WHERE HAVE ALL THE SCIENTISTS GONE? BUILDING RESEARCH PROFILES AT DUTCH UNIVERSITIES AND ITS CONSEQUENCES FOR RESEARCH

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ABSTRACT

This article investigates the links between universities' opportunities to shape their research profiles, the changing state interest concerning these profiles, and the impact of profile building on research at university and field levels. While the authority of the Dutch state over research profiles of Dutch universities has increased, university management has considerable operational authority over the inclusion of new research fields and removal of existing research fields. Since all universities have begun to follow the same external signals prescribing applied research, research that has easy access to external funding, and research in fields prioritised

by the state, a 'quasi-market failure' may emerge, as is demonstrated for evolutionary developmental biology and Bose-Einstein condensation.

INTRODUCTION

The new public management (NPM) reforms have been studied by higher education researchers mainly with regard to their impact on universities, with a focus on the latters' autonomy and action capabilities (Clark, 1998; De Boer, Enders, & Leišytė, 2007; Marginson & Considine, 2000). The impact of these reforms on the conduct and content of research has enjoyed far less attention, with empirical studies focusing on the micro-level, that is on researchers and research groups (Gläser & Laudel, 2007; Gläser, Lange, Laudel, & Schimank, 2010; Jansen, 2010; Leišytė, 2007). Owing to the methodological difficulties of causally linking micro-level changes in research practices to macro-changes of research fields in a country, such micro-level impact studies can only speculate about the impact of NPM reforms on the research of a country. In this article, we contribute to closing this gap by addressing possible macro-level effects of an aspect of NPM that hasn't enjoyed much attention so far, namely the building of research profiles by universities and its impact on research fields at the national level.

These effects are of both theoretical and political interest. Theoretically, studying the effects of changes in organisations on research fields reverses the perspective that has dominated organisational sociology so far. The recent interest of organisation studies in communities has treated them primarily as a context of organisational activities, for example as the dominant context (O'Mahony & Lakhani, 2011) or as a resource for organisations (Wenger & Snyder, 2000). The example of open source software production has been used in an attempt to establish communities as a distinct organisational form of production (Seidel & Stewart, 2011). Our investigation takes changes in organisations as the independent variable and asks how changes in organisations, in the aggregate, can affect communities that are distributed across many organisations.

There is also the theoretical question of what universities can actually do with their research. Investigations of the nature of the university as an organisation and of properties of research processes suggest that a university's

capabilities to shape its research can be increased by NPM reforms but still have fundamental limitations. NPM reforms are supposed to turn universities into corporate actors with full strategic action capability, which includes an increased capability to steer their core processes of research and teaching. At the same time, there are theoretical reasons which make the success of these steering attempts rather unlikely: the 'lack of transparency' of the university's core processes (Musselin, 2007), the uncertainties inherent to research which make scientific communities the 'control centre' of research (Whitley, 2008); the inability of universities to define research tasks, to control work flow interdependencies, and to control quality and use of results, caused by properties of the researchers' work (Gläser, 2012). Building research profiles seems to be as far as a university can go in the steering of its research (Von Stuckrad & Gläser, 2012; Whitley & Gläser, this volume), which makes this process a theoretical limit of NPM reforms.

Politically, the possible effects of NPM reforms on research fields have been discussed with regard to threats to the diversity of research. These effects have been shown to exist in British economics (Lee, 2009), and have been hypothesised for the interdisciplinary field of innovation studies (Rafols, Leydesdorff, O'Hare, Nightingale, & Stirling, 2012). In Germany, the conference of university rectors warned against a possible disappearance of 'small subjects', particularly in the humanities due to similar processes of profile building in German universities (Hochschulenrektorenkonferenz, 2007). In the Netherlands, the Dutch Academy of Science pointed out that universities' responses to profile building could result in blank spots in the research portfolio on the national level, with modern languages probably being the earliest victims (KNAW, 2013).

Effects of profile building on research fields can be expected from the interaction of two distinct trends in NPM reforms, namely the pressure by governments on their universities to develop distinct teaching and research profiles; and the strengthening of hierarchical structures in universities, which are supposed to enable that profile building (Meier & Schimank, 2010; Whitley & Gläser, this volume). These trends represent a departure from past practices, which of course always included decisions that shaped the profile of a university. Investment decisions, decisions on the denomination of chairs and recruitment decisions have consequences for the fields represented in a university and the topics addressed within these fields. Similarly, the decisions of professors on their research topics contribute to shaping the research profile of a university. However, these decisions have not always been part of a 'master plan'. They were made locally and ad

hoc and included a 'list of disconnected choices made by individual professors with respect to their theoretical and methodological interests' or other forms of voluntary bottom-up coordination (Meier & Schimank, 2010, p. 214). University profiles emerged as an aggregate effect.

The creation of research profiles as an intentional strategy of the university to 'set collectively binding rules for the members' is a relatively new development, triggered by NPM reforms (Meier & Schimank, 2010, p. 213). Many universities are now able to manage their research and teaching profiles by allocating resources between competing components of teaching and research activities, which are treated as investment portfolios (Whitley, 2008, p. 26). The creation or modification of profiles may still occur for a variety of reasons including responses to external expectations, internal initiatives by academics who want to extend their resource base, and financial considerations that are unrelated to interests concerning research content. The new intentional building of profiles that has been added to this mix is usually directed towards 'enhancing' the profile, which includes a reduction of topics and a redistribution of resources between fields with the aim of concentrating resources. These processes have been hardly investigated, and their effects are poorly understood.

The aim of our article is to explore the links between organisational situations of universities and faculties, their profile-building strategies, and effects of such strategies on research at universities as well as research fields on the national level. The Netherlands provide an excellent laboratory for the analysis of such consequences because their relatively small size makes national fields very sensitive to decisions at individual universities. This situation enables the causal attribution of changes of research fields to profile-building activities of universities.

Our argument draws together findings from several studies of the Dutch university system, and will be developed in the following steps. We will first describe the evolution of state expectations concerning the profile building of Dutch universities and demonstrate that these expectations have not only grown in strength but have been substantially transformed from the expectation that universities may develop any profile to the expectation of specific content, namely topics that contribute to specific political goals (third section). We then analyse profile-building activities and their effects at Dutch universities and develop an empirical typology of strategies of profile building (fourth section). Moving to the field level, we demonstrate consequences of these decisions for three fields, including two that are now developing contrary to international trends (fifth section). As a conclusion, we discuss the field-level effects of profile building as a quasi-market failure of a system

in which universities must use profile building to compete for money (sixth section).

THEORETICAL FRAMEWORK AND METHODOLOGY

The literature is rather opaque in providing definitions of research profiles and profile building that can be operationalised. For the purposes of this study, we define the research profile of an organisation or organisational unit as the distribution of research effort across a spectrum of research topics and their epistemic characteristics. Thus, a research profile depends on the research topics addressed by researchers of the organisation and the resources allocated to research on these topics. Both aspects of a profile can vary relatively independently of each other, and are changed both unintentionally and increasingly by actions that intentionally aim at creating a specific profile (profile building). Profile building at universities can include a wide range of activities from simply renaming research or defining new headings for old research to significant investments in research centres for topics not previously present at the university or the closing down of research on topics that are no longer deemed useful for a university's profile. Research profiles can be described by their content (research themes), their diversity (number and breadth of themes) and various epistemic characteristics of the research including its basic versus applied nature, interdisciplinarity and collaborations.

So far, research profile building by universities has been investigated primarily in the German context. Meier and Schimank (2010) investigated the profile building at universities in the German state of Lower Saxony, which was initiated by an evaluation of the university research of that state. They found that traditional bottom-up processes of profile building had become supplemented by top-down processes, which were enabled by the increased action capabilities of German university leadership. Owing to the still early stages of the profile-building activities they observed, little could be said about effects on the research profiles of universities. Probably for the same reason, Lange's observation of attempted top-down profile building by faculties at one German university showed nearly no effects (Lange, 2007, pp. 164−165). Germany's excellence initiative has also been considered because one of its aims is to stimulate the building of distinct research profiles (Leibfried, 2010; Meier & Schimank, 2010, p. 233). Again, little can be said about the effects because there is no conclusive evidence yet. The same holds for a recent study of the building of research profiles at Finnish

universities (Pietilä, 2014), for a descriptive account of Dutch and German profile-building activities (Klumpp, De Boer, & Vossensteyn, 2013) and for a bibliometric investigation of a Dutch government initiative termed 'focus en massa' (focus and mass) by Van den Besselaar and Horlings (2010).

While the knowledge about effects of profile-building activities is still very limited, the studies quoted above suggest that a variety of considerations may inform decisions on research profiles and the profiles emerging from these decisions. These include at least external expectations towards a university's profile, strategies formed at different levels of the university, financial interests and perceived necessities, and interests as well as capabilities of researchers. Thus, the building and shaping of research profiles takes place in a complicated actor constellation involving external actors as well as actors at several levels of the university hierarchy.

Our analysis of decision processes concerning university research profiles uses the authority relations perspective (Whitley, 2010), which is a promising way to conduct an integrated assessment of changes in public science systems. With this approach we can systematically analyse how authoritative agencies (the state, research organisations, organisational elites, external funding agencies, national as well as international scientific elites, and the researchers themselves) exercise authority over specific matters of governance, in our case research goals. Its basic assumptions are (a) that the changes that public science systems go through have implications for the relationships between actors and the way that they are able to realise their interests and (b) that authority relations as regards the selection of research goals are the main channel through which changes in the knowledge production system are effectuated (Whitley, 2010). We consider the authority perspective to be particularly useful for our purpose because it enables the integration of multiple overlaying governance processes through which a set of actors contributed to the rise and fall of scientific fields in universities.

We focus on the situations of universities in which profile-building strategies are developed, their decision processes on research profiles, and the impact of these decisions on research at the university as well as on fields at the national level. Concerning the situations of universities, the expectations by external stakeholders (mainly the state) and their authority and the university's financial situation are of particular importance. Decision processes on research profiles vary in their aims as well as the actors involved and their relative authority. Concerning the outcomes, we pay particular attention to the actual changes of the profile including secondary effects across the university. Concerning the national level, we discuss aggregate effects,

which can be described as unanticipated consequences for the national research profile of the country.

Our analysis is based on case studies in Dutch universities which, albeit conducted for different purposes, all included decision processes about university research profiles or the consequences of such decisions. The empirical data stem from three research projects: The first project seeks to find out whether the organisational transformation of Dutch and English universities can be explained as transition between organisational archetypes of authority structures (Weyer, 2014). The second project studied the impact of changing authority relations in four European countries on conditions for intellectual innovations in the sciences, social sciences and humanities (RHESI, see the introduction to this volume). Finally, a comparative project on the impact of national career systems on opportunities for researchers to change lines of research also contributed data on authority structures in Dutch universities and their impact on university research profiles (Laudel, 2012).

Case studies in all these projects were based on documentary analysis and semi-structured interviews (more detail on the methodology of the investigation of evolutionary developmental biology and Bose-Einstein condensation can be found in the articles by Laudel et al., this volume). Documentary sources include university newspapers, internet pages, minutes of university decision-making bodies as well as policy documents. Interviews were conducted with members of the university top management, mid-level managers, heads of department and academics at different levels. Interviews with researchers were prepared by reading research-related documents (web sites, popular descriptions of research, publications, project proposals, CVs) and individual-level structural bibliometrics (Gläser & Laudel, 2009). The interviews were analysed with qualitative content analysis (Gläser & Laudel, 2013). Analyses for the purposes of this article focused on authority relations concerning university profiles and consequences of profile building for the growth and shrinking of fields at universities.

THE EVOLUTION OF DUTCH STATE EXPECTATIONS CONCERNING UNIVERSITY RESEARCH PROFILES

First Phase: Changes in Profiles as Unintended Effects

State expectations of academic research started to rise at the end of the 1970s. The Dutch government wanted public research to be to a certain extent (nationally) programmed and it wanted to 'enhance the quality, the

practical value and the accountability of research' (Blume & Spaapen, 1988, p. 26). This is why research evaluations were introduced in 1983.

The government asked universities to submit so-called 'research programmes', that is coherent research plans for (initially) five years and of groups of at least five researchers, in order to receive funding for this research. Part of the funding of university research was made conditional on the approval of the research programmes by peer review committees (Blume & Spaapen, 1988, p. 11; Van der Meulen, 2007). Although the original idea was to conduct ex-post evaluations of the funded programmes later on in order to link further funding to their success, this never happened in practice.

While this exercise had some consequences for the research profile of universities, they were not intended and still fall under the category of 'unintended consequences of local decisions' described by Meier and Schimank (2010). Changes in research profiles might have occurred in universities and at the national level for three reasons:

— The necessity to provide five-year research programmes for groups of at least five researchers may have induced local collaborations;
— The success of programmes in being approved for funding was influenced by the fit between a discipline's epistemic practices and the need to have long-term plans for larger groups;
— The varying success rates of programmes from different disciplines — between 36% and 100% in the sample investigated by Blume and Spaapen (1988, p. 21) — effectively led to a redistribution of funding between disciplines.

None of these effects, whose strength is difficult to assess due to a lack of data, were intended or planned by either the state or universities. The whole evaluation exercise was still a bottom-up process in which research groups chose their own research areas.

The first attempts of the state to initiate profile building by specialisation and concentration in universities occurred in 1983 ('*taakverdeling en concentratie*' − division of labour and specialisation) and 1986 ('*Selectieve Krimp en Groei*' − selective shrinkage and growth). These policies led to the closure of some and amalgamation of other small university departments (Blume & Spaapen, 1988, p. 6). The aim of the policies was to increase efficiency in higher education (Westerheijden, De Boer, & Enders, 2009, p. 109). The state did not prioritise any themes.

Since these first initiatives, Dutch universities constantly changed the structures and thematic labels in which research was conducted. The

resulting structures are 'virtual' aggregations of research ('research schools', 'research institutes', 'research programmes' etc.) that overlay the more permanent faculties (although mergers of faculties occurred as well). Faculties are largely considered to be the units responsible for teaching, which is why the various research units create a matrix structure of the Dutch university. Our interviews confirm that until the 2000s, the impact of these structural changes on the content of university research remained limited (see also Leišytė, Enders, & De Boer, 2010).

Second Phase: Political Pressure on Profile Building

It was only in the early 2000s that the Dutch government took concrete measures to bring about the 'right' content in university research. It introduced its 'focus and mass' policy. The argument is that the Netherlands is too small to excel in all research areas. Therefore, resources should be concentrated in areas where the Netherlands are excellent and which are important from a socioeconomic point of view (Van den Besselaar & Horlings, 2010, p. 13). The concentration should be supported by the foundation of multi-disciplinary networks and consortia (i.e. build 'critical mass').

To support its focus and mass policy the government initiated two parallel measures: first, public higher education institutions should develop distinct research (and teaching) profiles. Second, the government established 'top sectors' in which research efforts should be concentrated, and research collaboration with industry be stimulated. Taking the 'strong' research areas of the Dutch economy as a point of departure, public and private stakeholders identified nine top sectors in the following areas: Agro-Food; Horticulture and Propagating Stock; High-Tech Materials and Systems; Energy; Logistics; Creative Industry; Life Sciences; Chemicals and Water.

About €1.5 billion was earmarked for the nine top sectors, mostly by reallocating existing budgets of various ministries that manage an innovation budget (Technopolis, 2011, pp. 7, 11). Particularly noteworthy in this respect is the decision made by the government to spend roughly half of the budget of the Dutch Research Council NWO on research in the top sectors. This re-allocation raised concerns about worsening conditions for fundamental research, as voiced by the Dutch Academy of Science: 'in essence, there is room for fundamental research in the economic top sectors, but whether that room will be made available remains to be seen' (KNAW, 2013, p. 13).

Third Phase: Using Performance Agreements for Prescribing Content

In 2010, a governmental advisory committee (the Commission Veerman, led by the former minister of agriculture, Cees Veerman) pointed out the need for profile building in Dutch higher education. By picking up the focus and mass argument, the Commission reiterated that universities could not excel at everything, and should therefore try to concentrate on their strengths in order to remain competitive with other knowledge economies. The Ministry of Education, Culture and Science followed the recommendations of the Veerman report by including the demand for profile building in teaching and research in the Strategic Agenda for Higher Education, Research and Science (September 2011). Although universities were formally free to decide whether to participate in the nine top sectors or not, their active involvement was nevertheless clearly expected by the government.

The process of profile building in Dutch higher education was given shape in the so-called performance agreements that were agreed upon between the Secretary of State and all universities. In the framework of these performance agreements, universities committed themselves to the development of unique teaching profiles and research profiles.

Participation in the performance agreements was voluntary but had financial consequences. To ensure that universities would take the call for profile building seriously, the government earmarked €105 million (5% of the total higher education budget) as performance-based funding. In addition, € 38 million (2%) were to be distributed among those universities having handed in the best plans as evaluated by the ministry. By means of coupling at least some part of the funding to specific performance expectations, the government reserved itself the right to withdraw this money again if universities should not reach the targets agreed upon in the performance agreements.

The evolution of profile-building activities in the Netherlands demonstrates interesting shifts in authority relations, which in some respects contradict the central tenet of NPM reforms, namely increasing the autonomy of universities with respect to formulating their own goals. The original intention of Dutch higher education policy back in the 1980s was that universities should build profiles, that is should concentrate their resources in selected areas which were supposed to differ between universities. However, at this time there were no political expectations concerning the content of these priority areas at universities. These expectations, which increasingly took the form of financially supported political directions,

emerged in the early 2000s. Clear expectations concerning the content of profiles were formulated and reinforced first by financial incentives in external funding and later by performance agreements and linked university block funding. Although the Dutch publicly funded universities are in principle free to 'ignore' the call for profile building, their increasing financial difficulties create a strong pressure to take the financial rewards. It is hence worth investigating how universities respond to these calls when deciding about the prioritisation of research activities.

PROFILE BUILDING AT DUTCH UNIVERSITIES

Strategies of research profile building include all decision processes at the university that are aimed at changing the distribution of a university's research effort across the spectrum of research fields. The two outcomes of profile-building activities include a description of research topics and an allocation of resources to topics.

Devolved Profile Building at University 1

The first case of profile building emerged as a response to the Dutch government's call for creating focus and mass in university research and to cuts in university block funding. The process was initiated by the university's executive board[1] as part of the university's strategic planning. The strategic plan included the introduction of clear-cut criteria for the development of new lines of research and a critical review of the current research portfolio, which should be modified if necessary. These aims should be achieved by the creation of faculty wide 'focus areas' in all faculties. The process was supervised by the senior management team (consisting of the executive board and the deans), and was supported by start-up funding (conditional on the faculties providing plans for their profile-building process). In addition, several budget tranches were distributed among the faculties during the subsequent three years to support the process of profile building.

The selection of 'focus areas' was largely a faculty affair. The executive board had formulated some general expectations (e.g. the stipulation of excellent research lines), which were discussed with faculty management.

The number and content of focus areas was at the discretion of the faculties, each of which applied its own strategies.

Faculty One − Further Devolution
One of the faculties − the faculty of the humanities − further devolved the profile-building process by delegating the choice of focus areas to the leaders of the existing 'research programmes', that is the current thematic units of research. The research programme leaders discussed the profile building with the researchers in their programmes. After this consultation process, the research programme leaders decided that the faculties' research programmes were to become the new focus areas. The only actual change was that within the research programmes (now focus areas), sub-foci should be formulated, of which some tended to be slightly narrower in their focus than had previously been the case. These narrower descriptions did not affect the research itself. Content-wise, the faculty's research portfolio remained by and large the same.

This left the task of distributing the funds that were allocated for the profile-building process. The faculty management required the research programme leaders to submit budget plans in which they explained how they intended to use the funds. The faculty management thereupon spread the amount of profile-building funds almost evenly across all research programmes (now 'focus areas').

Faculty Two − Participative Decision-Making at the Faculty Level
As part of the same university-wide profile-building process, another faculty − a science faculty − applied different strategies. All decisions about the faculty's new research profile were made by the faculty management, albeit in consultation with the university's executive board and senior faculty staff (research group leaders, heads of departments, etc.).

While the research profile of the faculty was not changed thematically, the profile building and the money made available for it were used selectively. In a first phase, the decision was made to strengthen the position of two of the faculty's research areas, which became the new 'foci' of the faculty. One area was a recent 'acquisition', a group that had moved from another faculty and had brought some 'profile-building money' with it. The other one was a highly successful research group in need of investment. Since the group leader had offers from other universities, the faculty was keen to provide the funds in order to make him stay. The money offered for the profile-building process provided a good opportunity to integrate the first group and to strengthen the other, which happened by channelling

all the funds available for profile building to these areas. Although not all staff members were satisfied with the faculty management decision to use the funds selectively, the faculty management could convince most of them, not least by promising that the regular distribution of funds would be left untouched.

Bottom-Up Generation of Options and Top-Down Confirmation at University 2

In University 2, too, the profile-building process was initiated by the university's top management, which asked the faculties to search for a greater concentration in their research portfolios. In particular, it was argued that if the university wanted to maintain a strong position internationally, it would have to channel its resources into a number of clusters and disinvest from some areas. The selection of focus areas was conducted as a centrally led process in which the faculties were expected to cooperate with each other in the creation of inter-faculty focus areas. The Executive Board did not provide financial support for the selection process itself but promised financial rewards once the final selection of focus areas had been made.

The selection process began as a bottom-up process. The deans asked the leaders of the research institutes (the current organisational units for research at university 2) to organise workshops among their research-active academics at which focus areas were to be suggested. On the basis of these initial ideas, researchers were expected to collaborate with their colleagues from other faculties in the development of multi-disciplinary proposals that had the potential to become part of the University's new research profile. The proposals were collected by the deans and submitted as a proposal of focus areas to the Executive Board. All proposed areas were multi-disciplinary and envisaged research collaboration among a considerable number of (senior) researchers from at least two faculties. The majority of topics were application-oriented and focused on issues of socioeconomic relevance. Some also addressed more fundamental questions. In contrast to university 1, the choice of focus areas was selective in the sense that not all researchers of a faculty were involved in them; their own research activities hence coexisted with the new focus areas.

Having received the proposals, the executive board asked an internal committee of active and emeritus professors from all faculties to assess these plans. Thereafter, the list was presented to an external committee that

provided an assessment of chances and risks of each proposed focus area. Neither committee's recommendations led to changes of the proposal, which was finally approved by the executive board.

To support cross-faculty collaborations in the new focus areas, the Executive Board provided a start-up budget for each focus area that was topped up by the Faculty. Researchers of the focus areas were then asked to double this original investment from external grants. The resulting budget could be used for the acquisition of additional personnel and research equipment.

Closing Research Groups at a Faculty of University 3

A faculty at university 3 responded to a growing budget deficit, which has been accumulating since the late 1990s. The faculty responded by a decade-long process of restructuring and profile building with the aim of having less and less costly research. The dean appointed an internal committee which proposed a plan for the restructuring of biological research at the faculty. The committee suggested an organisational structure that was supposed to lead to a more homogenous research profile, to enable the creation of 'critical mass', and to ensure the efficient use of infrastructure. Since some groups did not contribute to the new profile it was suggested that they should be closed. Among the areas to be closed was a subfield in biology.

The original plans were opposed by the faculty's science policy committee, especially with regard to the closure of the biology group. As a compromise, another group was closed, and members of the biology group were asked to retire early. This cost-saving strategy is possible at Dutch universities, and is applied occasionally. Dutch researchers go into early retirement, receive pensions, and continue to work at the university. There is an obvious financial advantage for the university and little disadvantage for the academics if they are close to retirement anyway. If a faculty is in financial difficulties, the existence of such an opportunity creates a strong pressure on those who can take it. If they do not agree, there is the possibility that some other unit or some of their colleagues are made redundant.

The senior staff of the biology group agreed to help their department with its financial problems. However, their early retirement turned out to be only a temporary solution for keeping the original profile. When the faculty ran into financial problems again, the department and faculty felt unable to honour their previous agreements. The head of the biology department, strongly backed by the dean of faculty and the financial

officer, imposed the original plans. For this purpose the faculty created a committee with 'outside experts', who again had the task of recommending a profile and a structure for the department.

Several factors indicate that the restructuring was triggered off by financial problems and that it served the purpose of solving them rather than creating a specific profile. Thus, an important criterion for including or excluding research topics in the second round of profile building was the amount of external funding acquired by the different research groups. Research performance, on the other hand did not seem to be a selection criterion. During the last research assessment, the international review committee had positively assessed the biology group's research and had recommended to keep this group. These recommendations were disregarded in the decision-making process.

Removing a Discipline from University 4

This section is based on an extensive description of a profile-building process published after the closure of Utrecht University's institute for astronomy by its last director (Keller, 2012). The account was triangulated by other sources (blogs of researchers, press releases of the university) and additional inquiries.

The decision on the faculty's profile was a response to a budget deficit. When the university's faculty of science was created by merging several science departments, some of them brought substantial budget deficits into the new faculty. The department of astronomy and physics did not but was now part of a faculty that started with financial problems.

Apparently unconvinced by the faculty's own plans for overcoming its problems, the executive board of the University of Utrecht commissioned two 'outside experts' to provide external advice on how to solve the problems of the faculty. Their recommendations deviated from the faculty's own perceptions and plans. The dean of the faculty resigned, and an interim dean was appointed for seven months. The interim dean appointed a committee (whose membership was kept secret) to advise him on the different institutes of the faculty. This committee advised the dean that astronomy should remain in Utrecht but that the previously planned additional investments for the institute should not take place. The institute achieved an agreement with the interim and the prospective dean according to which the existence of the institute of astronomy was secured. The institute for astronomy had received a very good assessment in its last

external evaluation, which was confirmed by a public internal ad hoc evaluation. The results of an additional ad hoc evaluation commissioned by the dean were kept secret. Keller quotes the dean's answer to his criticism of the secret nature of this evaluation:

> Yes, as a scientist I respect the wish of scientists to be evaluated according to a well-defined objective, quantitative procedure. In contrast, most of the decisions that I will have to take concerning which units of the faculty we will discontinue do not strictly depend on such a procedure. (Email of the Dean of the Faculty of Science at Utrecht university to C. U. Keller, 2012, p. 4)

For reasons that are unknown to Keller (he suspects an intervention by the university's executive board) the previous agreement was overturned, and the dean of the faculty decided to discontinue astronomy. According to Keller, the dean provided only very vague reasons related to the content or quality of research and teaching. The institute was split into three parts that were moved to three other Dutch universities.

The loss of a strong university institute had consequences for local collaborations which were epitomised by a large and prestigious theoretical physics group leaving the University of Utrecht after the institute for astronomy was closed. The group leader explicitly referred to the closure of astronomy as a reason for her move:

> My institute does not operate in an isolated environment; the elimination of other excellent groups in the department of Physics and Astronomy affects us considerably. (*Digitaal Universiteitsblad*, 4 April 2012, our translation)

The researchers themselves (here: the physicists) exercised authority over their research goals in that they moved away from unfavourable research conditions produced by the university through its profile-building activities. The reduction of theoretical physics in quantity and quality within the organisation was an unintended effect of these activities.

Authority Relations and Strategies of Profile Building

A comparison of the processes of profile building shows a pattern in authority relations concerning research profiles. In none of the cases did researchers lose the authority over their research goals. Some of them lost the opportunity to continue their research at their university due to being forced to leave or voluntarily leaving in response to worsening conditions. This is, however, different from having other authoritative agencies

intervening in the formulation of research goals or tying the provision of resources to specific goals.

While profile building does not 'reach through' to the formulation of research goals, it decides on the presence of research areas and their access to resources, which are important conditions for the formulation of research goals. Three distinct combinations of thematic structuring and resource allocations occurred in the cases presented above.

Purely Thematic Re-Contextualisation

This strategy consists of developing a new description of research activities without changing them. For example, links between research fields can be emphasised by subsuming them under new headings, or links to external expectations can be emphasised by describing existing research in a new way. This strategy can be applied to create a seemingly new profile because research is a multivalent process and thus can be linked to a number of different descriptions without being misrepresented. For example, a university can pretend to give priority to some 'new' topics without actually changing the allocation of resources. This strategy was applied by the humanities faculty in university 1.

Thematic and Financial Prioritisation

This strategy links new descriptions of research to changing the relative weight of topics in the new profile, which is supported by a matching allocation of resources. The latter can happen either by mobilising additional resources or by taking away resources from non-priority areas and allocating them to the new priority topics. It implies that only some research themes are included into the new profile. The changes in the allocation of resources do not lead, however, to the appearance of new or the disappearance of existing research. The university keeps all research efforts but changes their prospects of development. This strategy was applied by the science faculty in university 1 and by university 2.

(Positive or Negative) Selection of Topics

In contrast to the previous strategy of prioritisation which can be seen as shifting emphasis, this strategy leads to a sharp change of profile. It includes the import of new research or the removal of existing research. In the first case, additional resources or resources taken away from non-priority areas are used to create positions and infrastructure for a new area, which is usually linked to some existing priority area. An example of this strategy has been observed by Lucas (2006, pp. 100−104) in a British university.

Noticing that all biology departments that were rated highly in the research assessment exercise had biotechnology in their profile, the observed department decided to import biotechnology in its research profile. The opposite strategy, negative selection, means entirely removing topics, for example by taking away all vacant positions or by negotiating the redundancy of staff. Negative selection is usually motivated by the necessity to free resources, either for investing them elsewhere or for reducing budget deficits. It was applied by a faculty in university 3 and by university 4.

The occurrence of these strategies in our cases is linked to specific patterns in the distribution and exercise of authority summarised in Table 1, which we will now further discuss. Authority over research profiles, that is concerning decisions about what research areas should be at the university and how strong these areas should be, was held by the university executive board in all cases. When the modification of whole university profiles was decided upon, this authority had to be shared with researchers because existing research competences and priorities limit the options a university has. While researchers and research groups always have a spectrum of possible directions for future research, this spectrum is limited, and formulating topics outside the spectrum risks loss of performance. This is why researchers have authority over the generation of options for a profile. In some cases, authority over options had to be shared with managers at several levels of the hierarchy. However, the options were generated by researchers, and higher-level managers only reserved the right to select among them (a right which was not exercised in the cases analysed by us).

The situation was different, however, when research areas had to be removed for financial reasons. Again, these processes have very similar authority structures. The university management shares authority with internal and external expert committees rather than researchers. Veto rights are exercised if the higher-level management is not satisfied with the outcomes of processes.

THE IMPACT OF PROFILE BUILDING ON RESEARCH FIELDS

In the previous section, we discussed characteristic strategies and financial instruments for profile building at Dutch universities, and some of the consequences for research in these universities. We now turn to the

Table 1. Authority Relations in Different Strategies of Profile Building.

University	Strategy	Authority over Options for Profile	Authority over Selection of Options	Authority over Allocation of Funds	Veto Positions	Changes in Profiles
1	Thematic re-contextualisation	Researchers, research programme leaders	Research programme leaders	Faculty board	Faculty board (not used)	Virtually none
1	Thematic and financial prioritisation	Faculty management, shared with university executive board and senior staff	Faculty management	Faculty management	Faculty management (not used)	Growth of two research areas
2	Thematic and financial prioritisation	Researchers, research institute leaders	University executive board, shared with expert committees	University executive board, shared with funding agencies and national elites	University executive board (not used)	Growth of selected research areas
3	Negative selection of topics	Dean, shared with internal committee	Dean, shared with science policy committee	Dean, shared with science policy committee	Dean, head of Department (used, see next row)	see next row
3	Negative selection of topics	Dean, shared with internal committee	Head of department, shared with dean	Head of department, shared with dean	none	Removal of several research areas
4	Negative selection of topics	University executive board, shared with external experts	Dean and university executive board	Dean and university executive board	Dean (used)	Removal of one discipline, loss of one field

consequences of these strategies at the national level of fields of research. In each case, the strategies described in the previous section have been applied by all universities that host groups from a field, thereby creating aggregate effects at the field level.

The Extinction of Dutch Evolutionary Developmental Biology

Evolutionary developmental biology (evo-devo) is an interdisciplinary research field that combines evolutionary biology and developmental biology. It investigates the evolution of developmental processes, aiming for a mechanistic understanding of phenotypic change (Sommer, 2009, p. 416). It can be traced back to the end of the 1970s, when it became more and more obvious that neo-Darwinian theory was unable to account for all the empirical findings of evolutionary biology, was fuelled by discoveries of genes (HOX genes) regulating embryonic development in the 1980s, and got further impulses through the development of molecular technology techniques (Müller, 2007; Raff, 2000). Researchers who want to start evo-devo research may come from a variety of fields, mainly from evolutionary biology and developmental biology. By now it is an accepted field world-wide, still strongly rooted in its original disciplines, but with its own conferences and journals and emerging career tracks (for an extended representation of the evo-devo case − see Laudel et al., this volume). It is fundamental research that is difficult to link to medical or agricultural applications. It can be cost intensive if comparative experimental studies are undertaken, and will often fare low on common citation-based indicators due to its newness and interdisciplinary nature.

Evo-devo was originally deemed an underdeveloped area in the Netherlands by the scientific community, which led to the creation of a chair for evo-devo at one university. This chair was created at the initiative of a bioscience faculty, and was co-funded by the research council and the university. Shortly thereafter, however, evo-devo research suffered from negative selection of related fields at several universities and prioritisation of other areas at other universities.

At the university at which the chair was created, a subsequent long phase of reorganisations eventually led to the closure of an evolutionary biology institute. The top management of the university had put pressure on the faculty to solve their budget problems. An 'expert committee' was recruited for preparing the decision. It considered the evolutionary biology group's potential to acquire external funding insufficient despite the

high quality of the research, which was confirmed by a previous regular evaluation. The decision to close evolutionary biology had an effect that none of the profile builders anticipated: the largest and internationally highly recognised Dutch evo-devo group left the university shortly after. The prolonged process of decision-making about the fate of research groups had led to an atmosphere that researchers considered as unfavourable. Two leading evo-devo researchers went abroad. Although moves between universities usually have several reasons including the prospects of the new post (as was the case with those two researchers), a general pattern emerges in this case of simultaneous migration. Several tenured senior researchers moved to posts elsewhere, which can be traced back to the reorganisation.

> What I have seen now already a couple of times happening in various places where I've worked, people get a bit sort of nervous; if they're getting an opportunity to [establish] a good research group elsewhere they leave. Two or three good people left in that group.

A similar fate was met by one of the first Dutch evo-devo groups who had just started to move into the direction of evo-devo. The group leader (a professor) had secured an external grant and had several PhD students and postdocs working in this area. In the late 1990s the faculty had to reduce its number of permanent positions due to financial problems. As a result, the professor was forced to retire. The faculty appointed a new chair in a priority area which would enable large-scale collaborations with others. PhD students and postdocs whose professors retired or were obliged to retire went abroad or left science. As a result, the original evo-devo research lines, that had only just started to gain momentum, stopped.

In addition to universities there is one public research institute (the Hubrecht Institute funded by the Dutch Academy of Science) that is a potential host for evo-devo research. This institute had a long tradition in developmental biology, it is fully autonomous, and the directions of its research are decided by the institute's director. This director, a member of the national elite of biological research, was not interested in, and even hostile to, evo-devo research. Owing to his specific interest, the institute has shifted its research away from developmental biology, and has recruited research groups in other areas of biology. The second reason for this shift is the strong dependence of the institute on external funding and funding agencies' thematic expectations (see below). As a consequence, almost no evo-devo research is conducted in this institute.

Apart from effects that can be traced back to universities' and the public research institute's profile-building activities, other conditions had a strong influence on the development of the field, most notably external funding opportunities. In recent years, the most important funding agency for fundamental biological research in the Netherlands has shifted its funding more and more into an applied direction and earmarked thematic programs. Success rates for small investigator grants have gone down from 30 to 20% in the biology area. This led to significant increase in the competition for grants between evo-devo researchers and well established fundamental biology groups.

> There is this orientation towards fundamental research in Arabidopsis. There excellent groups exist. And they are very competitive in these grants, for example Vidi or Vrije Competitie. But with evo-devo I felt we never had much of a chance.

Several researchers had difficulties in pursuing their evo-devo research because they could not get grants for it. The unfavourable climate contributed to career decisions to leave the Netherlands and to do evo-devo research abroad.

Different from other countries who have large well-known evo-devo laboratories (e.g. the United Kingdom, Germany, Switzerland), research in evo-devo in the Netherlands exists today as scattered activities of individuals. What the researchers themselves refer to as 'hardcore' experimental evo-devo research hardly exists.

> So I would say I actually don't know if evo-devo has any significant presence in the Netherlands any more. […] I think evo-devo doesn't really have a presence in the Netherlands, unless there may be some plants people that do evo-devo type research. […] Some of its work may be classifiable as evo-devo. But I wouldn't know. (Dutch evo-devo researcher, currently working abroad)

The combined actions of authorities − state expectations, funding agencies' priorities, managerial decisions of research organisations − all went into the same direction, and thus drove evo-devo in the Netherlands close to extinction.

Chilling out Bose-Einstein Condensation

Bose-Einstein condensate (BEC) is a state of matter that occurs when gases of atoms or subatomic particles are cooled to near absolute zero degree Kelvin (see Laudel et al., this volume on BEC). In 1995 the first BEC was experimentally produced by two US groups. This achievement

has first triggered attempts at replication. After it became apparent that BEC can be used for a wide range of fundamental research several sub-fields of physics, BEC research grew rapidly. Today, more than 100 experimental groups and a multitude of theoretical groups worldwide work on BEC.

The Netherlands had a long tradition in atomic and laser physics and were particularly well positioned to move in this new direction. One Dutch research group belonged to the pioneers of BEC research and made impor-tant contributions on the route of experimentally realising a BEC for the first time. Other groups had already incorporated laser cooling techniques in their research. However, the successful production of BECs and interest-ing research with them came rather slowly. In the mid-2000s, four groups had succeeded in producing a BEC and established experimental BEC as their main line of research.

When universities began to build research profiles, atomic and molecular optics (AMO) physicists in general and BEC researchers in particular found themselves in a situation where they did not fit into a priority area. Although there was no immediate threat for the existing groups, not belonging to a priority area also meant that AMO physics and BEC research is not a growth area. New professors are more likely to be appointed in the priority areas of the universities.

And now the focus is shifting to use these lasers for life science and biomedical optics. So we have some new professors in biomedical optics. That's where most of the money goes.

I: And who made this shift?

That is on the highest level of the university. At the highest level of university is decided that the natural sciences should focus their research more on the medical center (that's the big thing over there). Actually, that does not hold so much for our research. So, we are a bit in a different situation. But if we keep up the quality we survive.

I: But why actually? It sounded as if the university didn't really hinder your research but didn't also promote it too much?

No. Now, in recent years universities are struggling. And they need to have their profile. And [our university] focuses on medical research.

I: Yes. But you have your lasers and you get your money from [the funding agency] FOM. How can they make you uneasy?

They don't throw us out yet. But in chemistry now they made plans … chemistry had to make budget cuts. And they keep the people who are in the life sciences. So, if there is at any point these political decisions are coming that there must be budget cuts made, the [university] would choose to keep the life sciences.

But the problem is that BEC research is not the focus of this department. […] We are in another reorganisation at the moment. And it is much easier if you can say, okay, but I'm in the focus.

Beside research profile-building activities of universities, profile-building decisions of the most important non-university institute in this area had also influenced BEC research. Strongly backed up by the national physics community, the agency funding the institute decided to move research towards biophysics. Biophysics was considered a neglected field and necessary to catch up with international developments. Consequently, it was decided not to invest into BEC research, despite the fact that the institute provided an ideal infrastructure and hosted the most successful BEC researcher.

As a result of these trends, the dynamics of BEC research in the Netherlands markedly differs from the international trend. While the field still grows worldwide, new professorships are devoted to BEC in Germany, and countries like Switzerland initiate research with BEC (see Laudel et al., this volume), Dutch BEC research is stagnating rather than growing, and its situation may become precarious.

CONCLUSIONS: CAUSES AND CONSEQUENCES OF PROFILE BUILDING

Profile building at Dutch universities emerged at the intersection of three major shifts in the governance of research over the last decades. Science and higher education policy considers that the Dutch state is unable to fund research across all fields and topics, and has introduced policies to focus research funding on some areas while, by implication, abandoning others. This policy includes the demand that universities should not all do the same research, which is implemented rather forcefully. The requirement for focus and (critical) mass is accompanied by directions what to focus on and where to create mass. The policy shift to more and stronger demands for 'useful' research has made the state define research areas that promise contributions to the solution of societal problems. These areas have been set up as targets for university profiles, and have been made attractive by the redistribution of public funding.

Thus, the history of profile building of Dutch universities is a history of universities and academics losing authority over research topics. Universities lose authority to the state, and researchers lose authority to both the state

and their universities. While the latter process is in line with the NPM ideology, which promotes increasing action capabilities of universities by strengthening hierarchical steering, the former is not. Quite contrary to the political announcements of increasing the autonomy of universities, Dutch universities have lost autonomy over their research profiles. Higher education reforms appear to have merely changed the channel though which authority over universities is exercised, which makes the newly granted autonomy contingent on state interests (see also Enders, De Boer, & Weyer, 2013 on 'regulatory autonomy').

The shift in authority relations concerning the formulation of research topics that has been produced by Dutch NPM reforms can be described as follows. Academics at Dutch universities retain the authority over their formulation of research goals, although they lost some of their authority concerning the profile building. Their authority is epistemic authority, that is authority that is based on their exclusive access to the knowledge that is necessary to design research topics and goals (Whitley & Gläser, this volume). This is why the university leadership, which by now has the ultimate formal authority to shape research profiles, devolves any processes in which a profile needs to be constructed from existing research. Only if budgetary considerations are dominant, and consequences for research seem less important, university management uses formal authority to override the epistemic authority of researchers, usually by using outside experts as a source of information on the research and as a source that is supposed to legitimise their decisions.

The consequences of these two profile-building processes are manifold. Only some of them are anticipated, and even fewer are taken into account in the two processes of profile building. Within universities, at least some researchers in fields that are given a lower priority feel unwelcome and threatened. Even if a prioritisation strategy lets them stay with the same or slightly reduced funding, they know that their position will become precarious whenever budget problems occur. Prioritisation strategies and increased selectivity of resource allocation in the university create a tendency to crowd out researchers in non-priority areas. These researchers begin to leave the university whenever the opportunity arises.

These shifts and the removal of topics usually sever collaborative ties within the university. They thus affect the removed or devalued topic's (previous) environment in ways that are difficult to understand and to predict. This was the case with the astronomy institute at Utrecht University, whose disappearance discouraged theoretical physicists. It may also affect the general climate for research as we have seen for the field of evo-devo

where the closure of one institute from a closely related field led evo-devo researchers to leave the university. The case of BEC is quite similar because the development in the Netherlands ground to a halt at a time where BECs become a research method that is used in an increasing number of subfields of physics.

The most severe consequences of profile building occur when a field disappears entirely. This kind of quasi-market failure has been discussed in relation to research evaluation systems (Gläser, 2007). The creation of research profiles by Dutch universities occurs in a similar situation. Through creating their profiles, the universities compete for money, both the additional block funding that is conditional on having the 'right' profile and research council funding that is increasingly shaped by research priorities set by the Dutch state. The signals the universities have to follow are the same for all universities and include priority areas of research set by the state, the state expectation of utility, and the necessity of maximising grant income, which is increasingly shaped by the same state expectations. We have shown that the management of Dutch universities has the formal authority to significantly strengthen or to remove research areas from their profile, and that university and faculty leaders do exercise this authority. If all universities follow the same signals when shaping their profiles, they are likely to positively and negatively select the same research topics, which leads to the growth of some fields and the disappearance of others at the national level. This has almost happened with Dutch evo-devo research, and may well happen with BEC in the future.

Thus, the current authority relations in Dutch higher education create a propensity for quasi-market failure because they combine thematic priorities prescribed by the state, a powerful demand for profile building of universities, financial problems of many universities and authority structures at universities that enable far-reaching changes of profiles. The warning about a possible quasi-market failure in Germany, namely the disappearance of the so-called 'small disciplines' (HRK, 2007), indicates another possible reason for such failure, namely the ubiquitous belief that the creation of 'critical mass' of research activities in an area creates better research (Schiene & Schimank, 2007). Such a quasi-market failure would have taken a very long time to occur due to the much lower authority of university management in Germany, which can only intervene when professorships become vacant. However, the example indicates a possible systematic side-effect of NPM: Transforming the governance of universities to sending strong signals via quasi-markets creates opportunities for quasi-market failures.

The argument that the small size and financial situation of the Dutch higher education system require the concentration of resources does sound convincing, and the current processes will very likely lead to a strengthening of research areas science policy wants strengthened. The loss of university autonomy in the process and the shrinking or disappearance of research fields are, however, inevitable side-effects of these processes whose long-term impact on the Dutch science system is difficult to predict.

NOTE

1. The Executive Board is the highest internal governing and administrative body in higher education institutions. It consists of three persons, including the Rector Magnificus. All members are appointed for a 4-year term by the University's Supervisory Board after receiving the views of the University Council. It assumes the ultimate responsibility for the policies of the university, including the appointment of deans, directors and professors. The Board is legally entitled to initiate new programmes and related research institutes and is responsible for managing the university's finances and other management tasks. The division of labour between the members of the Executive Board differs from university to university.

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