

Strategic management of higher education institutions: performance funding and research output

Nicoline Frølich and Antje Klitkou

Dr. Nicoline Frølich
Senior researcher NIFU STEP

Dr. Antje Klitkou
Senior researcher NIFU STEP

Contact address:

Dr. Nicoline Frølich
Senior researcher
NIFU STEP – Studies in Innovation, Research and Education
Wergelandsveien 7
N – 0167 Oslo
Norway

e-mail: Nicoline.Frolich@nifustep.no

Abstract

Paper submitted to the Conference on Indicators on Science, Technology and Innovation, Special session on Indicators for strategic management of higher education institutions, Lugano 15th to 17th of November 2006

Introduction

Most Western countries have experienced an increased demand for new and different types of audit, evaluations and reporting systems that reveal and visualise output and outcomes of public sector organisations (Pollitt and Bouckaert 2000: 223). The changes entail inter alia a shift from allocation of funds based on historical criteria to performance-based mechanisms. The reforms have been interpreted as an attempt of the state to use more systematically financial incentives to control organisational behaviour and to improve efficiency and quality (Geuna and Martin 2003; Taylor and Taylor 2003). The call for increased public accountability comprises one major reason why academic inquiry is increasingly conceptualised in terms of research outputs (Townley, Cooper, and Oakes 2003; in Frølich 2006b).

However, according to Barnetson and Cutright (2000: 277), there is very little written about performance indicators from an explanatory perspective; authors either ignore how performance indicators affect organisational behaviour or implicitly assume that organisations are rational and performance indicators mediate between outcomes and goal setting. Never the less, Ezzamel (1994) investigates how the budget system is used to oppose proposed organisational change. Prichard and Willmott (1997) argue that management knowledge and practice at best only partially reconstitute and displace existing knowledge and practice. Ferlie and Geraghty (2005: 429) ask if the professionalisation vs. managerialisation debate is

overstated and argue that more contemporary thinking and empirical study is needed (Frølich 2006b).

This paper adds value by a case study of recent reforms of national higher education funding mechanisms aiming at strengthening the relation between funding and research outputs. The specific contribution of the paper consists of taking into account the organisational context in which the reforms are to be implemented. The paper investigates the patterns of research publications as they are counted in the Norwegian research funding model. The overall question stated is: how does performance funding impact the production of research publications?

Analytical framework

Backdrop

In the 1990s the concept of accountability shifted from compliance with rules to production of results (Burke 2005a: 216). Peters (2001: 360), among others, asserts that the public administration reforms of the last 25 years have been directed at enhancing the transparency and accountability of the public sector. By creating measurable indicators and making managers responsible for meeting set targets the way government functions will improve (loc.cit.).

Power (2005: 329) asserts that performance funding, increased accountability and transparency form part of “the new managerialism” or New Public Management (NPM). He points out that there has been a long-standing concern with the efficiency and quality of public sector services, which can now be expressed in terms of performance accounting and customer focus (loc.cit. in Frølich 2006b).

The policy changes also hit higher education. Burke (2005b) lists the numerous accountability programmes (performance funding included) currently used in higher education: accreditation, assessment, academic audits; market forces; reputation ratings; performance budgeting; performance reporting; student-alumni surveys; standardised tests (Frølich 2006b).

Our argument – implications for research design

We take the national funding mechanisms as the point of departure. These mechanisms do however have to be taken into account (i.e. implemented) by the higher education institutions in order to produce effects (i.e. impact upon research production). In addition we make the point that for the institutional models to produce impacts, a significant condition is faculty’s adjustment to these mechanisms. Thus we argue that the beliefs and experiences of faculty constitute an important link between institutional funding mechanisms and research output (i.e. who else would produce the impacts?). Consequently, at least five steps of investigation are needed: look into the national funding mechanisms, search for their known impacts, investigate the institutional strategies, survey the beliefs of faculty, and finally look at research output.

Step 1: national funding mechanisms

When looking at national funding mechanisms for higher education we note that government funding for higher education institutions can be allocated by different mechanisms and there are several classifications (Geuna 2001; Kaiser et al. 1992; Lepori et al. 2005; Salmi and Hauptman 2006). There are two main distinctions: whether the funds are allocated according to negotiations or formulas and whether they are allocated based on inputs (such as enrolments) or outputs (such as degrees or research outputs). Negotiated allocation “mechanisms” can either be based on historical criteria or on input and performance indicators. Formula based allocation means that there is a mathematical formula calculating more or less automatically the funds. The formula may be based on inputs or outputs (Lepori et al. 2005 in Frølich, Schmidt, and Rosa 2006).

Step 2: Impacts of allocation mechanisms

The mechanism by which higher education institutions receive their funding has a powerful influence on their internal resource allocation models (Williams 1992). Changes in amounts and patterns of funding have an impact both on the balance between academic and supporting activities and the composition of academic activities (op.cit.: 147). Impact is however in this context a slippery concept. Pollitt and Bouckaert assert that the final results of reform are frequently difficult to identify with any confidence.

“Rhetoric and reality can be very hard to disentangle. Indeed, ultimately the final reality cannot be wholly separated out, because it is so thoroughly impregnated with the competing discourses through which it is constituted” (loc. cit. in Frølich, Schmidt, and Rosa 2006).

Talbot (2005: 496 - 501) acknowledges that a main argument in favour of the implementation of performance-based systems is that performance can be improved by increasing accountability and transparency. He points out that this implies that for democratic systems to work, citizens not only need information about what is spent on public activities, they also need information about which results are achieved. The argument also justifies performance in terms of user choice. In order for users to make qualified choices, performance information must be published. An elaborated version of this model links resources to the choices of users (such as patients or students) (Frølich 2006b).

Universities are complex organisations in which the agents have specialised knowledge about their activities that administrators do not share (Clark 1983: 25). The introduction of more rules and paperwork may send signals that academics can not be trusted which in turn possibly lead to suboptimal outcomes as the involved parties pit themselves against one another in a self-defeating game (Taylor and Taylor 2003). Shore and Wright (2000: 77) point out that “this new model of accountability is seen as having damaging effects on trust as audit encourages the displacement of a system based on autonomy and trust with one based on visibility and coercive accountability”. In addition, as Bovens (2005: 194) asserts, an inherent and permanent tension exists between accountability and effective performance. Nor is there an absolute commensurate relationship between transparency and legitimacy: increased transparency may decrease the legitimacy of governance (loc. cit.). Unsuccessful implementation of changes might be the result as these are “sedimented” uncritically upon the enduring aspects of the logic and structures of professionalism (Kitchener 2002). Most visibly in the UK, the relationship between quality and quantitative indicators of research performance has been a constant source of debate (Bence and Oppenheim 2004: 53 in Frølich 2006b).

Talbot (2005: 501 - 505), amongst others, demonstrates that there are several arguments against performance measurement systems. A brief list includes: the argument that performance is an incomplete indicator which obscures more than it reveals; the argument that performance systems are overly-complex, which renders them unusable and too expensive; a critique of the transaction costs attached to the operation of performance systems; the discussion of the links between output and outcomes; the discussion of quantity versus quality; the discussion of manipulation of the indicators when performance is linked to rewards or penalties; other unintended consequences, such as suboptimal behaviour; the political processes which undermine performance systems by changing the indicators and not allowing for sufficient historical data; a more general critique of rational planning versus muddled politics (Frølich, Schmidt, and Rosa 2006; Frølich 2006b).

Step 3: Institutional strategies

In order to produce impacts and not at least in order to be able to analytically establish a link between national funding mechanisms and faculty's responses, the higher education institutions have to implement allocation mechanisms responding to the national model. Another condition is the HEI leaders' promotion of the reforms. As for the Norwegian case, we know the the institutional allocation models are different from each other and different from the national allocation model. Distribution of research funding varies to a larger extent than funding for education. Several Norwegian higher education institutions have established a performance based allocation of research funding before the national mechanisms were implemented. Also the institutional funding mechanisms allocating resources for research are more encompassing than the national model. This is most prominent at the university colleges (Hetland 2005). Consequently there are variations in terms of institutional funding mechanisms for research and some of these were established in advance of the national model.

The academic values of a university are supposed to diverge from those of NPM (Bleiklie, Høstaker, and Vabø 2000), so presumably the implementation of such reforms provokes resistance in academia (Frølich 2005: 223). Implementation of the NPM reform in Norwegian universities provoked resistance (Collet 1999; Forland and Haaland 1996; Frølich 1994; Frølich 1996; Høstaker 1997; Vabø 2002). Academics asserted that the reform introduced market mechanisms that broke with the value base of universities. They argued that such management mechanisms might work in the business world, but universities operated according to a different logic, which was not amenable to this form of governance (Frølich 2006a: 194).

Step 4: Faculty's beliefs

When seeking to link funding mechanisms and research output, a highly relevant question is: which (additional) factors do "drive" research production? We distinguish between structural attributes and individual attributes (Frølich and Klitkou 2006: 12 - 17). Among the structural features we point in addition to the impact of institutional allocation models (Frølich, Schmidt, and Rosa 2006) to the growth in number of faculty (Aksnes 2005; Kyvik and Olsen 2005) and changes in patterns of publishing (instead of one extensive paper, several shorter papers). Together with these structural features which of course impact upon the number of research publications there are a number of individual attributes which Kyvik (1991) discusses impacting upon research production: the ability to do research, the amount of time and energy devoted to research, the financial resources, mode of communication, and

organisation. In addition age, position and female/male has been demonstrated to impact on research production. Kyvik's (ibid.) investigation indicates that among these factors position and amount of international contact are the most influential variables on research production. This implies that a complex set of variables has to be taken into account when trying to explain the impact of national funding mechanisms on research production (Frølich and Klitkou 2006: 16).

Step 5: Research output

The Norwegian production of scientific publications is following the same trends as all over the world. Numbers of articles are rising substantially (Figure 1). For Norway is interesting a rather strong position of the research institute sector. Co-authorship between the sectors is increasing especially important is the co-authoring between the universities and the institute sector (Figure 2).

Deleted: Figure 2

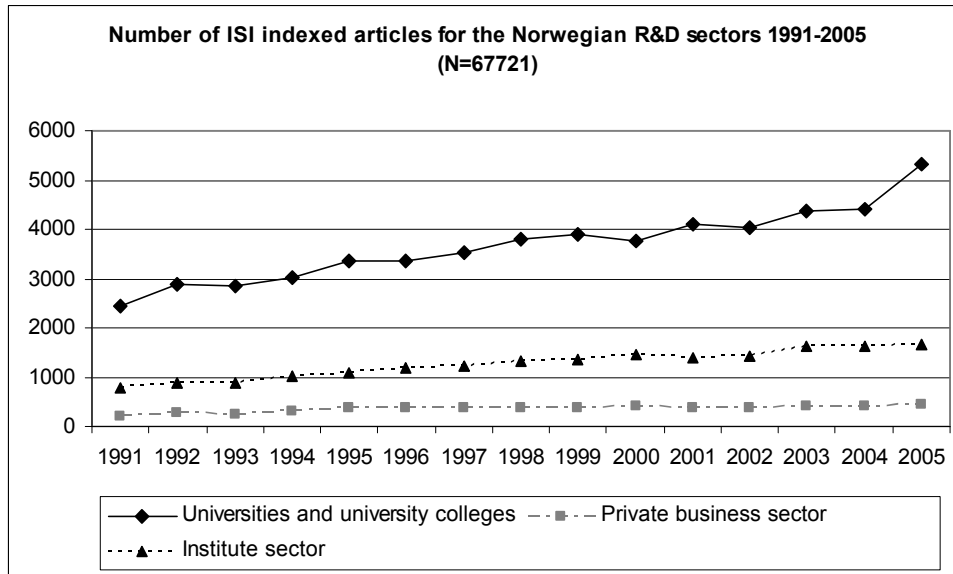


Figure 1: Number of ISI indexed articles for the Norwegian R&D sectors 1991-2005 (N=67721). Data source: NCR Norway 2005 / NSI Deluxe 2005 / NIFU STEP

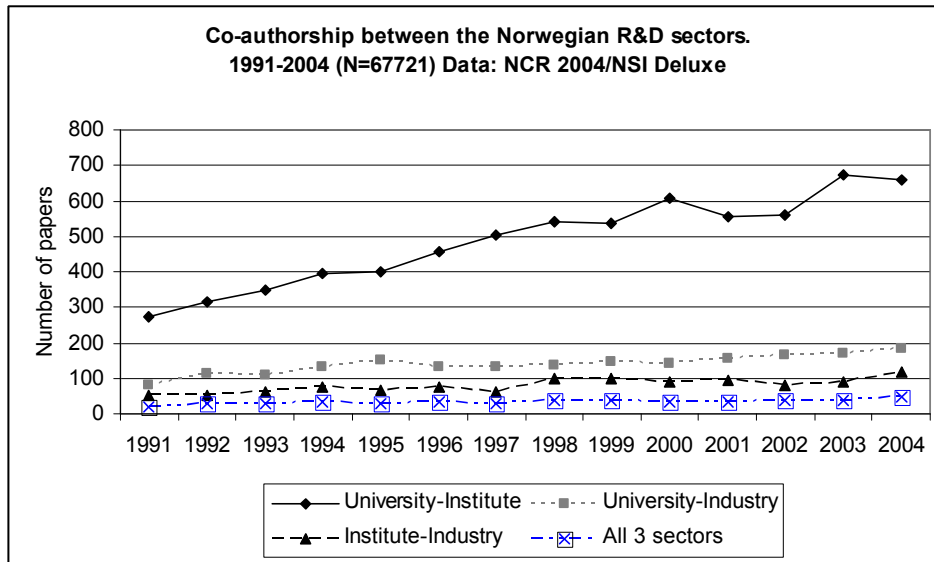


Figure 2: Co-authorship between the Norwegian R&D sectors, 1991-2004 (N=67721) Data: NCR 2004/NSI Deluxe

The international co-authorship of Norwegian authors has increased from sixteen percent in 1981 to over fifty percent in 2005 (Figure 3). At the same time has the share of papers that have only one author has decreased. In 1991 had seventeen percent of all Norwegian papers only one author, but in 2005 only nine percent. That means that the increased number of co-authored articles – both national and international - has contributed to the rise in the number of papers.

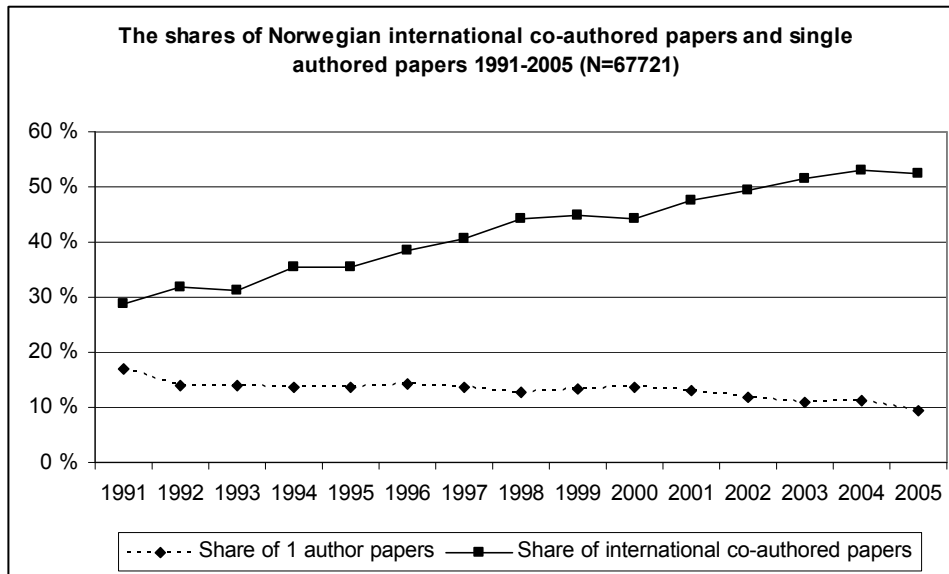


Figure 3: The shares of Norwegian international co-authored papers and single authored papers 1991-2005 (N=67721). Data source: NCR Norway 2005 / NSI Deluxe 2005 / NIFU STEP

If we look at the scientific profile of Norwegian article production that is indexed by ISI we can say the following: “Norway is still quite strong in research fields related to the sustainable exploitation of its natural resources, but also in fields like clinical medicine, Social sciences, Pharmacology, Biology & biochemistry, Microbiology and Neurosciences and behaviour. Fields like chemistry, physics, material science and engineering have still a relatively low activity level, but they receive an impact which is at least around the world average level or higher.” (Klitkou et al. 2005: 11).

Data and methodology

Several data sources have been applied: document analysis, in-depth interviews and survey data. The empirical basis consists of written documentation collected during the spring 2005 from the Ministry of Education and Research, University of Oslo, University of Bergen, University of Life Sciences, Oslo School of Architecture and Design, and Sogn and Fjordane University College. In-depth interviews with leaders and faculty at the University of Oslo (spring 2004), University of Life Sciences (spring 2004), and Sogn and Fjordane University College (autumn 2005) have been conducted. The faculty survey was conducted in the spring 2005; the sample consisted of 3,400 faculty members from a representative sample of universities and university colleges. Two thousand persons answered the survey, which corresponds to 60.3 per cent of the sample (Michelsen and Aamodt 2006). Finally, a stakeholder survey (autumn 2006) of informants from the Ministry of Education and Research, Ministry of Finance, Rectors’ Conference, Researchers’ Association, Quality Assurance Agency, and rectors and directors of the HEIs was conducted. The Rectors’ Conference, Researchers’ Association and 17 of a total of 36 HEIs took part in the stakeholder survey¹ (Frølich forthcoming).

The bibliometric study is based on data from a national research documentation system compared to data from Thomson ISI: NCR for Norway 2004 and NSI Deluxe 2004. We calculated numbers of articles and address shares for the Norwegian universities and university colleges in consideration of increased co-authorship. We also analysed the differences between the main research disciplines. An estimation of the historical development of scientific publishing is based on regression analysis (Frølich and Klitkou 2006).

Observations

Step 1: The national funding mechanisms

In 2002 a new funding model for higher education was introduced in Norway. Its intension was to “respond to concerns about the cost effectiveness of higher education, to stimulate student progression, and to enhance the development of new and attractive study programmes” (UFD 2005: 74). The new funding system forms part of a recent reform of Norwegian higher education (the Quality Reform). The reform was proposed by a national committee in 2000 (NOU 2000: 14) and handled by the National Assembly in 2001 (Report to the Storting 2000-2001: 14)(KUF 2001). The Quality Reform introduced a new degree structure (Bachelor’s/Master’s degrees), the ECTS and a new grading system (A–F), new

¹ The HEIs are: the Norwegian School of Sport Sciences, Vestfold University College, University of Bergen, Nord-Trøndelag University College, Volda University College, University of Oslo, Oslo University College, Molde University College, Ålesund University College, Oslo School of Architecture and Design, Bodø University College, Lillehammer University College, Østfold University College, Telemark University College, Norwegian School of Veterinary Science, Sami University College and Agder University College

commitments to quality assurance and evaluation, and a new incentive-based funding system (Gornitzka and Stensaker 2004; Michelsen and Aamodt 2006; Frølich 2006b).

The output-oriented, formula-based funding model used to allocate funds to higher education institutions (HEIs) has three main components: 1) an “education component” of 25 per cent of the total allocation, based on the number of credits, number of graduates and number of international exchange students; 2) a “research component” of 15 per cent of the total allocation, which is partly a result-based allocation introduced in 2006 based on the number of publications; and 3) a “basic component”, which is 60 per cent of the total allocation (Frølich 2006b).

With regard to the research component, one-half of the funds are redistributed on the basis of performance and one-half is related to quality and strategic considerations, which include funding of positions for doctoral students (UFD 2002a). In contrast to the education component, there is a ceiling limiting the HEIs’ revenue generation. The HEIs that do increase their revenues perform the best in comparison to other institutions (UFD 2005a). In the 2005 budget the research component is based on the production of scientific publications and the degree of funding from the EU and the Research Council of Norway (Frølich 2006b; UFD 2005b).

In the new funding model the research allocation mechanism was initiated by the Ministry for Education and Research and the Research Council of Norway (Sivertsen 2003) and was in more detail developed by order of the Norwegian Association of Higher Education Institutions (the Rectors conference) (UHR 2004). It is based on the definition of high quality publishing channels (a controlled list of journals or serial titles and book publishers) and publication forms (journal articles, articles in anthologies, monographs). Publishing channels were ranked in a consensus oriented process led by the national councils in the different science fields. Important was the attempt to reward publications with a high quality, by that avoiding similar reactions as have been observed in Australia, where the use of just one performance measure, raw publication counts, led to a 25 % increase of the Australian share of publications indexed in the SCI, but to a substantial decrease of the impact (Butler 2003a; Butler 2003b). There were national conferences where the funding model was discussed, f ex. the UHR conference in November 2005 “Scientific publishing as a basis for research funding”. The data collecting started for 2004. A similar system for the documentation of popularisation of research results is on the way.

Step 2: Impacts on what?

Our review of the literature indicates several possible impacts of performance based funding of research. However, in the Norwegian case to actually try to measure the development in number of publications that comes into the national funding model is not straight forward. There exist no historical data before 2004 in the database for scientific publishing (DBH). This means that we can not assess how the publishing activities have been in different fields of science given that the new accounting model would have been in place. Thus our solution was to estimate these developments.

Step 3: Top managers’ perceptions of institutional responses and impacts

According to the stakeholder survey, the HEI leaders do perceive marked influence of the national model on the higher education institutions and as a consequence they also perceive possible unintended impacts of the strategies the HEIs come to chose. Firstly the model is

perceived to possibly increase the income of the HEIs and secondly the increased attention on outputs is perceived to imply increased academic quality (Frølich 2006b).

The leaders of the HEIs perceive the funding system as providing a strong incentive for development and change, thus encouraging focus on the production of publications. In the view of the HEI leaders, the "result-based" components contribute to greater focus on the individual institution's "production" in terms of the number of publications generated by research activities. They believe that in the long run research quality, efficiency and relevance will improve as research activities become more focused on results. Institutions will probably place priority on the research and funding possibilities that will augment their budgets. They perceive the system of rewarding research results as helping to increasingly concentrate activities on larger programmes and international contact (Frølich 2006b).

According to the HEI leaders, there are certain elements of the funding system that may have unexpected impacts and side effects. According to the HEI leaders, the indicators of the funding model do not reflect the distinctive character of small, specialised institutions, some of which may be penalised for a lack of measured results or which may not receive remuneration for results that are not measured by the indicators. Also, the HEI leaders argue that when the government places priority on certain elements, the institutions will follow suit. Consequently an institution may find it more attractive to conduct mainstream research, which is easier to get published than is pioneering, critical and creative research. In addition, there are some areas of research in which it is more difficult to produce articles/monographs etc. that result in financial rewards (Frølich 2006b).

Step 4: The discussion of intended and unintended effects

Several strengths but also weaknesses of the funding model attached to the aim of enhancing academic quality are discussed in the interviews and the documents reviewed for the purpose of this study. The proposed criteria for allocation of research funding based on publications is perceived as possibly contributing to a shift in the pattern of publishing toward a more quality and internationally oriented track. On the other hand it is asserted that an increase in the number of publications does not necessarily imply an increase of the academic quality. Also it is argued that it is not certain that performance funding of research will make the world's researchers conduct better research than those systems of motivation that have contributed to the incredible growth in science and knowledge that the world has seen up to now (Frølich 2006b).

In the faculty survey a majority of faculty seems to support the idea of performance funding in terms of two-thirds agreeing that resources should be reallocated according to the quality of research. In the documents it is asserted that with the use of aggregated data it will be possible to measure research by bibliometric methods to create an adequate basis for resource allocation internally at the university and between national HEIs (Frølich 2006b).

As a consequence of the promotion of research quality and the quality of the educational programmes, possible shifts between research and teaching are perceived are discussed in the interviews. One of the intentions of the reform is seen as an urge to increase the quality of education as faculty earlier tended to put priority on the research activities. On the other hand, faculty fear that more teaching might be required by those who do not conduct research. According to some of the stakeholders the priority of credit production might also decrease the time and energy devoted to research activities (Frølich 2006b).

A major strength of the funding model is its perceived impacts on HEI funding. It is underscored that an increase in the number of publications may result in better research funding. Result based funding system is seen as a challenge, however entailing opportunities for increasing funds in the long run (Frølich 2006b).

Research funding based on publications is defended by pointing to the fact that external demands are increasingly being made for documentation of research results. Without a system of documentation it is feared that decisions regarding research funding will become political decisions (Frølich 2006b).

Step 5: Estimated research output

The bibliometric analysis indicates that it is possible to use ISI data for an estimation of the historical development of the scientific publishing in some research disciplines, like medicine, mathematics, natural sciences, social science and engineering although these fields have developed differently and there are also differences between universities and university colleges. The scientific publishing in research disciplines like law, humanities and teacher education can not be estimated by ISI data.

Publication data from ISI can be used to estimate the historical development of scientific publishing for some fields of science (Figure 4).

Deleted: Figure 4

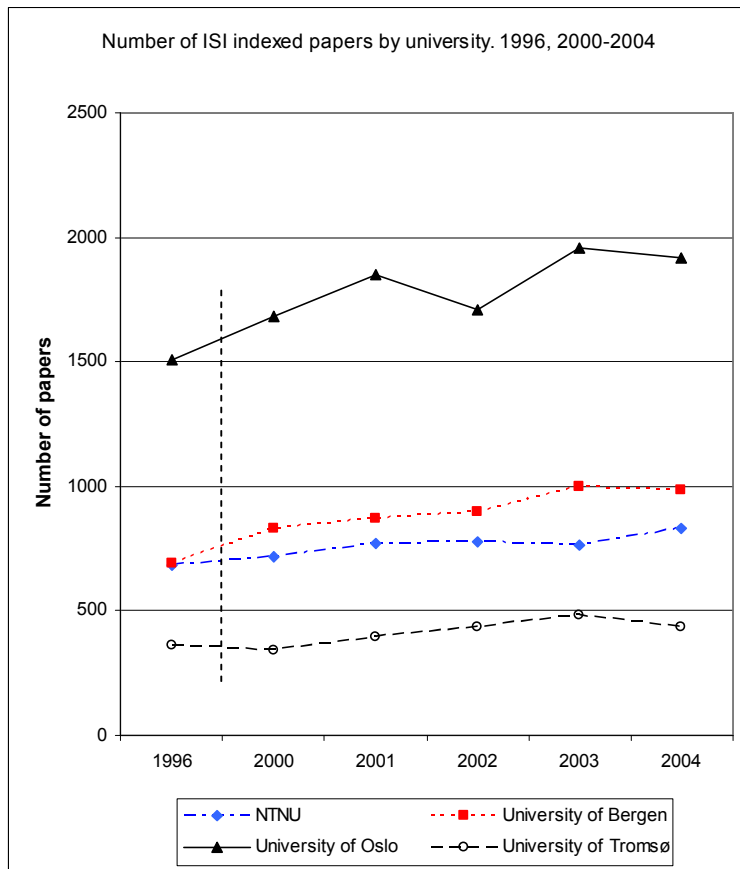


Figure 4: Number of ISI indexed papers by university, 1996, 2000-2004

Beside numbers of papers we analysed also shares of addresses² (Figure 5, Figure 6). As we have seen above is a huge part of all papers co-authored. Shares of addresses allow us more accurately to assess the publishing activities than ordinary numbers of papers. Increased co-authorship and multiple addresses in the last twenty years have led to increased numbers of papers.

Deleted: Figure 5

Deleted: Figure 6

² Shares of addresses can be obtained with the help of standardised addresses for the indexed papers. Every paper counts as one paper and get fractionised according to the number of institutional addresses. An article published by two authors from the same university and a co-author from abroad will achieve a share of 0,5 for the university, in the case of three different institutional addresses a share of 0,33. It is possible to calculate on different levels of organisations, dependent of the level of analysis: a study of universities as the main entity takes the university as a whole, but an analysis of different faculties has to be based on the faculty level.

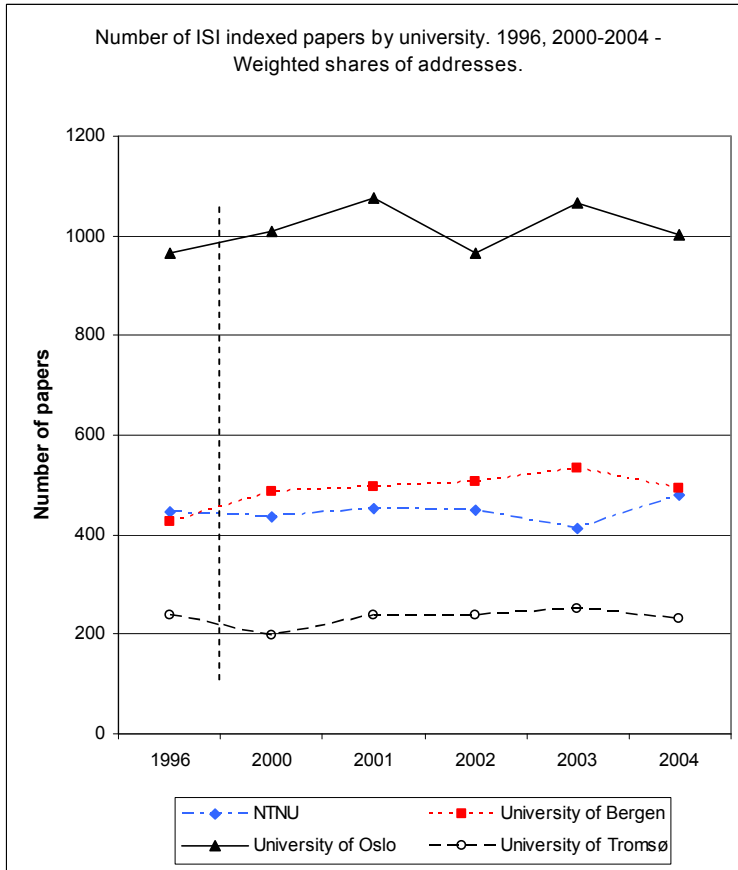


Figure 5: Number of ISI indexed papers by university. 1996, 2000-2004 - Weighted shares of addresses.

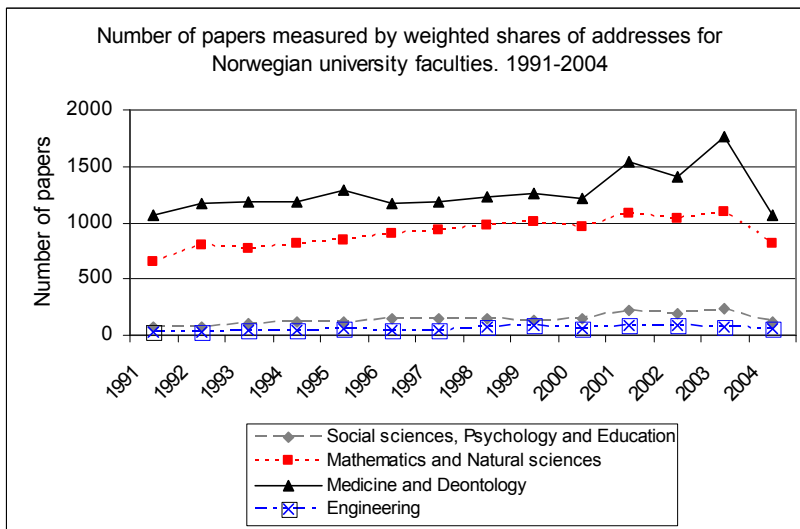


Figure 6: Number of papers measured by weighted shares of addresses for Norwegian university faculties. 1991-2004

For the university colleges these are disciplinary groups like social sciences, engineering and natural sciences and health and social care. Here we calculated weighted field shares because the organisational division of the university colleges is less based on disciplinary borders

(Figure 7).

Deleted: Figure 7

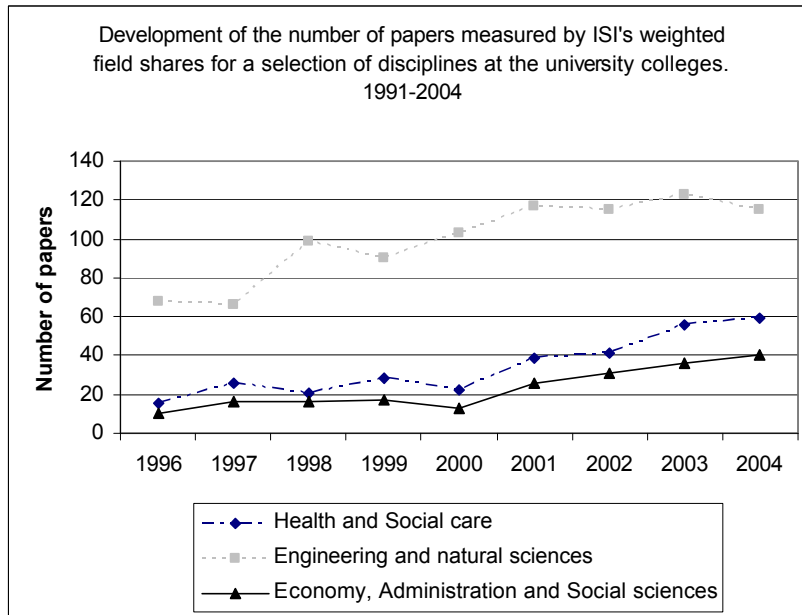


Figure 7: Development of the number of papers measured by ISI's weighted field shares for a selection of disciplines at the university colleges. 1991-2004

Regression analysis allowed us to estimate the development of publishing activities of university fields like medicine and deontology, mathematics and natural sciences, social sciences³ and engineering (Figure 8). The estimations were based on shares of addresses of the ISI indexed papers.

Deleted: Figure 8

The fields of science for which we can estimate the historical development of publishing had however different publishing profiles.

³ Social sciences are here grouped together with psychology and education. Norwegian social sciences have a rather high volume of scientific publications and the profile of the Norwegian social sciences is rather balanced, i.e. quite similar to the world profile (Ingwersen 2001). As Kyvik (2003) has pointed out, following social sciences to an increasing extent the publication pattern in the natural sciences.

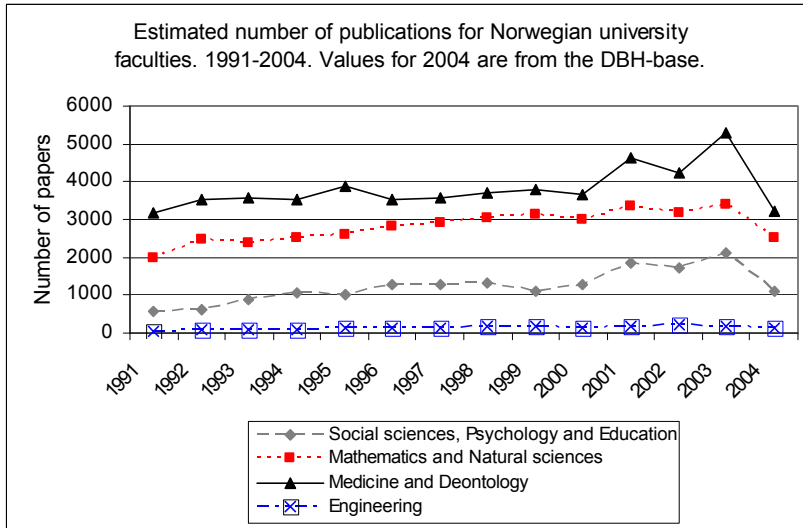


Figure 8: Estimated number of publications for Norwegian university faculties. 1991-2004. Values for 2004 are from the DBH-base

For the university colleges we used weighted ISI-field shares for the estimation of the publishing activities (Figure 9).

Deleted: Figure 9

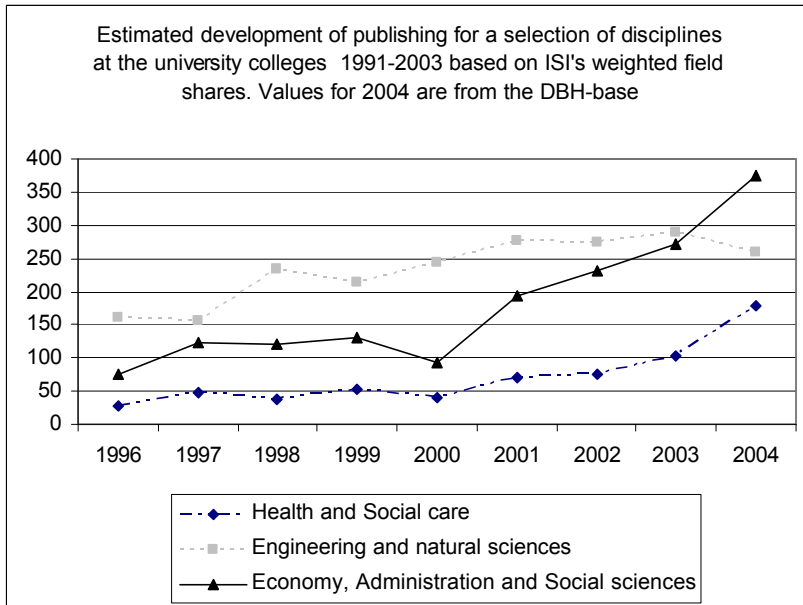


Figure 9: Estimated development of publishing for a selection of disciplines at the university colleges 1991-2003 based on ISI's weighted field shares. Values for 2004 are from the DBH-base

Before 2000 we have a rather shallow, but stable increase in the number of indexed papers. Analysing the last 4 years (2000 – 2004) we can conclude that the publishing activities have developed rather discontinuously – first a steep increase from 2000 to 2001, a stagnation in 2002, in 2003 again a steep increase especially in medicine, and in 2004 a rather strong

decrease under the level of 2000. The last decrease can be caused partially by delays in Thomson ISI's indexing. Over ten percent of all articles (ca. 700 articles) published in 2004 were not indexed in 2004 but first later in 2005 and are missing in our calculations.

Medicine and deontology at the universities reached a top in 1995 which the field did not pass before 2001. If we ignore the results for 1995, this science field did publish almost at the same level from 1992 to 1998 measured in address shares. Since 1999 there was a rather discontinuous increase.

The *mathematical and natural sciences* at the universities had a continuous increase from 1993 to 1999 measured in address shares. After 1999 these science fields developed discontinuously and increased in lower tempo. The levels for 2001 and 2003 were almost the same, hence the level for 2004 is on the level of 1994, but this decrease can be caused by the mentioned delays in the indexing in ISI's NCR.

The *social sciences* at the universities had a relatively steep increase in publishing from 1991 to 1994, a little decrease in 1995, followed by a continuous increase up to 1998 measured in address shares. After 1998 the field developed more discontinuously, but altogether has been increasing. Also here the level decreased from 2003 to 2004.

The *engineering field* at the universities increased rather steep till 1995, two years with a decreased level were followed by an increase up to 1999. After 1999 the indexed publishing activities swung and went down in the last two years, measured in address shares.

Engineering and natural sciences at the university colleges had a steep increase up to 1998, then a little decrease followed by an even increase up to 2003.

Social sciences at the university colleges had a relatively even increase up to 1999, then a clear decrease in 2000 followed by a steep increase up to 2003.

Health and social care at the university colleges had an even publishing up to 2000 followed by a steep increase up to 2004.

For some disciplines at the universities and university colleges we have no publishing data and it is therefore not possible to estimate the development of the former development. We can not calculate the development of university fields like humanities and law, and it is neither possible to estimate the development of the humanistic disciplines or teacher education at the university colleges. For these disciplines it is not possible to assess the impact of the new financing model on the publishing activities.

Based on the faculty survey ten per cent of the faculty agree that they have spent more time on research after the reform, while ninety per cent of the faculty disagrees that the reform has influenced their academic priorities in terms of increasing the time they devote to research. Research funding seems little affected by the reform: six per cent of the faculty have experienced an increase in research funding and 94 per cent of the faculty disagree with the statement that the reform has resulted in increased research funding. Publishing also seems to be affected to a slight extent: 90 per cent of the faculty report that the reform has not changed their publishing behaviour (Frølich 2006b).

When looking into the survey results, we note that a large group among faculty at Faculty of medicine and Faculty of Deontology are inclined to disagree that they publish more internationally after the Quality reform (95 %). Among faculty at Faculty of Mathematics and natural sciences 92 per cent disagrees in this statement; among Social sciences faculty 88 per cent disagrees and among engineers 85 per cent disagrees in the statement that the Quality reform has contributed to them themselves publishing more papers internationally. The survey results from the university colleges indicate that faculty in engineering and natural sciences to a large extent disagree in this statement (96 %). At the social sciences 89 per cent and at health 85 per cent of faculty indicate that they disagree that the Quality reform has made them publish more internationally. These numbers reveal that the disciplines that in bibliometric estimates have the largest growth in number of publications, are also the ones in which faculty to a large extent disagree that the Quality reform have made them publish more internationally.

Conclusions

We have reviewed the Norwegian funding mechanisms. The main feature of the funding system of higher education is a performance-based system. Almost half of the institutional block grants are allocated according to the number of credits, graduates and publications produced. In addition to the performance-based allocation mechanisms, slightly more than half the institutional block grants is a historic component. The model has recently been approved and is still being developed. There have been both changes in the model originally approved as well as new performance parameters being included in the model or being under consideration (Frølich forthcoming).

Our investigation indicates that at least in the view of the stakeholders, the funding system influences institutional strategies. In the stakeholder survey they expect the incentives the funding model provides to encourage institutions to increase the quality of their educational programmes and research. The stakeholders believe, however, that it may produce unintended effects and that the consequences have to be monitored. Possible unintended effects include an increase in the number, not necessarily the quality, of publications, or the emphasis on publishing resulting in mainstream research being given priority, rather than more critical research. Finally, it is reported that HEIs could be penalised for not achieving the results measured by the indicators of the model, and at the same time not receive remuneration for results that are not measured (Frølich forthcoming).

The Norwegian stakeholders consulted for the purpose of this investigation do perceive both strengths and weaknesses of the funding system. Several impacts, both intended and unintended are currently discussed. Our discussion demonstrates that both other factors driving researchers to publish internationally together with their possible interplay with the institutional resource models have to be taken into account. According to the HEI leaders the funding model provides strong incentives to ameliorate production in higher education. There are however several unintended effects as perceived by the stakeholders, such as a reduction in the academic quality of both research and educational programmes. Concerning research activities, the effects upon faculty's distribution of their time seem limited, as 10 per cent say that they invest more time in research activities. The impacts upon research also seem limited since international publishing is only impacted slightly according to faculty's answers on our survey. Concordantly, so far, the funding model seems to yet having a limited impact on research activities as it is measured when asked if the reform has made faculty devote more time to research activities or made them publish more internationally. However, since the national funding model did not include a performance measure of publications until 2005,

these answers cannot directly be linked to the funding model. They should rather be interpreted as a response to the total reform as well as seen in the light of the institutional allocation models in which several of the institutions have developed performance measures of research (Frølich forthcoming).

The main question investigated in this paper is how performance funding impacts upon research production. We have noted that “impacts” is a slippery concept (Pollitt and Bouckaert 2000: 38). Methodologically it is challenging to link patterns of publications to funding models. Our results indicate at least:

1. Different patterns of publishing according to different disciplines
2. An uneven development of number of publications which started to increase several years before the implementation of the new funding model

The most striking result of our study is however the fact that in the disciplines in which it is possible to estimate how the publishing pattern was in advance of implementation of the national model, we observe that there has already been an increase in number of publications. This observation is important because it out rules the national funding mechanism as the sole driver of an increase in number of publications.

It is also highly interesting that faculty in the disciplines that have experienced the steepest growth in number of publications are also the disciplines where faculty to the least extent agree that the Quality reform has made them publish more internationally. This could indicate that the growth in number of publications as a result of the national funding mechanism might come either in the disciplines that have not experienced yet a growth in number of publications. Data from 2005 and further on will reveal the development in number of publications and surveys of faculty’s experiences of impacts of the performance based model at a later point in time compared to our results at this point of time will make it possible to develop further this argument.

We conclude that taking developments in number of publications as a direct impact of the implementation of national as well as institutional performance based funding mechanism has to be considered an exaggeration. To track impacts of funding mechanisms is a complex task. To link research output back to funding mechanisms, one condition is institutional adoption of the model. We have demonstrated that there are differences both between the institutions and, depending on the institutional allocation models, inside each institution as well concerning the performance-based share of the budget.

Delays in registration of scientific publications in commercial databases can occur and that is why a national funding system has to be based upon a national system of publishing information which has a high quality of data, is consensus based and is non static, but is developing in accordance to the needs of the scientific community. This national system has to use also other sources for getting a reliable data set, like other commercial databases which focus on science fields that are less prominent in the mainstream databases, publisher information, library catalogues and direct information from the research institutions. If the national funding system would be based on gliding publication windows (2 to 3 years), one would probably avoid the disturbing effects of both delays in data registration and an “uneven volume of publishing” from year to year caused by the “natural” development of larger programmes or projects. This underscores the need for comparable and historical data for a national research funding system based on output indicators like scientific publications (Frølich and Klitkou 2006).

Finally we note that both niche journals and cross-disciplinary journals currently have harder conditions in the disciplinary process of evaluating and ranking journals.

References

- Aksnes, D. 2005. Vitenskapelig publisering ved universiteter og høyskoler. Oslo: NIFU STEP arbeidsnotat 6/2005.
- Barnetson, B., and M. Cutright. 2000. Performance indicators as conceptual technologies. *Higher Education* 40 (3):277-292.
- Bence, V., and C. Oppenheim. 2004. The role of academic journal publications in the UK Research Assessment Exercise. *Learned Publishing* 17 (1):53-68.
- Bleiklie, I., R Høstaker, and A Vabø. 2000. *Policy and Practice in Higher Education. Reforming Norwegian Universities*. London og Philadelphia: Jessica Kingsley Publishers.
- Bovens, M. 2005. Public accountability. In *The Oxford handbook of public management*, edited by E. Ferlie, L. E. j. Lynn and C. Pollitt. Oxford: Oxford university press.
- Burke, J C. 2005a. Reinventing accountability. From bureaucratic rules to performance results. In *Achieving accountability in higher education. Balancing public, academic and market demands*, edited by J. C. Burke. San Fransisco: Jossey bass.
- Burke, J C. 2005b. The three corners of the accountability triangle. Serving all, submitting to none. In *Achieving accountability in higher education. Balancing public, academic and market demands*, edited by J. C. Burke. San Fransisco: Jossey bass.
- Butler, L. 2003a. Explaining Australia's increased share of ISI publications - the effects of a funding formula based on publication counts. *Research Policy* 32(1): 143-155.
- Butler, L. 2003b. Modifying publication practices in response to funding formulas. *Research Evaluation* 12(1): 39-46.
- Clark, B.R. 1983. *The Higher Education System: Academic organization in Cross-National Perspective*. Berkley, Los Angeles, Oxford: University of California Press.
- Collet, J P. 1999. *Historien om Universitetet i Oslo*. Oslo: Universitetsforlaget.
- Ezzamel, M. 1994. Organizational change and accounting - understanding the budget system in its organizational context. *Organization studies* 15 (2):213 - 240.
- Ferlie, E, and K J. Geraghty. 2005. Professionals in public service organisations. Implications for public sector "reforming". In *The Oxford handbook of public management*, edited by E. Ferlie, L. E. j. Lynn and C. Pollitt. Oxford: Oxford University press.
- Forland, A, and A Haaland. 1996. *Universitetet i Bergens historie 1946 - 1996. Bind I. 2 vols.* Vol. 1. Bergen: Universitetet i Bergen.
- Frølich, N. 1994. *Kontroll, kritikk og pragmatikk: Konflikt over premisser. Virksomhetsplanlegging på Universitetet som kulturelt motivert argumentasjon*. Bergen: Universitetet i Bergen.
- Frølich, N. 1996. Målstyring som kommunikasjonssvikt. In *Kultur som levemåte*, edited by G. Grendstad and P. Selle. Oslo: Samlaget.
- Frølich, N. 2005. Implementation of New Public Management in Norwegian Universities. *European Journal of Education* 40 (2):223 - 234.
- Frølich, N. 2006a. The contribution of cultural theory to understanding the embeddedness of arguments in the implementation process: The case of university reform. *Innovation - The European journal of social science research* 19 (2):190 - 207.
- Frølich, N. 2006b. Value for money? Accountability and transparency within higher education. Paper presented at the 22th EGOS Colloquium, Bergen, 6 July to 8 July 2006.

Formatted: English (U.S.)

Formatted: English (U.S.)

Formatted: English (U.K.)

Formatted: English (U.K.)

- Frølich, N. forthcoming. Funding systems and their effects on higher education systems. National study Norway: IMHE OECD report.
- Frølich, N, and A Klitkou. 2006. Resultatbasert forskningsfinansiering. Evaluering av Kvalitetsreformen. Delrapport 4. Oslo: Norges forskningsråd Rokkansenteret NIFU STEP. **Formatted: Norwegian (Bokmål)**
- Frølich, N, E K Schmidt, and M J Rosa. 2006. Portugal - Denmark - Norway: A continuum of funding systems for Higher Education and their impacts on institutional strategies and academia. Paper submitted to track 4: Finance, Funding and Incentives, the 28th Annual EAIR Forum, Rome 2006, the 30th of August until the 1th of September.
- Geuna, A. 2001. The changing rationale for European University research funding: Are there negative unintended consequences? *Journal of Economic Issues* XXXV (3):607 - 632.
- Geuna, A, and B R. Martin. 2003. University research evaluation and funding: An international comparison. *Minerva* XLI (4):277-304.
- Gornitzka, Å, and B Stensaker. 2004. Norway. In *On cooperation and competition*, edited by J. Huisman and M. C. v. d. Wende. Bonn: Lemmens. **Formatted: English (U.S.)**
- Hetland, P. 2005. Insentivstrukturen av universiteter og høyskoler sett i forhold til nasjonale målsettinger for institusjonene. Oslo: NIFU STEP arbeidsnotat 8/2005.
- Høstaker, R. 1997. University Life. A study of the relations between political processes and institutional conditions in two university faculties. Bergen: LOS-senter.
- Ingwersen, P, B Larsen, and E Noyons. 2001. Mapping national research profiles in social science disciplines. *Journal of Documentation* 57 (6):715-740.
- Kaiser, F, R J. G. M. Florax, J. B. J. Koelman, and F A. van Vught. 1992. *Public expenditure on higher education. A comparative study in the member states of the European Community*. London: Jessica Kingsley Publishers.
- Kitchener, M. 2002. Mobilizing the logic of managerialism in professional fields: The case of academic health centre mergers. *Organization studies* 23 (3):391 - 420. **Formatted: English (U.S.)**
- Klitkou, Antje, N. H. Solum, T. Bruen Olsen, E. Kallerud and R. Søggen. 2005. Priorities, strengths and comparative advantage in Norwegian research, viewed in relation to the cooperation with South Africa. Working Paper 25/2005. Oslo: NIFU STEP. **Formatted: Norwegian (Bokmål)**
- KUF. 2001. Stortingsmelding nr. 27 (2000-2001). Gjør din plikt - krev din rett. Kvalitetsreform av høyere utdanning. Tiltrådning fra Kirke-, utdannings- og forskningsdepartementet av 9. mars godkjent i statsråd samme dag. <http://www.dep.no/ufd/norsk/publ/stmeld/014001-040004/index-hov011-b-n-a.html>: Kirke-, utdannings- og forskningsdepartementet.
- Kyvik, S. 1991. *Productivity in academia*. Oslo: Universitetsforlaget.
- Kyvik, S, and T B Olsen. 2005. Endringer i sammensetningen av forskerpersonalet. In *Forskning ved universitetene. Rammebetingelser, relevans og resultater*, edited by M. Gulbrandsen and J.-C. Smeby. Oslo: Cappelen.
- Lepori, B, M Benninghoff, B Jongbloed, C Salerno, and S Slipersæter. 2005. Changing patterns of higher education funding: Evidence from CHINC countries. Draft report. **Formatted: Norwegian (Bokmål)**
- Michelsen, S, and P O Aamodt, eds. 2006. Evaluering av Kvalitetsreformen. Delrapport 1. Oslo: NIFU STEP/Rokkansenteret, University of Bergen. **Formatted: Norwegian (Bokmål)**
- NOU. 2000: 14. Frihet med ansvar (Mjøs-utvalgets innstilling).
- Peters, G. 2001. *The politics of bureaucracy*. London: Routledge.
- Pollitt, C, and G Bouckaert. 2000. *Public management reform. A comparative analysis*. New York: Oxford University Press.
- Power, M. 2005. The theory of the audit explosion. In *The Oxford handbook of public management*, edited by E. Ferlie, L. E. j. Lynn and C. Pollitt. Oxford: Oxford university press.

- Prichard, C, and H Willmott. 1997. Just how managed is the McUniversity? *Organization studies* 18 (2):287 - 316.
- Salmi, J., and A Hauptman, M. 2006. Resource allocation mechanisms in tertiary education. In *Higher education in the world 2006. The financing of universities*, edited by J. F. Llop. Hampshire: Palgrave Macmillan.
- Shore, C, and S Wriht. 2000. Coercive accountability. The rise of audit culture in higher education. In *Audit cultures. Anthropological studies in accountability, ethics and the academy*, edited by M. Strathern.
- Sivertsen, G. 2003. Bibliografiske datakilder til dokumentasjon av vitenskapelige publikasjoner: en utredning for Utdannings- og forskningsdepartementet. Oslo: NIFU.
- Talbot, C. 2005. Performance management. In *The Oxford handbook of public management*, edited by E. Ferlie, L. E. j. Lynn and C. Pollitt. Oxford: Oxford university press.
- Taylor, J., and R. Taylor. 2003. Performance indicators in academia: An X-efficiency approach? *Australian Journal of Public Administration* 62 (2):71-82.
- Townley, B, DJ Cooper, and L Oakes. 2003. Performance measures and the rationalization of organizations. *Organization studies* 24 (7):1045 - 1071.
- UFD. 2002a. St.prp. nr. 1 (2002-2003) FOR BUDSJETTERMINEN 2003. Utgiftskapitla: 200-288 og 2410. Inntektskapitla: 3200-3288, 5310 og 5617 Tilråding frå Utdannings- og forskningsdepartementet av 13. september 2002, godkjend i statsråd same dagen. (Regjeringa Bondevik II). <http://www.dep.no/ufd/norsk/publ/stprp/045001-030004/index-dok000-b-n-a.html>: Utdannings- og forskningsdepartementet.
- UFD. 2005a. OECD Thematic review of tertiary education. Country background report for Norway. The Norwegian Ministry of Education and Research.
- UFD. 2005b. St.prp. nr. 1 (2005-2006) For budsjettåret 2006. Det Kongelege Utdannings- og Forskningsdepartement.
- UHR. 2004. Vekt på forskning: Nytt system for dokumentasjon av vitenskapelig publisering – Innstilling fra faglig og teknisk utvalg til UHR. Oslo: UHR.
- Vabø, A. 2002. Mytedannelser i endringsprosesser i akademiske institusjoner. Avhandling for dr. polit.- graden, Sosiologisk institutt, Universitetet i Bergen. Bergen.
- Williams, G. 1992. *Changing patterns of finance in higher education*. Bury St Edmunds: St Edmundsbury Press.