided the range of support given by RCN is in line with the others however:

- The better resourced NCPs in the comparison countries deliver more training sessions including those dedicated to management, financial and legal aspects of FP participation
- Increasingly NCPs develop specific services for specific target groups and at the same time expect the leading universities and companies to be more self-sufficient
- Subsidies as incentives to potential participants and proposal writers are used less and less

5.2.2 Observations

Comparing with the NCP organisation of other countries we can observe that the RCN NCP model is in some aspects similar to those very centralised systems in The Netherlands and Austria with the vast majority of NCPs under one roof of an agency. However in terms of how the NCPs are organised internally, within their parent organisation, RCN is quite different as both FFG-EIP and Agency NL operate as a dedicated international unit with people engaged in international programmes

¹⁰ <http://www.euresearch.ch/index.php?id=300>, as of Nov, 19, 2010

fulltime without functions geared to national programmes. In terms of the mainstreaming of the international functions (and NCP roles) RCN resembles Tekes in Finland more than any other system. Here NCPs also have a double function for the programmes internally and internationally. This has the advantage of connecting to the domestic priorities but the drawback of having less sharp focus on developments in Europe as well as visibility issues.

There is very little evidence across Europe what the direct effects of the support actions are on FP participation success so there is no 'best practice model'. A synthesis of other studies of these types of support structures does however suggest that:

- A system that is too dispersed with little coordination in the centre for exchange of experiences, information and so on loses visibility and commitments of its individual officers as the Irish FP6 support network found out. By adding a stronger coordination in the centre, the outreach to various communities and exchange of information across FP parts improved a lot in FP7. RCN does not have that problem as a majority of NCPs are under one RCN roof.
- The success of thematic NCPs depends on the specific expertise and connection they have with both the community 'at home' and the many developments in European circles. It is important to keep being informed about new developments within the Commission and have early warning systems for the upcoming calls, important committees etc. The Dutch evaluation of the impact of the European Framework programmes showed that the expertise and networks of individual NCPs with the specific research communities in their field is very important to win the trust of potential participants. The mainstreaming principle of RCN is in principle helpful to keep the RCN NCPs involved with the national programmes and their communities in thematic areas. The frequent coordination meetings within RCN are useful and necessary to exchange information on European developments. That is well developed at RCN. The main concern would be whether the mostly part-time tasks on EU-matters is sufficient for the NCPs to keep up with EU developments and to have time to network with the people in Brussels and NCPs from other countries in their domains.
- Experiences in other countries with subsidising FP proposal preparation have led to distortions and windfall effects. In Austria this type of support has been abolished and most other countries have deliberately chosen not to use these financial incentives. In Ireland this has helped providing incentives to potential coordinators but the bureaucratic burden of applying for these schemes made them less effective. This type of funding should be assessed more closely in the future.
- Increasingly the function of NCPs is less about providing information (the provision of information by the European Commission has greatly improved) and more about providing strategic support to the research and policy communities to position themselves better in Europe. This requires good networks in Brussels, where RCN has an office, as well as with decision makers in the national research and innovation communities. NCPs thus need to rebalance their attention from the individual research performers to those in strategic positions in universities, research centres, companies and government bodies. Many of the European support structures are struggling how to manage this new role.

In summary the FP support system in RCN seems to be well organised and connected to the other core programmes in RCN. In comparison to the centralised support units in countries such as Austria and The Netherlands, RCN has relatively modest human resources for this activity. If Norway should decide that a bigger exposure to the European research activities is necessary it should strengthen the central coordination and Brussels connections of the NCP system, where it has an office, – and therefore the human resources - within RCN and develop a stronger link between Norwegian (research) policy agendas and the activities of the Norwegian research and innovation communities.

6. The Role of RCN in International Cooperation – A Bibliometric Analysis

6.1 Introduction and Scope

This report presents an international and comparative bibliometric analysis of scientific publications associated with research sponsored by the Research Council of Norway (RCN). The report contributes to Work Package Wp(6): Internationalisation, undertaken as part of the Evaluation of the Research Council of Norway.

The objectives and issues covered in this analysis are discussed below, in Section 2. A summary of the methodology is contained in Section 4. This is followed by our analysis and presentation of results.

Under Work Package Wp(6), the bibliometric analysis of scientific publication records seeks to analyse Norwegian research performance in an international context. The specific topics of the work package covered in this report include:

1. Patterns of international co-publication of Norwegian researchers supported by RCN, including who publishes with whom and in what fields.
2. Patterns of international co-authorship in the current era of knowledge globalisation, including distributions by countries, collaborations with close Scandinavian partners, other European and North American links, and engagement with “rising” countries (e.g. in Asia).
3. Co-funding trends, to provide indication of the varied domestic and international funding sources accessed by Norwegian researchers engaged in international collaborations and supported by RCN. This helps to assess and guide the RCN’s international partnering strategies (for example, by identifying weaknesses and gaps).
4. Leading institutions and research groups in Norway engaged in international collaborative research of various kinds and supported by RCN.
5. Leading and lagging technical fields (by Web of Science subject categories) engaged in international collaborative research supported by RCN.
6. Citation impacts of Norwegian international collaborative research supported by RCN.

6.2 Methodology

6.2.1 Overview, data source and specification

This section summarizes the bibliometric search strategy used to identify, clean, and organize the publication records used in the analysis of Norwegian international cooperation in R&D supported by RCN.

The data for the bibliometric analysis is derived from publication records collated in Thomson Reuters Web of Science (WoS). More than 10,000 journals published worldwide are indexed in the WoS, with coverage in the sciences, social sciences, arts, and humanities. The WoS indexes a variety of publication types, including journal articles, proceedings, reviews, abstracts and editorial materials.¹¹ We identified more than 34,512 WoS journal article records published between 2008 and 2011 with at least one author from Norway. Our analysis covers science, social sciences, and arts

¹¹ http://thomsonreuters.com/products_services/science/science_products/a-z/web_of_science/

and humanities. About half of the records (about 19,000 papers) comprise internationally-collaborated publications with at least one Norway addressed co-author. Of these, around 5,000 records identified as supported by RCN. This provides a comprehensive evidence base for the bibliometric exploration of Norwegian international R&D cooperation patterns and the impacts of RCN. For international benchmarking, we compare Norway's journal article publications with those of other Scandinavian countries, Switzerland and the Netherlands.

In the analysis of Norwegian international cooperation in R&D supported by RCN, we focus on journal articles (which comprise the majority of all indexed records in the WoS). We accessed and identified all articles with a least one Norway author listed in the three WoS databases SCI-EXPANDED, SSCI and A&HCI for the period 2008-2011. SCI-EXPANDED covers science; SSCI covers social science; and A&HCI covers arts and humanities. The search terms are shown in Table 3.

Table 3 Data Search Queries

Search Term	Years	Databases	Type	N
CU=(Norway)	2008-2011	SCI-EXPANDED + SSCI + A&HCI	Article Only	34,512
CU=(Belgium)	2008-2011	SCI-EXPANDED + SSCI + A&HCI	Article Only	54,755
CU=(Denmark)	2008-2011	SCI-EXPANDED + SSCI + A&HCI	Article Only	39,248
CU=(Netherlands)	2008-2011	SCI-EXPANDED + SSCI + A&HCI	Article Only	99,896
CU=(Sweden)	2008-2011	SCI-EXPANDED + SSCI + A&HCI	Article Only	66,949
CU=(Switzerland)	2008-2011	SCI-EXPANDED + SSCI + A&HCI	Article Only	69,781

6.2.2 Data Cleaning

The WoS data records were identified and imported into VantagePoint text mining software. VantagePoint is used for data cleaning and analysis. We removed several non-vital record fields to reduce the file size.

A critical step in the cleaning process was the identification of records supported by RCN. WoS includes a structured funding organisation field derived from the funding acknowledgements since 2008. However this data is only available for SCI-EXPANDED database covering science. As this data is derived from author reporting to journals, the self-declaration of authors, it may exclude some portion of the funding. Similarly, it does not include block or core funding nor does it distinguish funding amounts of which funding was associated with particular publication authors.

Another data source available to us was the database of the projects supported by RCN since 2001. It includes the name of project and principal investigator but not other project participants. This database does not include the publications associated with RCN support. However, we matched the full names of the principal investigators of the RCN supported projects between 2001 and 2007 with the names of the authors in our publications database based on WoS. This method associates all the publications of an author even if he/she were supported by sources other than RCN. Similarly, although we used full names, there is the possibility of some misallocation of publications among authors who share the same full name as an RCN supported principal investigator. As the RCN database includes only the names of the principal investigators, we are likely to have excluded the publications of some of the authors who were supported by RCN but not as principal investigator of a project.

Each of these two available data approaches thus has trade-offs. While there is a degree of underestimation of association of funders to publications by using WoS funding organisations data, use of RCN supplied data is likely to overestimate the number of publications attributable with RCN funding. The extent of overestimation in the latter method is likely to exceed the extent of underestimation by using the WoS funding organisation data. Furthermore, the RCN supplied data does not give us any information about co-funding as it is only about RCN funding while WoS data includes the names of co-funders. Therefore, we have decided to use WoS funding organisations field as the primary method of sponsorship attribution for science and

engineering publications (SCI). For social sciences, arts and humanities publications, we reinforce our data with publications we attribute by using the RCN project database.

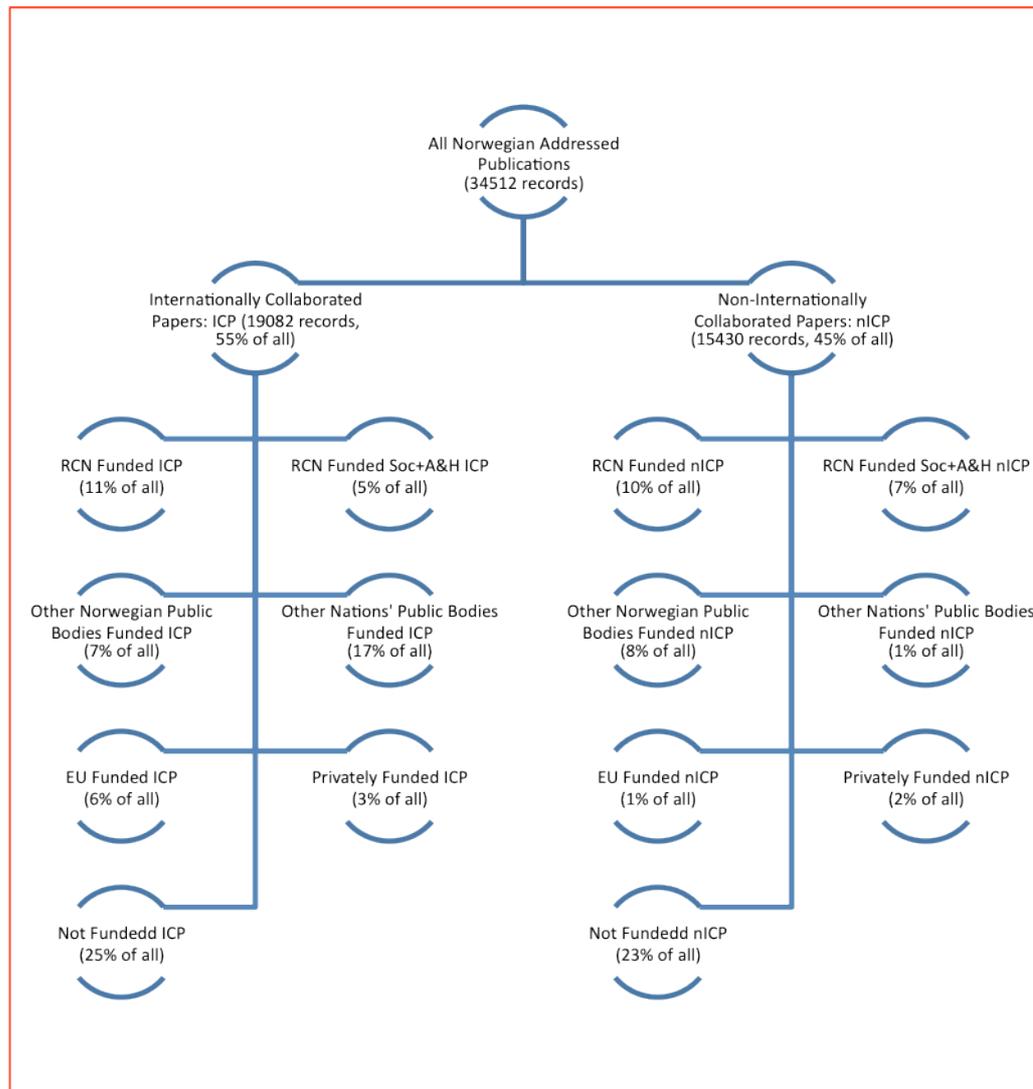
We grouped funders into following categories:

- **RCN:** publications attributed by using WoS, covering science and engineering.
- **RCN Soc+A&H:** publications attributed by using RCN sponsorship data. Covers social science, arts and humanities. Not mutually exclusive with the above category because of methodology described above.
- **Other Norwegian Public Organisations:** Norwegian public research funders other than RCN (e.g. ministries, health authorities, etc.)
- **Other Nations' Public Bodies:** Public Funders from other countries (e.g. ESRC, NSF, etc.)
- **European Union (EU):** includes all EU institutions and programmes (e.g. ERC, ESF, ESA, etc.)
- **Private Bodies:** includes companies and foundations (Statoil, AstraZeneca, Welcome Trust)

We undertook data cleaning to standardize institutional affiliations, funding organisations, and country names. Several fields such as author country affiliations, publication years, funding organisations and subject categories are further processed to form groups within them. For subject categories, the groupings used by the WP(4) are employed to ensure consistency. For author country affiliations, we identify these major groupings: Other EU and European Economic Area (EEA), Scandinavia, Other Europe, North America, BRICS (Brazil, Russia, India, and China), Asia, South America, Africa, Australasia.

In a final stage of data cleaning, the dataset is divided into two sub-datasets. The first sub-dataset is called “Non-Internationally Collaborated Publications” (nICP) which only includes the publications authored by Norwegian addressed authors while the second dataset, “Internationally Collaborated Publications” (ICP) includes publications that have at least one non-Norway addressed author. A summary of the groupings is presented in Figure 2.

Figure 2: Data Grouping



6.2.3 Data Normalisation

For scale variables such as number of authors for a publication, number of countries, number of references, and number of times cited, we normalised the data. We calculated the average values of scale variables for different subject categories as these variables change with the nature of scientific fields. We based this analysis on Norwegian publications within our database. Then we divided the scale variables for each record to the average value of that scale variable for the scientific field that the record belongs to. If a record fell into more than one subject category, we took the mean across the categories. We also excluded outliers (e.g. the top 1% of most cited papers in the citation analysis).

6.2.4 Comparison Countries

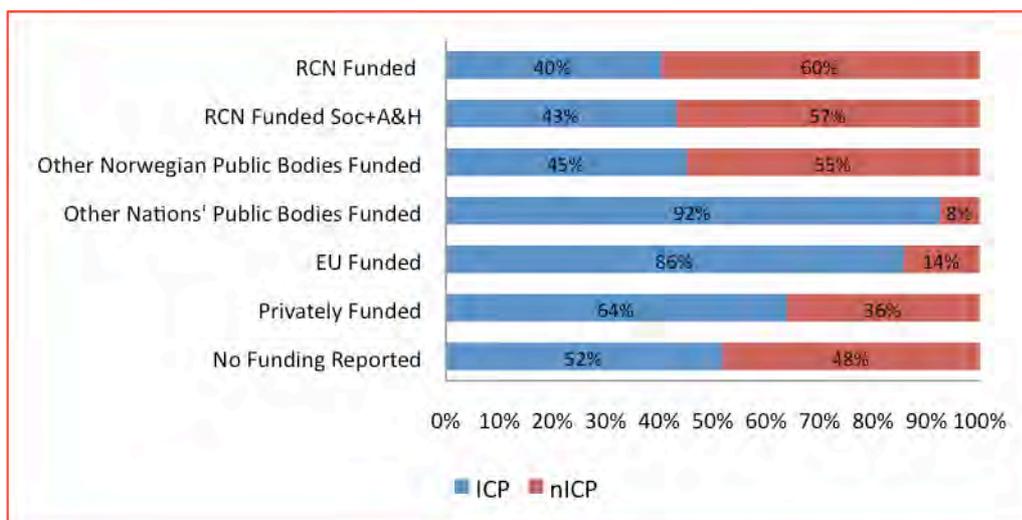
Belgium, Denmark, Finland, The Netherlands, Sweden, and Switzerland are selected as comparison countries. For these six countries, comparable data was identified and cleaned using the data mining process described above.

Results

Patterns of international co-publication of RCN Funded Research

While the approximately 55% of the all publications in Norway are ICP, this ratio is lower for RCN supported ICP (40% for RCN and 43% for RCN Soc+A&H). Other Norwegian Public Bodies Funded publications are slightly more international (45%). While international sponsors predominantly fund ICP, there are some nICP supported by them (8% for Other Nations' Public Bodies, 14% for EU and 36% for Private Funders). Publication for which there is no funding reported is close to the average in terms of the degree of internationalisation (52%). (Figure 3)

Figure 3: Degree of Internationalisation for Funding Categories (Percentage of ICP and nICP in Different Funding Categories)¹²



RCN sponsored papers include authors from 2.8 countries on average. This is equal to or greater for all other funding categories. When this indicator is normalised according to subject field averages, it reveals that RCN funded publications have significantly fewer author countries on average than other sponsor types (Figure 4). Additionally, RCN funded publications include fewer authors than publications funded by other sponsors. In particular, EU funded ICPs include a greater number of authors compared to other funding categories. In general, nICPs include fewer authors than ICPs (Figure 5). This suggests that ICPs funded international sources such as EU, private funders and other nations' public sponsors are more collaborative than ICPs funded by RCN, both in terms of number of authors and number of countries.

¹² Number of publications (N) in each category are presented in Figure 2.

Figure 4: Average Number of Countries Normalised with Field Averages (Top 1% Excluded)

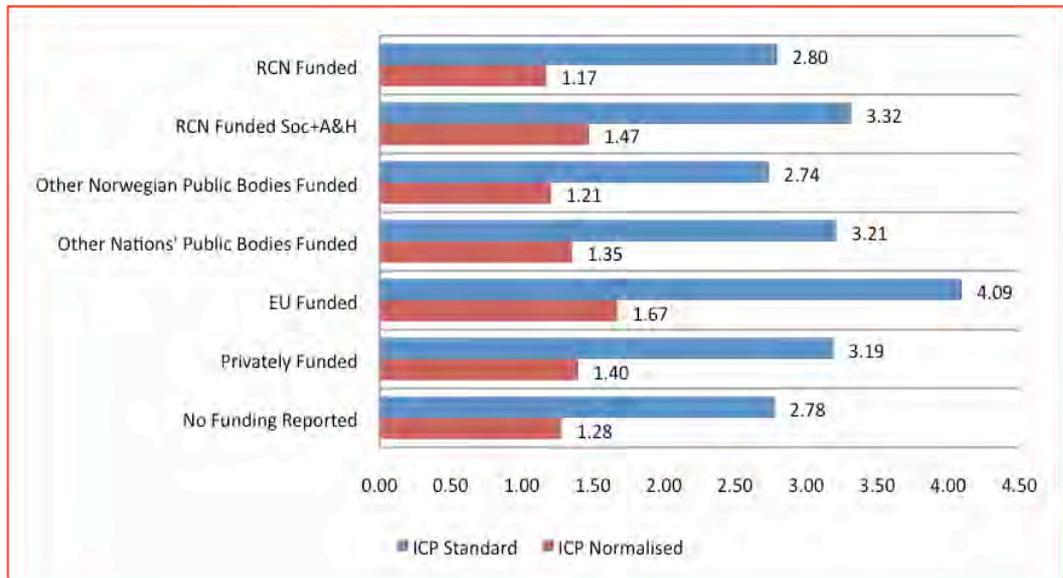
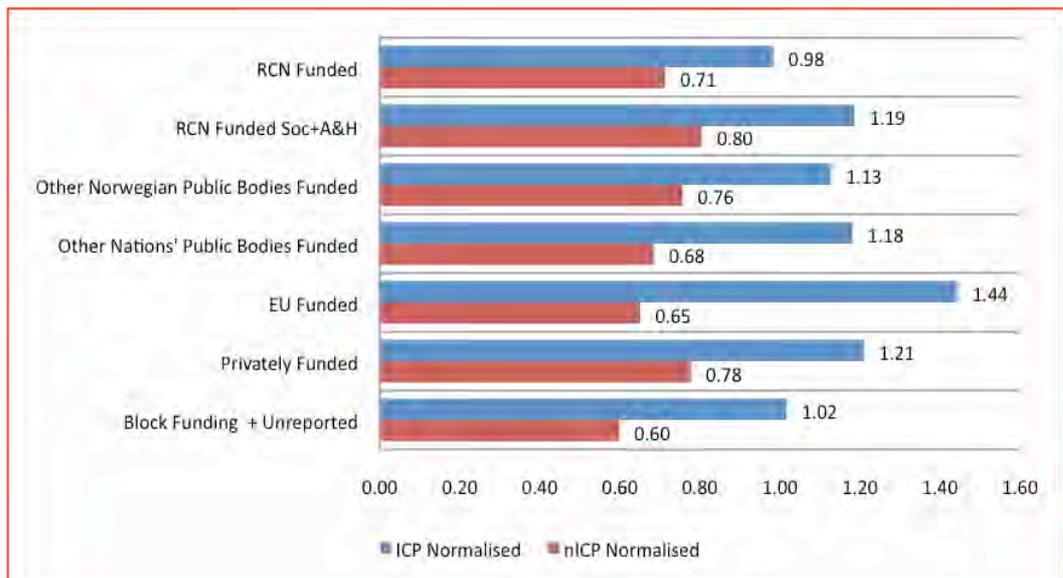


Figure 5: Average Number of Authors Normalised with Field Averages (Top 1% Excluded)



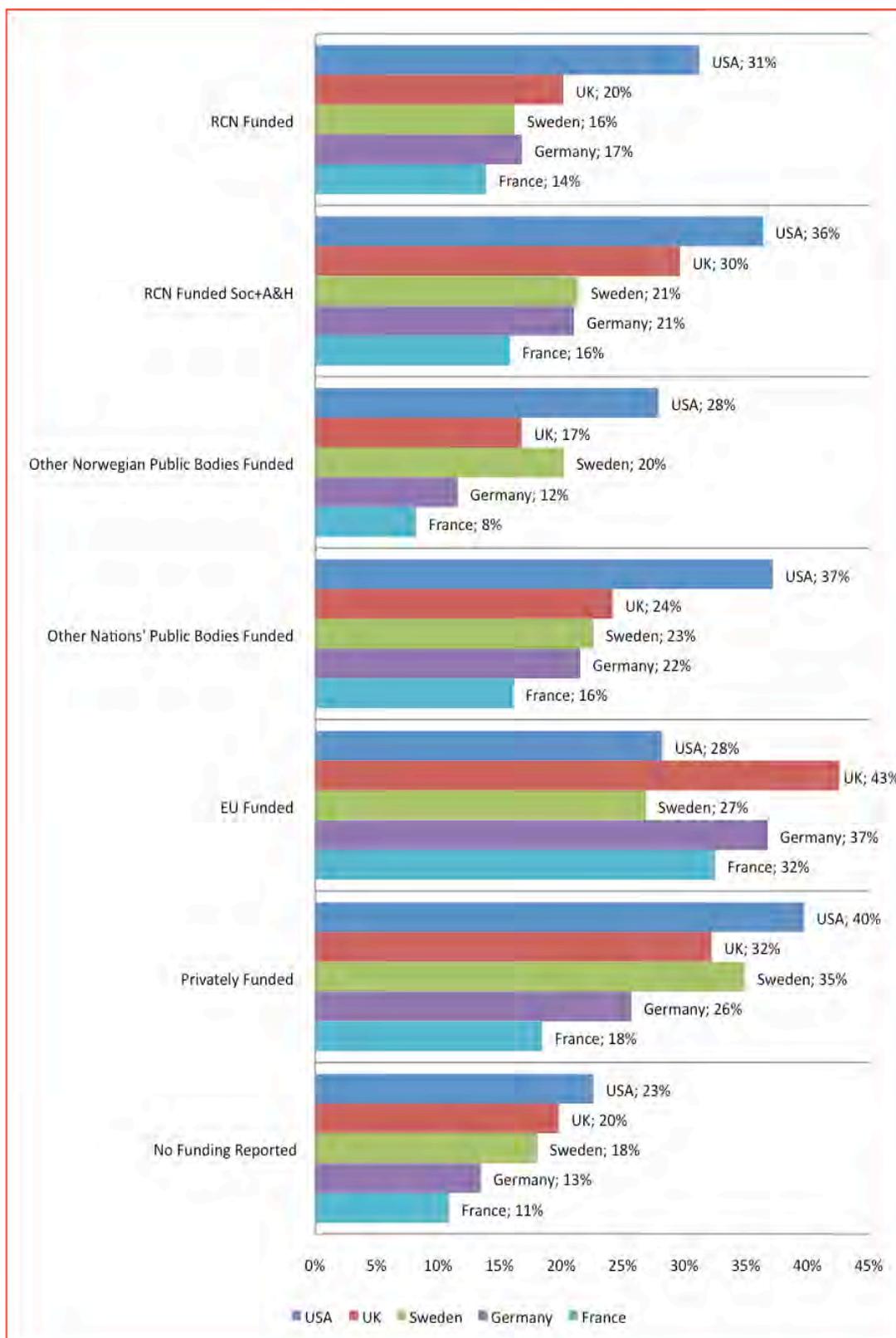
Norway's top ten partnering countries for scientific co-publication are the USA, the UK, Sweden, Germany, France, Denmark, the Netherlands, Italy, Canada and Spain. While these countries also appear in the list of top ten partnering countries for all funding categories, their relative importance differs across funding categories. For instance, while the US is the largest collaborator for Norway overall, for EU funding the most important partner country is the UK. The UK is also a more important partner for RCN Soc+A&H (30% of ICP in this category), than it is for RCN (20%) and Other Norwegian Bodies (17%). Germany and France are relatively more important for both RCN categories than they are to Other Norwegian Bodies (Figure 6 and Table 11).

In terms of partner country groups, RCN funding is most associated with EU and EEA countries (around 50%). North America (36%), Scandinavia (26%) and BRICS (16%)

are the next most important partner country groupings. One interesting finding is that the relative importance of Scandinavia and BRICS for EU funded publications are higher than their relative importance for RCN. This means that the RCN funding does not encourage collaboration with Scandinavia and BRICS more than EU funding. Scandinavia is a significant partner for publications funded by private sponsors (54% of all papers funded by private sponsors) (Figure 7).

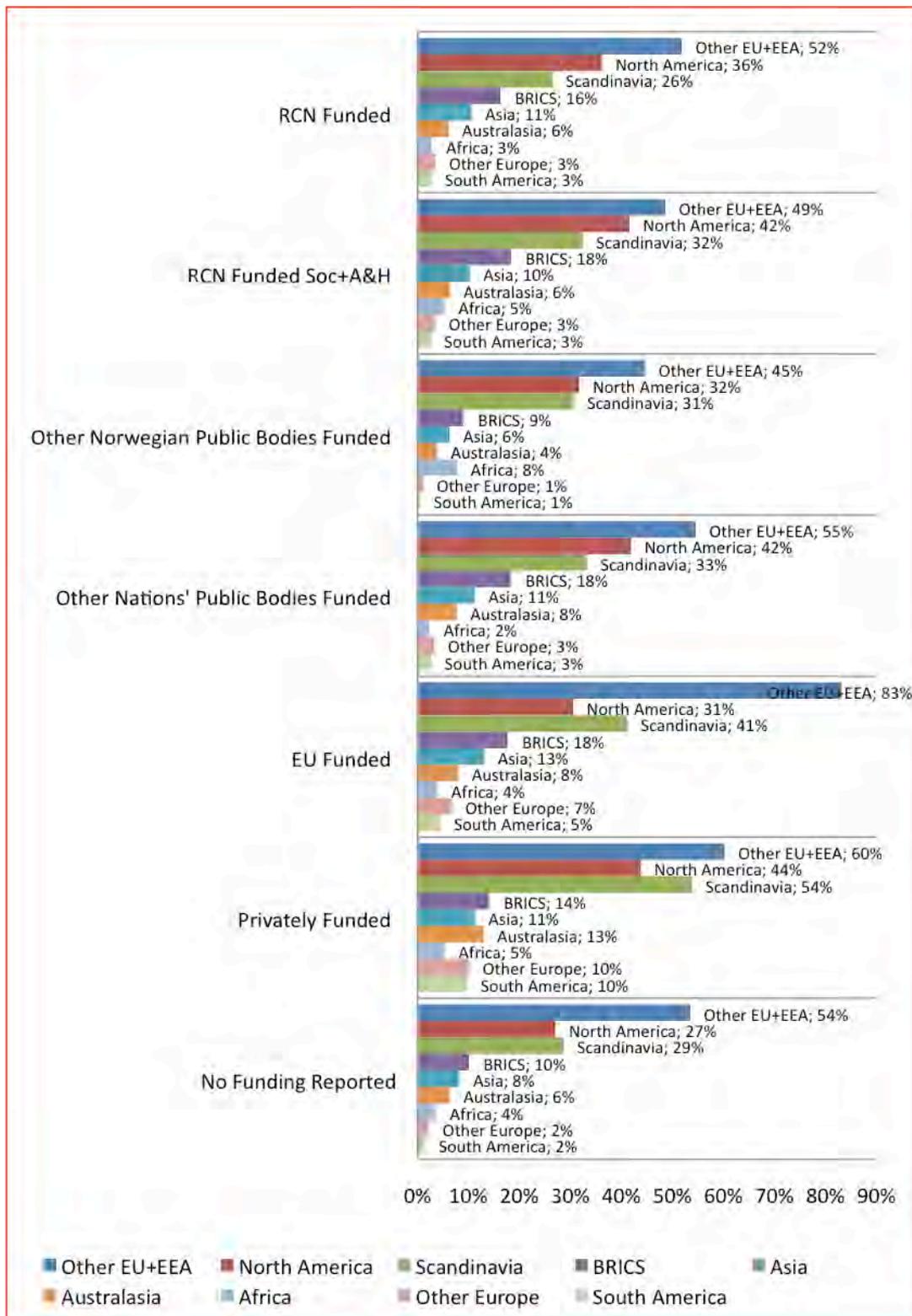
RCN funding is geographically more spread than other national sources of funding but less than papers funded by international bodies or no funding reported (Figure 6 and Table 11). Co-authorship with less collaborated regions such as BRICS, Asia, Australia, South America and Other Europe is predominantly funded by other nations' public bodies, while there is some degree of RCN funding as well. For Africa, other Norwegian public sponsorship is the dominant funder group. The relative importance of private funding for collaboration with other Europe and South America is also high (Figure 8).

Figure 6: Relative Importance of Co-Author Countries for Different Funding Sources¹³



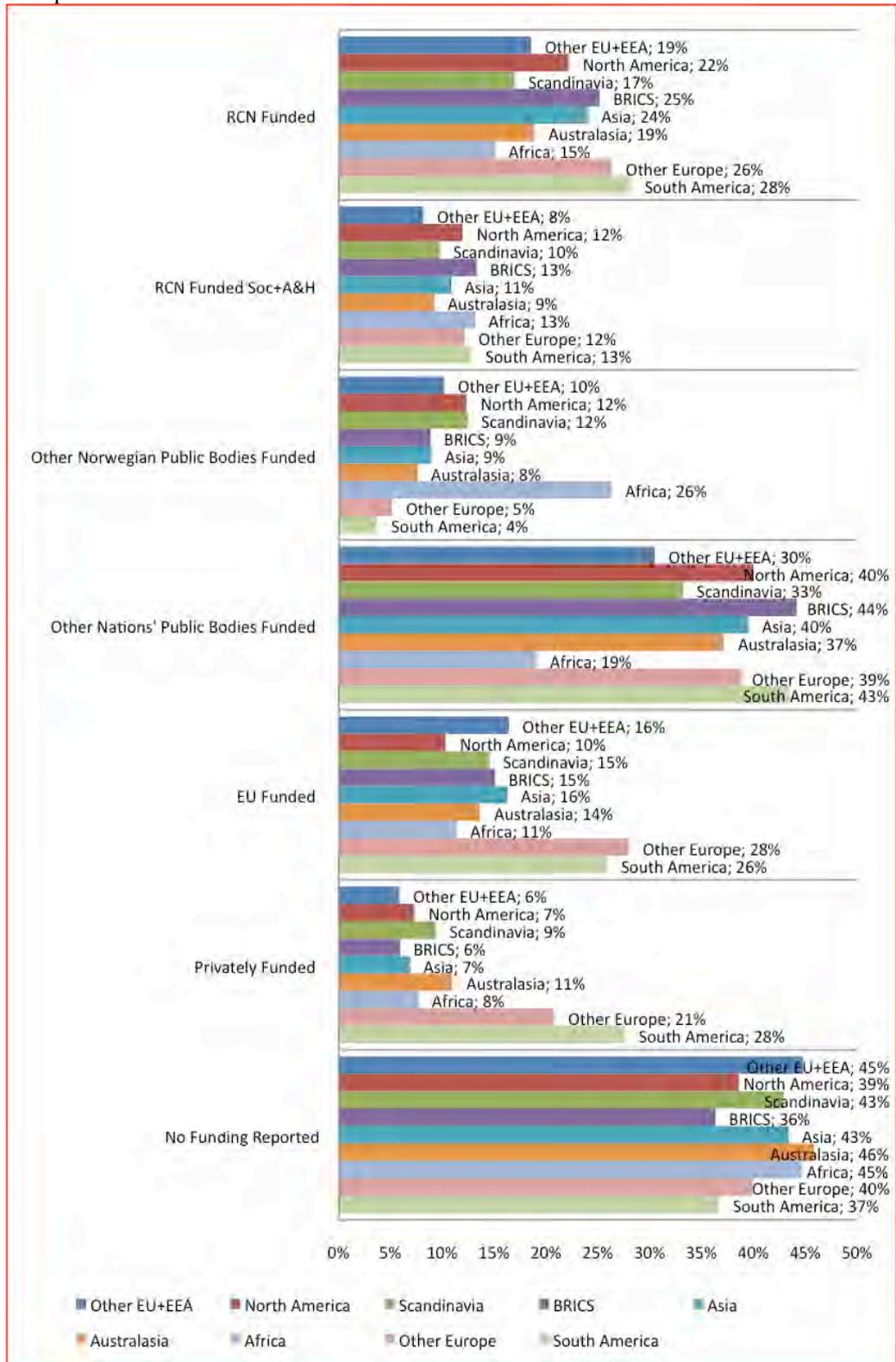
¹³ Number of publications (N) in each category are presented in Figure 2.

Figure 7: Relative Importance of Co-Author Country Groups for Different Funding Sources¹⁴



¹⁴ Number of publications (N) in each category are presented in Figure 2.

Figure 8: Relative Importance of Different Funding Sources for Co-Author Country Groups¹⁵



¹⁵ Number of publications (N) in each category are presented in Figure 2.

Funding and Co-Funding

According to funding acknowledgements, the largest individual funding organisations for Norwegian research are RCN (41% and 31% of all funding for science and for social science respectively), EU (12% of all funding) and Norway Regional Health Authorities (8% of all funding). Statoil is the largest private funder (2%). There are a number of funders from the US in the top twenty individual funders list (Table 4).

Table 4 Top 20 Funders¹⁶

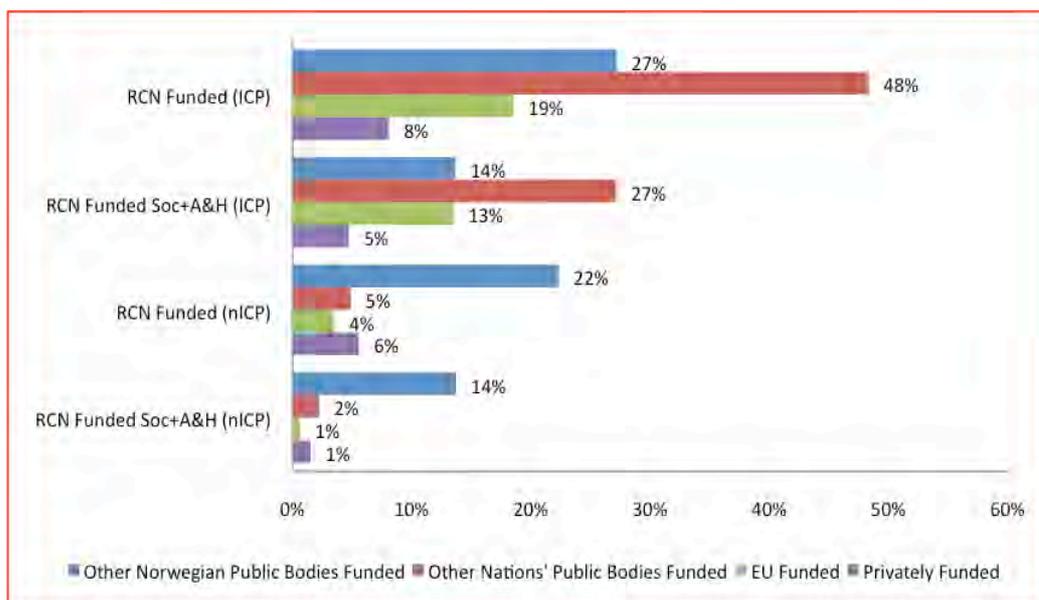
Funding Organization	% of total funded papers
Research Council of Norway	41%
Research Council of Norway (Soc+A&H)	31%
European Union	12%
Norway Regional Health Authorities	8%
University of Oslo	5%
National Institutes of Health (USA)	4%
Norwegian Cancer Society	4%
National Science Foundation (USA)	4%
Swedish Research Council	4%
German Research Foundation	3%
Norwegian University of Science and Technology (NTNU)	3%
German Federal Ministry for Education and Research	2%
Statoil	2%
Norwegian Foundation for Health and Rehabilitation	2%
University of Bergen	2%
Natural Sciences and Engineering Research Council (Canada)	2%
Department of Energy (USA)	2%
National Natural Science Foundation of China	2%
Ministry of Science and Innovation (MICINN), Spain	2%
National Center for Scientific Research (France)	2%

Sum exceeds 100% due to multiple funding of individual papers

RCN publications are co-funded by other funders to varying degrees. Forty-eight per cent of ICP Papers funded by RCN were also funded by other nations' bodies, 27% by other Norwegian bodies, 19% by EU and 8% by private funders. These ratios are slightly less for RCN Soc+A&H Group. Although RCN funded nICP papers are significantly less funded by international funders, there is still considerable share of international co-funding for nICP (around 5%). Other nations' public bodies are more important co-funding partner for RCN than the EU (Figure 9 and Table 5).

¹⁶ Number of publications (N) in each category are presented in Figure 2.

Figure 9: Percentage of RCN Funded Papers Co-funded by Another Sponsor¹⁷



¹⁷ Number of publications (N) in each category are presented in Figure 2.

Table 5 Correlation Between Different Funding Sources (Pearson's r)

		ICP					
		RCN Funded	RCN Funded Soc+A&H	Other Norwegian Public Bodies Funded	Other Nations' Public Bodies Funded	EU Funded	Privately Funded
ICP	RCN Funded	1.000	0.085	0.281	0.294	0.186	0.106
	RCN Funded Soc+A&H	0.085	1.000	0.063	0.065	0.074	0.025
	Other Norwegian Public Bodies Funded	0.281	0.063	1.000	0.173	0.101	0.111
	Other Nations' Public Bodies Funded	0.294	0.065	0.173	1.000	0.248	0.136
	EU Funded	0.186	0.074	0.101	0.248	1.000	0.084
	Privately Funded	0.106	0.025	0.111	0.136	0.084	1.000
		nICP					
		RCN Funded	RCN Funded Soc+A&H	Other Norwegian Public Bodies Funded	Other Nations' Public Bodies Funded	EU Funded	Privately Funded
nICP	RCN Funded	1.000	0.611	0.223	0.132	0.111	0.134
	RCN Funded Soc+A&H	0.611	1.000	0.053	0.020	-0.010	-0.003
	Other Norwegian Public Bodies Funded	0.223	0.053	1.000	0.151	0.073	0.158
	Other Nations' Public Bodies Funded	0.132	0.020	0.151	1.000	0.062	0.104
	EU Funded	0.111	-0.010	0.073	0.062	1.000	0.034
	Privately Funded	0.134	-0.003	0.158	0.104	0.034	1.000

Leading Institutions

The University of Oslo, the Norwegian University of Science and Technology and the University of Bergen are the dominant institutions in terms of publishing both with national and international collaborators. These three institutions produce around 60% of ICP and around 70% nICP. The Top twenty publishing Norwegian Institutions and their Share of ICP and nICP are shown in Table 6.

Table 6 Top 20 Publishing Norwegian Institutions and Their Share of ICP and nICP^{18, 19}

	ICP	nICP
Univ Oslo	30.6%	34.3%
Norwegian University of Science and Technology	14.4%	20.6%
Univ Bergen	17.9%	15.5%
Univ Tromso	7.6%	8.3%
Haukeland Univ	3.9%	5.4%
Norwegian University of Life Sciences	3.9%	5.0%
SINTEF	2.4%	4.8%
Stavanger Univ	2.4%	3.7%
Norwegian Institute of Public Health	2.7%	3.4%
Univ Hosp North Norway	1.3%	2.7%
Akershus Univ	1.0%	2.5%
Norwegian Sch Vet Sci	1.9%	2.0%
Inst Marine Res	1.9%	1.9%
Nofima	1.0%	1.7%
Oslo Univ Coll	0.5%	1.4%
Statoil	0.9%	1.2%
Norwegian Radium Hosp	1.0%	1.1%
Univ Trondheim Hosp	0.5%	1.1%
Norwegian Sch Sport Sci	0.8%	1.1%
Univ Agder	0.9%	1.1%

Sum exceeds 100% due to multiple institutional authorships of individual papers.

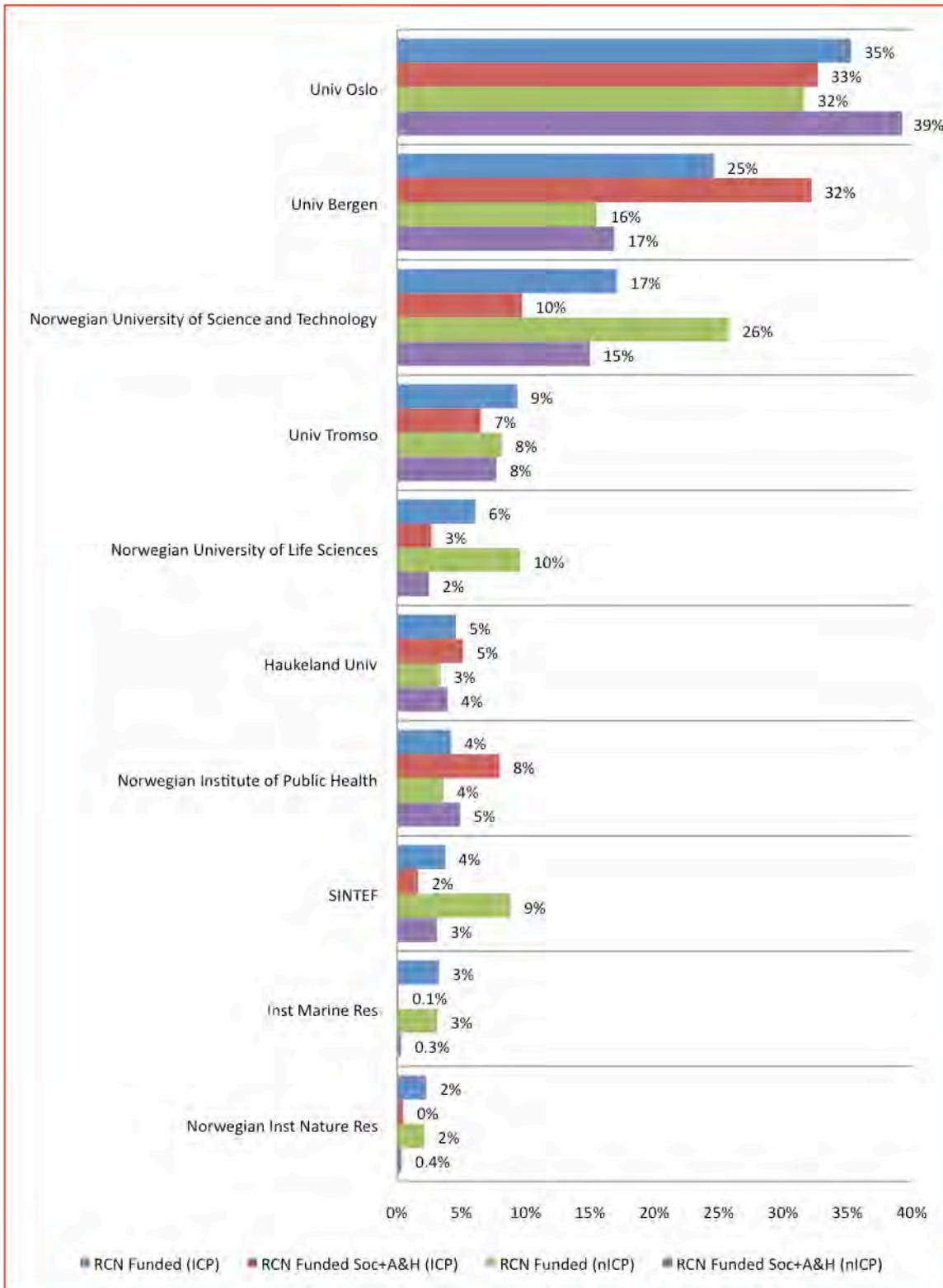
The three dominant institutions receive a greater share of RCN ICP funding (70% of ICP funded by RCN) than their overall ICP publication share (60% of all ICP). For nICP this is other way around: they make up 70% of nICP but receive around 65% of RCN nICP funding. The Norwegian University of Science and Technology is second in overall publications and the University of Bergen is third. In terms of receiving RCN funding, the University of Bergen is ahead of the Norwegian University of Science and Technology (which especially lags in RCN ICP funding). Institutions other than these three are more successful in receiving RCN nICP funding than their share of nICP in general (Figure 10).

While RCN funding is around 10%-15% for the top three sponsored institutions, for other institutions RCN funding is relatively more important. For instance, RCN nICP funding amounts to 26% of all nICP funding for SINTEF (Figure 11 and Figure 12).

¹⁸ Publications written by university based scholars who are also associated with hospitals might be reported in only one of these affiliations. Therefore, universities with a significant medical science faculty and hospitals in this list might be underestimated.

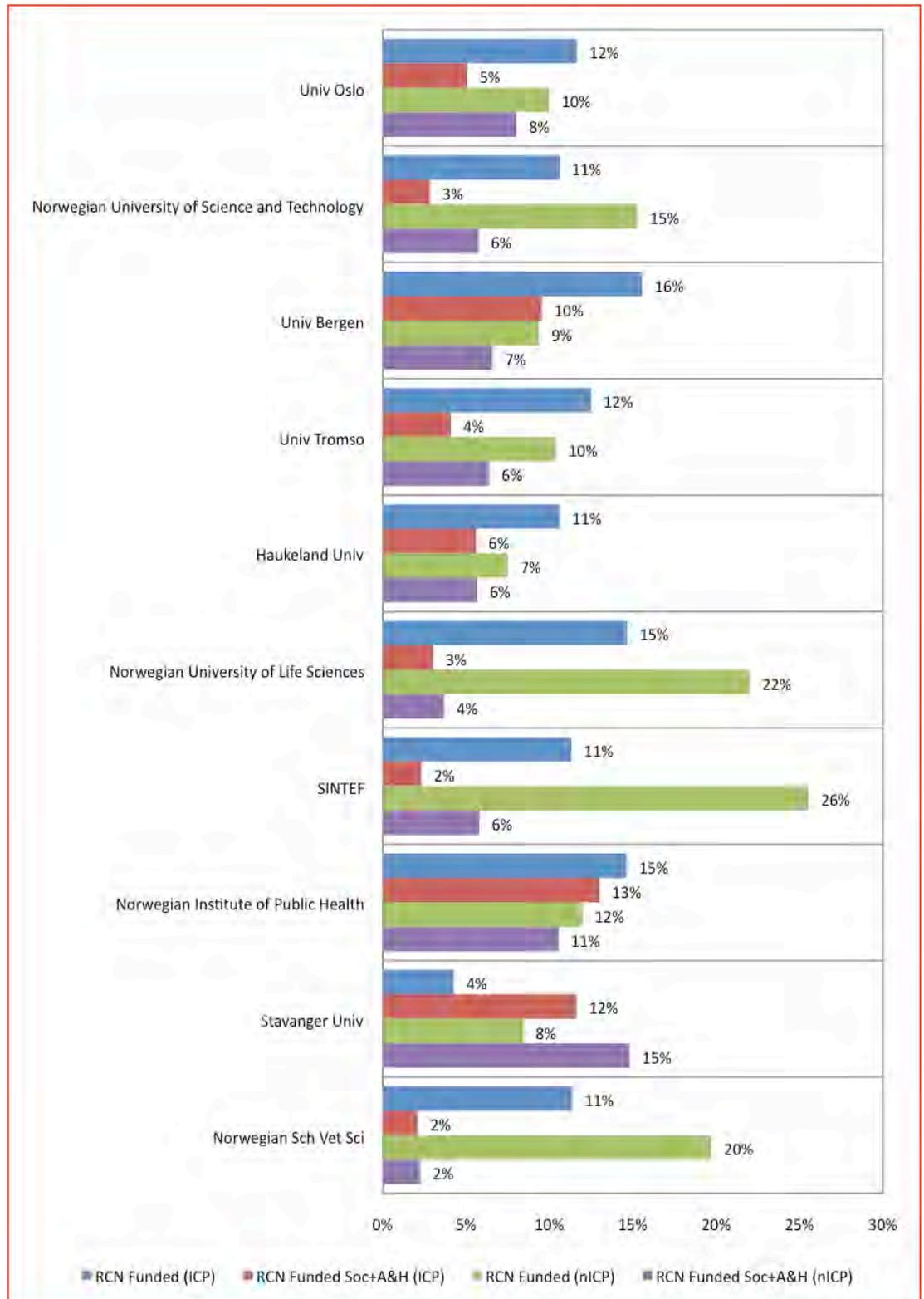
¹⁹ Number of publications (N) in each category are presented in Figure 2.

Figure 10: Relative Importance of Top 10 RCN Funded Institutions for Different RCN Funding Categories²⁰



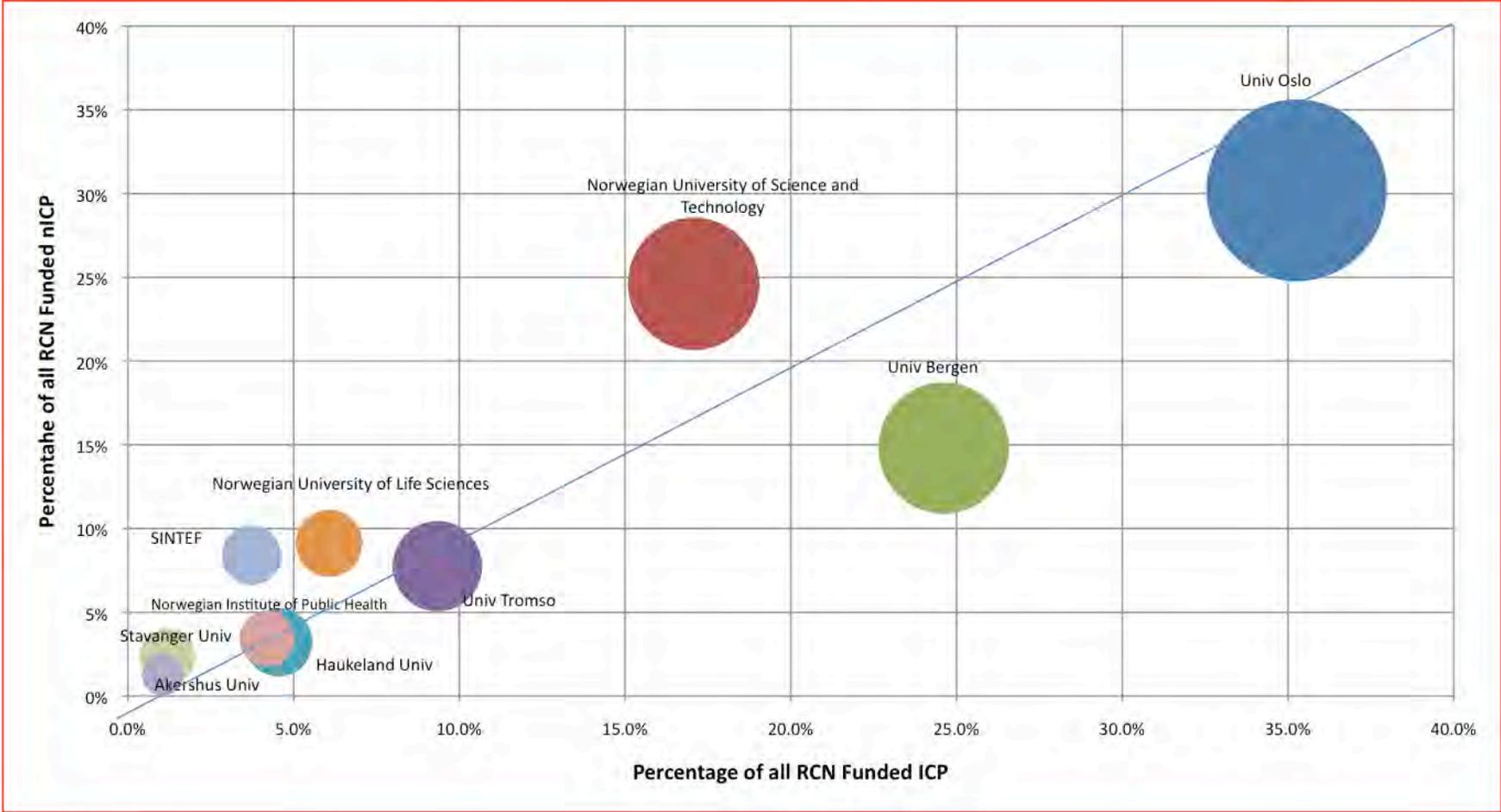
²⁰ Number of publications (N) in each category is presented in Figure 2.

Figure 11: Relative Importance of Different Categories of RCN Funding for Top 10 Norwegian Publishing Institutions²¹



²¹ Number of publications (N) in each category is presented in Figure 2.

Figure 12: Share of ICP and nICP RCN Funding of Top 10 Publishing Norwegian Institutions²²



²² Number of publications (N) in each category is presented in Figure 2.

Leading subject fields

The leading scientific areas RCN funded ICP publications fall in are Physics And Materials Science (17%), Biological Sciences (16%), Clinical Medicine (16%), Basic Life Sciences (15%), Earth Sciences And Technology (13%), Environmental Sciences And Technology 11% Chemistry And Chemical Engineering (10%), Biomedical Sciences (10%), Astronomy And Astrophysics (6%), and Agriculture And Food Science (5%). For RCN funded nICP, the top ten list is similar except that the relative importance of Life Sciences, Biological Sciences and Clinical Medicine is slightly higher and relative importance of Physics and Materials Science is much lower (Table 12).

It appears that Life Sciences, Biological Sciences and Clinical Medicine and allied subject groups are more important for Other Norwegian Public Bodies, in both the ICP and nICP groups, than they are to RCN. RCN funding is more evenly distributed to subject groups than Other Norwegian Public Bodies funding, especially in nICP group. For instance, top 5 most funded subject categories for RCN ICP and nICP groups, make up 69% and 54% of these groups respectively. These ratios are 77% and 83% for Other Norwegian Public Bodies, respectively. Privately funded publications are the most concentrated in terms of their subject category, while research where no funding reported is the most spread (Table 7).

Table 7 Share of Top 5 most Important Subjects for Each Funding Category²³

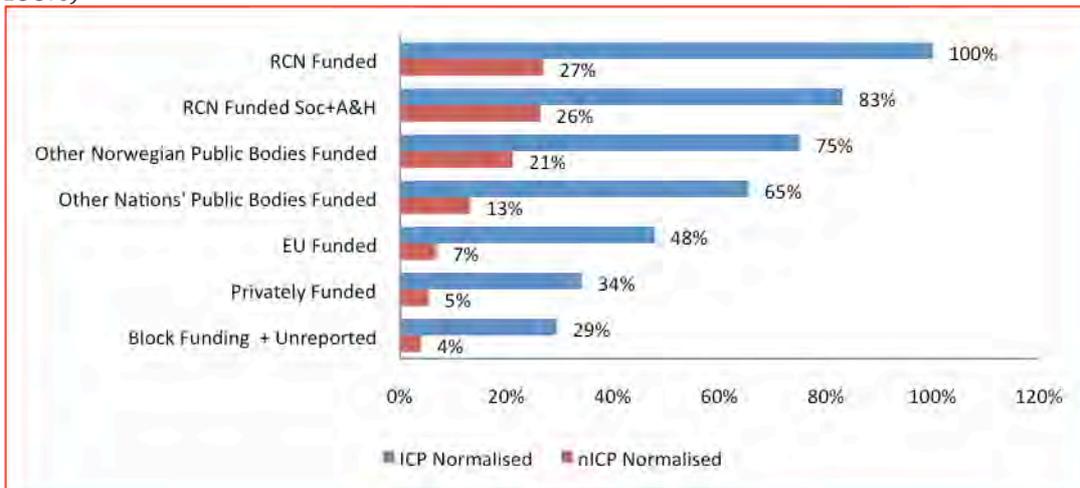
	ICP	nICP
RCN Funded	69%	54%
RCN Funded Soc+A&H	67%	67%
Other Norwegian Public Bodies Funded	77%	83%
Other Nations' Public Bodies Funded	59%	75%
EU Funded	74%	63%
Privately Funded	86%	75%
No Funding Reported	58%	54%

Cited references and citation impacts

ICPs list substantially more references to other publications than nICPs. Furthermore, RCN funded ICPs use more references than other publications funded by other funders or where no funding is reported. This suggests that ICPs in general and ICPs funded by RCN draw on a broader knowledge base, which in turn may be influenced by the number of authors, subject, and country factors (Figure 8).

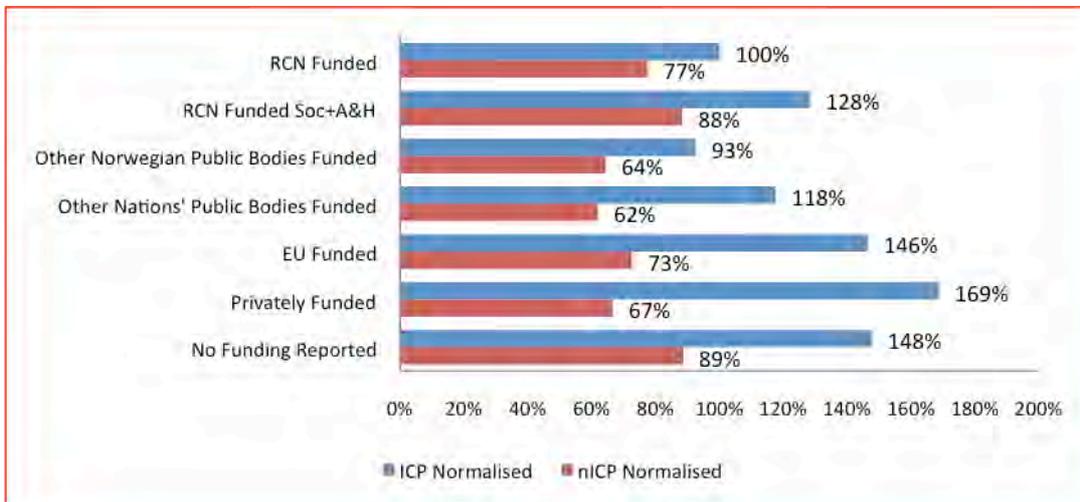
²³ Number of publications (N) in each category is presented in Figure 2.

Figure 13: Cited References Normalised with Field Averages (RCN Funded ICP = 100%)²⁴



In general, nICPs receive fewer citations than ICP no matter how they were funded. Most citations were received by publications funded by private funders and the EU. RCN funded ICPs attracts slightly more citations than Other Norwegian Public Bodies funded ICP but much less than internationally funded ICPs (Figure 14). nICPs are more likely to receive no citation than ICPs but there is no significant difference between different funding categories in terms of receiving at least 1 citation. The only exception to this is that RCN Soc+A&H funded nICP is more likely to receive no citation than all other nICPs received a different or no funding (Figure 14).

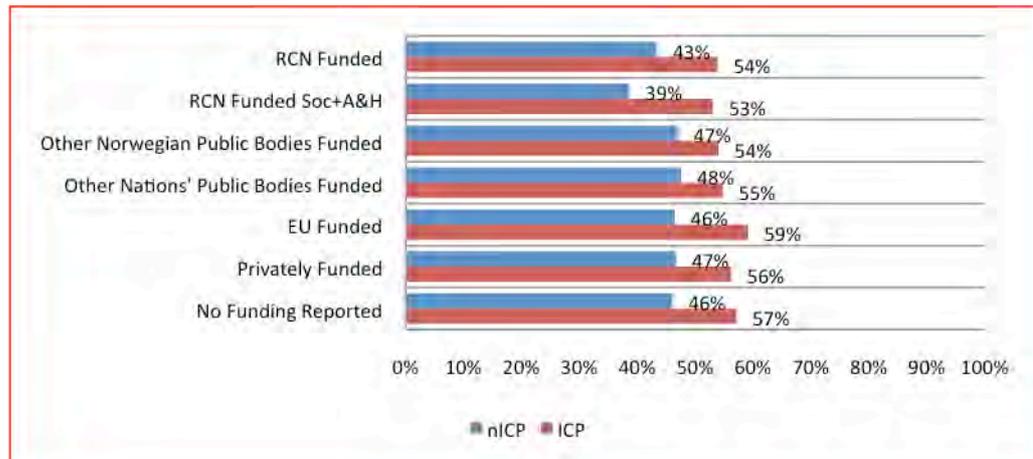
Figure 14: Times Cited Normalised with Field Averages (RCN Funded ICP = 100%, Top 1% Excluded)²⁵



²⁴ Number of publications (N) in each category is presented in Figure 2.

²⁵ Number of publications (N) in each category is presented in Figure 2.

Figure 15: Percentage of Papers that Received Citation²⁶



Benchmark Analysis

The rate of scientific paper internationalisation in Norway (share of ICP within all papers) is around 55%. This figure is close to the Netherlands (54%), Denmark (58%) and Sweden (57%) but lower than Belgium (61%) and Switzerland (67%). In terms of ICP per FTE researchers, Norway (0.72) is similar to Denmark (0.65), Sweden (0.77) and Belgium (0.88) but lower than the Netherlands (1.03) and significantly lower than Switzerland (1.85) (Table 8).

Table 8 Rate of Internationalisation in Comparison Countries²⁷

	All Publications	Publications per FTE Researcher	ICP	ICP per FTE Researcher	Rate of Internationalisation
NO	34512	1.30	19082	0.72	55%
BE	54755	1.43	33555	0.88	61%
CH	69781	2.78	46520	1.85	67%
DK	39248	1.11	22880	0.65	58%
NL	99896	1.92	53478	1.03	54%
SE	66949	1.36	37895	0.77	57%

As discussed earlier in this report, RCN funded publications are less international than Norway average (40% versus 55%). National Public Bodies Funded publications are significantly more international (ranging between 48% and 58%) than RCN funded publications. Furthermore, National Public Bodies funded publications in comparison countries are less international than the national average but the gap is the biggest in Norway. Level of internationalisation in Other Nations' Public Bodies funded research is similar in all countries (ranging between 89% and 94%). EU funded research is less international in Switzerland (56%), the Netherlands (58%) and Sweden (58%) than Norway (86%), Belgium (80%) and Denmark (78%). Finally privately funded research is less international in Norway (64%) and Denmark (68%) than other comparison countries (around 75%). (Table 9)

²⁶ Number of publications (N) in each category is presented in Figure 2.

²⁷ Source for FTE Researcher Statistics is EUROSTAT. Data year is 2010, except for CH which is 2008.

Table 9 Degree of Internationalisation for Different Funding Sources (Share of ICPs in a Funding Category)²⁸

	NO	BE	CH	DK	NL	SE
RCN Funded	40%					
RCN Funded Soc+A&H	43%					
National Public Bodies Funded	45%	58%	51%	48%	51%	51%
Other Nations' Public Bodies Funded	92%	94%	90%	91%	89%	89%
EU Funded	86%	80%	56%	78%	58%	58%
Privately Funded	64%	77%	79%	68%	75%	75%

RCN Funded publications make up 22% of all publications in Norway, while National Public Bodies fund 20% of publications in the Netherlands, 25% in Switzerland, 27% in Denmark, 30% in Belgium and 35% in Sweden. EU funding is almost twice as important in Sweden (15%) and Denmark (16%) than Norway (7%) which is similar to rest of the comparison countries. Finally privately funded research makes up 5% of all Norwegian publications while this ratio is around 9% in Denmark, Sweden and Switzerland (Table 10).

Table 10 Relative Importance of Funding in Comparison Countries (Share of Funded Publications in All Publications)²⁹

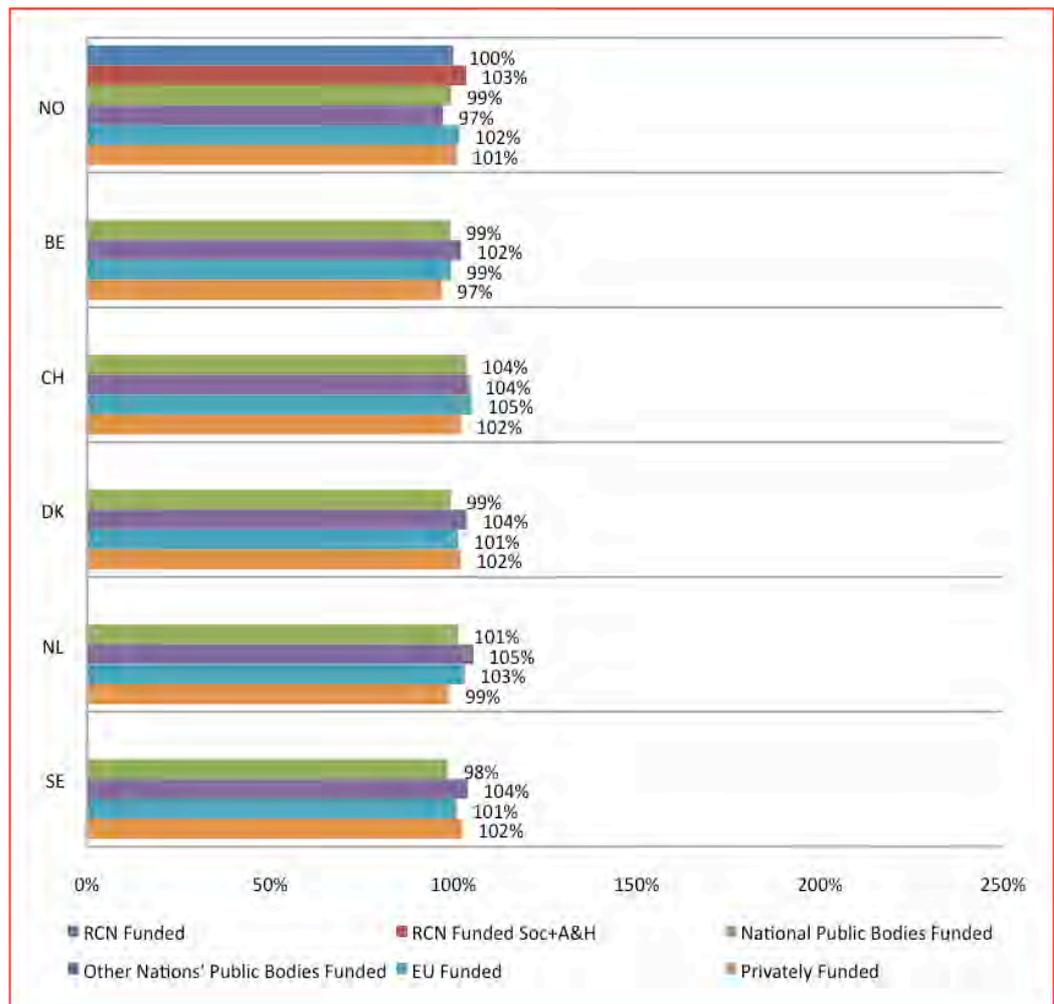
	NO	BE	CH	DK	NL	SE
Funding Reported	51%	44%	44%	47%	37%	
RCN Funded	22%					
RCN Funded Soc+A&H	12%					
National Public Bodies Funded	15%	30%	25%	27%	20%	35%
Other Nations' Public Bodies Funded	18%	19%	23%	22%	18%	21%
EU Funded	7%	10%	9%	16%	9%	15%
Privately Funded	5%	5%	8%	9%	5%	9%

Normalised cited reference count seems to be more or less equal amongst comparison countries so it is safe to conclude that extent of the knowledge base that the funded researchers rely on in all six countries are similar to each other (Figure 16).

²⁸ Number of publications (N) in each category is presented in Table 3 and Table 8

²⁹ Number of publications (N) in each category is presented in Table 3 and Table 8

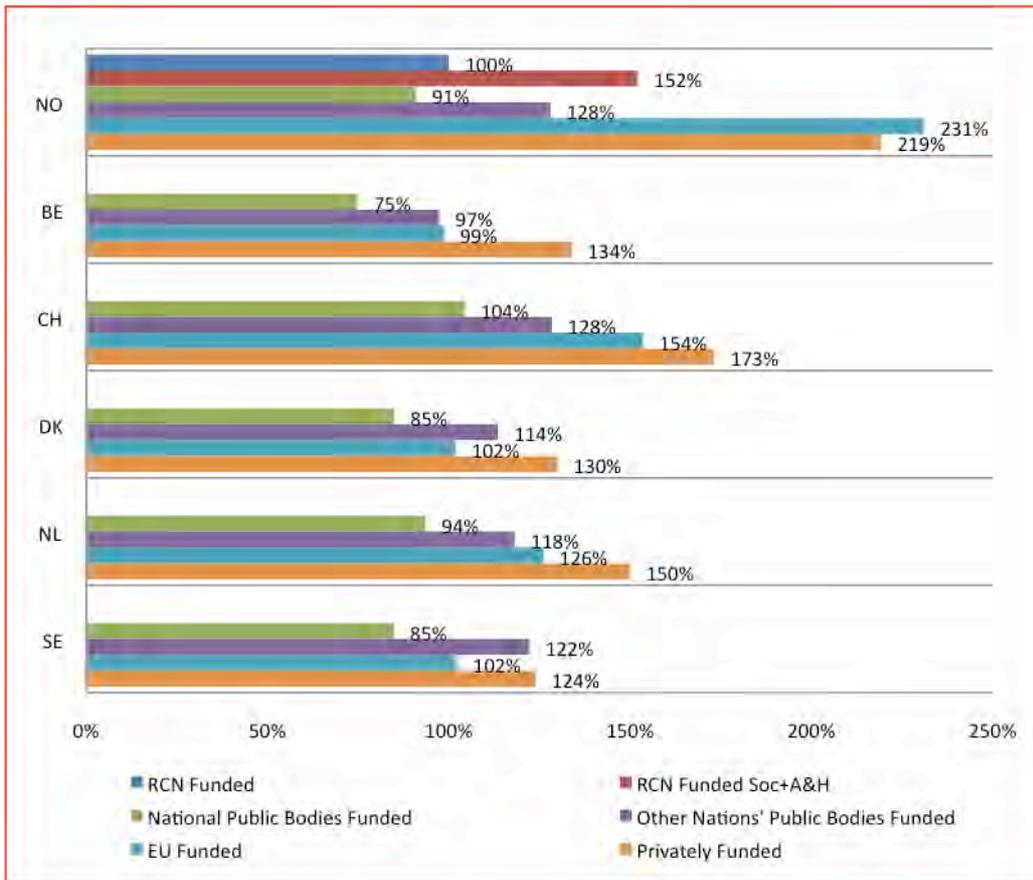
Figure 16: Cited References Normalised with Field Averages (RCN Funded = 100%)³⁰



RCN funded publications are more collaborative than publicly funded publications in comparison countries as they have more authors on average than publications funded by National Public Bodies in comparison countries. However, RCN funded publications are less collaborative than publications funded by international funders in Norway and comparison countries (Figure 17). The number of countries authors belongs to in RCN funded publications is slightly lower than those funded by National Public Bodies in comparison countries (Figure 18).

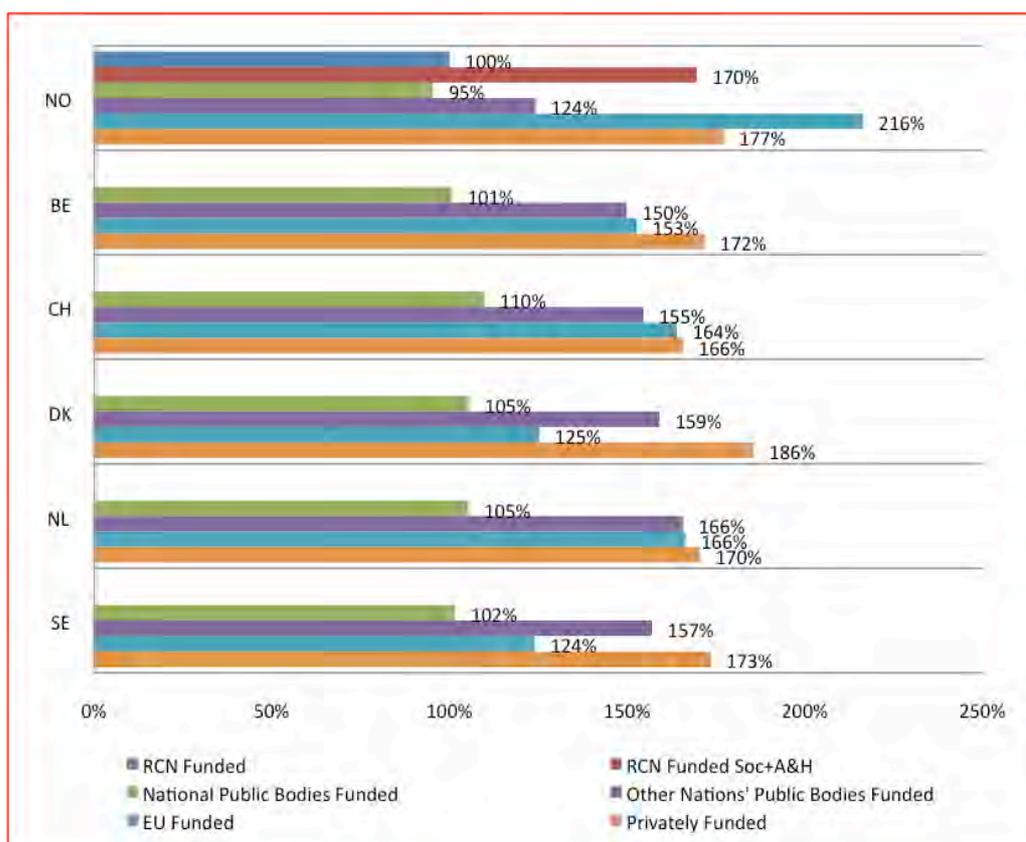
³⁰ Number of publications (N) in each category is presented in Table 3 and Table 8.

Figure 17: Number of Authors Normalised with Field Averages (RCN Funded = 100%)³¹



³¹ Number of publications (N) in each category are presented in Table 3 and Table 8.

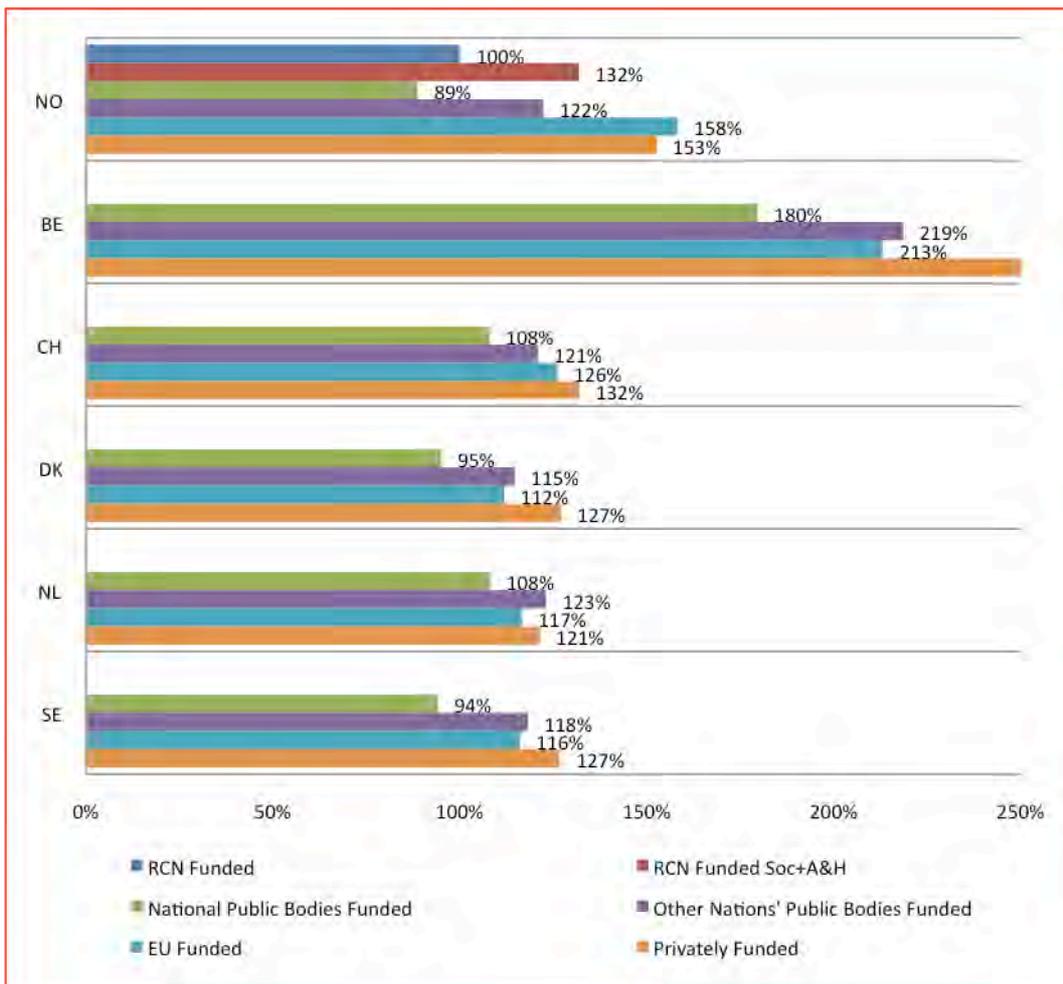
Figure 18: Number of Countries Normalised with Field Averages (RCN Funded = 100%)³²



The citation impact of RCN funded publications (measured as times cited normalised by field averages), is generally similar to those funded by National Public Bodies in comparison countries, except in Belgium where this indicator is almost 80% higher. Similarly while the impact of publications funded by other sources in Norway is generally similar to those in comparison countries, in Belgium impact is higher for all funding categories.

³² Number of publications (N) in each category are presented in Table 3 and Table 8.

Figure 19: Times Cited Normalised with Field Averages (RCN Funded = 100%)³³



³³ Number of publications (N) in each category are presented in Table 3 and Table 8.

6.2.5 Findings

The analysis and comparisons of RCN sponsorship of research, as presented in the preceding sections, offers the following findings:

- **Degree of Internationalisation:**
 - RCN Funded publications are less internationalised both in terms of the share of international papers and average number of countries than publications funded by other national and international sources or papers with no funding reported.
 - ICPs funded international sources such as EU, private funders and other nations' public bodies are more collaborative than ICPs funded by RCN, both in terms of number of authors and number of countries.
- **Geographical Spread:**
 - RCN funding is more geographically spread than other national funding especially in terms of least collaborated countries such as BRICS, Asia, Australia, South America and Other Europe. However, collaboration with these regions is predominantly sustained by other nations' public bodies.
 - The relative importance of partnering with Scandinavia and BRICS of RCN funding is not more than the relative importance of these country groups for EU funding.
- **Co-Funding:**
 - RCN publications are co-funded by other funders to varying degrees. Other nations' public bodies are more important co-funding partner for RCN than the EU.
- **Institutional Structure:**
 - Institutional structure of research performance is very concentrated. University of Oslo, Norwegian University of Science and Technology and University of Bergen produce around 60% of ICP and around 70% nICP. The three dominant institutions receive a greater share of RCN ICP funding acknowledgements (70% of ICP funded by RCN) than their overall ICP publication share (60% of all ICP).
 - Institutions other than top 3 are more successful in receiving RCN nICP funding than their share of nICP in general. While RCN funding is around 10%-15% of all the funding dominating top 3 institutions, for other institutions RCN funding is relatively more important.
- **Subject Groups:**
 - The leading scientific areas RCN funded ICP publications fall in are Physics And Materials Science (17%), Biological Sciences (16%), Clinical Medicine (16%), Basic Life Sciences (15%), Earth Sciences And Technology (13%), Environmental Sciences And Technology (11%) Chemistry And Chemical Engineering (10%), Biomedical Sciences (10%), Astronomy And Astrophysics (6%), and Agriculture And Food Science (5%).
 - Life Sciences, Biological Sciences and Clinical Medicine and allied subject groups are more important for Other Norwegian Public Bodies both in ICP and nICP groups, than they are to RCN.
 - RCN funding is more evenly distributed to subject groups than Other Norwegian Public Bodies funding, especially in nICP group. Privately funded publications are the most concentrated in terms of their subject category, while research where no funding reported is the most spread.

- **Citations and Citation Impact:**
 - ICPs in general and ICPs funded by RCN in particular rely on the broadest knowledge base (measured as count of references).
 - In general, nICPs receive fewer citations than ICP no matter how they were funded. Most citations were received by publications funded by private funders and the EU. RCN funded ICPs attracts slightly more citations than Other Norwegian Public Bodies funded ICP but much less than internationally funded ICPs.
 - nICPs are more likely to receive no citation than ICPs but there is no significant difference between different funding categories in terms of receiving at least 1 citation.
- **International Benchmark Analysis**
 - The level of internationalisation in Norway and ICP per FTE researchers is similar to some of the comparison countries but significantly lower than Switzerland.
 - RCN funded publications are less international than Norway average (40% versus 55%) and publications funded by National Public Bodies in comparison countries (ranging between 48% and 58%).
 - EU funded publications and privately funded publications are less international in Norway than some comparison countries.
 - Funding intensity is the highest in Norway (51% of all publications reported funding) than comparison countries (between 37% and 47%).
 - The extent of the knowledge base (measured as count of references) that funded researchers rely on in all six countries are similar to each other.
 - RCN funded publications are more collaborative (in terms of average number of authors) than publicly funded publications in comparison countries. However, RCN funded publications are less collaborative than publications funded by international funders in Norway and comparison countries. The number of countries authors belongs to in RCN funded publications is slightly lower than those funded by National Public Bodies in comparison countries.
 - The citation impact of RCN funded publications (measured as times cited normalised by field averages), is generally similar to those funded by National Public Bodies in comparison countries, except in Belgium where this indicator is almost 80% higher. Similarly while the impact of publications funded by other sources in Norway is generally similar to those in comparison countries, in Belgium impact is higher for all funding categories.

Table 11 Relative Importance of Partner Countries for Funding Categories (Publications with Co-Authors from Partner Countries as Percentage of Publications in a Funding Category)³⁴

	RCN Funded	RCN Funded Soc+A&H	Other Norwegian Public Bodies Funded	Other Nations' Public Bodies Funded	EU Funded	Privately Funded	No Funding Reported
USA	31%	36%	28%	37%	28%	40%	23%
UK	20%	30%	17%	24%	43%	32%	20%
Sweden	16%	21%	20%	23%	27%	35%	18%
Germany	17%	21%	12%	22%	37%	26%	13%
France	14%	16%	8%	16%	32%	18%	11%
Denmark	10%	16%	12%	13%	19%	38%	10%
Netherlands	11%	19%	9%	13%	30%	21%	9%
Italy	11%	16%	6%	11%	28%	18%	9%
Canada	10%	16%	5%	12%	13%	16%	7%
Spain	10%	16%	6%	13%	28%	16%	6%
Finland	5%	6%	4%	8%	12%	13%	6%
Australia	5%	6%	3%	7%	7%	12%	5%
Switzerland	4%	7%	3%	6%	12%	13%	5%
China	6%	5%	4%	8%	6%	9%	3%
Russia	9%	13%	2%	7%	13%	9%	3%
Belgium	2%	3%	2%	4%	9%	8%	4%
Poland	4%	4%	3%	5%	10%	12%	3%
Austria	4%	3%	2%	4%	9%	10%	4%
Japan	5%	3%	2%	6%	6%	8%	3%
Greece	3%	5%	3%	4%	12%	8%	2%
Czech Republic	4%	4%	1%	4%	7%	9%	2%
South Africa	4%	3%	2%	3%	4%	8%	2%
Portugal	3%	3%	2%	3%	7%	7%	2%
Israel	4%	6%	1%	3%	8%	6%	1%
Iceland	1%	1%	1%	2%	3%	3%	2%
Brazil	3%	4%	1%	3%	5%	9%	1%
Ireland	1%	1%	1%	2%	4%	2%	1%
India	3%	3%	1%	2%	4%	3%	1%
Hungary	2%	2%	0%	2%	5%	7%	1%
New Zealand	1%	1%	1%	1%	2%	1%	1%
Romania	2%	2%	0%	2%	5%	7%	1%
Turkey	2%	2%	0%	2%	4%	7%	1%
Slovakia	2%	2%	1%	2%	5%	7%	1%
South Korea	1%	1%	1%	2%	1%	2%	1%
Slovenia	2%	3%	0%	2%	5%	5%	1%
Taiwan	2%	2%	0%	2%	3%	5%	1%
Chile	2%	1%	0%	1%	3%	5%	1%
Singapore	1%	1%	1%	1%	0%	1%	1%
Tanzania	0%	1%	2%	0%	0%	0%	1%
Argentina	2%	2%	0%	1%	3%	7%	0%
Estonia	1%	0%	1%	1%	2%	1%	1%
Serbia	2%	2%	0%	1%	3%	6%	0%
Mexico	1%	0%	0%	1%	1%	3%	1%
Croatia	1%	1%	0%	1%	2%	3%	0%
Lithuania	0%	0%	0%	0%	1%	1%	1%
Ethiopia	0%	1%	2%	0%	0%	0%	1%
Uganda	0%	1%	2%	0%	0%	0%	0%
Ukraine	1%	1%	0%	1%	1%	2%	0%
Colombia	1%	2%	0%	1%	3%	6%	0%

³⁴ Number of publications (N) in each category is presented in Figure 2.

Table 12 Relative Importance of Scientific Fields for Different Funding Categories³⁵

	ICP							nICP						
	RCN Funded	RCN Funded Soc+A&H	Other Norwegian Public Bodies Funded	Other Nations' Public Bodies Funded	EU Funded	Privately Funded	No Funding Reported	RCN Funded	RCN Funded Soc+A&H	Other Norwegian Public Bodies Funded	Other Nations' Public Bodies Funded	EU Funded	Privately Funded	No Funding Reported
CLINICAL MEDICINE	15.7%	36.5%	41.7%	23.6%	19.3%	48.8%	26.7%	22.1%	31.9%	50.9%	35.5%	12.7%	27.8%	28.1%
EARTH SCIENCES AND TECHNOLOGY	13.3%	5.3%	8.8%	14.9%	16.8%	12.4%	11.8%	7.9%	2.6%	4.5%	10.5%	22.2%	17.9%	7.7%
BIOLOGICAL SCIENCES	15.8%	1.7%	12.8%	12.6%	13.9%	4.6%	9.9%	10.7%	1.5%	10.6%	11.6%	13.6%	5.3%	7.5%
BIOMEDICAL SCIENCES	9.6%	4.6%	13.9%	9.2%	9.4%	15.5%	9.5%	8.1%	3.4%	15.6%	9.0%	11.5%	11.7%	10.4%
ENVIRONMENTAL SCIENCES AND TECHNOLOGY	11.0%	8.8%	9.6%	9.9%	12.8%	4.9%	9.4%	11.1%	10.1%	7.3%	8.8%	13.9%	9.9%	8.1%
BASIC LIFE SCIENCES	14.9%	2.4%	18.3%	14.4%	14.0%	12.2%	7.9%	9.0%	0.4%	13.2%	9.7%	15.7%	9.0%	6.4%
PHYSICS AND MATERIALS SCIENCE	17.2%	14.1%	4.8%	14.0%	16.6%	10.2%	9.0%	7.6%	0.4%	3.5%	5.8%	8.9%	6.4%	7.1%
CHEMISTRY AND CHEMICAL ENGINEERING	9.7%	1.9%	4.6%	7.2%	5.7%	5.3%	7.1%	8.1%	0.7%	5.1%	10.1%	11.5%	16.8%	7.1%
HEALTH SCIENCES	1.3%	12.7%	4.9%	2.3%	1.3%	3.2%	5.2%	6.5%	13.5%	8.1%	8.0%	1.8%	5.1%	5.7%
AGRICULTURE AND FOOD SCIENCE	4.8%	1.2%	5.3%	3.1%	7.4%	1.4%	4.1%	5.0%	0.7%	3.4%	14.2%	5.9%	1.8%	3.4%
MATHEMATICS & STATISTICAL SCIENCES	3.8%	2.3%	0.9%	3.4%	1.6%	0.4%	3.9%	2.8%	1.5%	0.7%	2.8%	5.6%	2.0%	4.2%
ELECTRICAL ENGINEERING AND TELECOMMUNICATION	2.8%	4.1%	0.3%	2.5%	1.5%	0.7%	3.3%	3.7%	4.9%	0.6%	1.9%	2.4%	2.8%	3.6%
COMPUTER SCIENCES	2.3%	3.8%	0.6%	2.8%	2.4%	0.5%	3.6%	2.7%	2.7%	0.8%	1.7%	3.6%	1.4%	3.6%
PSYCHOLOGY	0.9%	11.4%	1.4%	1.0%	0.5%	0.4%	2.8%	5.2%	12.5%	1.3%	1.5%		0.4%	2.7%
ECONOMICS AND BUSINESS	0.3%	8.9%	0.2%	0.1%	0.3%		2.9%	4.8%	11.2%	0.1%				3.3%
ENERGY SCIENCE AND TECHNOLOGY	1.5%	1.9%	0.6%	1.1%	1.6%	1.9%	2.4%	2.5%	1.6%	1.2%	1.9%	2.4%	8.5%	2.7%
MANAGEMENT AND PLANNING	0.6%	6.0%	0.1%	0.6%	0.1%	0.1%	2.4%	3.9%	9.3%	0.2%	0.2%	0.3%	0.9%	2.3%
SOCIAL AND BEHAVIORAL SCIENCES, INTERDISCIPLINARY	0.3%	4.4%	0.4%	0.1%	0.1%		1.2%	3.4%	8.0%	0.5%	0.4%			2.1%

³⁵ Number of publications (N) in each category is presented in Figure 2.

	ICP							nICP						
	RCN Funded	RCN Funded Soc+A&H	Other Norwegian Public Bodies Funded	Other Nations' Public Bodies Funded	EU Funded	Privately Funded	No Funding Reported	RCN Funded	RCN Funded Soc+A&H	Other Norwegian Public Bodies Funded	Other Nations' Public Bodies Funded	EU Funded	Privately Funded	No Funding Reported
ASTRONOMY AND ASTROPHYSICS	5.5%	9.2%	0.3%	4.9%	7.1%	0.6%	1.2%	0.4%	0.2%	0.1%	0.6%	2.7%		0.5%
MECHANICAL ENGINEERING AND AEROSPACE	1.0%	0.2%	1.0%	0.8%	0.7%	0.5%	1.5%	1.6%		1.3%	1.7%	1.5%	2.1%	2.0%
SOCIOLOGY AND ANTHROPOLOGY	0.1%	2.6%	0.1%	0.1%	0.0%		1.1%	2.6%	6.2%	0.2%			0.2%	2.4%
HISTORY, PHILOSOPHY AND RELIGION	0.1%	1.5%	0.2%	0.1%	0.1%		0.6%	1.9%	4.5%	0.4%			0.2%	3.0%
POLITICAL SCIENCE AND PUBLIC ADMINISTRATION		3.1%					0.8%	2.7%	6.4%					1.8%
EDUCATIONAL SCIENCES		2.0%		0.0%	0.1%		1.0%	1.6%	3.7%	0.2%	0.2%			2.5%
GENERAL AND INDUSTRIAL ENGINEERING	0.5%	2.0%	0.2%	0.5%	0.2%	0.1%	0.9%	2.7%	5.2%	0.5%	0.2%	0.3%	2.0%	1.1%
CIVIL ENGINEERING AND CONSTRUCTION	0.7%	0.2%	0.4%	0.8%	0.6%	0.3%	1.0%	1.2%	0.2%	0.5%	0.6%	3.3%	2.3%	1.6%
BASIC MEDICAL SCIENCES	1.2%	0.5%	1.2%	0.8%	1.3%	0.5%	1.2%	0.7%	0.2%	0.8%	1.1%	0.3%	0.5%	1.4%
MULTIDISCIPLINARY JOURNALS	1.6%	0.1%	1.4%	2.2%	1.9%	1.3%	0.8%	0.4%	0.2%	0.2%	0.6%	0.9%		0.3%
INSTRUMENTS AND INSTRUMENTATION	0.6%	1.8%	0.2%	0.6%	0.9%	0.1%	0.7%	0.5%	0.7%	0.3%	1.3%	0.3%	0.7%	0.7%
INFORMATION AND COMMUNICATION SCIENCES	0.1%	0.5%		0.1%	0.1%		0.4%	0.7%	1.7%			0.6%		0.9%
CREATIVE ARTS, CULTURE AND MUSIC		0.4%			0.1%		0.2%	0.9%	2.0%					1.1%
LANGUAGE AND LINGUISTICS	0.1%	0.7%	0.1%	0.1%	0.1%		0.3%	0.5%	1.1%					0.9%
LAW AND CRIMINOLOGY	0.0%	0.3%		0.0%	0.1%		0.5%	0.7%	1.5%	0.2%				0.7%
LITERATURE							0.0%	0.1%	0.2%					0.4%

7. Review of Framework Programme Participation

7.1 Introduction

This analysis of E-CORDA data presents comparisons of Norwegian engagement with and performance within the various instruments of Framework Programme Seven (FP7). Comparisons are made with the average of all FP engagements (the Global) and with the following countries – Belgium, Switzerland, Denmark, Finland, the Netherlands and Sweden. Not all comparisons use the global amounts.

The following issues are addressed: a) how does Norway use the FP in terms of levels of proposals submitted, the level of successes of proposals; b) variations in involvement by activity area; and c) the engagement with international partners through the FP itself.

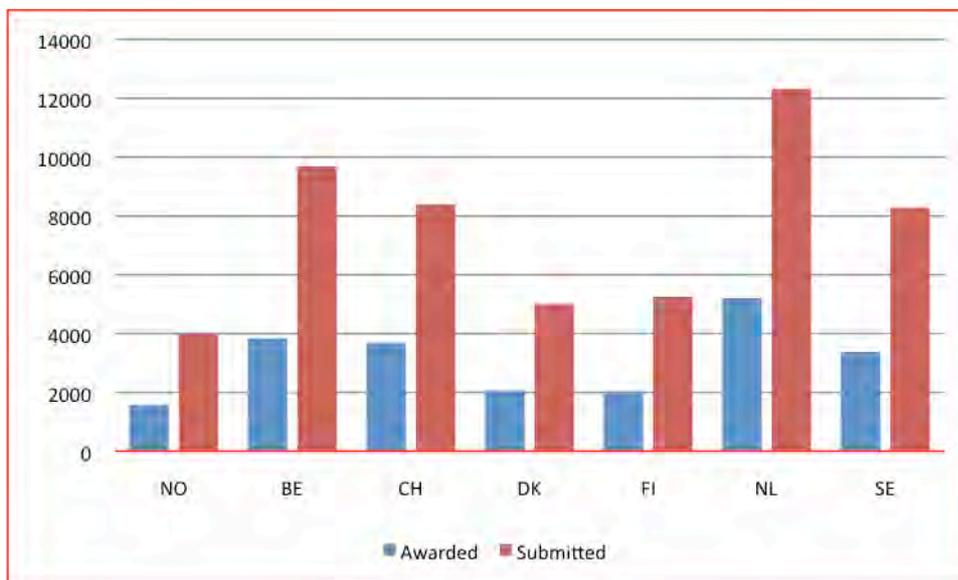
7.2 Use of the FP

7.2.1 Proposals Submitted

The following table indicates the number of proposal submitted by Norway and the number of proposals funded. The comparator countries are also shown. Norway submits fewer proposals than the other countries. The country with the next lowest number of proposals submitted submits 25% more proposals than Norway.

Such analysis ignores the size of Norway however and the population of possible applicants (firms, researchers etc). Normalization by reference to measure of the “eligible population” could offer further insight into the intensity of use of the FP.

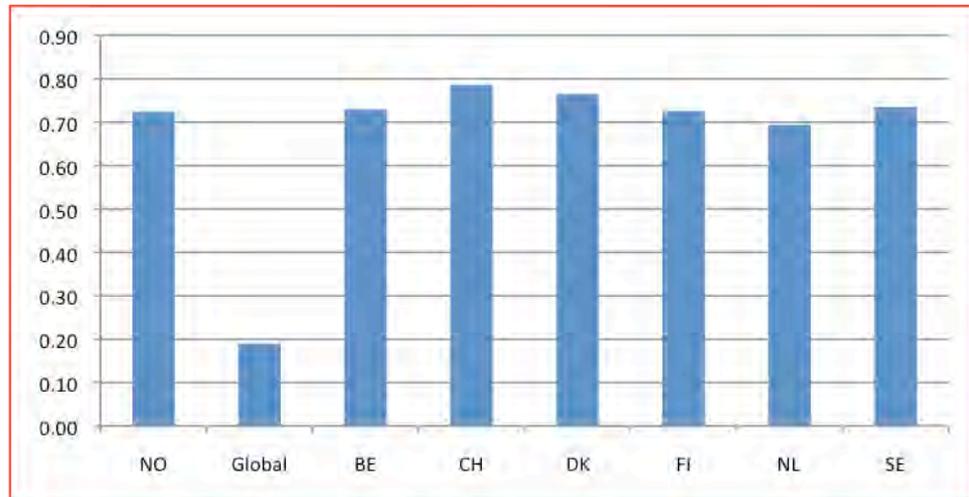
Figure 20 Total Proposals Submitted



7.2.2 Proposals per Applicant

This measures the number of applications that are made and the number of proposals that they make on average. When proposals per applicant are high, it can be assumed that there is greater interest in the FP with more applications being made. Amongst the comparator countries, the proposals per applicant is similar. Proposals per applicant also reflects the proposal support infrastructure. A good support system for proposal submission and the presence of suitable calls for proposals are likely to increase the number of proposals per applicant. Other organisational incentives may also affect the number of proposals per applicant. We might also note that where the proposals per applicant is greater, there is a less diverse applicant group. However, such a measure should take into account the size of the population from which applications could come. This normalization could be achieved by using the population of the country in the first instance; a more desirable measure would be the population of eligible applications, and this would be partly indicated by the number of researchers per head of population.

Figure 21 Proposals per Applicant FP7



7.2.3 Application Success

A number of possible measures of success can be used to examine how successful Norwegian organisations are in obtaining funding. We have considered the following measures which are generally correlated but which measure slightly different aspects of success:

- Proposal to Retained Proposal
- Proposal to Project

Figure 22 Success of Proposals – Proposal to Retained Proposal

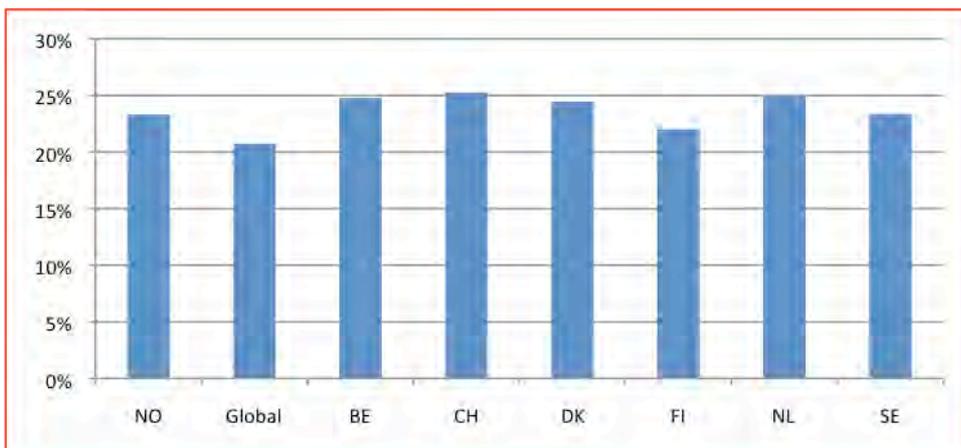
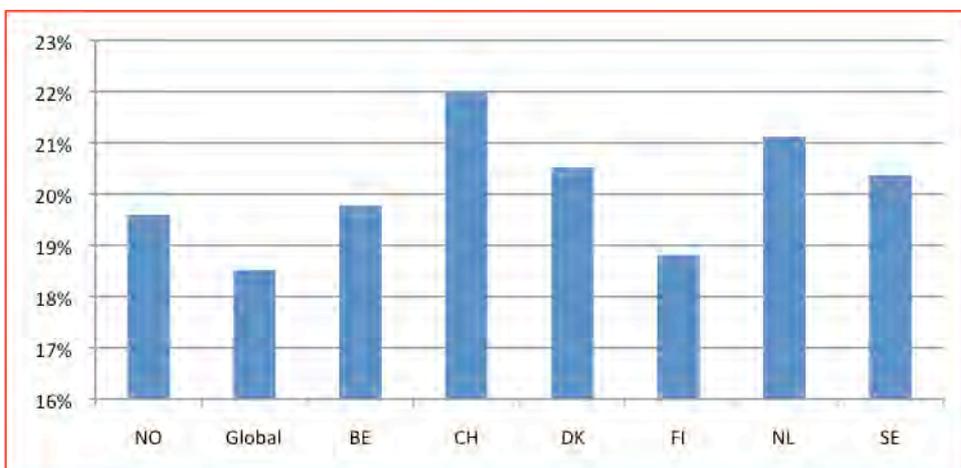
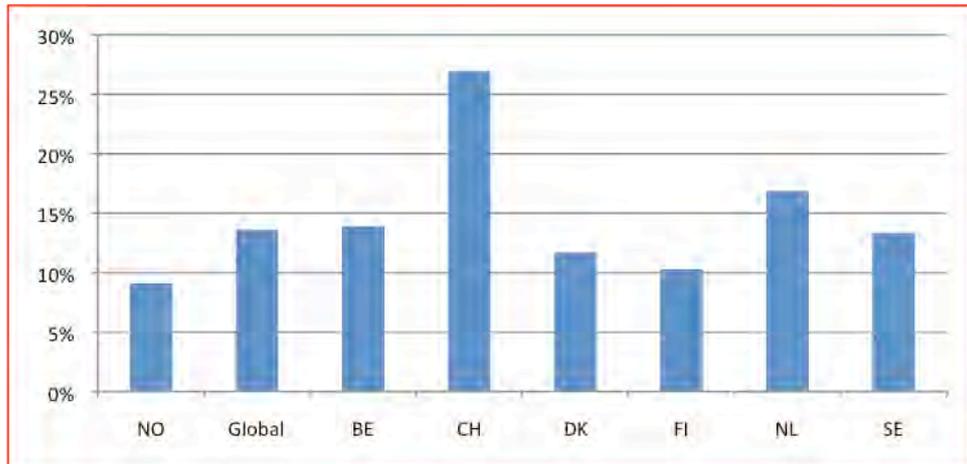


Figure 23 Success of Proposals – Proposal to Project



Norway’s overall success rate from proposal to project is good. It is better than the global amount for all FP applications, but compared with the comparator countries it is not so strong, being higher only than Finland. There is a smaller gap in the measure proposal to retained proposal than proposal to project. This might indicate that although the projects that Norwegian partners involved are of very similar quality to other nations *(which is evident from figure 3), Norwegian proposals lag behind other nations in areas where there is a fierce competition and there are a high number of high quality applicants.

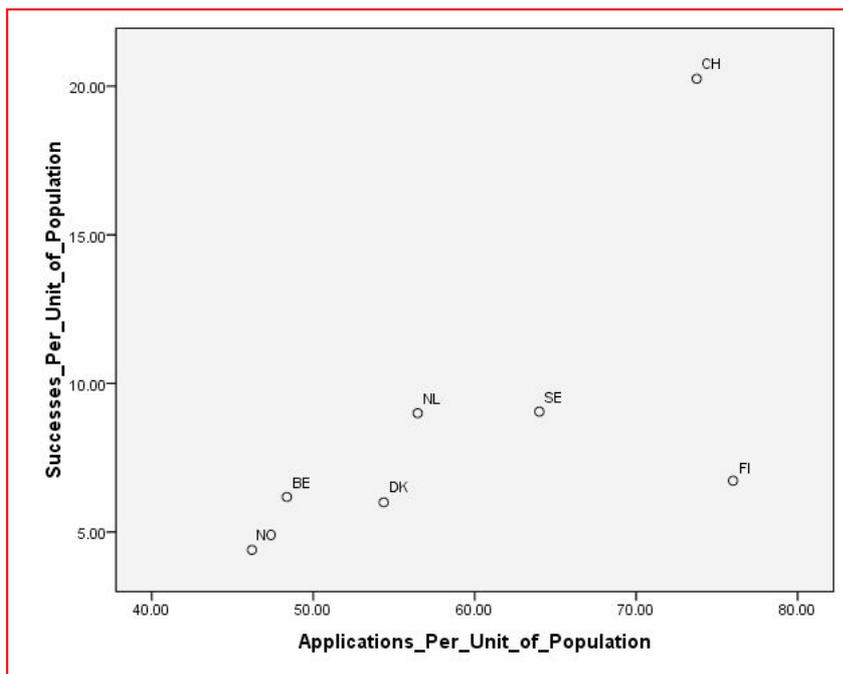
Figure 24 ERC (IDEAS) Success Rate – Proposal to Project



When we examine the success rate using the proposal to project measure for the ERC applications as part of the IDEAS area, we note however that Norway is not as successful as the majority of the comparator countries. Only Finland appears not to do as well as Norway in terms of success rate. Switzerland had a success rate that is over twice as high, using this measure of success, as Norway. ERC applications are unlikely to succeed in any case as can be seen from the overall success rate. The results of this analysis suggest that at the very highest level, Norway has some room for improvement.

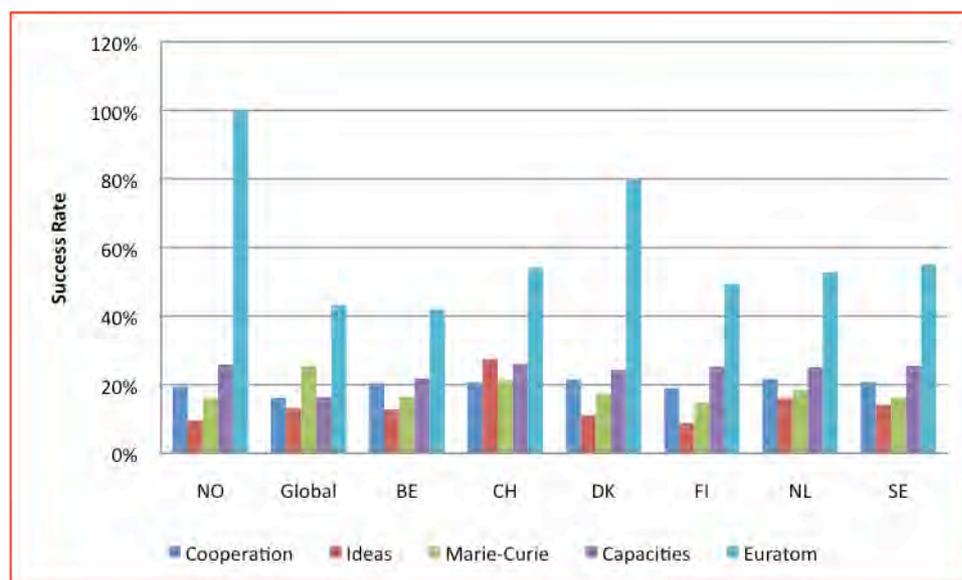
When the success rate in ERC proposals is adjusted for the size of the population, Norway fares less well than any of the immediate comparator countries, as is shown by the figure below where applications per unit of population to ERC and successes in the ERC competitions per unit of population are plotted against each other. The figure shows that Norway has the lowest number of applications per unit of population and the lowest successes for unit of population.

Figure 25 Mean Success Rate in ERC Proposals Adjusted by Population Size



When all the specific programme rates are considered, Norway can be seen to be comparable with the other countries. In the Euratom specific programme, where it is involved in fission but not fusion, it does moderately well, while in the Marie-Curie Programme it is less successful than the comparators. Norway does well in the capacities area where its success in the specific priorities of Research Infrastructures, Research for the benefit of SMEs, Regions of Knowledge and Research Potential are significantly higher than those of the comparator countries. In this area it achieves as high a rate of success at Switzerland.

Figure 26 Specific Programme Overall Success Rates (Proposal to Project)

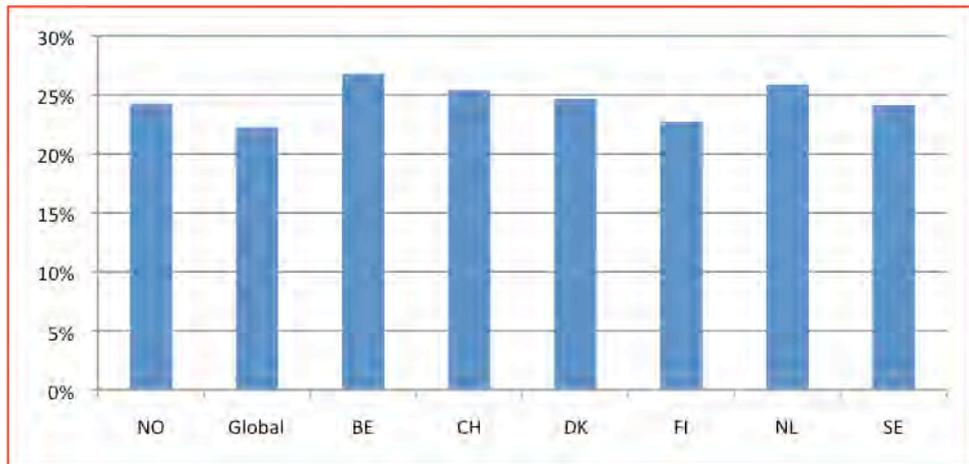


The above figure indicates the higher level of success of the Euratom Specific Programme and the Capacities Programme.

7.2.4 Application to Retained Applicant

The figure shown below gives the measure of success that shows how well initial project applications are viewed. This is a measure of success that examines success at the level of applicants rather than at the level of applications.

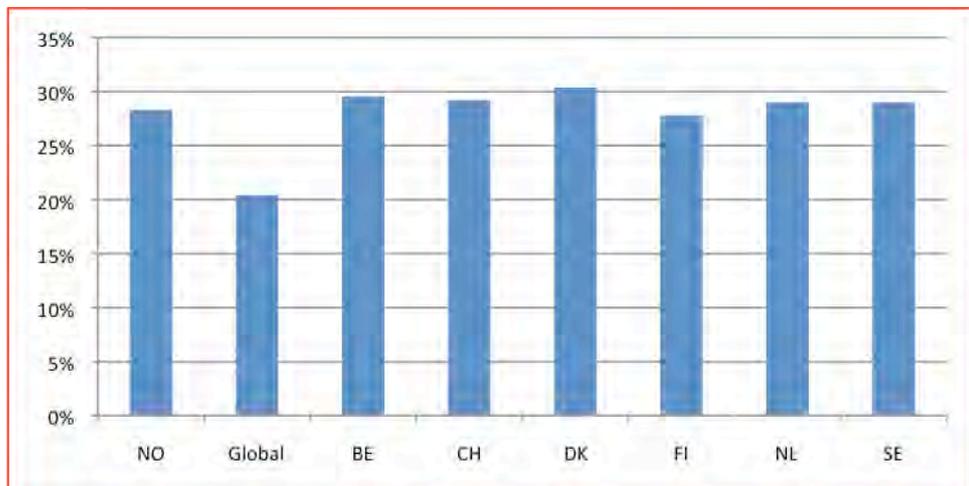
Figure 27 Success of Proposals – Application to Retained Applicant



7.2.5 Financial Aspects of Proposals

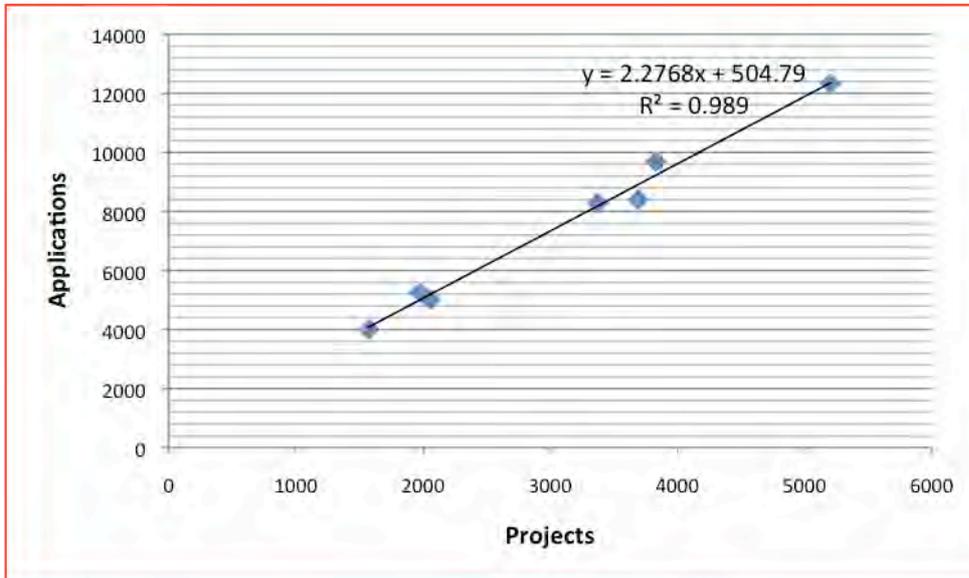
By measuring the required contribution to retained required contribution a measure of success in obtaining the amount of funds requested from the FP for the projects can be assessed. This is a measure both of the success of the application but also of the ability to obtain the financial resource to carry out the work. The measures shown below indicate that Norway is again more successful than the whole FP, but similar to the other countries.

Figure 28 Success of Proposals – Required Contribution to Retained Required Contribution



The relationship between application and award is as we have noted generally similar across the whole range of areas. We have looked for evidence of any negative feedback relationship from submitting larger numbers of proposals but the relationship is linear as indicated below.

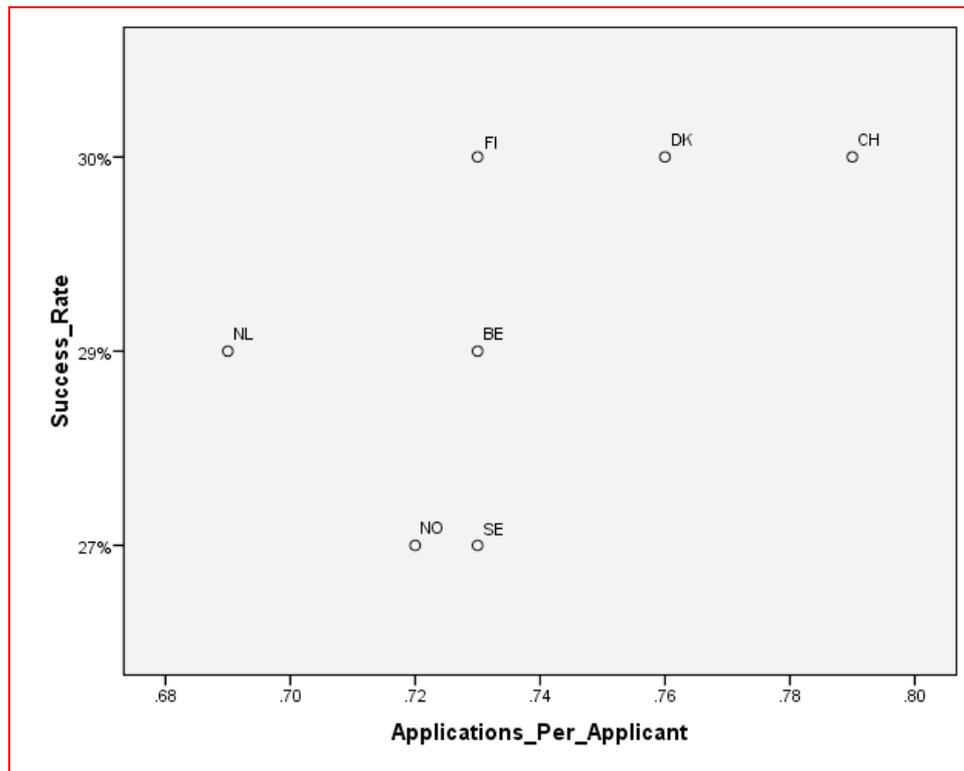
Figure 29 Success Rate by Country



We have examined a link between the success rate and the applications per applicant to investigate where a learning effect might be present or some other relationship. The information is presented below.

There is insufficient count of instances here to consider any inference from this data as strong evidence that a higher application rate leads to greater overall success. It is suggestive however that the two countries with the highest success rates are those with greater applications per applicant. Norway's position is that of a country with a lower level of applications per applicant and a lower success rate. A more detailed analysis might be able to determine whether a learning effect is present, whether it is present amongst all types of FP applicants, and whether the type of programme is important.

Figure 30 Success Rate and Applications per Applicant



7.3 FP Participation by Norway in the FP by Programme

In this next section we examine Norwegian participation in the FP by specific programme areas. The following tables give the priority area within the specific programme areas, the specific programme areas being as follows:

- Cooperation
- Ideas
- People
- Capacities
- Euratom

Information in five columns is then given. The columns are defined as follows:

- First column: the amount of funding received from the EU by the country for all organisations for that priority area;
- Second column: the global amount of funding received by all organisations for that priority area;
- Third column: shows the rank order for Norway of that priority area within all the priority areas used (thus, if the rank number is 10, this priority area shown is the tenth largest in terms of the amount of grant received by Norway);
- Fourth column: gives a number that compares Norway's allocation of funds to that priority area with the average of the other comparator countries³⁶ to indicate how

³⁶ The comparator countries are: Belgium, Switzerland, Denmark, Finland, The Netherlands, and Sweden.

different Norway's allocation is. If the number shown in this column is "0", then Norway's allocation is identical with the pattern of the average of the other countries in the comparison set. When the number is greater than 0, this indicates that Norway's allocation in that priority area is lower than the average rank for this priority area for the other countries. When the number is less than 0, this indicates that Norway's allocation in that priority area is higher than the average rank for this priority area for the other countries.

- Fifth column shows the fraction of the global amount that Norway has obtained of the whole budget for that Priority Area.

7.3.1 Cooperation Programme

Norway has a presence in all of the cooperation priority areas. The priority area in which most resource is received is the ICT area. The Norwegian fraction of the global amount varies with Energy and Environment including climate change being large areas. As the NO Rank Diff is negative for these two areas, we can infer that Norway has a higher allocation of resource with respect to all its priority areas in this area than the comparator countries. The Rank Difference information also suggests that in Transport, Health and Food and Agriculture, Norway a smaller share of its total FP budget in these priority areas than do the other comparator countries.

Table 13 FP Participation Norway: Cooperation Programme

	Priority Area	NO (€000s)	Global (€000s)	NO Rank	NO Rank Diff	Norway Fraction
COOPERATION	Health	29,098	2,637,322	5	2	1.10%
	Food, Agriculture, and Biotechnology	17,885	847,296	10	2	2.11%
	Information and Communication Technologies	55,213	4,733,802	1	0	1.17%
	Nanosciences, Nanotechnologies, Materials and new Production Technologies	23,358	1,536,170	7	1	1.52%
	Energy	36,731	854,662	4	-3	4.30%
	Environment (including Climate Change)	44,920	1,016,876	2	-5	4.42%
	Transport (including Aeronautics)	17,612	1,451,939	11	3	1.21%
	Socio-economic sciences and Humanities	6,192	277,194	14	1	2.23%
	Space	12,737	405,087	13	0	3.14%
	Security	15,753	516,413	12	0	3.05%
	General Activities (Annex IV)	998	220,187	16	-1	0.45%

7.3.1.1 Environment including Climate Change

We investigated further the Norwegian involvement in the Priority Area Environment (including Climate Change) part of the Cooperation programme to determine why the level of involvement was higher in this theme. In this Priority Area, Norway has a proportion of projects that is generally twice what would be expected (if it was the same as comparators). The difference between Norway and the comparators is not explained by the success rate particularly but by the proposal submission rate. Here we use the proportion of proposals in this priority area divided by the proportion of national proposals as the rate of proposal submission. Clearly such a calculation does not take account the number of organisations that submit the proposals and it uses Norway as the unit of analysis – ignoring the volume of relevant research

organisations that could make the applications. Nevertheless, the proposal submission rate does indicate that at the Norwegian level, this area is one where there appears to have been a greater level of proposal submission than comparator countries.

Table 14 Success Rates Cooperation Programme – Priority Area Environment (including Climate Change)

Priority Area	NO	BE	CH	DK	FI	NL	SE
Environment (including Climate Change)	27%	19%	27%	28%	22%	24%	21%

Table 15 Proportion of National Proposals Submitted

Priority Area	NO	BE	CH	DK	FI	NL	SE
Environment (including Climate Change)	341	574	365	331	263	762	496
Total Proposals	4006	9686	8396	5009	5252	¹²³² ₃	8282
Proportion of National Proposals	10%	5%	4%	7%	5%	5%	5%

7.3.2 Ideas Programme

Norwegian participation in the Ideas Programme is within the context of ERC applications. In terms of the overall ranking of resource for Norway, the IDEAS area and the ERC programme is very important. We also note that in terms of overall priority, Norway is very similar to the comparator countries as its Rank Difference is 0. If the difference had been larger than 0 it would have been the case that the proportion of Norwegian resources won for this priority area would have been less than the comparator country trend. This is not so however, so we may conclude that Norway's prioritization of ERC is similar.

Table 16 FP Participation Norway: Ideas Programme

	Priority Area	NO (€000s)	Global (€000s)	NO Rank	NO Rank Diff	Norway Fraction
IDEAS	European Research Council	40,770	3,225,207	3	0	1.26%

7.3.3 People

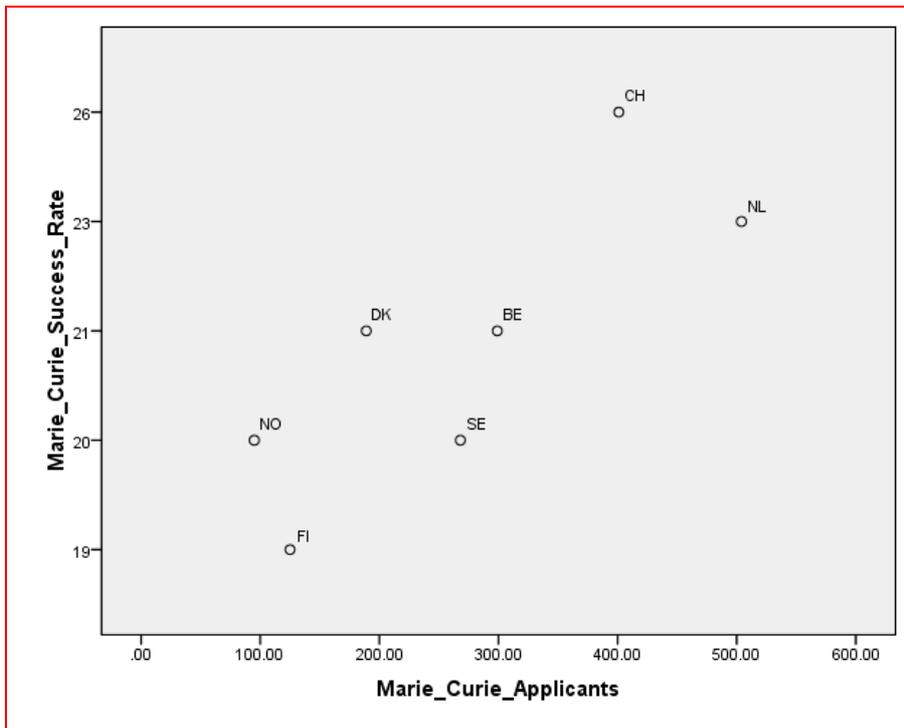
Norway's use of this programme is less than the comparator countries as the NO Rank Diff is positive. We note that Norway's success rate in this area is lower than the other countries which may play a part in the amount of money which is received for this programme activity.

Table 17 FP Participation Norway: People Programme

	Priority Area	NO (€000s)	Global (€000s)	NO Rank	NO Rank Diff	Norway Fraction
PEOPLE	Marie-Curie Actions	22,634	2,003,577	8	3	1.13%

We further note that Marie-Curie rates are more successful where countries have more applications, see the following figure. Norway, which has the lowest level of applicants, has the low success rate equal with Sweden but higher than Finland. The Netherlands (which does not do well in all areas it should be noted) does well here in terms of success rate and has the highest number of applicants. Switzerland does best in terms of success rate.

Figure 31 Marie-Curie Actions Applications and Success Rates



7.3.4 Capacities Programme

The capacities programme is one where Norway has done well and in the priority research for the benefit of SMEs it has a higher rank for this area than the average of the other countries. In the other areas, its award of grants (as a proportion of all grants) is similar to the comparator countries.

Table 18 FP Participation Norway: Capacities Programme

Priority Area		NO (€000s)	Global (€000s)	NO Rank	NO Rank Diff	Norway Fraction
CAPACITIES	Research Infrastructures	19,655	1,171,188	9	0	1.68%
	Research for the benefit of SMEs	27,854	587,958	6	-5	4.74%
	Regions of Knowledge	258	54,865	18	1	0.47%
	Research Potential	193	185,868	19	-2	0.10%
	Science in Society	4,992	143,510	15	-1	3.48%
	Coherent development of research policies	-	17,739	21	0	0.00%
	Activities of International Cooperation	533	70,782	17	-1	0.75%

We investigated whether in this area Norway had a greater level of support because it had a higher success rate in its applications and found that Norway had a higher success rate in this area. We also investigate whether Norway had a higher number of proposals in this area to explain its success and this analysis showed that Norway's applications in this area were significantly greater as a proportion. Norway's applications were at least twice as high as those of the next nearest applicant and nearly three times greater, as a proportion of its total applications, than Switzerland.

Table 19 Success Rates Capacities Programme – Priority Area Research for Benefit of SMEs

Priority Area	NO	Global	BE	CH	DK	FI	NL	SE
Research for the benefit of SMEs	21%	16%	19%	18%	18%	16%	17%	17%

Table 20 Proportion of Applications in Priority Area Research for Benefit of SMEs

Priority Area	NO	BE	CH	DK	FI	NL	SE
Research for the benefit of SMEs	409	457	312	346	239	599	393
Total Proposals	4006	9686	8396	5009	5252	12323	8282
Proportion of All Proposals %	10.21	4.72	3.72	6.91	4.55	4.86	4.75

7.3.5 Euratom (not FP)

Norway does not receive significant funding in this area. It receives nothing under fusion in which it does not participate, but a significant amount under fission and protection. It does not receive proportionally more than other countries in this area.

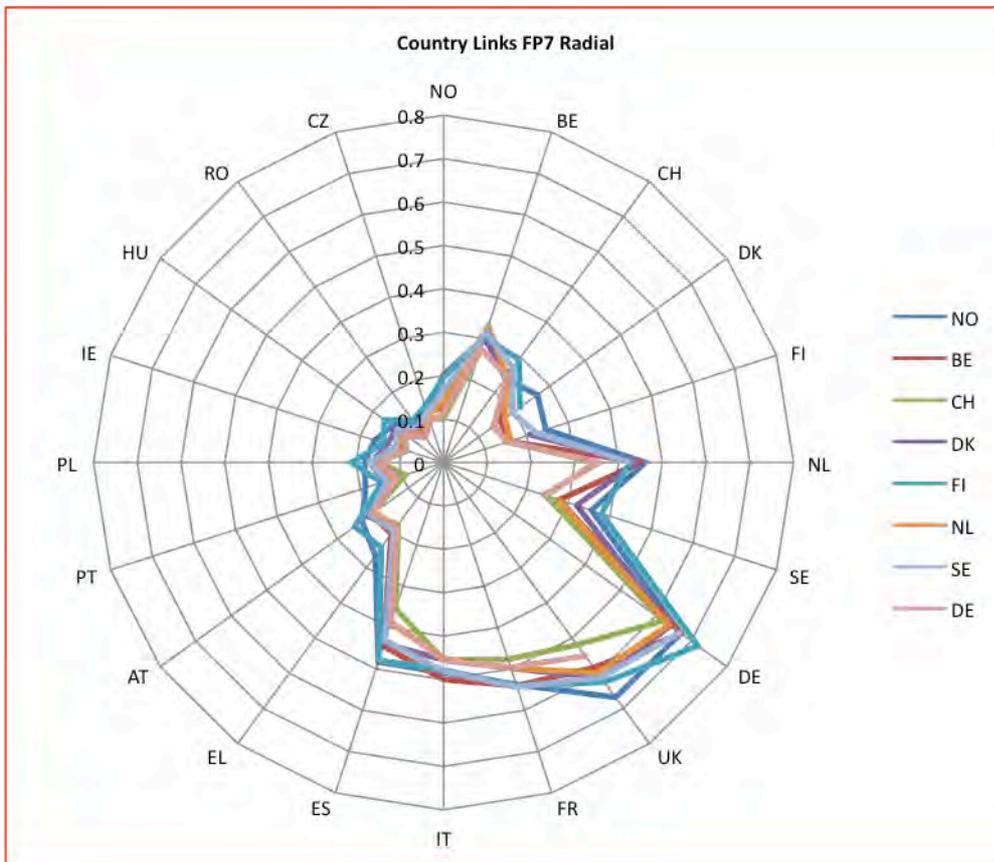
Table 21 FP Participation Norway: Euratom

Priority Area		NO (€000s)	Global (€000s)	NO Rank	NO Rank Diff	Norway Fraction
Euratom	Fusion Energy	-	4,999	21	0	0.00%
	Nuclear Fission and Radiation Protection	145	226,097	20	5	0.06%

7.3.6 Country Links - Comparisons

We note the very strong similarity between the patterns of collaboration between Norway and the comparator countries which is shown in the following figure. The countries with whom the proportions of collaboration are greatest for all the countries (comparator and Norway) are Germany, the UK, France, Italy, and Spain. The following figure gives a general picture of similarity between countries. We have used one of the large countries (Germany) as a further comparator to indicate similarity with the larger countries of the FP also. Our comparison of links is across 20 countries (including Norway). This includes the comparators and other major countries and then also some minor countries to draw up a more precise picture of internationalisation.

Figure 32 Norway Country Linkages and Comparators



A ranks test (not a formal statistical test of ranks) has been carried out based on the data used in the figure above. The data is presented in the figure below. This is a more precise inspection of the rank orders of collaboration across all FP activities.

The figure shows the rank order of collaborating countries by comparator country, starting with Norway. Norway appears in the first column and its ranked collaborators in order are shown. The whole data set is ranked by Norway's preference list. The differences between Norway's preferences for collaborating countries are then shown in the orange section to the right. A total of 20 countries was chosen, including most of the major European countries and key members of the FP. A sum of differences in ranking is shown at the foot of the second set of columns. The numbers which express the differences in the ranking of by countries of their partners shows Switzerland has the highest difference in terms of ranking of collaborating countries compared with

Norway. The country with the lowest difference is Denmark. We present this information in the figure that follows.

Table 22 Ranking of Collaboration – Norway and Collaborators

	Country								Difference in Ranking							
	NO	BE	CH	DK	FI	NL	SE	DE	BE	CH	DK	FI	NL	SE	DE	
Ranked Collaborator	NO	1	17	17	13	15	15	15	15	16	16	12	14	14	14	14
	DE	2	2	2	2	2	2	2	1	0	0	0	0	0	0	1
	UK	3	3	3	3	3	3	3	2	0	0	0	0	0	0	1
	FR	4	4	4	4	4	4	4	3	0	0	0	0	0	0	1
	IT	5	5	5	5	6	5	5	4	0	0	0	1	0	0	1
	ES	6	7	6	7	5	6	6	5	1	0	1	1	0	0	1
	NL	7	6	7	6	7	1	7	6	1	0	1	0	6	0	1
	SE	8	8	9	8	8	8	1	9	0	1	0	0	0	7	1
	BE	9	1	8	9	9	7	8	7	8	1	0	0	2	1	2
	EL	10	11	11	14	12	11	13	11	1	1	4	2	1	3	1
	DK	10	13	14	1	13	12	12	14	3	4	9	3	2	2	4
	FI	12	14	12	12	1	13	10	12	2	0	0	11	1	2	0
	CH	13	9	1	10	10	9	9	8	4	12	3	3	4	4	5
	AT	14	10	10	11	11	10	11	10	4	4	3	3	4	3	4
	PT	15	15	18	16	17	16	16	16	0	3	1	2	1	1	1
	PL	16	12	13	15	14	14	14	13	4	3	1	2	2	2	3
	IE	17	19	19	17	18	19	19	19	2	2	0	1	2	2	2
	HU	18	16	15	18	16	17	17	17	2	3	0	2	1	1	1
	RO	19	20	20	20	20	20	20	20	1	1	1	1	1	1	1
	CZ	20	18	16	19	19	18	18	18	2	4	1	1	2	2	2
									51	55	37	47	43	45	47	

Our conclusion is that Norway is closest to Denmark in its collaboration patterns, although Denmark has a much higher collaboration rank with Switzerland than does Norway. The next closest country to Norway is the Netherlands, followed by Finland and Germany. We have included Germany to reference the major countries of the FP.

Figure 33 Overall Differences between Norway and Comparators (Across 20 FP Members)



7.3.7 Norway's Role in Coordination

The role of project coordinator is regarded as important within any project. It is very often the coordinator that establishes the proposal intellectually, engages and draws in to the network the required partners who will carry out the work and then ensure that the project is implemented successfully. Coordination requires significant capabilities therefore and the tendency to take a coordination role (coordination propensity within projects) can be regarded as a general all round indicator therefore of research strength.

We have reviewed the E-CORDA data for FP7 but have not found any indication here that Norway is significantly different at the overall level in terms of coordination propensity. It may be the case that in certain priority areas the coordination propensity is greater or lower but this would require a more detailed analysis than we have the opportunity to conduct. On the basis of the data we have seen, we do not believe that Norway has significant weaknesses or strengths in its research capability as measure by this indicator.

7.3.8 Norway Partner Choices

Our review has also compared the mix of different organisations according to the classification (Higher or Secondary Education Organisation, Research Organisation, Private for Profit Organisation, Public Body, Other) used by the E-CORDA and FP analysis undertaken by the European Union. The analysis has provided some insight into the types of organisations that participate in the FP by type.

The following tables present the share of participation of organization of each of the above types in the projects undertaken by the country, in this case Norway and comparator countries.

Table 23 Share of Participation in Projects of Organisations of Each Type: Norway and Comparator Countries

	Higher or Secondary Education Organisation	Research Organisation	Private for Profit Organisation	Public Body	Other
NL	92%	78%	66%	27%	19%
BE	87%	83%	74%	29%	28%
CH	92%	73%	65%	21%	15%
SE	93%	79%	70%	27%	19%
DK	93%	77%	67%	31%	21%
FI	90%	84%	74%	32%	22%
NO	88%	87%	71%	37%	26%

Percentages are however not a reliable guide to the true extent of differences so a chi-square test was done on the data containing the count data. This helped to identify where differences in the actual numbers of participating organisations was larger than expected. For Norway, there is a greater participation level from public bodies than other countries than might be expected. Also, fewer higher education bodies are participating than might have been expected though are participating in Norway that might have been expected although the significance of this difference is less than that difference between Norway’s public body participation and that of the other countries.

7.3.8.1 Nordic Collaboration in FP as an Indicator of Nordic Collaboration

We examined Norway’s Nordic collaboration within the FP on the assumption that it might permit of some inferences about Nordic collaboration generally as data on this type of collaboration was not easy to obtain and interviewees had suggested that much of it was “under the radar”. Our review of FP projects in which Sweden, Denmark, Finland and Norway were participating suggested that while Norway’s participation in the FP is lower than these other countries, Norway’s involvement in FP projects that involve at least 3 Nordic partners (these projects involve other countries from outside the Nordic area) was not significantly less than might have been expected given Norway’s size. The following table reports the share of projects in which Nordic partners are involved.

Table 24 Share of FP Nordic Collaborations

	NO	FI	DK	SE
Share of Collaborations involving 2 Nordic Countries	37%	37%	55%	70%
Share of Collaborations involving 3 Nordic Countries	73%	83%	59%	83%

As can be seen, Norway’s share of collaborations in which there are two Nordic nations involved or three Nordic nations is comparable to that of Finland although lower when more partners are involved. We note that this review of the Nordic collaboration is not of Nordic collaboration only but of Nordic collaboration within the Framework Programme Seven. The analysis suggests that Norway is collaborating at a high level with its Nordic fellow nations and we might expect this to apply to solely Nordic collaboration also.

7.4 General Findings

This review has shown that Norway has very similar use of the FP compared with the other comparator countries although there are important differences in terms of focus on priority areas. In the area of Research for the benefit of SMEs, part of the Capacities Programme area, there is significant FP money won. This is the result of both a higher application rate and a higher success rate.

There are a number of areas where Norwegian success in proposal applications are good and above the average, the research for the benefit of SMEs is one such area. But there are other areas, Marie-Curie is an example, of where the success rate is slow. We note however that in the case of Marie-Curie awards, countries making larger numbers of applications, which is in great part related to the population of those countries, Norway does not do so well.

Nor does Norway achieve so well in the area of the ERC where the success rate is less than is perhaps desirable, although this is a very difficult programme in which to be successful.

Overall, the success rate for Norway is below the average for the comparator countries, is just higher than Finland, but is above the global average across the whole FP.

Its international partnering at the aggregate level is very similar to those other countries that we have compared it with. Within specific priority areas there may be major differences but it is not our expectation that this is the case.

8. Documentary Review of Research Instrument Database – Composition Analysis

8.1 Introduction

The following section provides insights on the RCN funding of international co-operation initiative and programmes, grouped in the overview above under the heading ‘internationalisation’. This document has been prepared by Technopolis and examines the focus of the research funding, characteristics of the research projects and their scientific focus, and then analyses the make-up of the participants.

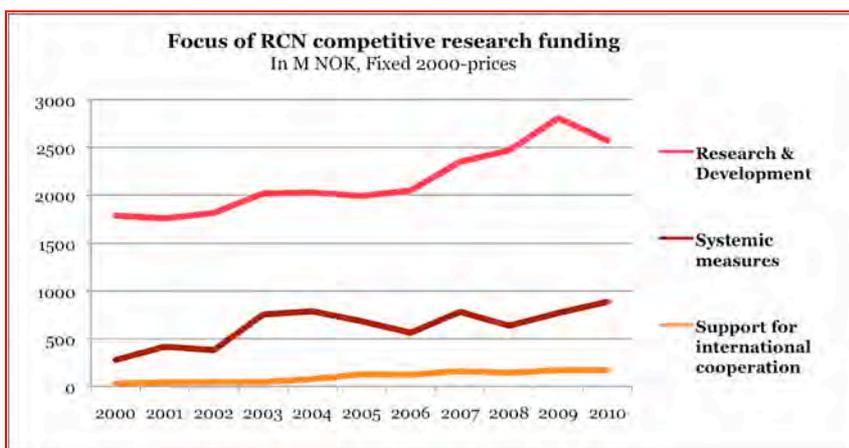
All budget figures are presented at fixed cost prices (2000).

The analysis by Technopolis of the RCN’s portfolio for competitive research has grouped the programmes and instruments adopted into broad categories applying the intervention logic concept, i.e. taking into account the underlying objectives of the initiatives. This categorisation led to the identification of 3 major “**intervention typologies**” constituting RCN’s policy mix for its **competitive research funding** over the last decade:

- Funding for *Research, Development and Innovation*, including Basic/bottom-up research programmes or initiatives; R&D programmes, covering most of the activities in the policy-oriented programmes and the Large-scale programmes; and initiatives and programmes fostering *innovation*, such as the user-directed innovation (BIA)
- Instruments or programmes constituting *systemic interventions*, e.g. fostering the constitution of Centres of Excellence or Competence Centres, research groups or research schools, network development, regional innovation, and infrastructure or scientific equipment development
- Instruments or programmes supporting *international cooperation* in research and innovation

In 2010, RCN allocated 5% of its competitive research-funding budget to support for internationalisation; there was a steady increase in the funding for internationalisation (Figure 34), accounting in 2004 for 3% of the budget.

Figure 34 Breakdown of the competitive research-funding budget



Source: RCN database, 2012 – Technopolis elaboration

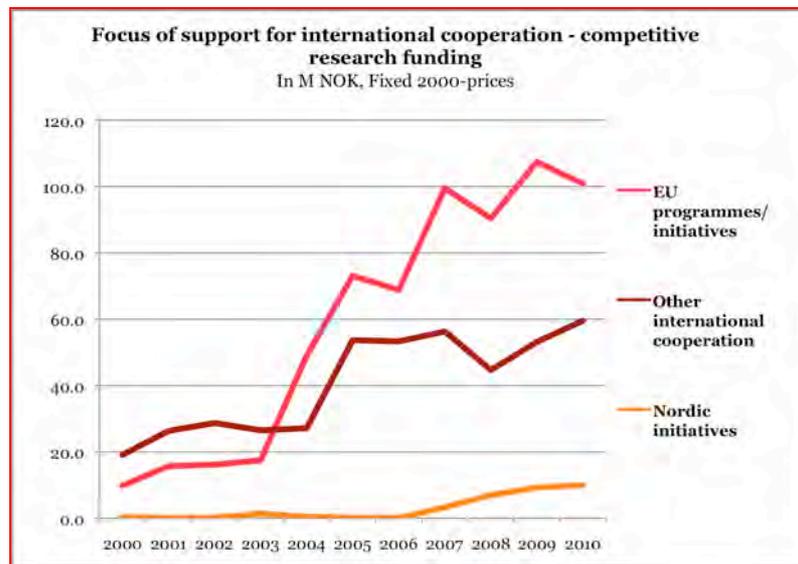
8.1.1 Funding for international cooperation in research and innovation

Since 2004-2005, there has been a sharp increase in the funding of international cooperation- and especially in the funding that aimed to foster Norwegian participation in EU programmes and initiatives (Figure 35).

In the second half of the 2000s international cooperation overall and specifically the collaboration in European schemes continued to receive strong support – albeit with some small fluctuations. There was a clear **shift in funding focus** in 2004, ie the pronounced concentration on supporting participation in EU programmes and initiatives.

Since 2007 also collaboration in Nordic initiatives saw a steady increase, but the support was relatively limited.

Figure 35 Focus of the support for international cooperation, 2000-2010, fixed 2000-prices



Note: these data are to be considered proxies, based on the indication of EU/Nordic programmes or initiatives in project titles

Source: RCN database, 2012 – Technopolis elaboration

The sharp rise in RCN funding for international collaboration as such was linked to the launch of some specific **instruments and schemes** that intended to facilitate and foster the internationalisation of research, and in particular a more pronounced participation in EU programmes and initiatives.

As of 2004, support for international cooperation was implemented increasingly in the form of research projects, rather than individual grants. The latter accounted for ~30% of the budget for international research; in 2010, individual grants took on a share of 12%.

The majority of the individual grants funded in 2010 specifically aimed at a stay abroad ('mobility grant' or 'grants for overseas', ~80%); 5% were PhD grants.

A new instrument launched in the beginning of the 2000s and open to all research actors, the *Project Development instrument*, provided support for the set-up of project proposals – in particular proposals for EU Framework Programmes - or for the establishment of strategic collaboration networks ('Network Development').

Figure 36 Instruments for the funding of international cooperation

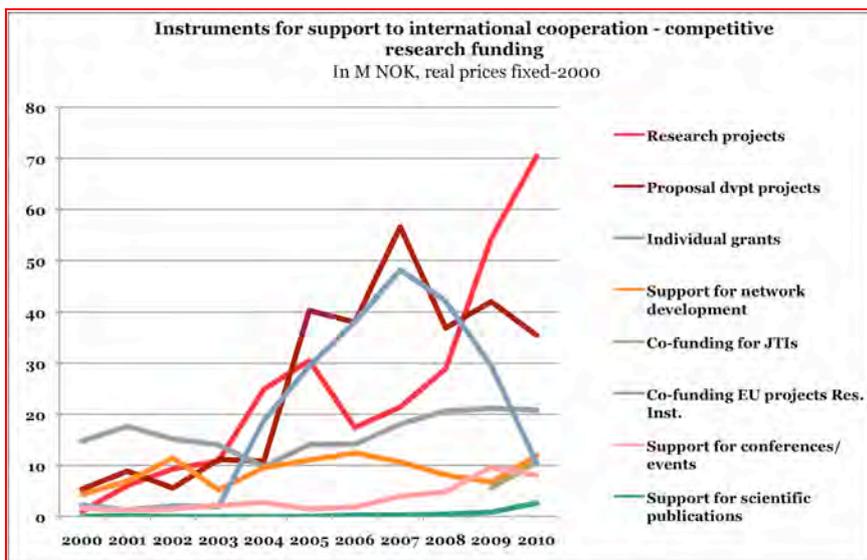
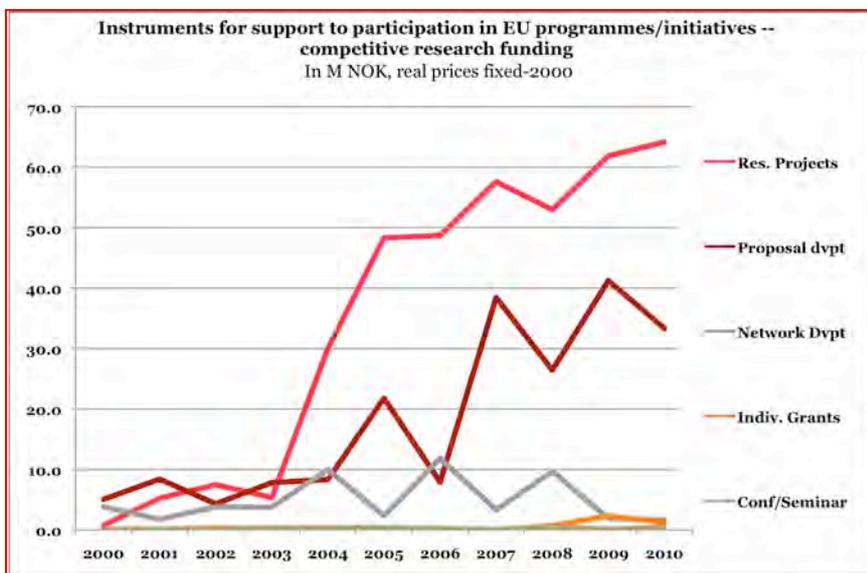


Figure 37 illustrates the importance of this instrument for the fostering of participation in EU programmes in 2003 and in the case of the project proposals, the renewed importance from 2007 onwards.³⁷

Figure 37 Instruments for the funding of participation in EU programmes/initiatives



Source: RCN database, 2011 – Technopolis elaboration

The major change related to the support for participation in EU programmes, however, was the **increase in co-funding of research projects**. In 2004, this was predominantly linked to the launch of the SAM-EU scheme, exclusively to the benefit

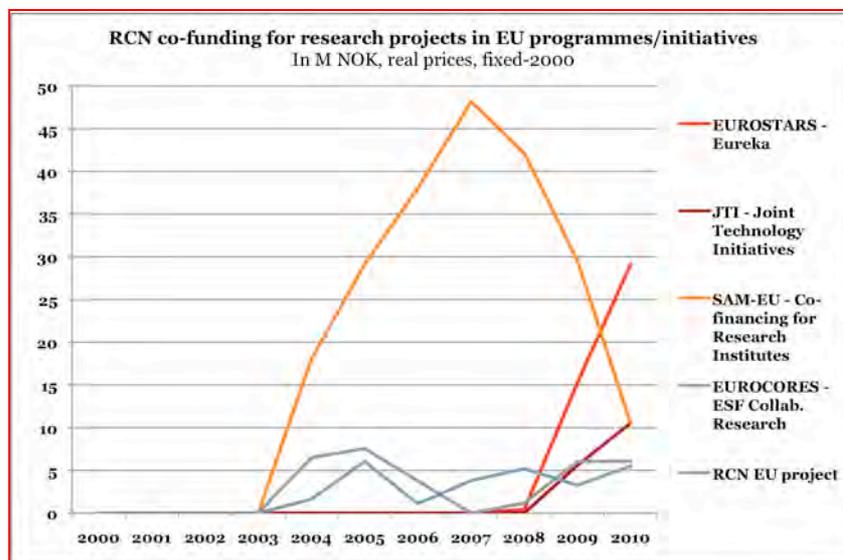
³⁷ In this context, individual grants refer to the co-funding of grants in ESF programmes and the Marie Curie programme.

of the research institutes.³⁸ This scheme intended to ensure fair competition of the Norwegian institutes with their European peers for their participation in the FP6 Integrated Projects (IP) and Specific Targeted Research Projects (STREP). This scheme was limited to FP6 and was therefore in the course of conclusion from 2008 onwards.

In 2004 we also see co-funding for participation in EUROCORES, a collaborative research programme of the European Science Foundation.

Co-funding for participation in **more industry-oriented programmes** started in 2009 with the participation in the EU JTIs and especially the EUROSTARS programme. The latter is a joint programme between EUREKA member states and the European Union, launched in 2008. It offers support for transnational bottom-up research by R&D performing SMEs.

Figure 38 Co-funding of research projects in EU programmes/initiatives

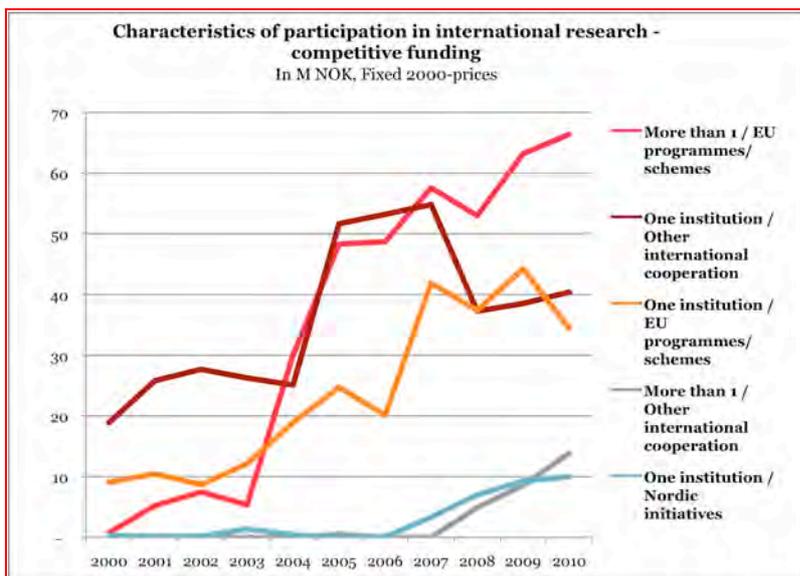


Source: RCN database, 2011 – Technopolis elaboration

We also note an overall trend in an **increase of 'joint' projects** (in terms of participation by multiple institutions –Norwegian or mixed Norwegian-foreign, see further below) compared to 'single' projects, ie RCN funding for individual researchers or one institution only. This was in particular related to participation in EU programmes or initiatives – and since 2007, also in other international projects (Figure 39).

³⁸ RCN funded 25% of the project costs (provided that RCN funding together with Commission funding did not exceed 75% of the overall R&D costs), compensating for the fact that Norwegian research institutes, by law private entities, were entitled to Commission funding for only 50% of their project costs.

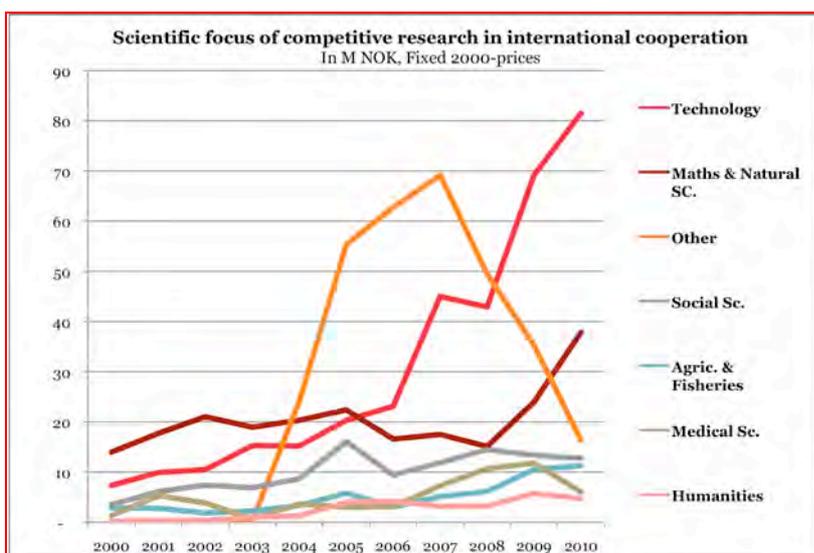
Figure 39 Characteristics of participation in international research, 2000-2010



Source: RCN database, 2011 – Technopolis elaboration

The before-mentioned increased focus on cooperation in industry-oriented schemes induced a **major shift in scientific focus** from Maths and natural sciences towards Technological disciplines - especially in the period after 2005 (Figure 40). Maths and natural sciences have somewhat regained their importance since 2008. Levels of funding of the other scientific disciplines fluctuated but their shares of total funding in 2010 were similar to the levels ten years before. Exception is the area of Humanities that has experienced a slight increase over the 10-year period.

Figure 40 Scientific focus of competitive research in international cooperation, 2000-2010, fixed 2000-prices



Source: RCN database, 2011 – Technopolis elaboration

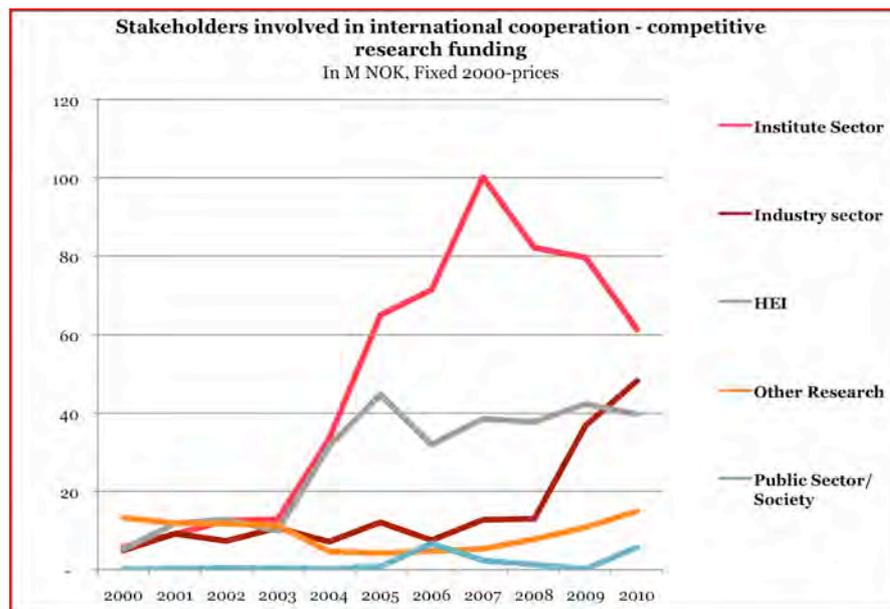
8.1.2 Profile of the participants in international cooperation programmes/initiatives

Figure 41 presents the total funding for international cooperation received by the different stakeholder communities. In this context 'other research' stands especially for research undertaken by individual researchers, 'foreign' are guest researchers, and HEI are Universities and Colleges. We will look at each of these groups in turn.

Key findings are:

- There was a **considerable drop in funding for individual researchers** ('Other research'), especially since 2004, but in the last years of the decade we see again a slight increase
- The **Institutes sector became the most active player** in international cooperation in 2003, with an ongoing steady increase in its participation up to 2007 and an equally steady abandoning of the international scene in the most recent years. These trends can at least partly be attributed to the co-funding for FP6 participation through the SAM-EU scheme and its gradual conclusion
- Since 2009 there is a **considerable rise in involvement of industry**, attributable to the co-funding of the JTIs and EUROSTARS programme
- Higher education institutions have a fairly stable level/ share of funding since 2005

Figure 41 Stakeholders drawing benefit of support for their international cooperation, 2000-2010, fixed 2000-prices



Source: RCN database, 2011 – Technopolis elaboration

8.2 International partners in RCN-funded competitive research

This section presents the analysis of the share of foreign partners in RCN-funded competitive research overall, ie including initiatives/programmes that did not specifically target an increase in internationalisation. The analysis was limited to years 2008-2010 due to data reliability concerns.

This analysis shows that the 'mainstreaming' of international co-operation in the RCN programmes and initiatives had an effect on the involvement of foreign institutions in the 'policy-oriented' RTD programmes and - especially - in basic research.

Table 25 shows the involvement of foreign partners in collaborative research for each of the **intervention types**. The results can be summarised:

- The highest share of foreign institutions is in Instruments or programmes fostering internationalisation, where about half of the partners are foreign.
- The data points out strong internationalisation of basic research in Norway. In 2008, in the Basic/bottom-up research programmes or initiatives only 5% of participations were foreign, in 2010 this share increased to 32%.
- Share of foreign partners in R&D programmes increased in 2008-2010 from 14% to 24%.
- Foreign share of participations in initiatives and programmes fostering innovation grew from 7% in 2008 to 11% in 2010.

Table 25 Involvement of foreign partners in collaborative research per intervention type (share of total number of participations by partners in that given year)

	Foreign share – 2008	Foreign share – 2009	Foreign share – 2010
Basic/Bottom-up Research	5%	17%	32%
Innovation	7%	8%	11%
Internationalisation	47%	51%	48%
R&D Programmes	14%	18%	24%
Overall	10%	12%	17%

Source: RCN database, 2011 – Technopolis elaboration (100% = all partners excluding coordinators)

Table 26 lists the specific **programme categories** and the level of involvement of foreign partners.

Programme categories with the highest share of foreign involvement across the 3 years were the *Fri prosjektstøtte* - 'Free' research, ie bottom-up basic research, and in the *Handlingsrettede programmer* - 'Policy-action oriented' programmes, focusing on the strategic priorities among which the societal challenges. The strongest increase in foreign participation, however, is to be noted in the *Grunnforskningsprogrammer* – Basic research programmes.

Table 26 Involvement of foreign partners in 'mainstream' collaborative research programmes (share of total number of participations by partners in that given year)

	Foreign share – 2008	Foreign share – 2009	Foreign share – 2010
Other independent projects	5%	6%	10%
User-directed innovation programme	8%	9%	12%
Free projects support	38%	47%	55%
Basic research programmes	2%	5%	14%
Policy-oriented programmes	29%	29%	42%
Centres of Excellence (SFF/SFI/FME)	0%	0%	2%
Large-scale programmes	8%	12%	14%
Overall	10%	12%	17%

Source: RCN database, 2011 – Technopolis elaboration (100% = all partners excluding coordinators)

Table 27 illustrates the level of involvement of foreign partners in collaborative research by **scientific area**.

Areas with highest share of foreign involvement across the 3 years were Medical science and *Social sciences*. Foreign partner participation in RCN-funded research in the field of *Maths and Natural sciences* saw an ongoing increase in the last 2 years. In contrast, the share of foreign participation in research in the field of Humanities decreased in 2009/2010.

Table 27 Involvement of foreign partners in collaborative research per scientific discipline (share of total number of participations by partners in that given year)

	Foreign share – 2008	Foreign share – 2009	Foreign share – 2010
Agric. & Fisheries	15%	16%	15%
Humanities	40%	16%	21%
Maths & Natural SC.	13%	20%	23%
Medical Sc.	30%	32%	37%
Social Sc.	4%	14%	29%
Technology	7%	8%	12%
Overall	10%	12%	17%

Source: RCN database, 2011 – Technopolis elaboration (100% = all partners excluding coordinators)

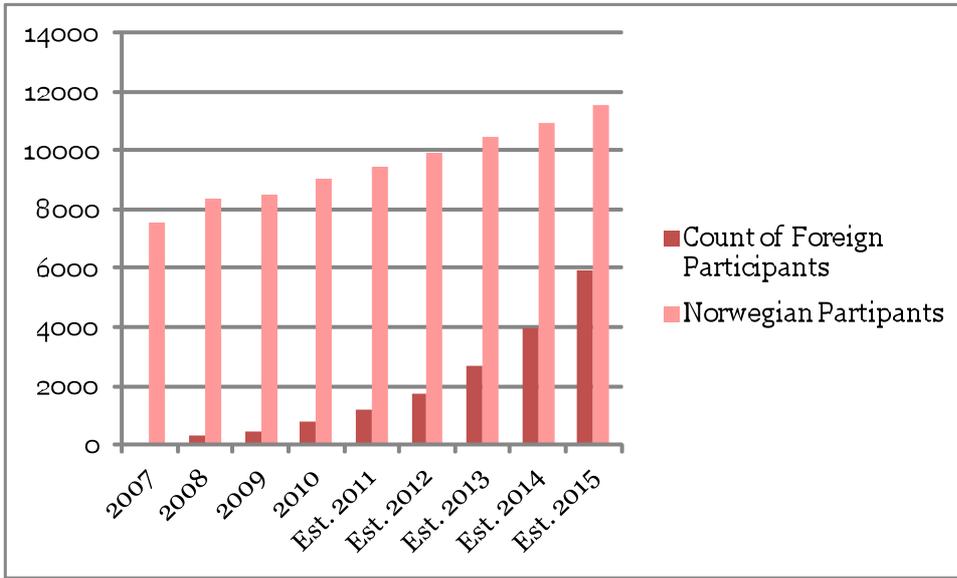
8.3 Growth of Foreign Participation: Observation

In the following figure we examine the growth of participation in the schemes of the Council, distinguishing between the foreign participants and the Norwegian participants. The count of participants is used. An estimate is made for the years after 2010. This is based on an average growth rate of the previous two years. The rate of growth in the first year for which there is data is nearly an order of magnitude, subsequently the rate from 2008-09 and 2009-10 is around 45%.

We note that Norwegian participation rises linearly; foreign participation rises at a fixed proportion of around 45% year on year (exponentially) in this very simple model. The model is introduced to show that within five years, half of participants will be foreign, under the current rate of growth.

While this rate of growth does not indicate a proportional requirement for resources, it does suggest that at the present rate of growth, the number of participants from outside Norway could be significant within a short period of time. This increase in participation is spread across the research instruments, albeit with some concentration in particular areas. While this may be regarded as signs of successful use of internationalization across the research programmes of the RCN, it may be that such a rate of growth will impose costs. Internationalization costs within projects may not be onerous, but the administrative burden upon the RCN might rise if external partner involvement has to be verified, audited and reviewed by the Council.

Figure 42 Involvement of Norwegian and Foreign Participants: Count of Participants: All Programmes, Current and Estimated at Present Rate of Growth



9. Results from Surveys of Researchers, Research Institution Leaders and Participants in RCN Meeting Places

The surveys asked for views from researchers, leaders and on how well RCN performed in terms of its funding activities and instruments, and its information and advice giving. We review in this section RCN performance in terms of what instruments and activities achieve in terms of research performance, and then in terms of the availability, visibility, quality, and relevance of its advice. Detailed reports of the surveys have been prepared by Technopolis. Here we present the main findings of these reports on the issue of the internationalisation strategy.

9.1 Role of Instruments and Activities

The researchers and leaders survey found that generally, there is widespread belief that internationalisation is an important strategy and the RCN should pursue it. Both leaders and researchers believe that internationalisation does not weaken domestic cooperation and that costs do not outweigh the benefits. When considering internationalisation generally, researchers believe that the future success of Norwegian research depends most on Norway's ability to retain key researchers. Leaders see it differently in that they believe it is Norway's ability to attract key researchers to Norway that matters most for the success of Norwegian research. There was significant support for the FP and Norway's involvement within it. Table 5.6 notes that 79 % of leaders and 60 % of researchers believe that "Norway's participation in the FP is very important for the internationalisation of Norwegian research." It remains the case however that between 12 and 15 % of researchers and leaders consider that international activities weaken domestic cooperation (Table 5.6).

Of the survey respondents, around three quarters had engaged in international collaboration. In terms of sector involvement, humanities had a lower level of participation (64%) than the others which had similar levels although natural sciences was higher than the average (79%). Women were more likely to engage in international collaboration. We note that generally across the whole set of responses, leaders rate the efficacy of RCN schemes more highly than researchers. This suggests possibly problems with communication strategies either at RCN or within institutions (or some combination) although the differences (both in terms of ratings of efficacy and in terms of awareness of the schemes) could be related to the experience of the respondents.

Table 5.2 indicates the geographical areas where international collaboration takes place. International collaboration accounts for around 42% of the collaboration activity of respondents in the three years before the survey. 58% of the collaboration was internal to Norway. Only 2% of those collaborating have worked with Asia although 7% had worked with the US. Russia, South America and Australia had only 1% each of the collaborations of the respondents.

The usefulness of schemes for supporting international research was examined. Responses show that the most effective of the four mechanisms was the PES, followed by ERC starting grant application support. Marie-Curie grants and grant schemes for collaboration with US/Africa Asia and South and Central America were thought to be useful but it was noted that such schemes while being useful were also found to have more respondents finding them "not helpful". This may indicate general problems in the overall quality of the provision of the schemes.

Regarding the involvement by Norway and Norwegian researchers in the FP, there were contradictory views but most were mainly positive. Amongst the leaders there is strong support for the FP and involvement in it. However, there are reservations about aspects of FP participation. Comments received include the following: EU programme calls are not on subjects that reflect and meet Norwegian interests; RCN policies are thought not to be consistent with the FP process; RCN support for researchers to

engage in EU projects, notably the Marie Curie schemes are limited in scope and effectiveness, a sentiment reflected in the responses to Table 5.5; the funding of PhDs is not easy to achieve with FP money and subjects that might receive funding are not those that interest Norwegian industry and commerce; while the FP is probably the most important instrument of internationalisation for Norway, it limits the number of Norwegian partners that can participate in any specific internationalisation project, because of the need to include partners from other countries, rather than more partners from within Norway itself; related to this, EU projects that weaken Norwegian internal cooperation limit the scope for interdisciplinarity within Norway.

A concern was raised about the BIA. While the programme is thought to be a good idea in principle, its funding rules were not thought likely to generate sufficient Norwegian industry involvement because RCN money could not be released to international businesses wishing to participate in the scheme.

9.2 Information and Advice

The Survey obtained information on the familiarity with RCN's schemes. Familiarity is understood here to mean either having used and knowing about a scheme or simply knowing about such a scheme. Table 5.5 part f suggests that information provided by RCN about its support for internationalisation is not yet easily accessible enough. A large number of respondents in Table 5.5 indicated that they did not know how to answer the questions, suggesting that fewer respondents had the experience of schemes to make what they felt were valid comments. Again, leaders had greater awareness of RCN activities than researchers.

It can also be noted that large proportions of researchers who have been in international collaboration but are not aware of support schemes to facilitate international collaboration offered by RCN (Table 5.3). This result is surprising and suggests that more promotion of these schemes should be undertaken. The schemes considered were the Project Establishment Support, Top-up funding for Marie Curie grants, Funding of Starting Grant Applicants and Grants schemes for collaboration with the US, Africa, Asia and South and Central America.

9.3 Results from the Company Survey

The policy of RCN as regards companies and internationalisation is that companies should be able to engage in collaboration activities with other organisations including those in other countries. However, Norwegian companies have other options to use in which to obtain support for research with organisations outwith Norway, the most important being the FP, then EUREKA, then the Nordisk InnovasjonsCenter. The company survey indicates extensive use of the FP by Norwegian companies and strong support from a significant proportion of companies for it.

Companies' reactions to the FP suggest that, compared with RCN's programmes, the FP is considered to be inflexible in that it does not allow projects to be adapted to changing circumstances, but a small number of comments suggest that RCN funding for internationalisation is not as generous as the FP: in the FP companies might get up to 70% of their costs, but RCN will only cover 30-40%. Indirect costs are also funded more generously by the FP than RCN.

10. Interview Programme

10.1 Interview Protocols

10.1.1 Protocol A

Indicative Survey Questions:

RCN members

The RCN Strategy for Internationalisation outlines five action points:

1. Integration of internalisation considerations across all activities
2. Encouragement of Norwegian participation in joint programmes across national boundaries, coordination with international activities and promotion of dialogue on thematic priority areas and organisation of international programme collaboration.
3. Development of financial instruments to support the establishment of long-term cooperation between Norwegian institutions and corresponding institutions in other countries.
4. Further development of stimulation measures to encourage Norwegian researchers, companies and research institutions to participate more actively in international collaborative and competitive arenas, strengthening advisory services vis-a-vis industry and research institutions to increase Norwegian participation in international research projects. .
5. Focus greater attention on international cooperation and researcher mobility in its internal grant application review processes. Encouragement of researcher visits to and from institutions in Norway.

The Strategy was adopted in 2010, thus it is too early to expect that all elements will have been implemented, let alone had an effect. However, several of the objectives are not entirely novel and, as noted, Norway has been active in international cooperation activities for many years. Therefore, it is perhaps reasonable to see the strategy as an encapsulation of many already ongoing policies.

Policy Formulation and coordination

1. Is there a (de facto or implicit) national policy towards internationalisation?
 - v) If yes, what range of activities are covered (scientific research, industrial research, development policy, trade policy, political considerations, etc.)?
 - vi) If yes, who is involved in its formulation and in coordinating it, and what is the RCN role within this?
2. (Conditional on Q1): How does RCN's Internationalisation Strategy fit within this national framework?

3. To what extent is RCN able to influence the performance and coordination of all scientific research activities across Norway (including both domestic and internationally oriented activities)?
4. Given the level of influence described from Q3, to what extent, in particular, has RCN been successful in integrating internationalisation considerations across all its activity areas, in particular:
 - i) in the provision of advice
 - ii) in its research funding
 - iii) in acting as a meeting place for the research establishment?

Advice/debate

1. Does the Council function effectively as a forum for debate on the coordination of research activities with international efforts?
 - i) Are there any good examples of how it does this?
 - ii) Is it effective in its advice to:
 - Government
 - Industry
 - The research community
2. With respect to each of these objectives, can you identify areas of particular success or weakness?

Research activity and performance

1. How well are national research activities coordinated with those undertaken in the international arena? What is the Council's role in achieving this coordination?
2. What evidence is there for successful long-term cooperation, particularly on the institutional level, between Norway and other countries?
 - i) Is the balance between Nordic, ERA and third-country activities appropriate? Are there any gaps, weaknesses or inconsistencies?
 - ii) How is the Council seeking to address these?
3. To what extent are Norwegian researchers, companies and institutes active in international cooperation?
 - i) Which areas are strongly represented and are any areas under-represented?
 - ii) Are any of these above groups insufficiently active? Why is this?
 - iii) How is the Council addressing these issues?
4. Are Norwegian researchers well represented in joint programmes across national boundaries – what evidence is there to support this?
 - i) Given the focus on FP and other EU research cooperation, how successful has RCN been in facilitating Norwegian participation?
 - ii) Is there an appropriate balance between EU and other areas of cooperation (Nordic, third country, bilateral)?
5. How extensive are the Council's activities for the provision of advice to potential Norwegian participants in international research projects? Is it possible to indicate the effectiveness of these services?

6. How does the Council operationalize the policy requirements for international cooperation and mobility in its application processes?
 - i) How effective have these been?
 - ii) What is the scale of research visitor flows to and from Norway and are these thought to be sufficient?
 - iii) Do sufficient numbers of young researchers take advantage of the provisions for researcher mobility?

Focus of international activities

1. Priority countries: is the balance of countries and distribution of effort appropriate? Are there any gaps or further countries that should be addressed?
2. With respect to the Grand Challenges – are there any major gaps where Norway should be and is not sufficiently active?
 - i) Is the balance of activities appropriate?
 - ii) How well is Norwegian international research cooperation aligned with Grand Challenge priorities such as development?
 - iii) In the search for (research) solutions to Grand Challenge problems appropriately balanced between Norwegian concerns and international concerns?
3. Overall, what have been the major discernible outcomes from the RCN strategy?
 - i) Do these represent new developments or are they a continuation of pre-existing arrangements and objectives?
 - ii) Are there any areas where progress has not been achieved – what are these and what are the reasons?
 - iii) Are there any likely further impediments to the achievement of the Strategy's objectives? What are these?

Indicative Survey Questions:

Stakeholders

The RCN Strategy for Internationalisation outlines five action points:

1. Integration of internalisation considerations across all activities
2. Encouragement of Norwegian participation in joint programmes across national boundaries, coordination with international activities and promotion of dialogue on thematic priority areas and organisation of international programme collaboration.
3. Development of financial instruments to support the establishment of long-term cooperation between Norwegian institutions and corresponding institutions in other countries.
4. Further development of stimulation measures to encourage Norwegian researchers, companies and research institutions to participate more actively in international collaborative and competitive arenas, strengthening advisory services vis-a-vis industry and research institutions to increase Norwegian participation in international research projects. .

5. Focus greater attention on international cooperation and researcher mobility in its internal grant application review processes. Encouragement of researcher visits to and from institutions in Norway.

The Strategy was adopted in 2010, thus it is too early to expect that all elements will have been implemented, let alone had an effect. However, several of the objectives are not entirely novel and, as noted, Norway has been active in international cooperation activities for many years. Therefore, it is perhaps reasonable to see the strategy as an encapsulation of many already ongoing policies.

Policy Formulation and coordination

1. To what extent is RCN able to influence the performance and coordination of all scientific research activities across Norway (including both domestic and internationally oriented activities)?
2. Given the level of influence described from Q3, to what extent, in particular, has RCN been successful in integrating internationalisation considerations across all its activity areas, in particular:
 - i) in the provision of advice
 - ii) in its research funding
 - iii) in acting as a meeting place for the research establishment?
3. Is the balance between international and domestic (or Nordic) priorities appropriate?
 - i) Should more or less effort be dedicated to the internationalisation of Norwegian research?
 - ii) Given that international cooperation in research is largely a bottom-up driven process, does the strategy (and its implementation by the RCN) place too much emphasis on a top-down governance approach?
4. How effective is the Council at taking in the views and opinions of stakeholders? Are there any areas where this could be improved?

Advice/debate

1. Does the Council function effectively as a forum for debate on the coordination of research activities with international efforts?
 - i) Are there any good examples of how it does this?
 - ii) Is it effective in its advice to:
 - Government
 - Industry
 - The research community
2. With respect to each of these objectives, can you identify areas of particular success or weakness?

Research activity and performance

1. How well are national research activities coordinated with those undertaken in the international arena? What is the Council's role in achieving this coordination?
2. What evidence is there for successful long-term cooperation, particularly on the institutional level, between Norway and other countries?
 - i) Is the balance between Nordic, ERA and third-country activities appropriate? Are there any gaps, weaknesses or inconsistencies?
 - ii) How is the Council seeking to address these?
3. To what extent are Norwegian researchers, companies and institutes active in international cooperation?
 - i) Which areas are strongly represented and are any areas under-represented?
 - ii) Are any of these above groups insufficiently active? Why is this?
 - iii) How is the Council addressing these issues?
4. Are Norwegian researchers well represented in joint programmes across national boundaries – what evidence is there to support this?
 - i) Given the focus on FP and other EU research cooperation, how successful has RCN been in facilitating Norwegian participation?
 - ii) Is there an appropriate balance between EU and other areas of cooperation (Nordic, third country, bilateral)?
5. How extensive are the Council's activities for the provision of advice to potential Norwegian participants in international research projects? Is it possible to indicate the effectiveness of these services?
6. How does the Council operationalise the policy requirements for international cooperation and mobility in its application processes?
 - i) How effective have these been?
 - ii) What is the scale of research visitor flows to and from Norway and are these thought to be sufficient?
 - iii) Do sufficient numbers of young researchers take advantage of the provisions for researcher mobility?

Focus of international activities

1. Priority countries: is the balance of countries and distribution of effort appropriate? Are there any gaps or further countries that should be addressed?
2. With respect to the Grand Challenges – are there any major gaps where Norway should be and is not sufficiently active?
 - i) Is the balance of activities appropriate?
 - ii) How well is Norwegian international research cooperation aligned with Grand Challenge priorities such as development?
 - iii) In the search for (research) solutions to Grand Challenge problems appropriately balanced between Norwegian concerns and international concerns?
3. Overall, what have been the major discernible outcomes from the RCN strategy?
 - i) Do these represent new developments or are they a continuation of pre-existing arrangements and objectives?

- ii) Are there any areas where progress has not been achieved – what are these and what are the reasons?
- iii) Are there any likely further impediments to the achievement of the Strategy’s objectives? What are these?

10.1.2 Protocol B Instrument and Prioritization Issues

To investigate for all major project types how priorities for internationalisation are formed and how they are implemented in the programmes.

1. What programme type do you take responsibility for?

See note below on types of programmes

2. Please answer for all types of programme that you take responsibility for?

See note below on types of programmes

3. How are priorities for internationalisation for your programme identified?
4. What form do priorities take – countries and subject matter, any other factors?
5. Who identifies those priorities? Does RCN identify them? Do any ministries influence these priorities for this programme?
6. What is the process – organisational machinery – by which these priorities are decided?
7. Could this process be improved? If so how?
8. How do you implement these priorities within your programme type?
9. How are programmes and sub-programmes (i.e. Store Programme and sub programme Verdikt) instructed to internationalize themselves?
10. What direction is given to Programmes about internationalisation?
11. What direction is given to individual Programmes within a type?
12. What discretion do Programmes and individual programmes have in deciding the internationalisation activities that they support?

13. Do they have complete discretion?
14. Can specific programmes change the internationalisation priorities they have been given?
15. What are the dimensions internationalisation for this Programme type in terms of

Involvement of foreign organisations?

Involvement of foreign research students masters and PhD?

Scale of funds allocated to foreign partners?

16. What levels of internationalisation have your programme and any others you may be aware of reached in terms of the following:

Funds flowing to foreign organisations

Personnel exchanges (PhDs or postdocs from Norway going overseas institutions, or foreign PhDs or postdocs coming to Norwegian institutions)

17. In what sense is there a limit to internationalisation? Where is that limit? When will it be reached?
18. What variation is there between specific programmes in terms of the internationalisation that they undertake?
19. Why does this variation occur?

10.2 Interviewees

Ministries

Pål Sørgaard, Ministry of Education and Research
Pål Gretland, Ministry of Trade and Industry
Per Sjaastad, Ministry of Foreign Affairs
Erik Yssen, Norwegian Mission to the EU
Kari Balke Øiseth, Ministry of Education and Research
Per Koch, Innovation Norway
Aris Kaloudis, Ministry of Education and Research

Research Organisations

Kristian Berg Harpviken, Peace Research Institute Oslo
Torbjørn Digernes, NTNU
Ruth Haug, Norwegian University of Life Sciences
Jan-Gunnar Winther, Norwegian Polar Institute
Nina Sindre, NTNU
Egil Kallerud, NIFU

NGOs

Ragnar Lie, Association of Universities (UHR)
Gunnar Jordfald, Association of Research Institutes (FFA)
Tore Li, Confederation of Norwegian Business and Industry (NHO)

Scientists

Atle Mysterud, Department of Biology, University of Oslo
Fernando Corfu, Department of Geosciences, University of Oslo
Göran Svensson, Oslo School of Management
Nils Christian Stenseth, Centre for Ecological and Evolutionary Synthesis, University of Oslo
Gry Gundersen, Centre for Ecological and Evolutionary Synthesis, University of Oslo
Nigel A. Yoccoz, Department of Biology, University of Tromsø
Kari Melby, Department of interdisciplinary studies of culture, NTNU (RCN Board Member)
Anne Husebekk, Institute of Medical Biology, University of Tromsø (RCN Board Member)
Bernt-Erik Sæther, Department of Biology, NTNU (RCN Board Member)

RCN Staff

Svend Otto Remøe
Kristin Danielsen
Marianne Jensen
Thomas Hansteen
Odd Ivar Eriksen
Tom Espen Møller
Sverre Sogge
Rune Rambæk Schjølberg
Trude Dypvik

11. Consultation

11.1 Focus Group with Stakeholders

The Study Team for the Internationalisation Module

Issues for RCN Evaluation Focus Group:
Oslo 9 May 2012

Dear Sir / Madam

We are writing to you to invite you to participate in a Focus Group as part of the Evaluation of the Research Council Norway. The Focus Group will provide the opportunity for the Evaluation Team carrying out the review of the internationalisation activities of the RCN to consider and clarify issues raised in the interviews with stakeholders conducted in April.

The Focus Group provides an important opportunity for stakeholders in the Norwegian research system to comment on initial findings and to give any further evidence on important and emerging points. We believe that the main issues for discussion will be related to the following:

- RCN's strategic and advisory role
- RCN's funding activities and performance
- RCN's responsiveness to stakeholders
- Opportunity to stakeholders to respond to early findings of the bibliometrics research carried out to support the evaluation of the Internationalisation Strategy of RCN
- Other issues related to RCN's internationalisation Strategy

The Focus Group will take place on the morning of the 9th May, 2012 at the premises of NIFU, Nordic Institute for Studies in Innovation, Research and Education, Address: Wergelandsveien 7, N-0167 Oslo. The meeting will be on the 6th floor. The meeting will begin at 09:15 and finish at 12:30.

If you are unable to attend but could suggest a colleague of yours who might attend in your place, please let us know who they are and we will forward an invitation to them.

Thank you for the help you have already given to the Evaluation. We look forward to meeting you on the 9th May.

Yours sincerely,

Dr Paul Cunningham, Dr John Rigby, Dr Thordis Sveinsdottir
Manchester Institute of Innovation Research

The University of Manchester

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Evaluation of the Research Council of Norway for the Ministry of Education and Research

Focus Group on internationalization

9th May 2012
09:15 – 12:15

Nordic Institute for Studies in Innovation, Research and Education,
Address: Wergelandsveien 7, N-0167 Oslo

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Context and Purpose of Today's Focus Group Meeting

- Working Package on Internationalization
- Today
 - Discuss first results of WP
 - Group discussion on SWOT
 - Action Points / policy gaps
 - Chatham House Rules if you prefer...

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Aims of the Focus Group

- RCN's strategic and advisory role
- RCN's funding activities and performance
- RCN's responsiveness to stakeholders
- Opportunity to stakeholders to respond to early findings of the bibliometrics research carried out to support the evaluation of the Internationalization Strategy of RCN
- Other issues related to RCN's Internationalization Strategy

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Context of Study

- Client
- Elements of the Work – List of WPs
 - Strategy Formation
 - Organisation and governance
 - Adding value national priorities sectors
 - NRS balance international excellence
 - Value added surveys
 - Internationalization
 - Panel
- The Internationalization WP
- Work done in this WP

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WP6 - Internationalization

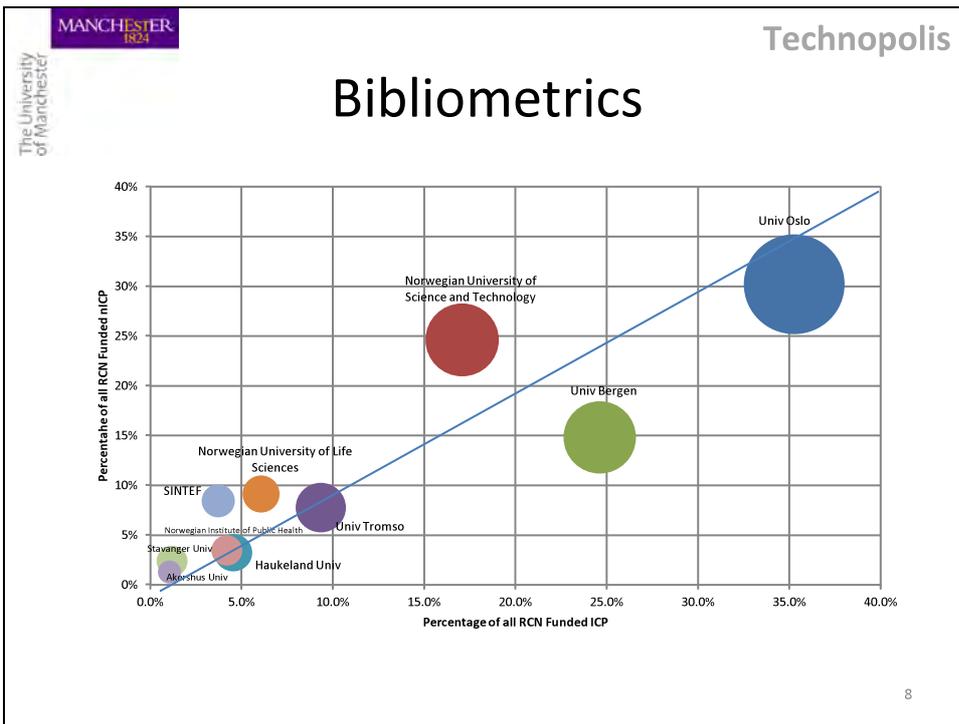
- Internationalization - Bibliometrics
- Involvement in EU FP & funding patterns
- Intl activities & strategies of the RCN
- Focus Group & Dissemination Workshop (with Client and RCN in June)

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Bibliometrics

- RCN international papers more impact than non-international papers
- RCN international papers have generally lower number of country collaborators
- Top ten collaborating countries (USA, the UK, Sweden, Germany, France, Denmark, the Netherlands, Italy, Canada and Spain)
- RCN even distribution across subject areas
- Major users of RCN (but not dependency): Oslo, Bergen, NTNU
- Oslo and Bergen RCN funded research ↑ international; NTNU SINTEF ↓ international
- RCN funded papers slightly ↓ international than other funders (including Norwegian or EU) but wider coverage of countries
- ½ of RCN int. papers also have funding acknowledgement from other nations

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- ## Key outcomes of the interviews
- We interviewed:
 - Stakeholders (researchers & business)
 - Ministry officials
 - RCN personnel
 - Generally found consensus
 - But roles (strategy/advice, implementation, stakeholder forum) have large overlaps
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1. Strategic and advisory role - findings

- Well-placed to implement internationalization strategies
- internationalization still an 'add-on' – not integrated across RCN
- Scylla & Charybdis: RCN between ministries and research community (BUT **not** lobby group – **not** quasi-ministry)
- Ministries happy to delegate – but RCN not proactive enough with policy advice – and some ministries too internally oriented
- Nordic cooperation – top-down is too bureaucratic, bottom-up approach works best – but below horizon of RCN?
- EU engagement has high political weight
- Limited engagement over university research and health research (cf. bibliometric results)
- RCN suffers lack of information of Norwegian research strengths

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1. Strategy and advice: issues for discussion

- Internationalization – balance needed: silo versus too thinly spread?
- Does RCN have equal influence over all research fields and research actors?
- Need for clarification of RCN role? – options to split advisory, implementation and forum roles?
- How to prioritise strategically? – perhaps need for higher-level advisory body?
- How to balance EU, Nordic, national and wider international concerns at strategic level?
- How to improve RCN knowledge of the NO research system?

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2. Policy implementation - findings

- Overall, RCN has good performance at integrating Norway in international arena
- In reality, EU funding is low (c.f. national) but:
 - “there is too much focus on ERA issues”
 - On the other hand, “EU participation has benefits beyond numbers of projects (quality, presence in network)”
- Need for greater prioritisation
 - Why certain partners and not others?
 - No clear idea of what works, what are impacts?
 - Issue of ten JPIs – how to operate and fund these?
 - Too focused on big, multi-partner programmes – lack of small grants
 - Focus is too thematic rather than ‘blue skies’
 - RCN lacks flexibility to enter into deeper and broader bilateral agreements – **but** also enters too many bilaterals at too shallow level
- Domestic priorities align quite well with Grand Challenges

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2. Implementation – issues for discussion

- How to deal with expansion and commitment to EU (Horizon 2020)? (is the tail wagging the dog?)
- How to balance range of international opportunities – what are the priorities?
- What is the balance between (international) demands for business-oriented and basic research?
- Is there a need to improve information about what works and what doesn't – is there a need for more SWOT studies?
- Does RCN's portfolio address all Norway's research needs (at all levels)?

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3. Responsiveness to stakeholders - findings

- Incomplete research coverage:
 - 30% of universities' research budget – Research Institutes have greater influence
 - Health largely under Health Authorities –are needs addressed? (N.B. bibliometrics findings)
 - Much Norwegian research focuses on resources
- Norwegian researchers 'inward looking' on domestic issues
- Lack of correlation between international research and business/trade interests – is there a mismatch?
- Weak links between research and industry (domestically)
- Sometimes problem of balancing consensus views versus strong individual concerns

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3. Stakeholders – issues for discussion

- How to cover all research funding demands and integrate with internationalization concerns?
- How to balance industry and research needs in international arena?
- How to increase research-industry links (in international context)?
- Are all stakeholder views accounted for – and how to ensure all stakeholders get equal weight?

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11.2 Workshop with Client

A workshop with the Client was held on 19th June 2012 to seek feedback on the interim findings of the study. The key areas on which the client was consulted were on the following topics:

Internationalisation and Quality

Internationalisation Patterns and Priorities

Support for Internationalisation

The workshop took place at the premises of the Norwegian Government, Akersgata 59 Ministry Building on 19th June between 09:00 and 14:45 Hrs.

The following were invited:

Ministry of Education and Research, Asgeir Fløtre (Project Contact)

Ministry of Education and Research, Pål Sørgaard,

Ministry of Education and Research, Jana Weidemann

Ministry of Education and Research, Heidi Dybeslan

The Ministry of Trade and Industry, Kjetil Jaasund
(Kjetil-Kolsrud.Jasund@nhd.dep.no)

The Ministry of Health and Care Services, Maiken Engelstad
(Maiken.Engelstad@hod.dep.no)

The Confederation of Norwegian Enterprises, Tore Li (Tore.Li@nho.no)

The Norwegian Association of higher Education Institutions, Ola Stave
(Ola.stave@uhr.no)

The Norwegian Association of Research Institutes, Gunnar Jordfald
(Gunnar.Jordfald@abelia.no)

RCN – Staff

Actual Attendees were:

Heidi Dybesland Ministry of Education and Research

Ola Stave, Norwegian Association for Higher Education Institutions

Terje Emblem, RCN

Mette Lending, Ministry of Education and Research

Pål Sørgaard, Ministry of Education and Research, Department of Research

Svend Otto Remøe, RCN

Gunnar Jordfald, FFA

Jana Weidemann Ministry of Education and Research

Review of Research Council Norway

Internationalisation Study

Workshop for Ministry and RCN

Date: Tuesday 19th June, 2012

Time: 09:00 – 14:45

Location: Akersgata 59 (R5), Ministry Buildings, Government Quarter, Oslo

Invitation

You are invited to a workshop for Ministry officials, including those of the Ministry of Education and Research, and staff from the Research Council Norway, to consider, and provide comments on, the draft final report of the Internationalisation Study, carried out as part of the Review of the Research Council Norway (1545 RCN) led by Technopolis. The Internationalisation Study has been conducted by Manchester Institute of Innovation Research. The workshop will be presented by Professor Jakob Edler and Dr John Rigby, both of the Institute of Innovation Research.

The Workshop will cover the following three areas: a) RCN internationalisation strategy and research impact; b) RCN approach to selection of research areas and research partners and c) RCN support for and enabling of internationalisation activities of Norwegian research actors. The Workshop covers the advice, strategy making and engagement roles of RCN.

Please indicate your availability to me by email, John.Rigby@manchester.ac.uk

Thank you.

12. References

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