Rathenau Instituut

Spinning plates

Funding streams and prioritisation in Dutch university research

Report

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Publisher: Rathenau Institute

Editing: René Rector
Photography: Nick Agelidis
Layout: BOVEN DE BANK
Translation: Balance

Preferred citation:
Elizabeth Koier, Barend van der Meulen, Edwin Horlings and Rosalie Belder, *Spinning plates - Funding streams and prioritisation in Dutch university research*. The Hague, Rathenau Instituut 2016

Foreword

The present report offers a detailed analysis of how university research is financed in the Netherlands. It is based on an analysis of the budgets and annual financial reports of government and of research organisations. We have also used data drawn from our surveys of university deans and members of the Royal Netherlands Academy of Arts and Sciences and The Young Academy for our report 'De ontwikkeling van vakgebieden in Nederland'.

Competitive funding
Our report shows that a much larger proportion of Dutch university budgets consists of competitive project funding than the official figures show. Funding bodies such as the European Union and the Netherlands Organisation for Scientific Research (NWO) usually cover only a portion of the total costs of a research project, leaving universities to cover the rest with ‘matching’ funds. They do that by using money received through the first funding stream (i.e. direct government funding) – meant to pay for teaching, research and the general university infrastructure – to cover their share of projects that have been awarded funding.

Science policy and faculty
The mechanism described above forces universities to make choices at faculty level because that is where external funding enters the university. It is in the faculties that science policy ultimately takes shape. There are major differences between faculties, however. That is why the various policy measures that faculties deal with affect each one differently.

Difference in perspectives
The unanticipated way in which funding streams and policy measures affect one another also causes major differences in how policymakers and researchers perceive matters. Individual researchers may find themselves in very different situations.

Conclusions of the study
- Deans play a key role in coordinating different types of funding and policy measures.
- The policy effects vary as much within research fields as between them.
- The pressure to compete for funding, fuelled, for example, by the rise in EU funding and thus growing pressure to match funds, is much greater than the ratio between first and second-stream funding would have us believe.

Spinning plates
Plate spinning is a circus act in which a juggler tries to spin as many plates as possible at one time on a series of poles. It was the image that forced itself upon our researchers as they analysed the responses to their survey of university deans. At first glance, science policy appears to involve two parties: government and researchers. However, a whole series of policy measures and allocation mechanisms have been created between these two that converge within the university. In the real world, it is up to university deans to keep the plates spinning, something that considerable energy and attention. We hope that our report will lead to a new and better understanding between researchers and policymakers, so that the faculty plates can continue to spin smoothly.

We would like to thank a number of people who have assisted in this study: Anouschka Versleijen, Margo Strijbosch and Eva Hoogland for their suggestions, data and time, and Jack Spaapen, Ans Vollering, Erik van de Linde, Arie Korbijn, Laurens Hessels and Jos de Jonge for helping us with the survey.

This study comes under the theme 'Between science policy and research practice', part of the Rathenau Institute's 2015-2016 work programme.

Yours sincerely,

Dr Melanie Peters
Director, Rathenau Institute

Summary

Prioritisation is a constant in Dutch science policy. Although the language of policymaking has changed over the course of time, the thinking behind that policy has remained the same: as a small country, the Netherlands cannot excel at everything. It must be selective. The assumption is that concentration and competition are good for the quality of research.

Three different measures play a role in the government's current prioritisation policy: strategic positioning, the government-designated Top Sector policy, and the Dutch National Research Agenda. These policy measures have led to broad discussion about the size of public investment in research, about the allocation of funding among researchers and the growing competition for scarce resources, about the autonomy of science and citizen engagement, and about choosing between research priorities and diversity and between basic and applied research.

The Rathenau Institute observes that these discussions are devoid of hard data on the effects of policy and the allocation of funding. Policymakers lack information about the way policy influences the universities, the most important parties in scientific research and autonomous in their spending decisions and selection of research subjects. That autonomy means that discussions of research funding tend to ignore faculties, even though it is the faculty that implements many policy incentives. Researchers also regularly misconstrue how research funding is allocated.

Purpose and questions
The purpose of this report is to examine how university research is funded in the Netherlands and how the Dutch government's prioritisation policy affects researchers. We have analysed the mechanisms that play a role in the relationship between the government's prioritisation policy and research practice, based on data that we have collected and present systematically here. We have examined the size and allocation of the various sources and types of funding and studied the perceptions and practices of deans and researchers.

It was explicitly not our intention to analyse or evaluate the policy itself. We hope that this report will provide a factual basis for discussions of science policy, so that the discourse can focus on policy choices rather than figures.

Title
'Spinning plates' refers to the key role of the dean as faculty administrator. It is within the faculty that funding streams and their strategic consequences converge. This is where all the separate components must be coordinated: the minister's policy objectives, the priorities identified by the university's executive board, funding awarded by NWO within the context of its Talent Scheme, the government's Research Excellence and Top Sector policies, EU funding, investment in infrastructure, successful lines of research, and, last but not least, changes in student preferences. Like a true juggler, it is the dean's task to keep all the plates spinning.

Approach, data and methods

We have taken information from the central government's national budgets and annual financial reports and the annual reports and annual accounts of universities, university hospitals, funding bodies and institutes. We supplemented this information with data from the University Hospital Interdepartmental Policy Study and – after approval by all universities – with information about their internal allocation models, collected within the context of the Science Policy Interdepartmental Policy Study.

Our study of the funding streams *within* universities and what researchers think about the allocation of funding is based mainly on research conducted in cooperation with and at the request of the Royal Academy's Advisory Committee on 'Blank Spots' in University Research. We developed and conducted two surveys for this purpose. The first was distributed to deans at Dutch universities and concerned research funding, policy impacts and strategy development within faculties. The second was distributed to members of the Royal Academy and The Young Academy.

Dean as juggler

Science policy often comes down to funding, and priority-setting in research is often stimulated by changes in funding. The Dutch Ministry of Education, Culture and Science encourages the strategic positioning of university research by awarding performance-dependent funding from the first funding stream. The Ministries of Economic Affairs and Education, Culture and Science use the competitive allocation of funding by NWO and other channels to align university research more closely with the requirements of the Netherlands' top economic sectors.

Many science policy initiatives and many of those participating in public debate assume that government policy incentives are passed on directly to researchers. Our findings contradict this assumption. In Chapters 2, 3 and 4, we describe as precisely as possible how government funding of university research is allocated. Our analysis shows that stakeholders are constantly required to make other choices and to coordinate the government's policy incentives with their internal strategies, with the desire to maintain some continuity in teaching and research, and with other changes. University executive boards make choices in line with the principle of university autonomy. The deans then make further choices. Researchers seek to chart their own course between all the various funding sources and policy incentives.

In Chapters 5 and 6 we discuss the effects of policy as witnessed by deans and perceived by researchers, based on the results of two surveys. Deans are reasonably positive about the financial effects of the government's prioritisation policy. Researchers generally expect this policy to reduce their funding. They believe that policy is largely responsible for the contraction of research fields, but attribute their expansion to dynamic internal processes. The blend of funding sources for research varies considerably, both within faculties and within research fields.

One notable point is that funding tends to differ less between domains (e.g. Language & Culture, Health & Life Sciences, and Engineering & Agriculture) than within them. The domains are much less homogenous then we thought they were at the start of this study. That means that we must exercise caution when making assertions about the effects of policy on certain domains. What we have noticed is that researchers in the Engineering & Agriculture domain are more positive about

the possibility of undertaking promising research, and that they feel more disadvantaged by the discontinuation of the Economic Structure Enhancing Fund (FES). We have also noted that virtually all researchers in the social sciences and humanities expect their funding to be cut owing to the government's policy of prioritising the top economic sectors (Top Sector policy). These differences are not apparent between faculties, however. There are many different sources of revenue within the domains, and the anticipated and perceived policy effects also diverge widely.

Policy incentives are quickly absorbed into the broader dynamic of the faculty and of university-level teaching and research. Government allocation parameters should thus not be viewed as policy incentives, in particular when we consider the principle of university autonomy and the associated block grant funding system. The one exception appears to be the number of doctorates awarded. It is a relatively influential factor in the Ministry's allocation model and has made its way into all university and many faculty allocation models. As a result, many see this parameter as a 'bonus' – which it is not; technically speaking it is an apportionment formula – and regard the sharp focus on doctorates as a perverse effect.

The dynamics of research funding are clearest if we consider the role of the dean in allocation. Direct government funding, funding channelled through NWO and the European Research Council (ERC), other forms of competitive funding, and the rise and fall of student numbers all converge within the faculty. To keep all the faculty plates spinning, the dean must constantly seek balance and stability. A notable percentage of deans (94%) had amended their faculty's research strategy and/or internal allocation model in recent years, or were actively doing so at the time of the survey.

Deans amend the faculty allocation model and research strategy for three important reasons:

- To improve the faculty's strategic profile in order to attract outstanding researchers and/or develop new research fields
- To assist efforts to obtain competitive research funding
- To adapt to changes in student enrolment in study programmes and in student preferences for certain majors within study programmes.

The most important reason in virtually every field was to improve the faculty's strategic profile.

This brings us to two key observations regarding our question about the dynamics of strategic positioning. The first is that strategic positioning clearly takes place, but that it is fuelled mainly by local interaction between different situations and opportunities. The second is that the first funding stream appears to play mainly a facilitative role in the above. The first funding stream allows the dean to key into the dynamic forces of research and teaching and into external funding opportunities. The national policy of strategic positioning can legitimise the dean's efforts to improve the faculty's strategic profile. But national priorities – whether or not linked to the Top Sector policy, sector-specific plans or positioning agreements – are virtually never a decisive factor. Their facilitative role fits in flawlessly with the principle of university autonomy and the block-grant nature of direct government funding.

The importance of the facilitative role increases as the balance between direct and competitive funding tips towards the latter. Viewed from the national government's perspective, the first funding

stream (direct funding) for universities is ten times the size of the second funding stream. If that were the case, then it should be enough to allow the universities to use part of their direct funding for prioritisation purposes. However, the distinction between the first and second funding streams and the terminology used are antiquated and confusing. In Chapter 7 we present a new, functional classification of the current funding streams and see a more balanced relationship between direct funding and competitive funding. In 2014, direct funding was 2.2 times the size of competitive funding, and 1.3 times when it came to the portion spent on research. The matching requirement that year was 1,580 million euros or 65% of direct public funding used for research. When the ratio between the two funding streams is this even, deans can only improve their faculty's strategic research profile if they allow for the specific local situation.

Towards an informed discussion of research policy

One of the most important initial results of this study was our observation that there is a major shortage of hard data on the allocation of research funding. That shortage makes it virtually impossible to develop informed policy, estimate policy effects and know whether the priorities set by a funding body will have an impact. Dutch universities are highly dynamic places and neither their researchers nor policymakers in The Hague can predict the patterns that will emerge upon the heels of new policy. In Chapter 8 we clarify a number of points in the hope of facilitating a more evidence-based discussion of research policy and funding.

What does this mean for policy?

While the findings of this report tempted us to analyse the government's current science policy, changes in NWO and university research policy, we have refrained from doing so. Our main aim is to improve our understanding of research funding and policy effects. In addition, we propose a better classification system for the existing research funding. This new system makes plain why there has been such a huge disparity in recent years between data available on research funding and policy based on that data on the one hand and researchers' perceptions on the other. We sincerely hope that our findings and new classification system will lead to a new understanding between researchers and policymakers.

Acronyms and abbreviations

ACTS	Advanced Chemical Technologies for Sustainability
ALW	Earth and Life Sciences (NWO)
CW	Chemical Sciences (NWO)
DUO	DUO education executive agency
ERC	European Research Council
EW	Exact Sciences (NWO)
FES	Economic Structure Enhancement Fund
GW	Humanities (NWO)
HERD	Higher Education Research & Development
IBO	Interdepartmental Policy Study
KNAW	Royal Netherlands Academy of Arts and Sciences
MaGW	Social Sciences (NWO)
N	Physical Sciences (NWO)
NCF	National Computing Facilities Foundation
NGI	Netherlands Genomics Initiative
NIHC	National Initiative Brain and Cognition
NWA	Dutch National Research Agenda
NWO	Netherlands Organisation for Scientific Research
OCW	Ministry of Education, Culture and Science
OECD	Organisation for Economic Cooperation and Development
PPP	Public-private partnership
STW	Technology Foundation STW
TKI	Top Consortium for Knowledge and Innovation
TW	Engineering Sciences
UMC	University Medical Centre
VSNU	Association of Universities in the Netherlands
VWS	Ministry of Health, Welfare and Sport
ZonMW	Netherlands Organisation for Health Research and Development

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1 Introduction

Prioritisation is a constant in Dutch science policy. Although the language of policymaking has changed over the course of time – from 'task allocation and concentration' and 'selective contraction and expansion' to 'focus and mass', 'strategic positioning', 'top sectors' and 'research agenda' – the thinking behind the policy has remained the same: as a small country, the Netherlands cannot excel at everything. It must therefore be selective. The assumption is that concentration and competition are good for the quality of research.

Three different measures play a role in the government's current prioritisation policy: strategic positioning, the Top Sector policy and the National Research Agenda.

Strategic positioning: In 2011, the State Secretary for Education, Culture and Science published a report entitled 'Kwaliteit in Verscheidenheid' (Quality in Diversity) announcing measures that would give each university a clearer and more distinctive teaching prioritisation profile and introducing a number of internationally recognised and competitive priorities in Dutch research.[1] Strategic positioning belongs to a package of performance agreements between the Ministry and the universities set out in a Framework Agreement. Each university subsequently signed a performance agreement with the Ministry that is monitored by the Review Committee headed by Frans van Vught. The performance agreements involve a total of 3% of the national government's block grant.

Top Sectors: In the same year, the Minister of Economic Affairs informed Parliament of the launch of the government's Top Sector policy.[2] One of the aims of this policy was to make business needs and requirements a larger factor in how research funding is allocated by the Netherlands Organisation for Scientific Research (hereafter: NWO). Since then, businesses, researchers and government have cooperated closely in Top Consortia for Knowledge and Innovation (TKIs). The nine top sectors are Agri & Food, Chemicals & Bio-based Economy, Creative Industry, Energy, High Tech Systems & Materials, Life Sciences & Health, Logistics, Horticulture & Propagation Materials, and Water, Delta & Marine.

National Research Agenda: In the strategic agenda *2025 Vision for Science*, the Ministry of Education, Culture and Science describes the Dutch National Research Agenda (NWA) as a way to involve citizens in science programming so that science would have greater relevance for society.[3] The Agenda must meet a number of expectations: identify societal themes and top scientific fields, build on existing agendas, and connect with the Top Sectors and the EU's 'Grand Challenges'. It should lead to more third-stream funding, increase the public's involvement in research, build

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1 Ministerie van Onderwijs, Cultuur en Wetenschap, 2011, *Kwaliteit in verscheidenheid, Strategische Agenda Hoger Onderwijs, Onderzoek en Wetenschap*, The Hague: Staatsuitgeverij.

2 Ministerie van Economische Zaken, Landbouw en Innovatie, 2011, *Naar de top*, Kamerstuk 32637 nr. 1, Tweede Kamer.

3 Ministerie van Onderwijs, Cultuur en Wetenschap, *Wetenschapsvisie 2025, keuzes voor de toekomst* (The Hague, November, 2014).

cooperation throughout the knowledge chain, and increase the impact of research.[4] *Vision for Science* foresees the NWA playing a role in the allocation of specific sources of research funding, for example the Gravitation Grants, strategic positioning funds, the Top Sector funds allocated by NWO, and investments in large-scale research infrastructure.

These measures have led to broad discussion of several issues: the size of public investment in research; the allocation of funds among researchers and growing competition for scarce resources; the autonomy of science and citizen engagement; and the choice between research priorities and diversity and between basic and applied research.

More specifically, some fear that the Top Sector policy will erode research freedom and reduce the appreciation for research to its economic value. Strategic positioning and priority-setting could lead to 'blank spots' on the Dutch research map, i.e. fields in which Dutch researchers are no longer active and in which we therefore squander our knowledge. In its advisory report on this subject – based on data collected especially for this purpose by the Rathenau Institute, also used in the present report – the Royal Academy notes that there are no true 'blank spots' on the Dutch research map (KNAW 2015). There are, however, 'areas of concern' that require attention because they are suffering under the current policy.[5] There are also areas that are benefitting from the current policy, however.[6] Watchfulness remains necessary to prevent the concentration of research funding on certain themes from reducing the financial scope for basic, investigator-driven research, something that the Academy's advisory committee believes would be especially unfavourable for young, innovative research groups.

The Rathenau Institute observes that these discussions are devoid of hard data on the effects of policymaking and the allocation of funding. Policymakers lack information on the way policy influences the universities, the most important parties in scientific research, which are autonomous in their spending decisions and selection of research subjects. That autonomy means that discussions of research funding tend to ignore faculties. They usually only attract attention when they are in financial straits, but the darts are generally aimed at the university's executive board first, and only then at the Minister. It is the faculty, however, that actually implements many of the policy incentives.

Researchers also regularly misconstrue how research funding is allocated. Some believe that allocation within universities depends largely on number of publications and citations. Others assume that NWO allocates the lion's share of government funding. Both assumptions are incorrect. One typical example is the word 'PhD bonus', which suggests that universities receive *extra* money for every doctorate awarded; in fact, the funds are distributed by means of an apportionment formula based on a maximised budget.

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4 Letter from Minister Bussemaker (Education, Culture and Science), State Secretary Dekker (Education, Culture and Science) and Minister Kamp (Economic Affairs) to the Knowledge Coalition asking it to produce a National Research Agenda (23 January 2015). http://www.rijksoverheid.nl/documenten-en-publicaties/brieven/2015/01/23/brief-met-verzoek-nationale-wetenschapsagenda.html.

5 The report cites Dutch law, the Humanities, Sociology and Anthropology, Plant Sciences, Mathematics and Information Science.

6 The report specifically mentions bio(nano)technology, synthetic biology, research on ageing, the neurosciences and research making use of digital tools and big data.

1.1 Purpose and questions

The purpose of this report is to examine how university research is funded in the Netherlands and how the government's prioritisation policy affects researchers. We have analysed the mechanisms that play a role in the relationship between the government's policy and research practice, based on factual data that we have collected and present systematically here. We have examined the size and allocation of the various sources and types of funding and studied the perceptions and practices of deans and researchers.

It was explicitly not our intention to analyse or evaluate the policy itself. We hope that this report will provide a factual basis for discussions of science policy, so that the discourse can focus on policy choices rather than figures. We have thus been guided by the following questions:

- What principles can we recognise in the way in which public research funding is allocated at the various levels? And what is the relationship between the various funding streams?
- How does the government's prioritisation policy affect researchers? And what role do faculties play in this?

1.2 Structure of the report

In Part 1, we describe the three funding streams for university research (Chapter 2) as well as the allocation models that channel the money from the national government through the university executive boards, faculties and research units to researchers (Chapter 3). In Chapter 4 we show that the faculty is the pivot in distributing resources and selecting research subjects.

In Part 2 we analyse what deans have to say about the influence of policy (Chapter 5) and how prominent researchers perceive this (Chapter 6). This part specifically does not address the factual influences of policy, because those influences are difficult to isolate within the complex science system.

In Part 3, we process and analyse the results of the foregoing parts in two ways. In Chapter 7 we introduce a new functional classification of existing funding streams that offers a more accurate picture of the impact of the various types of funding and the objectives of the funding bodies. This gives us a better understanding of perceived problems in the research system, for example matching, competitive pressure and budgetary shifts owing to the Top Sector policy. In Chapter 8 we return to the points identified in this introduction.

The title of this report, 'Spinning plates', refers to the key role of the dean as faculty administrator. It is within the faculty that funding streams and their strategic consequences converge. This is where all the separate components must be coordinated: the minister's policy objectives, the priorities identified by the university's executive board, funding awarded by NWO within the context of its Talent Scheme, the government's Research Excellence and Top Sector policies, EU funding, investment in infrastructure, successful lines of research, and, last but not least, changes in student preferences. Like a true juggler, it is the dean's task to keep all the plates spinning.

1.3 Approach, data and methods

There is no central source to which one can turn for information about Dutch university policy and the university funding system. Almost none of the funding bodies provide a clear overview of the way in which funding is allocated and the consequences for individual universities. Documents sometimes contradict one another. Budgets are sometimes counted twice. Information that is available one year is not available the next. Definitions are ambiguous.

Based on available information, we have reconstructed the size of the various funding streams and the funding allocation system. We made use of many different sources that we tried to reconcile as well as possible. We used information from the central government's national budgets and annual financial reports, as well as the annual reports and annual accounts of universities, university medical centres, funding bodies and institutes. In some cases, the data we wanted was only available for a specific year. That is why this report covers data on 2013 and 2014. In highly exceptional cases, we had to go back to data from 2011. We supplemented this information with data taken from the University Hospital Interdepartmental Policy Study (IBO) (Ministerie van Financiën 2012) and – after approval by all universities – with information about their internal allocation models collected within the context of the Science Policy Interdepartmental Policy Study (Ministerie van Financiën 2014). Where the ambiguity of the definitions forced us to make explicit choices, we have noted this in the text. The results, including any estimates, were submitted to the staff of the specified organisations.

We then explored what happens to the funds once they have been channelled to the universities, and what researchers themselves think of how the funds are allocated. This part of the report is based mainly on a study carried out in cooperation with and at the request of the Royal Academy's 'Blank Spots' Advisory Committee.[7] We worked with the committee to develop and conduct two surveys. The first was distributed to deans at Dutch universities and concerned research funding, policy impacts and strategy development within faculties. The second was distributed to members of the Royal Netherlands Academy of Arts and Sciences and The Young Academy; its purpose was to gauge how prominent experts perceive the effects of various policy measures on their own fields and on the financial scope for investigator-driven research. The results of the two surveys have been published in a separate report (Koier et al. 2015). The present report is a more in-depth study of the government's prioritisation policy and the funding streams impacted by that policy. We have reused the survey data and at times presented it in a new format because it rounds out the picture of prioritisation policy in the Netherlands.

At the request of the Academy's 'Blank Spots' Committee, we sent an email in November 2014 to 89 deans at 13 Dutch universities asking them to participate in a survey. We did not include the Open University of the Netherlands or the smaller theological universities because they deviate too much from the customary structures to adapt the survey to their situation. We also did not include the university colleges, although some are classified as faculties. Wageningen University and Research Centre consists of a single faculty. There, the university executive board distributes the

7 The committee used the results of these studies in its advisory report, *Ruimte voor ongebonden onderzoek* (KNAW 2015),

funds in the first funding stream directly among the chair groups, which are accountable to the directors of their science groups. We therefore asked the directors of the science groups to complete the questionnaire. Of the 89 deans (including the science group directors), 68 ultimately completed the online questionnaire, a response rate of 76%.

The survey of Academy and Young Academy members was distributed among all active members of the two organisations between November 2014 and the second week of January 2015. Deans who are also Academy members were excluded from this survey. We asked a total of 265 researchers to participate. The final response rate, after eliminating those Academy members not affiliated with a Dutch university and partial responses, was 51% (n=135).

2 Funding streams

Universities receive funding from many different sources. It is customary to distinguish between the first, second and third funding stream. In general, the first funding stream is money that the universities receive directly from central government, plus student fees; the second funding stream consists mainly of public funds distributed to the universities by NWO, and for which the universities compete; and the third funding stream consists of funds that universities obtain through other channels. University medical centres have four funding streams: government block grants, funds channelled through Dutch and international bodies (including NWO and ERC grants), health fundraising organisations, and private enterprises.

Many discussions concerning the size and allocation of research funding refer to these funding streams. For example, some claim that the first funding stream is waning and a much larger share of it is being used to 'match' funds acquired through the second and third funding streams, that the third funding stream consists mainly of commercial contract research, and that the allocation of second-stream funds now favours the Top Sectors. We say 'claim' because there is much uncertainty about the nature and size of the three funding streams and how they are evolving, and because it is uncertain whether detailed study will uphold these assertions.

In this chapter, we review the funding streams for university research funding and calculate their size in terms of what is received by the university. Some passages in this chapter are fairly technical because we want to show which choices we have made in our calculations. An overview is provided at the end of the chapter.

2.1 Background

The primary purpose of the calculations provided in this chapter is to determine the size of the funding streams for the 13 universities and eight university medical centres in the Netherlands in 2014. The results reveal the total volume of university funding and the relative importance of the various funding streams.

The figures presented in this chapter are not precise but they are the best that we can produce given the information available. We base our work on data about specific research-related revenue and expenditure. Our main sources are the annual accounts and annual reports of the universities and university medical centres (hereafter: UMCs), the annual reports issued by the Ministries of Education, Culture and Science, Economic Affairs, and Health, Welfare and Sport, and the mandatory statement of itemised receipts and charges that the universities must report to the education executive agency (DUO) and the UMCs to their own specified agency (Jaarverslagen Zorg). In consolidating the data in the annual reports, there was some overlap between the universities' data and that of their UMCs. We have assigned such data to one of the two organisations, and that means that our totals may deviate from those published by DUO.

Additionally, and as a control measure, we have also taken information from the annual accounts and annual reports of NWO, Technology Foundation STW, the Netherlands Organisation for Health Research and Development (ZonMw) and the Royal Academy, from the 2012 University Hospital Interdepartmental Policy Study (IBO), and from the Rathenau Institute's own *Facts & Figures* publications. Any assumptions we have made in order to fill in missing information and resolve inconsistencies are always based on hard data. Where we have found it necessary assume certain data, we explain our reasoning in the explanatory notes to the tables.

Calculations of expenditure on research are based on the Rathenau Institute's TWIN data (Total Investment in Research and Innovation), i.e. annual figures showing which proportion of the first funding stream and student fees is actually destined for research. The calculation is based on figures by Statistics Netherlands and is explained in the TWIN figures for 2012-2018 (Steen 2014). These figures only include that portion of each funding stream that is channelled into research. A research percentage has been derived from this information for all funding streams.

The figures are rounded to millions of euros (whole figures). Because we round off the figures, it may seem as if the numbers in a table do not add up correctly.

2.2 First funding stream

The first funding stream consists of all funds that go directly from the national government to the universities and UMCs so that they can carry out their statutory tasks, plus student fees. Below, we differentiate between three components: (1) the government block grants provided by the Ministry of Education, Culture and Science and, in the case of Wageningen University and Research Centre, from the Ministry of Economic Affairs; (2) the funding provided by the Ministry of Education, Culture and Science and the Ministry of Health, Welfare and Sport for research and teaching at UMCs and (3) student fees.

The direct government funding is a block grant allocated to a university or university hospital. The recipient institution is free to decide how to spend the funds in order to fulfil its statutory tasks. The block grant principle is discussed throughout this report. It means that funds allocated to a university based on its performance of a specified task (e.g. number of students being taught) need not be spent on that same task (in our example, teaching). Neither do those funds need to cover the costs of that task.

One important reason for applying the block grant principle is that government cannot determine the ideal allocation of funds for all universities and UMCs or for the various disciplines that make up their organisation and the educational programmes that they run, nor can it monitor how those funds are spent. Indeed, such intervention is even more difficult if the idea is to differentiate between institutions and programmes.

In addition, the various tasks of universities and UMCs are closely intertwined. Buildings are used both for teaching and research. Academic staff teach, conduct research and valorise their knowledge. Students receiving tuition also perform research during the final phase of their study

programme. Junior doctors are trained in university hospitals and at the same time carry out care tasks. The basic idea is that university executive boards are better placed than the minister to determine how best to use funds internally to achieve their aims. Government can demand, however, that the institutions account for the proper performance of their statutory tasks. They do so by conducting evaluations of their teaching and research.

The block grant principle also plays a role in calculating the percentage of the first funding stream that is in fact spent on research. The model used by government to fund the universities and UMCs is an allocation model and says nothing about actual expenditure on research. We therefore used other sources to calculate actual expenditure on research.

2.2.1 Government block grant for universities and UMCs

Direct government funding consist of block grants allocated to the universities for performing their statutory tasks (see Box 1). Virtually all the universities receive their block grant from the Ministry of Education, Culture and Science. For historical reasons, Wageningen UR receives its direct funding from the budget of the Ministry of Economic Affairs. Economic Affairs uses the same system for this as Education, Culture and Science. The UMCs receive not only a government block grant for research and teaching from Education, Culture and Science, but also 'service provision contributions' (*beschikbaarheidsbijdragen*) from the Ministry of Health, Welfare and Sport for referred tertiary care,[8] R&D and teaching. Because these grants also qualify as direct funding, we categorise them in the first funding stream in this report.

The size of the government block grant is determined by the relevant Minister. If no policy changes are forthcoming, the amount is adjusted annually to reflect the wage and price index, unless a freeze or extra budget cut applies. Measured in absolute terms, the government block grant has increased in recent years. It is expected to increase further in the years ahead because the amount that becomes available by converting student grants into student loans will be added.

8 Referred tertiary care is care that can only be offered by university medical centres. It involves difficult, expensive or rare diagnostic and treatment categories that require advanced and specialist expertise. The law identifies referred tertiary care as one of the core tasks of UMCs.

Box 1: Statutory tasks of universities and university hospitals

Article 1.3. Institutions for higher education
1. The universities provide an academic education and carry out research and scholarship. In any case, they provide initial programmes of academic education, carry out research and scholarship, train researchers or engineers, and disseminate knowledge to society as a whole.
5. The universities, ideological universities and the Open University of the Netherlands are dedicated to personal development and to fostering a sense of responsibility to society. Within the context of their work with Dutch-language students, they promote facility of expression in Dutch.

Article 1.4. University hospitals
1. University hospitals are active in patient care and in medical instruction and research at the universities with which they are affiliated. They serve as tertiary referral clinics and tertiary referral centres in the health care system. They also assist in training medical specialists.
2. The university hospitals make an educational facility available to teach pupils admitted to hospital and supply information to the staff of a school guidance service to support their teaching, within the meaning of Article 180 of the Primary Education Act and Article 166 of the Expertise Centre Act.

Source: *Wet op het hoger onderwijs en wetenschappelijk onderzoek* as valid on 12-1-2016

Government block grants for universities

Information on the government's direct funding of universities has always been consistent. It can be found in the various ministerial annual reports, in the Rathenau Institute's *Facts & Figures* publications, and on the website of the Association of Universities in the Netherlands (VSNU). In 2014, the block grant that the government parcelled out to the universities and UMCs came to 4,285 million euros. This block grant consists of five components (see Table 2.1; for detailed information, see section 3.1), and the size of the grant is determined by component. It is not always easy to find out precisely how each component is calculated. Officially, the amount reserved for teaching is based on the number of students multiplied by the sum per student as reported by the Ministry of Education, Culture and Science in central government's national budget. In actual practice, that amount does not always match the outcome of the calculation.

The five components of the government block grant are (see also Table 2.1 and section 3.1):

- A teaching portion that is distributed to the universities based on teaching-related parameters and fixed percentages (38%)
- A research portion that is distributed to the universities based on teaching- and research-related parameters and fixed percentages (40%)
- Block grant from the Ministry of Economic Affairs for Wageningen UR (4%)
- Performance-dependent funding, consisting of a sum apportioned in accordance with the performance agreements between the Minister and the institutions (3%)
- An earmarked sum to support medical training and research at the UMCs (in-hospital training; 14%)

A portion of these sums is meant for the UMCs and overlaps with their government block grant. Although 'knowledge utilisation' – knowledge transfer for the benefit of society – is one of the universities' statutory tasks, no funds are allocated to them based on associated parameters. Table 2.1 provides an overview.

Table 2.1 Government funding for universities and funding transferred from universities to UMCs in 2014 (in millions of euros)

Funding body	Item	Total universities and UMCs	Transferred to UMCs
Education, Culture and Science	Main funding: teaching portion	1,642	500 (faculty grant)
Education, Culture and Science	Main funding: research portion	1,731	
Economic Affairs	Wageningen UR	169	
Education, Culture and Science	Performance-dependent funding	129	
Education, Culture and Science	Main funding: support for medical training and research	614	614 (in-hospital training)
Total		**4,285**	**1,114**
Net government block grants allocated to universities (excluding UMCs)			**3,171**

Source: *Rijksjaarverslag ministerie van OCW* 2014, *Rijksjaarverslag ministerie van EZ* 2014.

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Government block grants for university hospitals

A university medical centre (UMC) is a partnership between a university medical faculty and a university hospital. There are eight UMCs in the Netherlands. Direct public funding of UMCs is channelled through four different funding streams. Some of the funding meant for research and teaching comes from the Ministry of Education, Culture and Science (faculty grant and in-hospital training) and some from the Ministry of Health, Welfare and Sport (service provision contributions for the Teaching Fund and for Academic Care) (Chiong Meza et al. 2014). Table 2.2 shows the UMCs' revenue in 2014 by funding stream and associated statutory task. The table reveals that 29% of their total revenue is associated with teaching and research. Of this, 70% comes from the first funding stream.

Table 2.2 UMC revenue in 2014 (in millions of euros)

Funding stream	Funding body	Task	M€
Faculty grant	Education, Culture and Science and university executive board	Programme in general medicine and research	500 [a]
In-hospital training	Education, Culture and Science	In-hospital training for programme in general medicine and (basic) research	614
Service provision contribution for Academic Care	Health, Welfare and Sport	Tertiary referral care and related research	712 [b]
		–Tertiary referral care	*556* [c]
		–Development and innovation	*156* [c]
Service provision contribution for Teaching Fund	Health, Welfare and Sport	Specialist training	369
Insurance-funded care, service provision contribution, fixed portion	Health, Welfare and Sport, medical insurers	Basic care, tertiary referral clinic and tertiary referral hospital	4.394
Other government funding			40
Second, third and fourth funding streams	various	Research and innovation	671 [d]
Other business revenue			369
Total revenue			**7,669**
Total teaching and research			**2,214**
First funding stream, teaching and research			**1,543**

Note: a) The faculty grant for LUMC and MUMC+ in 2010 is based on the ratio faculty grant/in-hospital training of the other six UMCs in 2010 and 2014. b) National expenditure according to the UMCU Annual Report for 2014. According to the Ministry of Health, Welfare and Sport's annual report in 2014, total expenditure on 'Service provision contribution for Academic Care' was 708.7 million. c) Breakdown by estimated national budget for the two components according to the UMCU Annual Report for 2014 p. 129. d) Equal to the sum of second, third and fourth funding stream revenues for AMC, LUMC, MUMC+, UMCG, UMCU and VUmc, added to revenue from invoiced contract research for third parties by Erasmus MC and Radboud UMC.

Totals are rounded off to whole numbers (millions) and may therefore not match the sum of individual items.

Sources: *IBO Universitair Medische Centra* (2012), *Rijksjaarverslag ministerie van VWS* 2014, *Rijksjaarverslag ministerie van OCW* 2014, Chiong Meza et al. (2014), consolidated annual accounts of UMCs and universities in 2014.

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2.2.2 Student fees

Student fees have always been categorised in the first funding stream. In the past, students paid their fees to government, which then passed them on to the university along with the other funding. Nowadays, students pay their fees directly to the university at which they are enrolled, creating a direct financial relationship between the university and its student. That is why in Chapter 7, we present a new classification system for funding streams in which student fees are no longer categorised in the first funding stream.

The amount received in student fees depends on the amount collected in statutory fees and institutional fees and the number of students paying one or the other type of fee. Between 2004 and 2013, statutory student fees for a full-time programme rose from €1,476 to €1,835. Where the rate of increase exceeded that of the consumer price index, the government block grant was reduced by that differential. The number of students enrolled in a university programme came to 250,100 in 2014 and continues to climb (OCW, *Referentieraming 2014*).

2.2.3 Size of first funding stream

Consolidating the data on university and UMC funding allows us to calculate the size of the first funding stream and estimate the portion that – according to calculations by Statistics Netherlands – is spent on research. Table 2.3 provides a summary, in amounts as received (by the universities and UMCs). In 2014, the first funding stream provided 2,770 million euros for research, with 569 million euros (21%) going to the UMCs. Of the total amount from the first funding stream spent on research, 2,378 million euros (86%) came from the Ministry of Education, Culture and Science (and the Ministry of Economic Affairs). The other 392 million euros came from student fees (12%), the Ministry of Health, Welfare and Sport (1%), and government and other grants (1%).

Table 2.3 First funding stream received by universities and UMCs (in millions of euros)

Funding body	Recipient	Item	M€	% for Research (M€)
Education, Culture and Science, Economic Affairs	Universities	Allocation of government block grant excluding UMC	3,056 a)	60.7%
Education, Culture and Science	UMCs through universities	Faculty grant	500	2,157
Education, Culture and Science	UMCs through universities	In-hospital training	614	36.0% 221
Total government block grant for universities			**4,170**	
Students		Student fees	556	60.7% b) 337
Total first funding stream revenue for universities			**4,726**	
Health, Welfare and Sport		Service provision contribution for Academic Care	156	13.3% 21
Health, Welfare and Sport		Service provision contribution for Training Fund	369	0.0%
		Other grants for UMCs	40	60.7% b) 24
		Other government grants for universities	17	60.7% b) 10

Total	**5,308**
Adjusted for care-related expenditure Service provision contribution for Academic Care at UMCs	-136
Total after adjustment	**5,172**
Universities	*3,629*
UMCs	*1,543*
Amount spent on research	**2,770**
Universities	*2,201*
UMCs	*569*

Note: Research percentages are derived from the Statistics Netherlands calculations that underpin the TWIN figures (2013). a) After adjusting for the item 'Other changes and revenue carry-overs' (-17.1 million). b) Percentage brought in line with percentage for total government block grant (see also Steen 2013). There are no indications of a different percentage being applied in university and faculty allocation models. Totals are rounded off to whole numbers (millions) and may therefore not match the sum of individual items.

Sources: Table 2.2., *Rijksjaarverslag ministerie van OCW* 2014, Table 6.4. *Rijksjaarverslag ministerie van EZ* 2014, p. 94, annual reports and consolidated annual accounts of universities 2014, Steen (2013).

2.3 Second funding stream

Precisely which funds count as second funding stream depends on the information consulted. The second funding stream is often described as competitive government funding. The organisations classified as second funding stream in this report are NWO, the Royal Academy, Technology Foundation STW and ZonMw, which funds health care research. In Chapter 7 we will discuss the confusion concerning the second funding stream and propose a new classification system for current university funding. In this chapter, we review the information available about the second funding stream.

NWO awards grants and manages a number of research institutes. It is funded primarily through a government block grant furnished by the Ministry of Education, Culture and Science. In addition, various ministries provide targeted grants. External parties also contribute through public-private partnerships (PPPs).

NWO distributes much of the budget for research across its divisions, which then submit a budget estimate for the programmes they want to run. Table 2.4 shows the budget allocation in 2011; no division-specific data is available for the years thereafter. Different divisions often join together in funding one and the same programme. When approving the division budgets, NWO must allow for the funds earmarked by the Ministry (including those intended for Talent Development, STW, large-scale research infrastructure, and the Netherlands Initiative for Education and Research) and for Top Sector policy agreements (see section 2.3).

The Engineering Division is managed by Technology Foundation STW. The Medical Sciences Division has joined forces with the Netherlands Organisation for Health Research and Development in ZonMw. Most of the funds allocated to the Physics Division are spent by the Foundation for Fundamental Research on Matter (FOM). NWO also manages a number of interdivisional programmes and taskforces and funds the institutes.

Box 2: NWO

NWO is an independent administrative body for which the Ministry of Education, Culture and Science is responsible. It was founded in 1950, when it was called the Netherlands Organisation for Pure Scientific Research (ZWO). In 1988, it became the Netherlands Organisation for Scientific Research.

Statutory tasks

1. The organisation's tasks are to promote the quality of scientific research and initiate and encourage new developments in scientific research.
2. NWO performs this task specifically by allocating funding.
3. NWO also promotes dissemination of the results of the research it initiates and fosters for the benefit of society.
4. It focuses primarily on university research, taking special note of matters of coordination and promoting these where necessary.

Source: *Wet op de Nederlandse organisatie voor wetenschappelijk onderzoek* valid on 12-01-2016 (Article 3).

Table 2.4 Total expenditure per NWO division in 2011 (in millions of euros)

Division	Expenditure
Earth and Life Sciences (ALW)	61.4
Chemical Sciences (CW)	32.0
Physical Sciences (EW)	37.1
Humanities (GW)	43.7
Social Sciences (MaGW)	69.8
Physics (N) [a)]	45.6
Engineering Sciences (TW) [b)]	58.0
WOTRO Science for Global Development (WOTRO)	13.7
Medical Sciences (MW) [c)]	53.4
Central programmes [d)]	155.3
Basic institutional funding	97.2
Other outgoings [e)]	87.3
Total	**754,5**

Note: The amounts have been taken from NWO's consolidated annual accounts. Comments: a) largely through FOM. b) Managed by Technology Foundation STW. c) Managed by ZonMw. d) Does not include basic institutional funding. e) Spent on NCF, E-Science, ACTS, ICT, NGI and NIHC.

Source: *Jaarverslag NWO 2011*, Table 17.

Box 3: Technology Foundation STW

STW is an NWO domain. It receives funding from NWO, the Ministry of Economic Affairs and other sources, including programmes (such as the Talent Scheme), block grants, royalties, cash contributions to projects, and interest.

'STW's aim is to make optimal use of the funds entrusted to it for outstanding research in the applied sciences and engineering, and to encourage third parties to utilise the results of this research. It does this by funding outstanding research in the applied sciences and engineering, by bringing users and researchers together, and by guiding all its projects towards ideal opportunities for knowledge transfer. To succeed in its mission, STW is proactive in pursuing its own policy and responds to external developments.'

Source: Technologiestichting STW, annual report 2014.

Box 4: ZonMw

The Netherlands Organisation for Health Research and Development (ZonMw) is the result of an alliance between Netherlands Care Research [Zorgonderzoek Nederland] and NWO's Medical Sciences Division. Like NWO, ZonMw is an independent administrative body. Its activities cover the entire research spectrum, from basic medical research to application and implementation of research projects. Its most important clients are the Ministry of Health, Welfare and Sport and NWO.

Statutory tasks

1. The task of the organisation is to instruct others to carry out, or to fund or contract out, projects, experiments and R&D pertaining to health, prevention and care. The organisation further monitors the quality and cohesiveness of this work and encourages utilisation of the results.
2. Our Minister may issue a general order in council instructing the organisation to perform the work identified in the previous paragraph in other related fields, to be specified in the general order.
3. Subject to Our Minister's consent, the organisation may perform the work identified in the first paragraph at the request of third parties, insofar as such arrangements are cost-effective and the work falls within the fields referred to in the first or second paragraph. Ministerial regulations may impose further rules on work performed for third parties.
4. In performing its task, the organisation coordinates with the NWO and with other organisations that organise, fund or perform activities within the meaning of the first paragraph.

Source: *Wet op de organisatie ZorgOnderzoek Nederland* (Article 3), consulted 26-01-2016.

Table 2.5 Sources of funding for NWO, ZonMw, STW and the Royal Academy and size of second funding stream by source, 2014 (in millions of euros)

	NWO	STW	ZonMW	Academy
Assets, including institutes	**819**	**90**	**165**	**155**
Total Basic Funding	*769*	*71*	*162*	*97*
Min. of Education, Culture and Science (government block grant)	678			91
Min. of Education, Culture and Science (specific grants)	10			
Min. of Economic Affairs	28 [c)]	20		
Min. of Health, Welfare and Sport	0		108 [d)]	
EU	17			
Other	36			6
NWO funding		*51* [a)]	*54* [b)]	
Total other revenue	*50*	*19*	*0*	*57*
Grants and funding by third parties		7		42 [e)]
Enterprise	27			
Commercialisation and co-financing		10		
Other	23	2		15 [f)]
Grants awarded	**449** [g)]	**82**	**149**	**3** [h)]
Total second funding stream	**683 million euros**			

Note: a) € 57 million according to NWO's annual report for 2014 (p. 38). b) According to NWO's annual report for 2014 (p. 38). c) This may be the € 25 million channelled through the Ministry of Education, Culture and Science and NWO for PPP in basic research (*Rijksjaarverslag EZ* 2014, p. 42). d) €101,743 million in programming, €1,497 million in grants from the Ministry of Health, Welfare and Sport for commercialisation and €4,741 million in grants from the Ministry of Health, Welfare and Sport for programme management. e) Revenue from work performed for third parties. f) Includes revenue from designated funding. g) After comparing the consolidated and non-consolidated annual accounts and the allocation of funding in Table 10 on p. 38 of NWO's 2014 annual report, we took the amount allocated to third parties from the non-consolidated statement of revenue and expenses to avoid overlaps between the STW and ZonMw figures as much as possible. h) Only the Academy Professors programme and no amounts transferred from externally funded projects. Totals are rounded off to whole numbers (millions) and may therefore not match the sum of individual items.

Sources: *Jaarverslag en geconsolideerde jaarrekening NWO* 2014, *Jaarverslag Technologiestichting STW* 2014, *Jaarverslag ZonMw* 2014, *Rijksjaarverslag ministerie van OCW* 2014, Table 16.3, *Rijksjaarverslag ministerie van EZ* 2014, p. 94.

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Much of the funding that NWO distributes ends up at the Dutch universities. The remainder is destined for Academy and NWO institutes, with a tiny portion ending up with other scientific

institutes. Since the funding is competitive in nature, the universities differ in size and prioritisation profile, and some fields need more money than others, the amounts allocated to the universities differ from one university and from one year to the next.[9]

Table 2.5 compares the revenues and grants awarded by NWO, STW, ZonMw and the Academy. In 2014, the total amount that they awarded to universities, UMCs and other research institutions came to 683 million euros. This does not include the basic institutional grants that went to the NWO and Academy institutes. Of the total amount in grants channelled through the second funding stream, 66% was distributed by NWO, 22% by ZonMW, 12% by STW and less than 0.5% by the Academy.

This amount is not necessarily the same as the amount that universities and UMCs receive through the second funding stream. There were two reasons for this. First of all, funding awards are not the same as fund transfers. By awarding a grant, the funding body creates a multi-year obligation that results in the annual transfer of a portion of the grant. The university's annual accounts report the total received in annual transfers. Second, some of the awards go to non-university research institutions. That is why we have based our calculation of the total revenue received through the second and third funding streams on the annual reports and annual accounts of the recipients, i.e. the universities and UMCs (Table 2.6). According to their own reporting, the universities and UMCs together received 533 million euros in second-stream funds in 2014.

Table 2.6 Second and third funding streams, as received, 2014 (in millions of euros)

University / UMC	2nd funding stream	3rd funding stream	Total 2nd and 3rd	Other operating revenue
Total	**533**	**1781**	**2314**	**920**
Universities	*418*	*1224*	*1642*	*551*
UMCs	*114*	*557*	*671*	*369*

Note: For MUMC+, we calculated second and third funding stream revenue based on the average share that the two funding streams account for in the total revenue received by the remaining seven UMCs through the second, third and fourth funding stream. The third funding stream includes revenue that universities generate through contract teaching (178 million euros). Totals are rounded off to whole numbers (millions) and may therefore not match the sum of individual items.

Sources: Annual reports and consolidated annual accounts of universities, 2014, DUO *Jaarrekeninggegevens wetenschappelijk onderwijs*, final data reference date 31 December 2014, Jaarverslagen Zorg*, Wettelijk verplichte bijlagen Jaardocument Maatschappelijke Verantwoording* (DigiMV), Chiong Meza (2014).

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9 For the amounts per university, see NWO's annual reports.

2.4 NWO and the Top Sectors

In 2012, NWO concluded a knowledge and innovation contract with the Ministries of Education, Culture and Science and Economic Affairs undertaking to spend a certain sum on research related to the Top Sector themes by the end of the year. A total of 225 million euros was spent in 2012 and 2013, with the Ministry of Economic Affairs adding another 75 million euros. The agreement is that this sum will rise to 275 million in 2015. This amount need not be reserved for research programmes pertaining to the Top Sectors. Any awards granted within the context of other programmes (such as the Open Programme and the Talent Scheme) relevant to the Top Sector themes may also be included. Whether a research proposal is relevant to the Top Sectors plays no role in the award of grants outside the Top Sector programmes, but after the award is made, NWO does consider which projects can be classified as 'relevant to the Top Sectors'.[10] Some of the funding meant for the Top Sectors is spent on programmes that promote various forms of public-private partnership (PPP).[11]

Since 2002, NWO has worked with theme-driven programmes; the themes are revised every three years. In 2011, it focused on themes that fit in with the Top Sectors and the EU's 'Grand Challenges'. A significant share of NWO's contribution to the Top Sectors lies in its theme-based programmes. These are often funded by multiple divisions, making them multidisciplinary and accommodating of research in different fields.

The Top Sector expenditure agreements account for a significant share of NWO's budget. Table 2.7 shows NWO's overall finances and the role that the Top Sectors play.

Table 2.7 Total expenditure, grants awarded and NWO expenditure in Top Sectors, 2011-2015 (in millions of euros and %)[12]

	2011	2012	2013	2014	2015
Total expenditure	754,6	756,5	735,2	766,8	
Grants awarded	548,3	499,1	486,2	527,2	
Agreements concerning expenditure in Top Sectors		117,5	182,5	210	275

Source: Annual reports and consolidated annual accounts NWO 2011-2014, NWO reports on Top Sector expenditure. Rathenau Institute

10 About 40 to 85 million euros (source: KNAW, 2015, 32) of the Open Programme and Talent Scheme are labelled as relevant to the Top Sector after the fact.

11 Within the special Top Sector programmes, about 100 million euros are channeled through PPP programmes (source: NWO website: http://www.nwo.nl/over-nwo/aandachtsvelden/thematisch+onderzoek+en+pps, consulted 7-1-2016).

12 In 2012 and 2013, NWO drew the funds needed for the Top Sectors not only from grants awarded but also from monies distributed to its institutes and its reserves. Its annual report does not indicate the size of this amount. It is therefore incorrect to set off the grants against the Top Sector expenditure. In other years, there is no information whatsoever on the relationship between the expenditure ascribed to the Top Sectors and the various funding streams within NWO.

The financial impact of the Top Sectors policy within NWO differs from one division to the next. Table 2.8 gives us a general idea of what each division spent on the Top Sectors in 2012 and 2013. Because there were no division budgets available for these years, we have based our calculations on the situation in 2011. The table shows that, relatively speaking, the Top Sectors had the biggest impact on Engineering, Medical Sciences and the hard science divisions and the smallest impact on the Humanities.

Table 2.8 Estimated contribution of NWO division budgets to Top Sectors in 2013, in millions of euros

	ALW	EW/CW /N	GW	MaGW	MW/ ZonMW	TW/ STW	Central programmes
% of 313 m for Top Sectors in 2012 and 2013 [a)]	10%	32%	4%	9%	16%	20%	10%
Average annual amount for Top Sectors	15,650	50,080	6,260	14,085	25,040	31,300	15,650
Total expenditure per division in 2011	61,362	114,792	43,669	69,786	53,360	58,043 [b)]	155,303
Overall indication of size of contribution to Top Sectors from division budget	26%	44%	14%	20%	47%	54%	10%

Note: NWO ceased itemised division budgets in its annual reports in 2012. We have therefore compared the amounts with division expenditure in 2011. According to NWO's 2013 annual report, p. 68, the total sum, 313 million euros, came from various sources: 225 million was allocated from its own budget, and the 75 million euros targeting the Top Sectors came from various ministries (channelled through STW, ZonMW and others). The remaining sum of 13 million euros was not itemised; most of this likely concerns implementation costs.

a) The average annual amount is 156.5 million euros. b) This sum includes the grant that the Ministry of Economic Affairs disburses directly to STW.

Totals are rounded off to whole numbers (millions) and may therefore not match the sum of individual items.

Sources: KNAW (2015 p. 33), *NWO jaarverslag 2011* p. 56-57, Table 17 at the bottom: total expenditure 2011 per division.

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2.5 Third funding stream

The third funding stream is made up of almost all remaining university revenue. It is highly diverse and consists of all EU funding (specifically from the EU Framework Programme), funds provided by health fundraising organisations, and revenue from work performed for other public non-profits, for enterprises (contract research) and, previously, for the Economic Structure Enhancing Fund (hereafter: FES funding), which was financed by revenue from natural gas exploration.

The many funding instruments deployed within the European Framework Programme (Horizon 2020 and its predecessors) are based on differing apportionment formulas and have differing aims (e.g. 'research and innovation actions', the European Institute of Technology, Marie Curie Actions and the European Research Council grants).

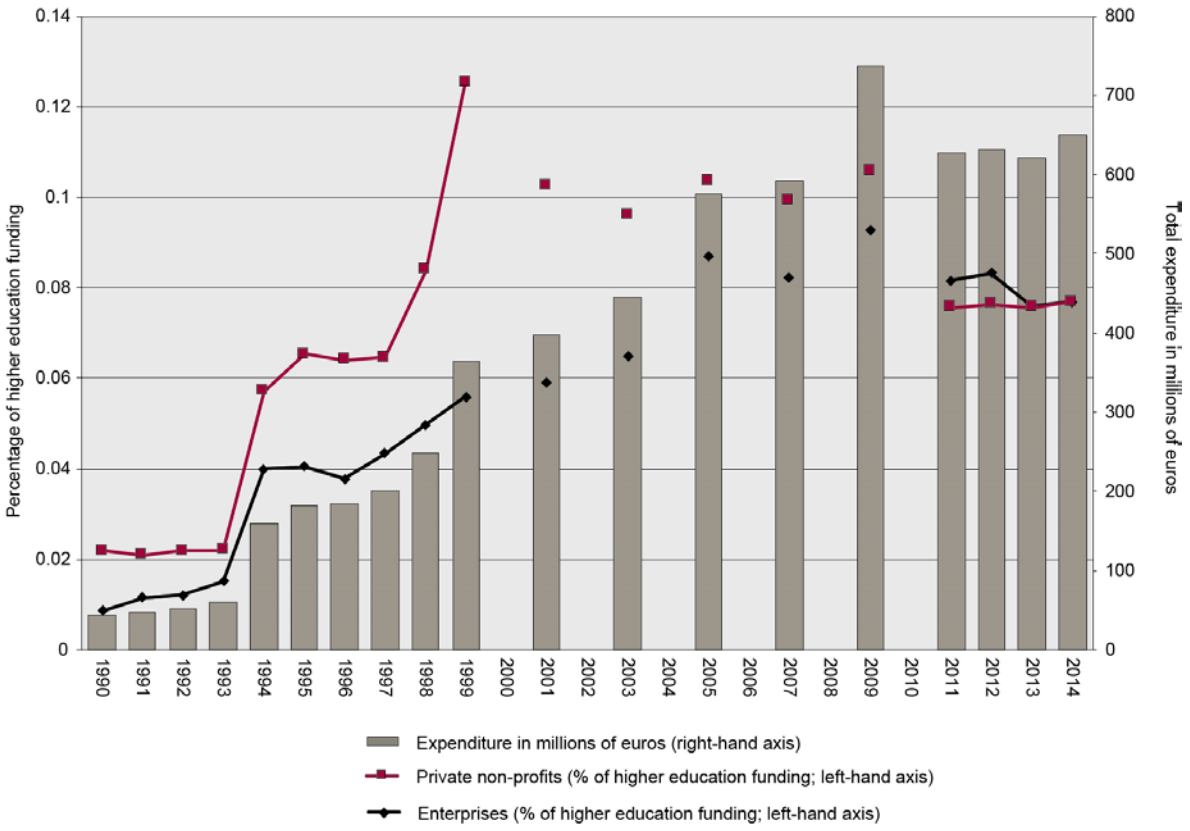
The private non-profit sector consists of public fundraising, bequests and donations to science. The most prominent funding bodies are the health fundraising organisations, for example the Dutch Cancer Society, the Dutch Kidney Foundation, and Lung Foundation Netherlands. At times, their methods and aims closely resemble those of second funding stream organisations such as NWO, STW and ZonMW.

One key component of the third funding stream is revenue generated by performing contract research for companies and other private organisations in the Netherlands and abroad, including the Volkswagenstiftung in Germany, the Wellcome Trust in the UK, and the National Institutes of Health and National Science Foundation in the USA.

Revenue obtained through public-private partnerships is also categorised in the third funding stream. Examples include revenue provided by the Top Sectors (other than through NWO) and the QuTech consortium at Delft University of Technology. In the past, this also included FES funding allocated to universities, in which PPPs were a key component. This was a major source of revenue in some areas of science. The government decided in 2011 to dismantle the FES; although its final projects are still under way, revenue from natural gas exploration is no longer being invested in the knowledge infrastructure.

Because the third funding stream brings together many different funding channels, it is impossible to break it down entirely. Based on the annual accounts of the universities and UMCs, we estimate the total at 1,781 million euros in 2014, 1,602 million euros of which was intended for research. We can provide an indication of the size of a number of sources within the third funding stream. Figure 2.1 shows what enterprises and private non-profits spent on research carried out at institutions of higher education, according to the OECD's classification (HERD; Higher Education R&D). This includes universities of applied sciences (*hogescholen*), although they are likely to account for only a small share. Table 2.9 shows what a number of specific organisations spent (ERC, health fundraising organisations, private enterprises and other private non-profits). It should be noted that their expenditure does not cover research at universities and UMCs alone. For example, the health fundraising organisations also fund researchers at the Dutch Cancer Society, and enterprises also fund research at universities of applies sciences.

Figure 2.1 Expenditure by private enterprises and non-profits on research at institutions of higher education, 1990-2014 (in millions of euros and as a % of HERD)



Source: http://stats.oecd.org/Index.aspx?DataSetCode=MSTI_PUB#

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Table 2.9 Expenditure by organisations in the third funding stream in 2014 (in millions of euros)

Funding body	Expenditure
Private enterprises	325
Health fundraising organisations	191
Other private non-profits	134
ERC	166

Sources: http://stats.oecd.org/Index.aspx?DataSetCode=MSTI_PUB# Gross domestic expenditure on R-D by sector of performance and source of funds 2016; https://www.rathenau.nl/en/page/research-expenditure-health-funds https://www.rathenau.nl/en/publication/dutch-science-system-european-research-area

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2.6 Conclusion

Dutch universities and UMCs together receive an annual 8,405 million euros through the first, second and third funding streams. Of total receipts for teaching and research, approximately 4,906 million euros (58%) goes to research. Of that amount, almost three quarters is spent by the universities and more than a quarter by UMCs. The first funding stream accounts for 62% of total revenue and for 56% of all research funding.

The second funding stream accounts for 11% of total research revenue – 11% at the universities and 9% at the UMCs.

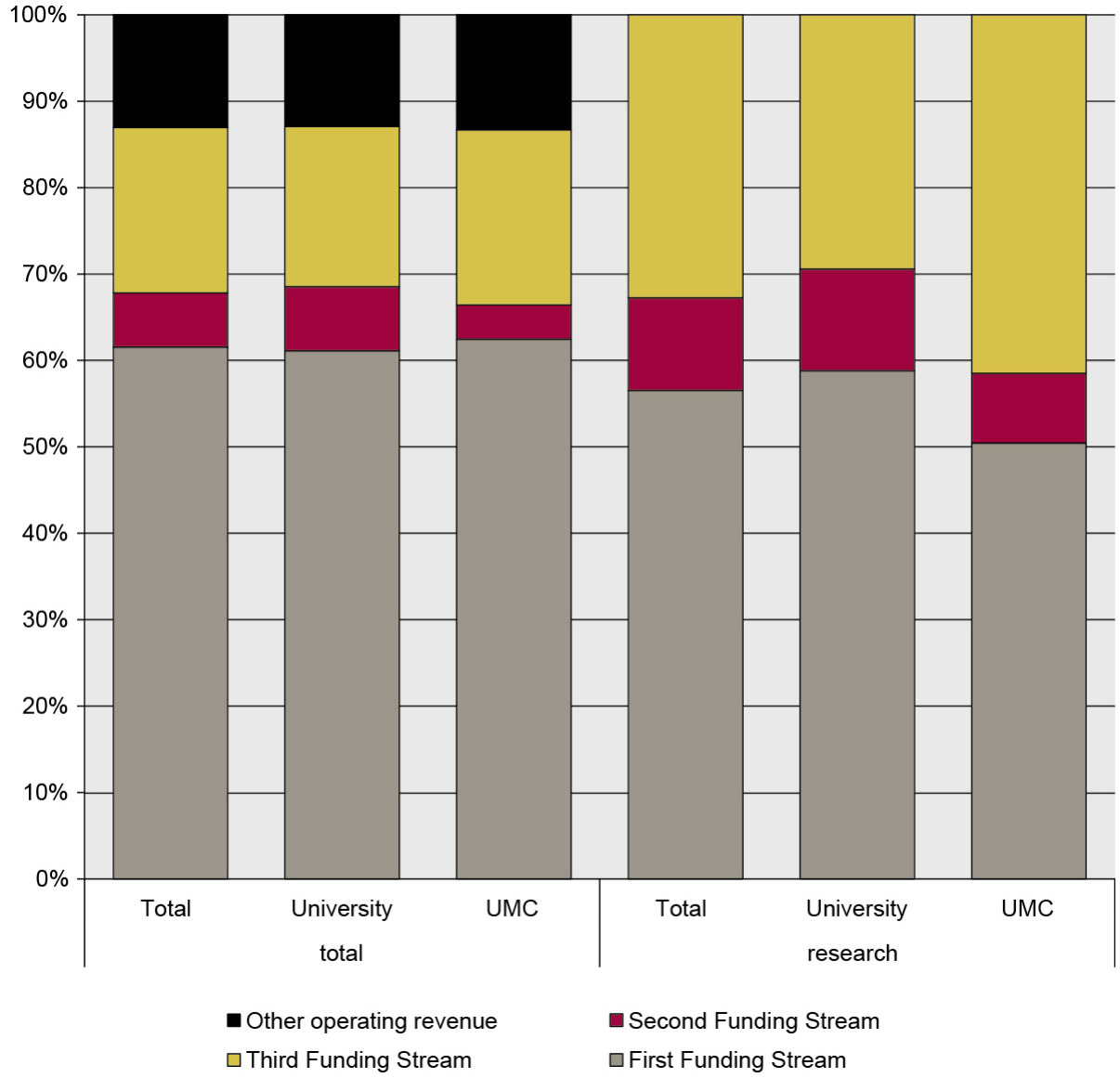
Table 2.10 Teaching and research funding at universities and UMCs in 2014 (in millions of euros and %; as received)

	total			**research**		
	total	university	UMC	total	university	UMC
First funding stream	5,172	3,629	1,543	2,770	2,201	569
Second funding stream	533	418	114	533	418	114
Third funding stream	1,781	1,224	557	1,602	1,046	557
Other operating revenue	920	551	369	0	0	0
Total	**8,405**	**5,822**	**2,584**	**4,906**	**3,666**	**1,240**
First funding stream	62%	62%	60%	56%	60%	46%
Second funding stream	6%	7%	4%	11%	11%	9%
Third funding stream	21%	21%	22%	33%	29%	45%
Other operating revenue	11%	9%	14%	0%	0%	0%

Note: Research amounts are derived from the Statistics Netherlands calculations that underpin the TWIN figures for 2013. Apportionment of student fees is based on the share of the block grant going to universities and UMCs. The third funding stream includes revenue that universities receive through contract teaching (136 million euros). The figures differ somewhat from the universities' annual reports published by DUO because we have adjusted for the overlap between the universities and their UMCs. We have not included the smaller theological universities.

Source: Tables in this chapter.

Figure 2.2 Breakdown of teaching and research funding for universities and UMCs in 2014 (%; as received)



Source: Table 2.10. Rathenau Institute

When discussing research funding it is important to look not only at total amounts but also at the way in which the money is allocated and the performance required by the funding body in exchange. A large proportion of research funding is channelled through the first funding stream, which is basically paid out in the form of a block grant. In the following chapters, we look more specifically at how the first funding stream is apportioned between and within universities.

3 First funding stream allocation

There is plenty of information available about the funding streams that go to the universities and UMCs, but we know little about how that money is then distributed to researchers. Money is an important driving force in science policy. The incentives that such policy offers by means of funding influence researchers both directly and indirectly. The criteria, conditions, objectives and focus of individual sources of funding affect the way in which researchers organise their work (Braun 1998). Much of the money reaches researchers indirectly, after it has been redistributed within the university. In this chapter, we describe how the universities distribute the first-stream funds to their faculties.

We also chart how the policy of strategic positioning affects researchers through first-stream funds. Strategic positioning forms part of the performance agreements with research universities and universities of applied sciences and is supported by performance-dependent funding in the first funding stream. A budget has not yet been made available to implement the Dutch National Research Agenda, but the government's strategic agenda for science, *2025 Vision for Science*, suggests using the first funding stream to encourage research that fits in with this agenda.

3.1 Allocation of first funding stream: from national government to universities

In this section we discuss in more detail how the Ministry of Education, Culture and Science allocates funding to the universities.[13] The Minister first sets the overall budget for a specific year, subdivided into a teaching portion, a research portion, a portion for medical training and research, and a portion allocated on the basis of the performance agreements.

Government block grant

The government block grant is allocated to the universities after its overall size has been determined. That overall amount is based on the teaching and research portions. The size of the teaching portion is calculated by multiplying the number of students by the price per student defined in the Ministry of Education, Culture and Science's budget. A university can increase the size of its government block grant by performing better than other universities. The direct government funding takes the form of a block grant . The universities may spend their block grants as they see fit and are not required to apply the Ministry's allocation model internally.

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13 The Ministry of Economic Affairs applies virtually the same principles for Wageningen University as the Ministry of Education, but any changes affecting that university are up to Economic Affairs. Funding of the Open University is based on the number of degrees awarded, but not on enrolment numbers. Although the block grant allocated by Economic Affairs may fluctuate, it is subject to pre-determined minimum and maximum amounts.

The teaching portion (1,642 million in 2014, 40% of the block grant) is made up of two portions: a student-related provision and a teaching provision, which in turn consists of a variable portion (percentage-wise) and a fixed portion.

The *student-related provision* (in 2014, 65% of the teaching portion) is allocated to the universities proportional to the number of students registered for the nominal course duration (2/3) and the number of degrees awarded (1/3). A programme-specific multiplier is applied to both figures. The multipliers are:

- 1 for low-funded programmes (primarily the arts and social sciences)[14]
- 1.5 for high-funded programmes (agriculture, natural sciences, engineering and education)
- 3 for top-funded programmes (allocated in exceptional cases, e.g. to pharmaceutical programmes).

Most of the *teaching provision* (35% of the teaching portion) is divided between the universities on a percentage basis.[15] Each university receives a pre-determined percentage of the provision, regardless of performance or policy.

Seventeen percent of the teaching provision is allocated to maintain special facilities (such as Delft University of Technology's engineering library, which serves as a national library), to maintain vulnerable programmes, and to support special facilities under a ministerial decree.

The research portion (1,731 million in 2014, 42% of the government block grant) consists of four portions:

1. Number of government-funded degrees
2. Number of doctorates
3. Research provision in sums
4. Research provision in percentages

*Government-funded degrees (15%***)**: The Minister determines the size of this portion. It is allocated proportional to the number of Bachelor's and Master's degrees awarded per programme, to which a field-specific multiplier is applied, and with Master's degrees counted twice.

Number of doctorates (20%): In this parameter, every university receives a sum for each doctorate (PhD) or professional doctorate in engineering (PDEng) awarded (in 2014, 95,561 euros per PhD, 79,635 euros per PDEng). This is not an extra sum but an allocation parameter, because the research portion is fixed. In recent years, the fixed sum and the rise in the number of doctorates awarded have increased this parameter to more than 20% of the research portion. As from 2017, a 20% ceiling applies for this parameter.

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14 For exceptions see *Bijlage 3 Wet op het Hoger Onderwijs en Wetenschappelijk Onderzoek*.

15 The amounts and percentages associated with the teaching provision can be found in Appendix 1 and 2 of the *Regeling financiën hoger onderwijs*.

Research provision in sums (7%): This includes NWO's Gravitation Programme[16] and the sector-wide plan for physics and chemistry.

Research provision in percentages (58%): This is what remains after the allocations for government-funded degrees, doctorates and the research provision in sums. This money is divided across the Dutch universities according to a pre-determined percentage per university. The percentages have an historical basis. They vary per university from approximately 50% to about 70% of the government block grant for research.[17]

A number of components in this allocation model determine the context in which universities operate. The first is that there is a pre-determined budget. The size of the government block grant is only keeping pace with the rise in student numbers or other parameters to some extent. The second is that allocation of about 40% of the government block grant is performance-based, and therefore relative. In other words, if a certain university has a stable number of students and/or PhDs while those numbers increase at other universities, the university that does not grow will receive a smaller share of the budget each year. That means that if the total number of students and PhDs increases (as they have in recent years), a university must also grow to stabilise its revenue from the first funding stream.[18] At macro-level, this gives individual universities an incentive to attract more students and PhD candidates than their counterparts; it would, however, be better for the universities as a group to limit those numbers in order to maintain the total government block grant per student.

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16 The Gravitation Grant is allocated to the consortia in competition and therefore qualifies as competitive funding. It is not the universities that compete but rather consortia of researchers. It does not represent a fixed amount in the government block grant, but varies depending on the outcomes of NWO's selection procedure.

17 For precise percentages, see *Regeling financiën hoger onderwijs*.

18 Because a fixed amount has been determined per doctorate, the number of doctorates awarded has had a growing impact on the research portion. Because the total amount of the research portion is fixed, the research provision in percentages is shrinking. Every university thus receives a fixed amount from the budget per doctorate, but funds the rise in doctorates awarded at other universities by means of the research portion in percentages item. This will change in 2017, when a ceiling of 20% of the research portion will be introduced for the doctorates item.

Table 3.1 Allocation model of government block grant channelled through Ministry of Education, Culture and Science

Block grant in 2014 M€	**Component**		**Calculation / allocation**	
% total	% sub	% total	% sub	% total
Teaching portion 1,642 40%	Student-related 65%	26%	No. of nominal students with field-specific multiplier 67%	17.29%
			No. of degrees with field-specific multiplier 33%	8.64%
	Teaching provision 35%	14%	Portion of teaching provision divided between institutions on a percentage basis 83%	11.57%
			Amount allocated for quality, vulnerable programmes and special facility 17%	2.39%
Research portion 42%	Student-related 15%	6.31%	No. of degrees with field-specific multiplier Master's counted twice	6.31%
	Doctorates 22% [a)]	9.25%	€ 95,561 per doctorate, € 79,635 per professional doctorate in engineering	9,25%
	Research provision 63%	26.49%	Amount allocated for Gravitation Programme, physics and chemistry sector plan, etc. 8%	2.10%
			Portion of research provision divided between institutions on a percentage basis 92%	24.39%
Medical training & research 615 15%			Allocated to universities with UMCs based on student numbers, degrees, fixed budget and accommodation component 15%	
Performance agreements 129 3%			Apportioned to universities that satisfy the performance agreements 3%	
Total **4,116**			**100%**	

Note: a) Estimate based on 20.7% in 2013 (Interdepartmental policy study on scientific research) and 24.1% for 2015 (according to Vision for Science).

Sources: *WHW, Regeling financiën hoger onderwijs, IBO wetenschappelijk onderzoek*, OCW, *Wetenschapsvisie*.

Gravitation Programme

The Gravitation Programme was introduced in 2012 and is funded by the Ministry of Education, Culture and Science. At the start, its intended budget was 50 million euros a year, but the full amount has yet to be awarded. The Gravitation Grants are an exception within the first funding stream in several respects. First of all, the direct government funding takes the form of a block grant in the first funding stream, whereas the Gravitation Grants are earmarked amounts. Second, the basis for allocation differs; whereas other parts of the government block grant are allocated on the basis of university performance or characteristics, the Gravitation Grant is awarded on a competitive basis. The programme's features are similar to those of grant programmes in the second funding stream. NWO makes the selection and is paid for its efforts, but the grant itself is paid out as part of the government block grant.

In 2012, the budget came to 167 million euros and in 2013 to 153 million euros to meet ten-year obligations towards a total of twelve consortia. If both budgets are distributed equally over the ten years, then the Gravitation Programme will have allocated 32 million euros in 2014. This sum has not, however, been itemised as such in the Ministry of Education, Culture and Science's annual report. The third selection round will take pace in 2016, and the annual amount will increase to 50 million euros.

3.2 Channelling the first funding stream from university executive board to faculties

As we explained in the previous section, the block-grant principle means that each university is at liberty to use its own internal model to distribute the funds it receives from the first funding stream to its organisational units. These are virtually always the faculties. Although many universities claim to follow the Ministry's allocation model (at least in part), our data shows that they in fact apply many different allocation models. What these models are, is the subject of this section.

In this study, we turned to two sources to examine the universities' allocation models. First, the deans who participated in the Royal Academy's 'Blank Spots' survey indicated which allocation model was used at their institution to distribute first-stream funds. Second, with the consent of all the universities, we were given access to their responses to questions about their governance structures, funding models and policy during the Scientific Research Interdepartmental Policy Study (hereafter: 'IBO Study').

We must comment on three points concerning the data that we use to describe university allocation models. First, deans at the same university gave different impressions of the parameters that determine the size of the first-stream funds that they receive from their executive board. There may be several reasons for this variation. The allocation model a university applies may involve faculty-specific arrangements, or some parameters may scarcely play a role for some faculties but determine a major share of the budget for others. We have therefore chosen to use the IBO Study data for our general description of the allocation models. The IBO Study explains which parameters are applied in the university-level allocation models. We do make use of the information provided by the deans in our description of the faculty-level models.

Second, it is not clear at all universities what the university-level funds cover. Almost all the universities divide the first-stream funds into three portions: one portion that they distribute to the faculties according to a fixed budget, a variable portion that is distributed based on various parameters, and a final portion that is used for all sorts of university-level purposes, for example strategic objectives, building management, or to pay for university-wide services. Whether the university-level funds cover all the facilities (buildings, equipment) and support services (such as HR) or whether the faculties 'lease' facilities and services through a system of internal invoicing makes an enormous difference to the allocation models.

Third, as we explained in the previous section, the Gravitation Grants belong to the first funding stream. However, it is impossible to use the universities' own data to determine how the grants are allocated to the winners and how much freedom universities claim in this regard.

A review of the parameters applied shows that the universities not only pick and choose which ministerial parameters they use in their own allocation model but also add extra parameters. According to the universities, their choices depend on practical or strategic objectives, for example faculty budgetary stability, an obvious relationship with costs incurred, or a highly transparent allocation model.

Table 3.2 University allocation parameters

Parameter	No. of universities
Fixed budget	13
Doctorates	13
BA degrees	10
MA degrees	10
Student numbers	9
Strategic fields	8
Course credits	7
Multiplier for arts, humanities, exact sciences and social sciences	6
Supplement for external funds	6
No. of nominal students	5
First-year students	4
Matching funds	2
Research inspections	1

Source: Underlying documents for IBO Study. Rathenau Institute

The list of parameters in Table 3.2 shows that the universities all apply a fixed budget and use number of doctorates as a parameter for distributing the money across their faculties. The number of degrees (BA and MA) also plays a role at many universities, whereas the result of a research inspection is a parameter at only one university.

Table 3.2 does not show which combinations of parameters are most common or why universities do or do not apply a particular parameter. We attempt to clarify these points by presenting a number of representative allocation models. At the request of the universities, we do not reveal which university applies which parameters, and our representative models cannot be traced back to a specific university.

To come up with representative models, we clustered allocation models that closely resemble one another and exaggerated the similarities and differences between clusters. We began by differentiating between teaching parameters, research parameters and more general parameters. Next, we compared the university allocation models with the Ministry's allocation model (see Figure 3.1), giving us three representative types. The result is a description of a number of allocation models that may not actually be in use in precisely the same form at a specific university, but that together provide an overall picture of the diversity of models. Each of these representative types is based on the national allocation model but adds its own 'local colour' to it.

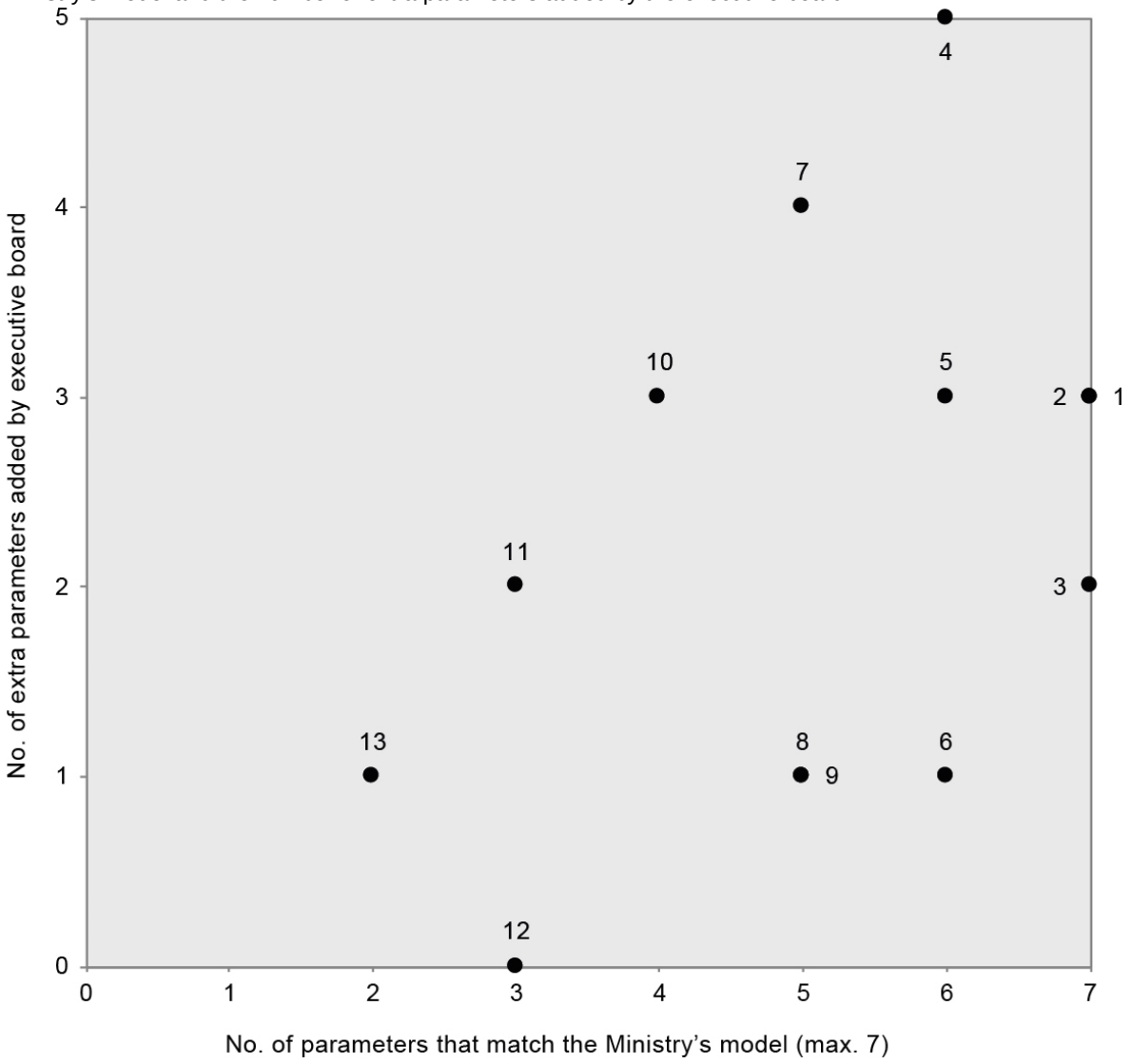
University X

This allocation model is used by a university that wants stable budgets for its faculties. Intent on offering them a stable basis for continuity and long-term investment, it has chosen a decentralised model with a relatively large fixed budget. The amount allocated by means of parameters and the number of parameters determining the amount faculties receive are both relatively small.

As in the ministerial allocation model, the parameters used for the variable portion in this model focus more on teaching and less on research. University X deliberately follows the Ministry's model in its parameters, but it is also highly selective. It has chosen to use only the number of doctorates as a research parameter.

For teaching, the sum to be allocated depends on both student intake and earned course credits. It is therefore unrelated to number of degrees awarded, as in the Ministry's model. The parameters are meant not only to cover costs but also to encourage good performance with regard to these variables. Nevertheless, number of degrees is not a variable.

Figure 3.1 Relationship between number of parameters in the executive board's model that match those in the Ministry's model and the number of extra parameters added by the executive board.



Note: The numbers stand for universities.

Source: Rathenau Instituut, *Onderliggende documenten uit het IBO Wetenschappelijk onderzoek,* Table 3.1.

Rathenau Institute

The small number of research parameters applied by this university is related to its success in the second and third funding streams. It does not regard incentives for outstanding research as a top priority because it has had relative success in that regard, and because it sees such incentives as a faculty matter. The university executive board therefore does not match or supplement external funding, nor does it regard research inspections as a parameter.

This university takes a systematic, forward-looking approach to its budget. It therefore shies away from making too much use of variables that hark back to previous years.

University Y

The university using this representative allocation model basically wants to be able to trace performance responsible for external funding in its internal model. The rationale behind its following the external ministerial model is to cement the relationship with external allocation. The faculties' performance thus has more direct consequences for their budgets. In addition, this allocation model ensures that the faculties contribute to the university's ranking vis-à-vis the other universities in the ministerial allocation model. Another rationale for following the national allocation model is that it offers a large measure of transparency; the faculties know precisely what their executive board is doing for them.

Although this university claims that its internal allocation model is the same as the external (ministerial) model, it does not apply all of the Ministry's parameters. For example, it does not apply a multiplier for its arts/humanities, exact sciences and social sciences programmes, and student progress (nominal or not) plays no role in how the money is distributed. It does make use of a fixed budget, but that budget is much smaller than in University X's allocation model. The research parameters applied by University Y are number of doctorates and research in strategic fields. In the latter case, it reserves a sum from the first funding stream at university level for research in several theme-driven strategic fields. Regarding teaching, the faculty budgets are based in intake (student numbers) and output (BA and MA degrees). The striking thing about this set of parameters is that one extra parameter has been added to the Ministry's allocation model: the strategic fields. These are, however, determined in consultation with the Ministry.

Comparing the two universities, we note that although both have stability as an important aim, each one attempts to achieve it in its own way. University X's model has fewer parameters and a large fixed budget. University Y's model offers more incentives and seeks stability by maintaining multi-year averages in its parameters.

University Z

University Z is a broad-based university that is attempting to be fair to its many different faculties and disciplines by applying a relatively large number of parameters. The Ministry's allocation model is merely a point of departure because, according to this university, it does not really help it achieve its strategic objectives. Its model therefore follows the national allocation model (and University Y's model) in a general sense, but deviates from it in its details by adding extra parameters. The rationale behind its following the Ministry's model is roughly the same as University Y's, i.e. to maintain a direct relationship between the external and internal model. To maintain its status as a broad-based *and* leading research university, however, University Z adds further incentives, for example matching of NWO and ERC funding.

Because this university aims to achieve certain strategic objectives, it applies a relatively large number of parameters. In terms of research, it focuses on doctorates, strategic fields and acquisition of external funding, for example through matching funds. It also applies a multiplier that

favours exact sciences faculties above arts/humanities and social sciences faculties. In terms of teaching, the model focuses on intake, student performance, and output.

This model applies many more parameters than those of University X and Y. It also is less concerned about budgetary stability. This is clear in the lower fixed budget, which makes parameters a more important factor in allocation. The faculties compete more in this allocation model, and although they are once again at liberty to allocate their budgets as they see fit (for the most part), the plethora of parameters restricts their teaching and research choices to a certain extent.

3.3 Conclusion

The allocation model used to parcel out the government block grant across universities and UMCs is nothing more than an apportionment formula. Once a university has received its share, its executive board decides how the funds will be divided up between the faculties.

Universities' internal allocation models differ enormously, even though they generally claim to have the same aims in mind. The external allocation model and their own internal allocation model must align to some extent, and the model must strike a certain balance between stability and incentives, so that long-range planning becomes possible. At the same time, they wish to maintain and if possible improve their ranking in the external allocation model.

The three representative models have shown how the universities' internal allocation models differ from one another. The most important differences are the number of parameters that they apply and the extent to which they tend to follow the national, external allocation model. Regarding the first difference, the importance attached to stability and systematic planning is significant. The opposite of this is a highly dynamic model that offers many different incentives. Regarding the second difference, what is important is the extent to which the university wishes to align its own model with the ministerial allocation model, thereby encouraging its faculties to help it maintain or improve its relative ranking in that external model.

4 The faculty as pivot

In the tradition model of policy implementation, the national government's higher education and research policy takes the form of measures and funding handed down to the university executive boards; the executive boards then add student fees and pass on policy measures and funding to the faculties. The funding streams show that in addition to this hierarchical route, there is a second route in which funds earmarked via NWO and individual researchers reaches a university through a faculty. In addition, other organisations that have their own policy or other objectives also furnish research funding.

In this chapter, we analyse the point within the university where the various funding streams, external circumstances and policy incentives must be coordinated. That point is the faculty. Here is where policy and funding streams are reinterpreted as decisions that influence research, researchers and the strategic research profile. We might consider the example of a faculty's appointments policy and the apportionment of research time. The faculty board decides on the expenditure of non-designated funds and on funds used to match revenue received through the second and third funding streams. If we want to know how policy impacts the researcher in the laboratory, then we must get to know the faculty.

This chapter focuses on how faculties distribute their budgets. The previous chapter described the government's allocation model, which it uses to apportion the first funding stream between the universities, and the universities' allocation models, which they use to apportion the first funding stream internally, between their faculties. Based on a survey of deans in the Netherlands, we describe how the faculties, in turn, apportion their funds.

4.1 Faculty funding

Faculties obtain money from many different sources. The ratios between those sources offers a glimpse of the relative influence of the policy associated with each source. Table 4.1 shows the ratios between the first, second and third funding streams by domain.

In every domain except Health & Life Sciences, at least half of the faculty's revenue on average comes from the first funding stream. In the Natural Sciences and Engineering & Agriculture, that is somewhat more than half. In the other domains, the first funding stream accounts for between 69% and 75% of the faculty's revenue. This suggests that there are major differences between the domains.

Table 4.1 also reveals major differences *within* the domains, however. The percent share accounted for by the first funding stream varies considerably, especially in Health & Life Sciences, Natural

Sciences, and Engineering & Agriculture. The prominence of the second and third funding streams in total revenue also differs considerably from one faculty and domain to the next.[19] These differences *within* a domain are equal to or greater than the differences *between* domains, except for Economics and Behavioural & Social Sciences.[20] We must therefore exercise caution when generalising about the effects of a policy measure on a single domain.

Table 4.1 Breakdown of faculty revenue by origin (in %; 66 faculties)

	Funding streams						
	1st	2nd	3rd	other	total	Spread 1st funding stream	No. of faculties
Economics	69%	9%	22%	1%	100%	60-80%	5
Behavioural & Social Sciences	69%	11%	16%	4%	100%	59-80%	10
Health & Life Sciences	40%	16%	41%	3%	100%	25-60%	8
Natural Sciences	53%	18%	28%	0%	100%	20-75%	7
Law	73%	3%	19%	5%	100%	49-85%	7
Language & Culture	75%	14%	9%	1%	100%	55-94%	12
Engineering & Agriculture	54%	14%	31%	0%	100%	27-80%	17

Note: The spread indicates the lowest and highest percentage shares that the first funding stream contributes to faculty revenue within a single domain. Some faculties have an 'other' category. In most cases, these are special arrangements that are difficult to sort into one of the three funding stream categories. The ratios were reported by the deans; we have not cross-checked their reports against the annual accounts, nor did we check whether every dean adhered to the given definition of first, second and third funding stream.

Source: Rathenau Instituut, deans' survey. Rathenau Institute

Why do faculties in the same domain differ so much?[21] We can illustrate this by describing the situation at three different faculties in the same domain. We have chosen these faculties because their situations clearly differ and we have enough information about each one to provide an accurate sketch. It is not our intention to suggest that all variation between faculties should be attributed to the parameters we outline here. We only describe what is important for these three faculties.

19 The variation coefficient for the share of the first funding stream within domains is low for Economics (0.108) and Behavioural & Social Sciences (0.110), somewhat higher for Law (0.185) and Language & Culture (0.172), and high for Health (0.346), Natural Sciences (0.326) and Engineering & Agriculture (0.289).

20 The second funding stream plays a negligible financial role only in the Law domain.

21 We answered this question based on all the information furnished by the deans in their responses to the open and closed survey questions and the comments that they added while completing the questionnaire. The description of the faculties is less detailed than our data actually permits because we promised the deans that their faculties would not be identifiable.

The teaching intensity at all three faculties is above average. In recent years they have amended or are planning to amend their strategic research profiles, their allocation models, or both. They are all relatively dependent on the first funding stream. Their other revenue comes mainly through the third funding stream; the second funding stream plays a relatively small role.

Faculty 1: Doing well

Faculty 1 has a growing number of students and expects this number to continue rising for the time being. Most of its students are from the Netherlands. The dean's chosen strategic research profile is quite broad. The faculty is entering into new alliances and its policy is geared towards facilitating interdisciplinary research. The faculty wants to offer enough research time to attract (and continue attracting) quality staff, even though student numbers are climbing.

Faculty 2: Doing well now, but expecting heavy weather

Faculty 2 is seeing a slight increase in number of students, but expects student numbers – and therefore its revenue – to decline. To mitigate the effects of that decline, it would like to depend less on the first funding stream. The faculty is worried about the reduction in the per-student amount that it receives. It has developed a number of strategies to solve this problem: a new teaching system that will improve student success rates, an apportionment formula for research time based on external revenue-earning capacity, and a sharper focus on international themes to improve its uptake of EU funding.

Faculty 3: Doing better after a period of austerity

Faculty 3 is recovering from a decline in student numbers and – consequently – in first funding stream revenue. Student numbers are picking up again, thanks in particular to a growing body of foreign students. The faculty has an international focus, but also conducts research in the Netherlands. To soften the blow of its declining revenue, the faculty cut back on research time for all researchers. As soon as the budgetary constraints are alleviated, it will increase research time again.

These sketches show that local circumstances can be a defining factor for faculties in the same domain. They differ in the degree to which they appeal to students and in the type of students to whom they appeal. One faculty depends on international students, the other on Dutch students. Their financial forecasts are also very different. The two faculties that have faced or expect to face difficult times are employing different coping strategies. One faculty wants to reward external revenue by giving staff more time for research and spend as little as possible of its budget on research time that is not revenue-generating. The other faculty has simply cut research time across the board.

Below we attempt to sketch an overall picture, despite these variations. We look more closely at how faculties distribute their money internally and what factors play a role. We look specifically at

three recurring topics in university discussions: the status of 'special' research fields,[22] the need to match some of the revenue from the second and third funding streams, and the influence of research on teaching.

4.2 Apportionment within faculty

It is researchers and research groups that bring second- and third-stream funds into a faculty. The faculty creates the strategic leeway, staffing capacity and physical space to perform the research funded through these streams, with the possible support of the first funding stream. Most faculties divide the first funding stream between their units, e.g. institutes, departments, subject groups, chair groups, divisions, capacity groups and sections.

We asked deans how they apportion the money within their faculty. Globally speaking, they identified three parameters:

- *Research parameters*: number of doctorates, number of PhD candidates, number of publications, grants awarded, citation scores or journal rankings, participation in research priorities, large-scale facilities (labs, equipment)
- *Teaching parameters*: number of degrees, number of students, number of course credits, teaching hours, student success rate
- *Fixed budget*

Some smaller faculties (specifically in the Language & Culture domain) are not divided into smaller units. In those cases, it is the dean who decides how the money will be spent. That is also the case at Wageningen University and Research Centre because the university has only a single faculty. The executive board distributes the money directly among the chair groups and the teaching institutes. However, it is the science group directors who are held accountable, and they are the ones who filled in our questionnaire. There are also a few faculties that make separate agreements with all of their units, subject to allocation criteria only to a certain extent.

The vast majority of faculties utilise an allocation model with a number of fixed parameters. Table 4.2 shows how many faculties apply each parameter but not how they do so or how much weight a parameter carries. The number of doctorates is the most common parameter and plays a role in more than 80% of the faculty allocation models. Of the other research parameters, number of grants awarded is reasonably common, which indicates that the faculty allocation model arranges matching funds, at least to some extent. Number of publications or citation scores are relatively rare. Faculties in the Economics and Health & Life Sciences domains form an exception; they often use a combination of the two criteria.

[22] The designations differ, leading to differences in what is considered a special field. Sometimes it means 'singular', sometimes 'a minor language'. Other discussions refer to fields associated with Dutch culture and society, e.g. Dutch law, Dutch history and Frisian.

The faculty allocation model funds participation in university or faculty research priorities in a quarter of the faculties. Large-scale facilities play a role in almost a quarter of the faculties (23%); most of these are faculties of medicine or engineering.

Teaching parameters can be found in all allocation models, but the precise parameters differ from one faculty to the next. Relatively little use is made of student success rate as a parameter. Almost half of the faculties have a fixed budget. The deans of 25 faculties reported the size of the fixed budget. Their reports indicate that this comes to an average of 34% of the total amount apportioned by the faculty.

Table 4.2 Number of faculties and universities that use a parameter for allocating first-stream funds (n=66)

Parameter	No. of faculties (n=66)	No. of universities (n=13)
No. of doctorates	54	13
No. of PhD candidates	6	
No. of publications	14	
Grants awarded	25	6 [a)]
Citation scores or journal rankings	13	
Participation in research priorities	18	8 [b)]
Large-scale facilities (labs, equipment)	15	
No. of degrees	26	10
No. of students	27	9
No. of course credits	27	7
Teaching hours	27	
Student success rate	11	
Fixed budget	31	13
Other, i.e.:	20	
Multiplier for the arts/ humanities, exact sciences and social sciences		6
No. of nominal students		5
First-year students		4
Matching		2
Research inspections		1

Note: a) supplement for external funds. b) strategic fields.

Source: Rathenau Instituut, deans' survey, underlying data IBO Study. Rathenau Institute

For each faculty, we counted the number of parameters used in each group. The average number per group is 1.8 teaching parameters and 2.2 research parameters, while 47% of the faculties

surveyed use a fixed budget. Within the overall group of faculties, four clusters have emerged. Based on the number of parameters, we can distinguish between faculties with:

- **Few parameters**: In these faculties, the number of research and teaching parameters is average or lower. There are 23 such faculties (35%)
- **Many teaching parameters:** In these faculties, the number of research parameters is average or lower, and the number of teaching parameters is above average. There are 15 such faculties (22%)
- **Many research parameters:** In these faculties, the number of research parameters is higher than average, and the number of teaching parameters is average or lower. There are 10 such faculties (15%)
- **Many parameters:** These faculties apply an above-average number of research and teaching parameters. There are 18 such faculties (28%)

We have compared the faculty allocation models with the allocation model used by their university's executive board. The comparison shows that in general, there is no clear relationship between the faculty allocation models and the university allocation model that determines their revenue.

4.3 Specific research fields, matching and the influence of teaching on research

It is up to researchers and research groups in faculty units to acquire funding through the second and third streams. The units contribute to their faculty's funding in various ways. One subject group may attract a large number of students while another generates a steady flow of funds from contract research or the EU's Framework Programme. Such variation in unit funding can provide stability for the faculty as a whole. Units that depend heavily on a single source of funding, however, are also more susceptible to external trends (such as the supply of new students) and policy measures (such as the introduction or cancellation of the Economic Structure Enhancing Fund). A faculty may then be forced to make other choices. In this section, we discuss three recurrent themes in the policy debate related to this diversity.

4.3.1 Specific research fields

The extent to which a faculty depends on the first and other funding streams varies considerably between and within domains. We asked the deans which of their units depends most and least on the first, second and third funding streams. This gave us an idea of the extreme ends of the spectrum within faculties. At the upper end of the spectrum are units that receive 60 to 90 percent of their funding from the first funding stream. They depend less on the other funding streams, although this once again varies from a maximum of 20-35 percent for the second funding stream to 20-50 percent for the third funding stream.

It is interesting to see whether and how faculties take the traits of specific research fields into account. We asked the deans (1) whether their faculty included fields that focus specifically on the

Netherlands and that were intrinsically less interesting to other countries and (2) whether they allowed for publication patterns in these fields when allocating funding.

What is so special about research fields that focus specifically on the Netherlands? Research is largely an international affair. Papers are published in international journals and books are published by international publishers. Studies that focus on the Netherlands may attract attention internationally, but there are also instances where the lion's share of researchers and readers are in fact located in the Netherlands. It stands to reason, then, that much less research on the Netherlands is carried out in other countries. In faculties where publication in international, high-impact journals constitutes a quality assessment or funding allocation criterion, a research field that focuses on the Netherlands may run into problems.

The deans identified 47 research fields (with some overlap) that focus specifically on the Netherlands. These fields mainly fall under the headings law, Dutch history, language, heritage, construction, architecture, fiscal economics and subsections of the social sciences (e.g. political science), clinical psychology, educational theory, the study of public administration, pastoral care and general medicine. The number of faculties that link financial consequences to number of publications or citation scores is relatively small. This may explain why the vast majority of deans (87%) do not take publication patterns in these fields into account. Three Economics faculties, one Behavioural & Social Sciences faculty, and one Language & Culture faculty do allow for publication patterns in their fields.

Nevertheless, it is clear to most deans that the policy favours some research fields above others. Asked to list research fields for which policy measures are exceptionally favourable or unfavourable, the deans cited 93 fields; 51 experience favourable effects and 42 unfavourable ones. Both types occur in every domain.

Table 4.3 shows the percentage of research fields for which specific policy measures had favourable or unfavourable effects. Exceptionally favourable, according to the deans, are policies supporting university research priorities (45%), investment (41%) and Horizon 2020 (41%). Exceptionally unfavourable are policy measures resulting from the shift in the NWO budget towards the Top Sectors (52%), the discontinuation of FES funding (31%), and university-level budget cuts (26%).[23] Strikingly, the deans identify the Top Sectors as a factor in more than a quarter of the fields that had experienced exceptionally favourable effects. It is impossible to draw any conclusions from the table about the effect of policy measures across all research fields. Chapter 5 will look more closely at the impact of these policy measures, and more particularly at whether they influence faculty allocation models and strategies.

[23] The deans were also asked whether the sum total of policy measures affects opportunities to fund research infrastructure. Most (45.5%) said that this was not the case. According to 33.3%, the influence of the policy measures is positive; 21.2% say that their influence is negative.

Table 4.3 Percentage of research fields (n=93) for which policy measures had been exceptionally favourable or unfavourable, according to deans (in %)

Policy measures	Favourable	Unfavourable
University-level investment	41%	14%
University-level budget cuts	0%	26%
Introduction of (new) research priorities	45%	14%
Strategic positioning of university teaching based on performance agreements	0%	5%
Top Sectors, not including NWO calls	29%	19%
Shift in NWO budget towards Top Sectors	27%	52%
Discontinuation of FES funding	2%	31%
(Preparations for) Horizon 2020 / Grand Challenges	41%	7%
Sector plans/discipline committee [a)]	18%	10%

Note: a) The discipline committees report on priorities in research fields

Source: Rathenau Instituut, deans' survey.

Rathenau Institute

4.3.2 Matching

Revenue obtained through the second and third funding streams does not always cover the overall costs of the research that it is meant to fund. It often covers direct staff and non-staff expenditure, but not indirect expenses. That means that indirect expenses must be covered by 'matching funds' from other funding streams. Matching goes beyond co-financing; it often covers costs associated with facilitating research (e.g. office space, library and other research facilities). At the request of the Association of Universities in the Netherlands (VSNU) and the Ministries of Education, Culture and Science and Economic Affairs, EY (2014) studied and calculated matching requirements. It found that every euro a university obtains through the second or third funding stream must be matched by 0.74 eurocents. There is (once again) considerable variation between universities, funding sources and projects.

There are many different ways of interpreting the phenomenon of matching. Some believe it restricts the university's strategic leeway and makes it more dependent on external parties. Others believe that matching reveals the leveraging effect of the first funding stream, allowing universities to achieve more than if they had only the first funding stream to rely on. This difference of opinion also reflects the extent to which funding supplied through the second and third streams is geared to the research carried out by university, faculty or group. If the various second- and third-stream funding sources are geared to supporting that research, then the first funding stream will provide leverage. But if acquiring second- and third-stream funding means undertaking research other than originally intended, then matching has a restrictive effect.

We asked the deans where the financial responsibility for matching lies and who must approve funding applications. The questionnaire allowed them to select multiple responses. In a slight majority of cases (55%), the responsibility for matching lies with the applicant unit, in 45% of cases with the faculty board, and in 9% of cases with the university executive board. A number of deans who checked the 'other' category went on to explain that the faculty would rather have the units take responsibility, but that this often happens in mutual consultation. In some cases, the university executive board makes a matching budget available, and at universities where accommodation costs are financed at university level, for example, the university executive board is automatically responsible for that kind of matching in kind.

A slight majority of faculties always require the faculty board's consent to apply for external funding; consent is sometimes required in 32% of cases; and in 14% of cases researchers do not need the faculty's consent to apply. The general picture that emerges is that responsibility for matching is transferred to the lowest possible tier of the organisation, and that most of the cost-benefit analysis is therefore also made at unit level.

How large is the matching requirement in monetary terms? If we apply the results of the EY study to the data in Table 2.10, we get Table 4.4. A sum of almost 1,580 million euros is needed from the first funding stream to match revenue generated from the second and third funding streams. After matching, 1,190 million euros remain from the first funding stream to spend on research and a further 2,402 million euros to spend on teaching. After matching, the first, second and third funding streams account for 24%, 19% and 57% respectively of the funding spent on research. If we include all funding destined for research and teaching, then the percentages are 49%, 13% and 38% respectively.

Table 4.4 Matching requirement and amounts received through funding streams before and after matching in 2014 (in millions of euros)

	millions of euros	matching funds	after matching
Second funding stream revenue	533	394	927
Third funding stream revenue	1,602	1,186	2,788
Total	2,135	1,580	3,716
First funding stream revenue destined for research	2,770	-1,580	1,190
First funding stream revenue destined for teaching	2,402		2,402

Note: We assume that the outcomes of EY's study are representative for all universities and UMCs.

Sources: Table 2.10. EY (2014). Rathenau Institute

4.3.3 Relationship between teaching and research

The first funding stream is paid out as a block grant to universities to fund research and teaching. Many academic staff at universities both teach and conduct research. This means that changes in

one of the two areas may also affect the other area. In this section, we look more closely at the relationship between teaching and research in terms of funding.

Of the 34 deans (52%) who say that policy measures do affect teaching and research, nine stated in their responses to the open questions that such measures put pressure on the ratio between teaching time and research time or create divisions between instructors and researchers. Table 4.5 shows teaching intensity per domain and trends in student numbers per domain according to the reference estimates of the Ministry of Education, Culture and Science used as a funding prognosis tool.

Table 4.5 Teaching intensity and estimate of student numbers by domain

	Teaching intensity (students per FTE	No. of university students by sector (2013=100)				
Domain	academic staff)	2005	2010	2013	2020	2030
Law	21.5	97	106	100	89	88
Economics	15.6	82	98	100	101	102
Behavioural & Social Sciences	13.7	89	102	100	99	98
Language & Culture	9.2	89	106	100	104	104
Engineering & Agriculture	6.2	78	90	100	112	116
Natural Sciences	4.4	62	81	100	119	123
Health & Life Sciences	4.0	82	96	100	99	100

Note: Teaching intensity is defined as the ratio between the number of students and the number of FTE academic staff, both as reported by the deans. Deans in the Health & Life Sciences domain indicated that they had difficulty delineating FTE academic staff because of the many different tasks that one person may carry out at a UMC. The figure for Health & Life Sciences may therefore be distorted.

Sources: Teaching intensity: Rathenau Instituut, deans' survey. Student numbers: Ministerie van OCW, *Referentieraming 2014*.

Rathenau Institute

Funding of teaching and research is a recurring theme for those deans who say that policy measures influence the relationship between teaching and research. Teaching intensity is lowest in the Natural Sciences, Health & Life Sciences, and Engineering & Agriculture; none of the deans in these domains described the relationship between teaching time and research time as under pressure. Eleven deans said that they have had problems budgeting teaching and research. Teaching and research provide the revenue that enables research fields to earn their own keep. The dean of a faculty in the Natural Sciences domain said the following:

> *'Only groups that teach large numbers of students are viable, or groups that are especially successful at obtaining external funding. The balance between teaching and research will change; some groups will do more teaching because that's their key to survival, and some groups will undertake more research.'*

A dean in the Law domain was more explicit:

> *'We're going to change the teaching/research ratio in some fields. In some cases to 80% teaching, 20% research. Mainly because those fields have little chance of acquiring European and external funding."*

In one Engineering & Agriculture faculty, the emphasis has shifted to the third funding stream. As a dean explained:

> *'We can only cover the cost of teaching with the money that we get for research. Research has become our core business, financially speaking. We also rely heavily on the second and third funding streams. It's become impossible to pay for good teaching with the money that's provided for that purpose.'*

It should be noted here that universities may differ considerably in how they allocate costs to teaching and research. Some recover the cost of laboratories and equipment from all the users, including students. In those cases, the faculty must pay the university a fee for every student it has in the lab. Other universities pay for laboratories from separate funds and classify all laboratory costs as research cost items. This makes it difficult to compare the costs of teaching and research at differing universities.

4.4 Conclusion

This chapter examined how the first funding stream is apportioned within universities and within faculties. In discussions concerning funding and the effects of policy, it is often suggested that changes in the Ministry of Education, Culture and Science's policy have a direct impact at all levels, right down to the research group or individual researcher. The results of this chapter provide a different picture.

We saw, first of all, that there can be major differences between the government's and a university's allocation model, which is entirely in keeping with the block grant principle. Some universities use almost the same parameters as the government in their internal model. Most, however, have their own particular model. Second, we saw that faculties also have their own allocation models, which may deviate from that used by their university. In other words, if policy has an impact on the research group or individual researcher, then the university and/or faculty has deliberately chosen for it to do so.

Regarding the research priorities, we saw that eight of the 13 universities allow for the strategic fields in their funding formula. Of the 66 faculties surveyed, 18 applied 'participation in research priorities' as a parameter in their funding formula.

It is striking how much importance is attached to doctorates as a funding variable. In the government's allocation model, approximately 20% of the research portion, i.e. about 9% of the total

first funding stream, is apportioned based on number of doctorates.[24] All thirteen universities include this parameter in their own models, making it the only one that they have adopted unanimously. Of the 66 faculties surveyed, more than 80% (54) also apply this parameter. This may explain why many researchers perceive this parameter as a bonus and believe it has perverse effects.

In the following chapter we look more closely at the relationship between government policy and research by analysing faculty strategies.

[24] Starting in 2017, this variable will have a ceiling of 20%.

5 Impact of policy on faculties

Distributing money across a faculty is a balancing act. An allocation model that appears to offer stability may in fact foster instability owing to external circumstances. If student enrolment in certain programmes suddenly becomes volatile, and the relevant allocation model bases the apportionment of first-stream funds on teaching parameters, then massive changes in allocation may ensue. If a research group suddenly witnesses a sharp drop in external revenue, a model that takes external grants as a parameter may further aggravate this decline.

In the previous chapter we saw how universities promote stability by making their allocation model predictable and transparent. We saw that faculties also promote stability and balance by making changes to the allocation model. Faculty policy is dynamic in two respects. Of the 68 faculties whose deans took part in the survey, 75% had amended their first funding stream allocation model in the past five years, are doing so now or are planning to do so. An even larger proportion of deans (84%) had amended the faculty's strategic research profile in the same period, are doing so now or are planning to do so. A total of 64 of the 68 deans (94%) indicated that the allocation model or strategic research profile had been or would be altered in the future. In this chapter, we discuss this dynamic and use the deans' reasons as an indicator for the impact of internal and external factors on the faculty.

It should be noted that a small number of faculties had not altered their allocation model recently and had no plans to do so. Virtually all of these faculties belong to universities whose own allocation model has remained stable in recent years. There are also faculties that have not altered their strategic research profile or have no plans to do so. This bears no relation to their university. The faculties that do not amend their strategic research profile tend to be those with a broad profile. Deans of other faculties with stable strategic research profiles explain – in response to open questions – that their choices in that regard are long-standing ones and that they are satisfied with those choices.

We asked the deans about the role of external factors in the following situations:

- when deciding in the past five years whether to change how first-stream funds are allocated within the faculty
- when deciding again whether to change the way first-stream funds are allocated within the faculty
- when deciding in the past five years whether to change the faculty's strategic research profile, and
- when deciding in the future whether to change the faculty's strategic research profile

We also asked the deans about the influence of European, national and university policy measures on the amount of money available to their faculty in the past three years and on the amount of money that would be available for the next three years.

We specifically asked them to consider nine factors, three related to university policy, two to the university's agreements with other parties, and four to external policy.

1. University policy
- Introduction of (new) research priorities by the university
- university-level investment
- university-level budget cuts

2. Agreements between university and others
- strategic positioning of university teaching based on performance agreements
- sector plans and discipline committees

3. External policy
- Top Sectors, not including NWO calls for proposals focusing on Top Sectors
- shift in NWO budget towards Top Sectors
- discontinuation of FES funding
- (preparations for) EU's Horizon 2020 and 'Grand Challenges' programmes

We first consider the impact of policy on revenue and then the impact of policy on faculty decision-making.

5.1 Impact of policy on faculty revenue

We asked the deans what effects various policy measures are having on their faculty's finances. These effects must be considered in the light of their overall budgetary expectations, which vary significantly: 38% of the deans expect their budget to increase, 36% expect it to remain the same, and 27% expect it to decrease (Table 5.1). The breakdown into domains shows that the majority of the deans in the Behavioural & Social Sciences and Health & Life Sciences domains expect the budget to remain stable. All the deans in the Natural Sciences save one expect their budget to increase. Expectations vary widely in all the other domains.

Table 5.1 Deans' expectations regarding overall faculty budgetary trends in the next three years, in number of deans per domain (n=64)

Domain	Increase	Same	Decrease	Total
Economics	3	0	2	5
Behavioural & Social Sciences	1	6	3	10
Heath & Life Sciences	1	5	1	7
Natural Sciences	5	0	1	6
Law	3	1	3	7
Language & Culture	4	5	3	12
Engineering & Agriculture	7	6	4	17
Total	**38%**	**36%**	**27%**	**100%**

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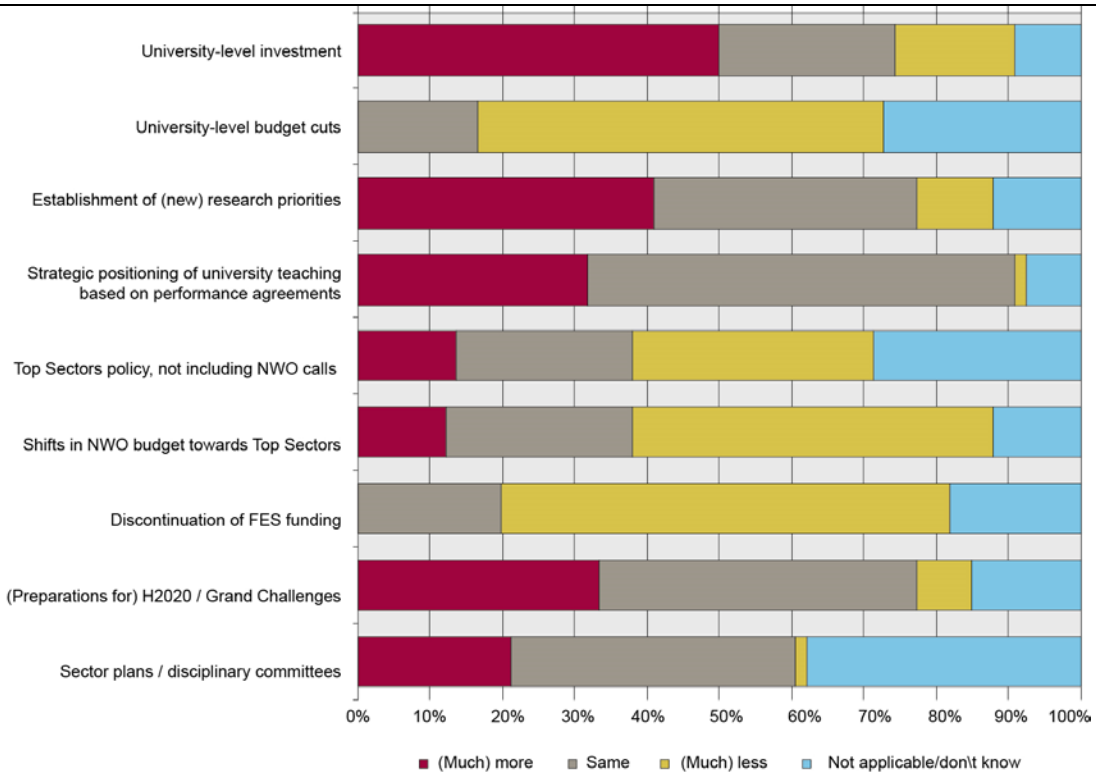
Source: Rathenau Instituut, deans' survey. Rathenau Institute

Interestingly, the deans think that university-level investment, research priorities, strategic positioning of university teaching, sector plans and Horizon 2020 have more positive than negative effects (see Figure 5.1). University budget cuts (obviously), the discontinuation of FES funding, and the Top Sectors policy are having a negative rather than a positive impact on more faculties. A considerable percentage of deans see the Top Sectors as detrimental to faculty finances. Fifty percent of the deans expect to receive less money owing to shifts in NWO funding to the Top Sectors. Thirteen percent of all deans say that NWO's Top Sector policy has given them more money. Once again, we break down their assessments down by domain (see Figure 5.2).

Figure 5.1 What influence have the following European, national and university policy measures had on the amount of money made available to your faculty in the past three years? (% of deans, n=66)



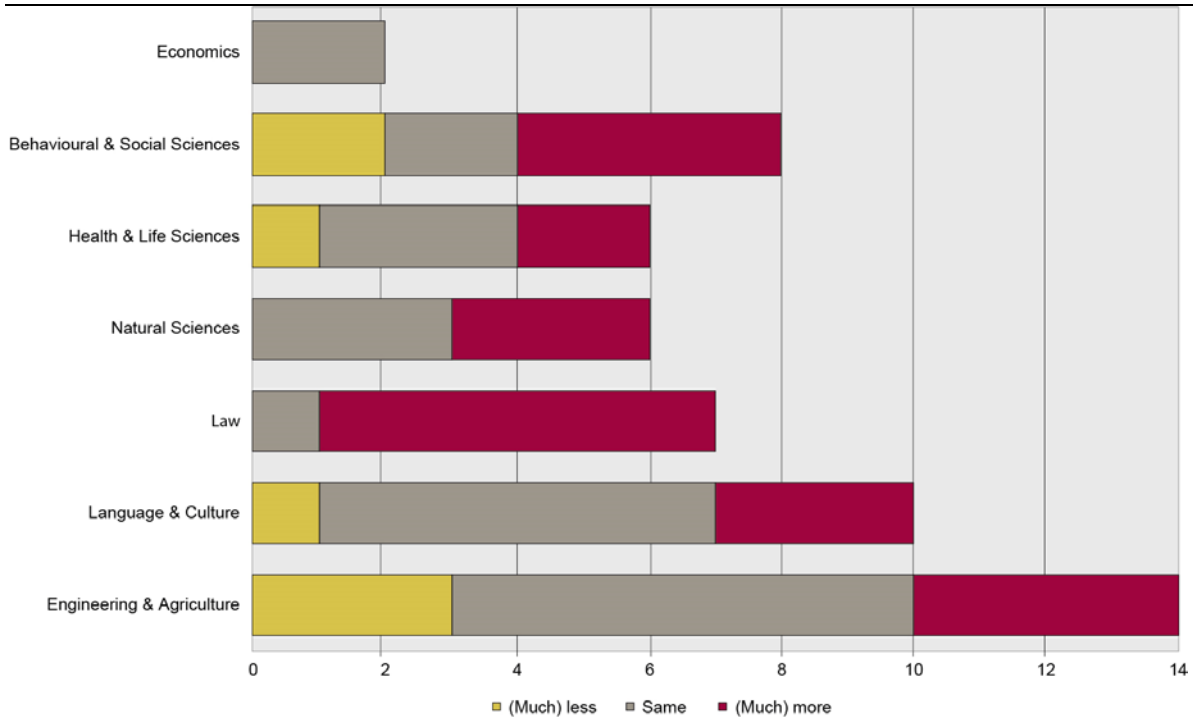
Source: Rathenau Instituut, deans' survey. Rathenau Institute

In discussions about university-level research priorities and the Top Sector policy, there are frequent claims that these policies have very different effects from one domain to the next. Some domains benefit greatly, while others lose out. Figures 5.2 and 5.3 show the impact on faculty revenue of establishing research priorities and of NWO's budgetary shifts towards the Top Sectors, by domain.

In none of the domains has the average effect of establishing research priorities been negative. In four of the seven domains, there were deans who received more money and deans who received less. In the Natural Sciences, Law, and Engineering & Agriculture, all deans received the same amount or more for their faculties.[25]

[25] This is also true in the Economics domain, but this observation is based on the responses of only two deans in all.

Figure 5.2 Impact on faculty revenue of establishing (new) research priorities in the past three years (no. of deans, n=56)



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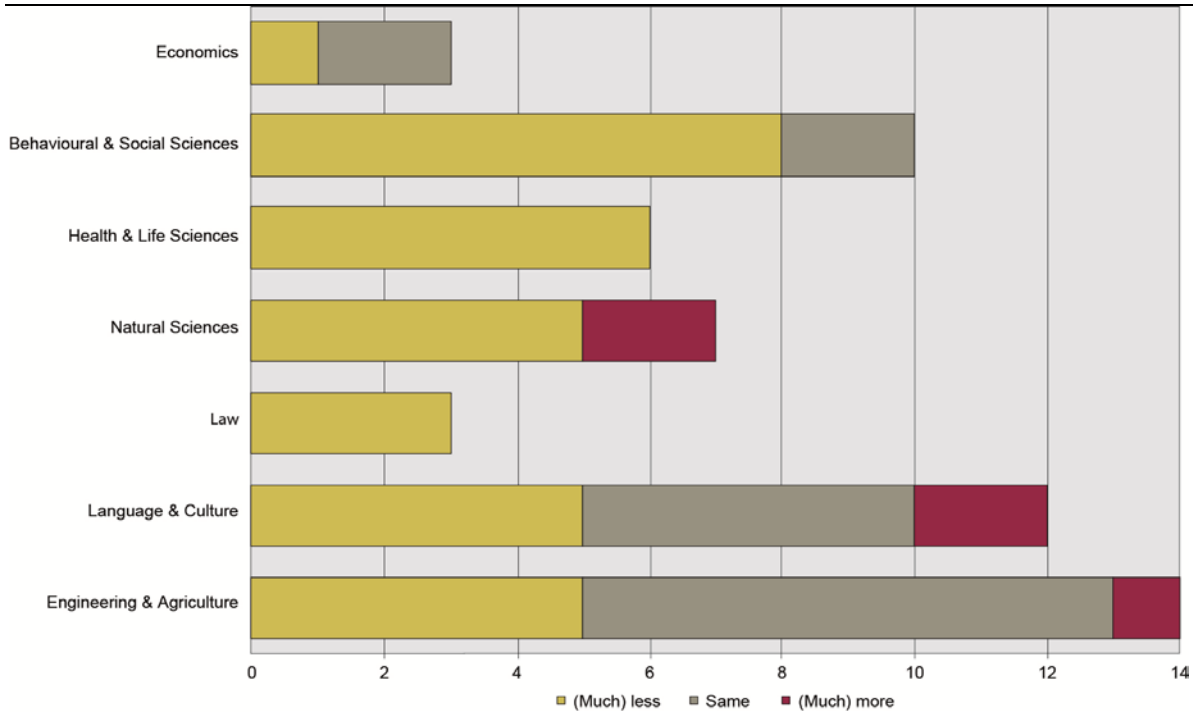
Note: The category 'Not applicable/Don't know' has been omitted.

Source: Rathenau Instituut, deans' survey. Rathenau Institute

The deans anticipated the effects of the Top Sectors policy to be predominantly negative. Only in the Natural Sciences, Language & Culture, and Engineering & Agriculture did the shift towards the Top Sectors lead to more revenue for some deans.

Figure 5.3 Impact on faculty revenue of shifting NWO's budget towards the Top Sectors in the past three years (no. of deans, n=58)



Note: The category 'Not applicable/Don't know' has been omitted.

Source: Rathenau Instituut, deans' survey. Rathenau Institute

Our conclusion, based on what the deans have reported, is that the negative impact of these two measures have so far not been concentrated in the domains to which they are least relevant. We also cannot say that their positive financial impact has been concentrated in domains to which the Top Sectors policy is most relevant.

5.2 Impact of policy on allocation model

Of the 68 deans, 36 (53%) say that they have made changes to the faculty allocation model in the past three years. In their responses to open questions, they cite changes in their university's policy, for example a change in the university allocation model, as their most important reason for doing so (13 times). Austerity measures are also cited a number of times (four), especially in relation to the amount of money received per student, but much less often than university policy.

Besides external reasons, the deans also point out numerous faculty-specific reasons for altering the faculty allocation model. The most important reason (cited ten times) is to make the model more performance-driven. The deans give many different arguments for this, for example quality improvement, encouraging academic entrepreneurship, and the efficient allocation of resources, often accompanied by or introduced concurrently with budget cuts. They also mention rewarding

productivity or revenue-generating capacity, transparency, or the wish to delegate responsibility to lower tiers of the organisation. Less important are considerations related to teaching.

A total of 29 deans (43%) indicate that they would like to alter their allocation model in the future. Changes in the university allocation models play a less prominent role in this case, although the deans do mention this regularly (five times). They more often cite performance targets along with the strategic positioning of their faculty (this in contrast to responses regarding the past). Notably, the remaining responses identify future stability as a bigger factor than it was in the past. In general, the deans scarcely ever refer to national or European policy spontaneously.

That is why, in addition to an open question about the reasons for the changes, we also included closed questions asking the deans to consider a number of external (for the faculty) policy changes and internal reasons. Table 5.2 shows how important these reasons were / are to the deans when deciding to change the faculty's allocation model and strategic research profile, both in the past five years and in the future.

In the past five years, the deans tended to put more emphasis on internal, faculty-specific reasons for changing the allocation model than on external ones. Especially important to them were rewarding excellence, facilitating new research fields, increasing student numbers and facilitating matching. Of the external policy factors, only Horizon 2020 played an important role. Less than half of the deans found university-level research priorities important. The Top Sectors policy was only of limited influence.

We see roughly the same pattern when it comes to changing the allocation model going forward (Table 5.3). Faculty-specific factors play an important role. Of all the policy measures, Horizon 2020 is most prominent, followed at some remove by university-level research priorities. The deans saw the Top Sectors as a more important reason going forward, but as a policy it still takes a back seat to faculty-specific reasons and Horizon 2020.

Table 5.2 Reasons for changing allocation of first funding stream and faculty's strategic research profile (% of deans)

	in the past five years (n=36)				in the future (n=29)			
	(very) important	neutral [a)]	(very) unimportant	n.a./don't know	(very) important	neutral [a)]	(very) unimportant	n.a./don't know
University-level research priorities	36%	3%	44%	17%	45%	21%	24%	10%
Increase in budget	6%	25%	28%	42%	14%	21%	21%	45%
Reduction in budget	33%	17%	19%	31%	41%	24%	14%	21%
National agreements	14%	0%	61%	25%	17%	21%	34%	28%
Relevance to Top Sectors	14%	17%	58%	11%	41%	21%	24%	14%
Relevance to Horizon 2020	53%	11%	28%	8%	72%	14%	10%	3%
External reasons	**26%**	**12%**	**40%**	**22%**	**39%**	**20%**	**21%**	**20%**
Facilitate matching	47%	11%	31%	11%	62%	17%	14%	7%
Facilitate new research areas	56%	8%	31%	6%	59%	21%	14%	7%
Attract/reward excellence	64%	6%	25%	6%	66%	7%	21%	7%
Change in student numbers	53%	6%	28%	14%	55%	17%	17%	10%
Change in degree programmes	25%	14%	33%	28%	31%	17%	24%	28%
Internal reasons	**49%**	**9%**	**29%**	**13%**	**54%**	**16%**	**18%**	**12%**

Note: [a)] neither important nor unimportant.

Source: Rathenau Instituut, deans' survey.

Table 5.3 Reasons for changing faculty's strategic research profile (% of deans)

	in the past five years (n=47)				in the future (n=33)			
	(very) important	neutral [a)]	(very) unimportant	n.a./don't know	(very) important	neutral [a)]	(very) unimportant	n.a./don't know
University-level research priorities	62%	11%	21%	6%	67%	15%	12%	6%
Increase in budget	21%	13%	23%	43%	12%	30%	12%	45%
Reduction in budget	23%	9%	26%	43%	24%	30%	15%	30%
National agreements	23%	19%	30%	28%	33%	21%	27%	18%
Relevance to Top Sectors	45%	9%	32%	15%	52%	12%	21%	15%
Relevance to Horizon 2020	77%	6%	13%	4%	82%	6%	6%	6%
External reasons	**42%**	**11%**	**24%**	**23%**	**45%**	**19%**	**16%**	**20%**
Facilitate matching	47%	15%	26%	13%	58%	15%	12%	15%
Facilitate new areas	81%	2%	11%	6%	85%	3%	6%	6%
Attract/reward excellence	26%	15%	36%	23%	42%	21%	24%	12%
Change in student numbers	70%	11%	13%	6%	67%	24%	6%	3%
Change in degree programmes	28%	6%	32%	34%	30%	18%	21%	30%
Internal reasons	**50%**	**10%**	**23%**	**17%**	**56%**	**16%**	**14%**	**13%**

Note: [a)] neither important nor unimportant.

Source: Rathenau Instituut, deans' survey.

5.3 Impact of policy on strategic research profile

There are 47 deans (69%) who say they have altered their faculty's strategic research profile in recent years. The two most common reasons given in response to the open questions are to improve the faculty's strategic positioning (27 times) and to encourage interdisciplinary or interfaculty cooperation (13 times).[26] Two other frequently cited reasons are to key into societal issues and to boost the impact of research (ten times). In some instances, this appears to be a strategic effort to attract funding, while in other cases it is presented as an internal change in direction. Other reasons that are given multiple times are to create scope for new research fields, university policy (often aimed at encouraging interfaculty cooperation), Horizon 2020, the Top Sectors and, specifically in Engineering, the preferences of certain companies or other funding bodies important to the field. Big data is mentioned regularly as a new field in which the faculty is investing.

One frequently mentioned change that is being made to the strategic research profile is a shift in the ratio between staff teaching time and staff research time. Some faculties have a general rule that applies equally to all researchers. Other faculties use this measure as a control mechanism to promote quality or revenue-generating capacity, with some researchers thus being given more time for research and some less in accordance with the selected criteria. The underlying reason for changing the teaching time/research time ratio was and in most cases still is a cash shortage. There is not enough money to give all staff the same amount of research time. Nevertheless, some faculties are so satisfied with their new time allocation mechanism that they maintain it even when their financial distress has been alleviated. Other faculties consider a reduction in research time as an extreme measure and plan to reverse the changes as soon as their finances permit.

Some faculties are winding down certain research topics in order to finance new fields, to attract top researchers by offering attractive start-up packages, to create more mass in focus areas, or to solve (anticipated) financial problems. Eight of the deans specifically mention winding down research topics. In other cases, the terminology used (e.g. 'reorganisation') implies that research topics are being wound down there as well. A number of the deans whose faculties are winding down research topics see a direct relationship with the relevant group's anticipated revenue-generating capacity in Horizon 2020, or refer more generally to changes in policy.

The reasons cited are not specific to a certain domain (Table 5.4). There are, however, differences in the role each reason plays in changing the strategic research profiles. The most important or second most important reason in every domain is to improve the faculty's strategic research profile. Other prominent reasons given in response to the open questions are to encourage interdisciplinarity (especially in the Behavioural & Social Sciences, Law, and Language & Culture) and to key into societal issues (Health & Life Sciences, Natural Sciences, Engineering & Agriculture).

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[26] In this case, strategic positioning concerns reasons related to the faculty's (international) reputation, limiting research themes, adding focus and developing a strategic policy.

Table 5.4 Reasons for changing the strategic research profile by domain, as cited in responses to open questions and in decreasing order of frequency

Domain	Reasons for changing strategic research profile
Economics	teaching and improve faculty's strategic profile
Behavioural & Social Sciences	relevance for H2020, improve faculty's strategic profile, university-level research priorities, interdisciplinarity
Health & Life Sciences	improve faculty's strategic profile, societal issues, winding down
Natural Sciences	improve faculty's strategic profile, societal issues
Law	improve faculty's strategic profile, interdisciplinarity
Language & Culture	improve faculty's strategic profile, interdisciplinarity, quality
Engineering & Agriculture	innovation, improve faculty's strategic profile, societal issues, winding down, Horizon 2020, Top Sectors, budget cuts, funding sources other than government

Source: Rathenau Instituut, deans' survey. Rathenau Institute

Regarding future changes to the strategic research profile, the responses to the open questions do not differ all that much from the reasons given for making changes in the past. Strategic positioning of the faculty, interdisciplinarity and innovation are cited most often as reasons. Looking ahead, there are fewer explicit references to funding programmes. Sources of cash other than public ones are growing more important. Societal issues and quality are important underlying reasons for the projected changes in strategic research profiles. There are fewer explicit announcements of winding-down operations than reports of changes that have already been made.

To supplement our open question about changes to the faculty's strategic research profile, we once again presented a list of reasons and asked to what extent these too had played a role in the past three years, or would do so in the next three years. The most important external influences are Horizon 2020 and the university-level research priorities. The Top Sectors play less of a role. The most important internal reasons for changing the faculty's strategic research profile are to create scope for new research fields and to reward or attract outstanding researchers. Internal, faculty-specific reasons play a bigger role than external ones. The reasons for wanting to change the strategic research profile going forward are roughly the same, except that student numbers, facilitating matching and – to a lesser extent – national agreements, the Top Sectors and Horizon 2020 are more important than they used to be.

5.4 Conclusion

Faculty policy is a balancing act in which many different factors must be taken into account. It is hard work to keep everything in balance. That much is apparent from changes made to the allocation model for the first funding stream and the strategic research profile – changes that were in fact undertaken in recent years by many of the faculties whose deans we interviewed.

Public discussion can easily create the impression that budget cuts and the Top Sectors policy are forcing faculties to amend their policies. The results of this chapter show that the reality is much more subtle. Of all the external factors, recent reductions in budgets were less important than the desire to key into the EU's Horizon 2020 Framework Programme and the establishment of university-level research priorities. The Top Sectors played a limited role.

In general, however, internal reasons figure more prominently than external factors, both in the past and in the future. Three factors had a relatively large impact on faculty policy in recent years, and that impact is likely to continue:

- The desire to improve the faculty's strategic research profile by attracting outstanding researchers and developing new research fields
- The desire to facilitate matching of second- and third-stream revenue
- The need to adapt to changes in student numbers, whether this means declining or rising enrolment in degree programmes or changes in student preferences for certain majors within study programmes

What is striking is that the deans rate these factors as relatively more important than university-level research priorities, national agreements, the Top Sectors, and reductions in the budget.

6 Impact of policy on researchers

In the foregoing chapters, we described how public funding for university research is channelled to researchers through allocation models and competitions. The money provides incentives and serves policy objectives, but how these ultimately affect researchers is difficult to predict. If we follow the money, we see that its relationship to the original objectives seems increasingly diluted.

Policy involves more than distributing money, however. It also involves controlling behaviour. If seemingly small incentives are the only way to increase a researcher's budget, they can lead to considerable behavioural changes. And the expectation that there will be more or less money available for some research topics can influence researchers in their choices. In this chapter, we analyse how researchers perceive the impact of policy, and specifically whether they perceive or anticipate policy as affecting revenue and choice of research topics in their field.

We do this making use of the survey distributed among all active members of the Royal Netherlands Academy of Arts and Sciences and the Young Academy between November 2014 and the second week of January 2015. We asked a total of 265 researchers to participate. The final response rate, after eliminating deans, Academy members not affiliated with a Dutch university, and incomplete questionnaires, was 51% (n=135).

Our survey of Academy and Young Academy members does not establish factual influences. They are difficult to isolate within the complex science system, something that requires a detailed analysis of research lines and strategies.[27] Instead, we approached the Academy and Young Academy members – researchers whom we expect to be well informed about trends in their field and the effects of policy – and asked them what policy influences they themselves perceive.

Academy and Young Academy members are clearly not a representative sample of Dutch university researchers. The distribution of respondents across universities and research fields is skewed. If we compare the number of respondents per university and HOOP area[28] with the total number of professors per university and per HOOP area according to the WOPI,[29] we see that we must be cautious when drawing conclusions about specific universities or HOOP areas.

Of the 135 respondents, 125 are professors, five are associate professors, two are assistant professors and three have a different title. Almost half (64; 48%) are also administrators, for example dean (1), assistant dean (4), director of an institute (12) or head of department (23). Their research groups have a staff of between 14 and 100 FTEs, with a median of 40 FTEs.

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[27] For recent studies, see for example Horlings & Gurney (2013) and Laudel & Gläser (2014).

[28] HOOP refers to a planning document (the Higher Education and Research Plan) that divides the entire education system into nine areas.

[29] WOPI (Wetenschappelijk Onderwijs PersoneelsInformatie) refers to a database of information on the staff of all Dutch universities. This study is based on the WOPI of 31 December 2013.

6.1 Impact of policy on revenue

We asked the Academy and Young Academy members to list their three most important sources of research funding (Table 6.1). 74% identified the first funding stream as one of their three most important sources. For 61% it is the most important source of funding, while the remaining 13% put it in second or third place. The source identified most often, however, is NWO. No less than 93% of the Academy and Young Academy members refer to research funding through NWO, ZonMW and STW. This was usually the second most important source. The third source identified by most of the Academy and Young Academy members is the European Framework Programme (69% of respondents), usually the third most important source. A minority of respondents put other sources of funding among the top three. The Top Sectors were cited least (by six respondents) and never as the most important source.

Table 6.1 Sources of research funding (no. of times identified, no. of respondents)

	No. of respondents who identified funding stream				
Funding stream	no. who identified	% respon-dents	no. times 1st place	no. times 2nd place	no. times 3rd place
NWO (incl. ZonMW and STW, excl. Top Sectors)	125	93%	44	64	17
1st funding stream	99	74%	60	15	24
European Framework Programmes	92	69%	16	27	49
Contract research for government	23	17%	1	10	12
FES programmes	18	13%	5	5	8
Health fundraising organisations	13	10%	3	2	8
Contract research for industry	12	9%	2	3	7
Top Sectors (calls and TKI allowances)	6	4%	0	4	2

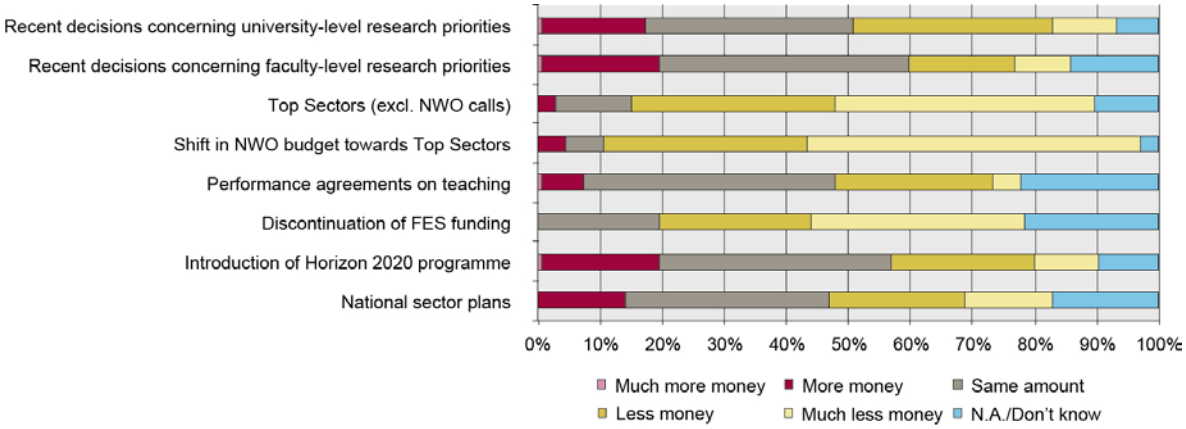
Source: Rathenau Instituut, survey of Academy and Young Academy members. Rathenau Institute

As we did with the deans, we asked the researchers about the impact they expected specific policy measures to have on research funding in their field at their university. Their responses were noticeably negative. In the case of every measure presented to them, the number of respondents who expect money available in their field to decrease (sharply) is larger than the number who expect it to increase (sharply). Most expect there to be (much) less money available due to the discontinuation of FES funding (59%) and the introduction of the Top Sectors policy (75% and 87%). Their negative expectations mirror those of the deans. The projection concerning the Top Sectors policy is striking, given how unimportant the Top Sectors are for the members' research funding.

The Academy and Young Academy members did not have distinctly positive expectations of Horizon 2020 and the university-level research priorities. Only between 17 and 20% expected

Horizon 2020 and the university and faculty-level research priorities to increase revenue in their field, and between 26 and 42% expected it to decrease revenue. These expectations are striking because the deans generally expected these measures to lead to *more* money for their faculty.

Figure 6.1 Impact of policy measures on amount of money available in Academy and Young Academy members' fields at their own university (n=134).



Source: Rathenau Instituut, survey of Academy and Young Academy members Rathenau Institute

We have also broken down these expectations into different domains. Compared with the general pattern, the following aspects are notable:

- Members active in Health & Life Sciences and Engineering & Agriculture believe that discontinuation of FES funding will hit their fields hardest: 83% to 89% of the respondents in these domains indicate that there will be (much) less money available for their field at their university. Members active in these domains expect relatively fewer problems from the shift in NWO funding to the Top Sectors.
- By contrast, 88% to 97% of members active in Language & Culture, Behavioural & Social Sciences, and Law do expect (much) less money to be available for their field because of the Top Sectors policy.
- Members also expect national sector plans and university-level research priorities to have mainly a negative financial impact on research fields in the Language & Culture, Behavioural & Social Sciences, and Law domains. In the latter domain, 63% of Academy and Young Academy members expect less money to be available because of these plans. In the other domains, that is between 38% and 57%.

We saw earlier that the deans also have extremely negative expectations concerning the impact of the Top Sectors policy on the humanities and social and behavioural sciences.

6.2 Impact of policy on strategic research profile

We asked the Academy and Young Academy members about the impact of various policy measures on research choices in their fields (Figure 6.2). The responses show that the university-

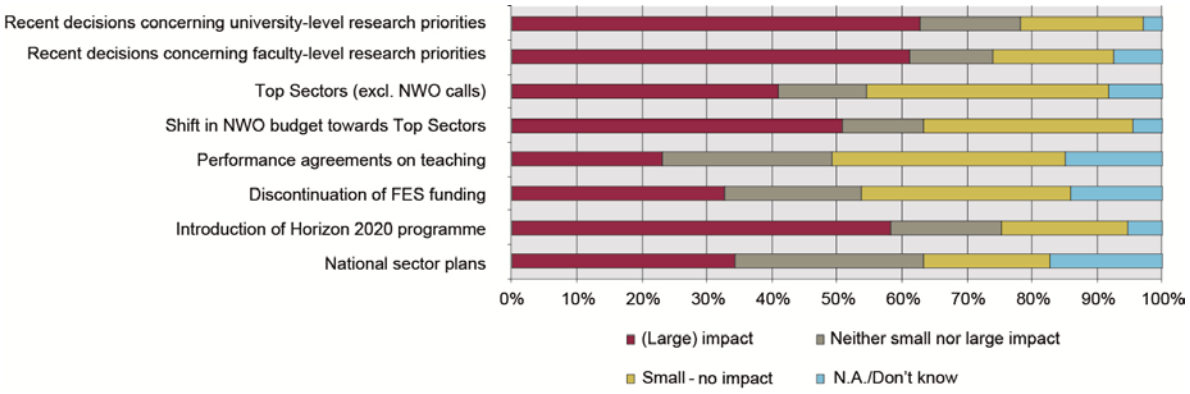
level research priorities and Top Sectors policies have the most impact on the chosen research topics. There is, furthermore, little uncertainty concerning these policy measures (given the low percentages for ‘don’t know’ and ‘not applicable’). The national sector plans, the discontinuation of FES funding and the introduction of Horizon 2020 are having a relatively large impact on the amount of money that respondents expect to receive, but little influence on the choice of research topics.

In view of their expertise, we also asked Academy and Young Academy members to provide information on areas of research in their fields that:

- are expanding at their own university
- are expanding in the rest of the Netherlands
- are contracting or disappearing altogether at their own university
- are contracting or disappearing altogether in the rest of the Netherlands

We were not concerned with the specific fields as such; the Academy’s ‘Blank Spots’ Committee has provided an overview of such fields, including six ‘areas of concern' that require special attention.

Figure 6.2 Impact of policy measures on choice of research topics in the fields in which Academy and Young Academy members are active at their own university (n=134)



Source: Rathenau Instituut, survey of Academy and Young Academy members. Rathenau Institute

In our analysis, we are interested in the causes to which the respondents attributed the expansion or contraction. We differentiate between four different trends. We refer to *national expansion or contraction* when the respondents say that a research field is expanding or contracting in the rest of the Netherlands, or not only at their own university but also at all other universities that carry out the same type of research. In all other cases, we refer to *local expansion or contraction*.

Of the 510 research fields listed, 151 (30%) are contracting or even disappearing nationally and 128 (25%) are expanding nationally. Of the research fields in which the trend is only local, 158 (31%) are classified as expanding locally and 73 (14%) as contracting or even disappearing locally.[30]

The respondents cite ‘appeal to students’ to more or less the same degree as a factor driving all four trends. Other non-policy-related factors are mainly important for expanding research fields. International interest and researcher excellence are the main drivers behind expansion. By contrast, respondents see very little relationship between contraction and these factors (or their absence). Another notable point is they are more likely to attribute expansion at their university to the excellence of their own researchers than to attribute expansion in the rest of the Netherlands to this cause (Table 6.2).

Of the policy-related causes, there is almost no mention of sector plans and discipline committees. University-level priorities and the Top Sectors or Horizon 2020 are identified as causes of national and local contraction and, to a lesser extent, expansion.

[30] Nineteen research fields were not included in our analyses because they were not clearly designated or the designation was too general in nature (e.g. ‘applied research in the broad sense, ‘impossible to foresee’, ‘diverse’). A number of research fields were extremely broad in nature (e.g. ‘chemistry’, ‘basic clinical research’, ‘traditional model-driven research’) but were included in the analyses.

Table 6.2 Percentage of respondents who identify a specific cause (%, shaded areas indicate >30 (light grey) and >50% (dark grey))

Causes [a)]	National expansion	Local expansion	Local contraction	National contraction
Non-policy related				
Research field is attracting / no longer attracting international attention	76%	80%	19%	15%
Research field has been expanding for several years	49%	46%	b)	b)
Researchers involved have an excellent / weak international reputation	41%	65%	19%	11%
Research field attracts many / few students	28%	32%	39%	36%
Policy-related				
University has / has not designated it as a priority	25%	39%	65%	59%
Was agreed in a sector plan / discipline committee	1%	7%	3%	6%
Relevant / not relevant to a priority in one or more Top Sectors	20%	16%	36%	71%
Relevant / not relevant to one or more of the Grand Challenges in Horizon 2020	36%	31%	24%	50%
Total no. of respondents	**123**	**157**	**72**	**142**

Note: a) This was a closed question presenting a list of possible causes. b) Cause not queried for fields that are contracting or disappearing.

Source: Rathenau Instituut, Survey of Academy and Young Academy members. Rathenau Institute

6.3 Impact of policy on opportunities to explore promising research topics

We asked the Academy and Young Academy members whether they felt they had adequate opportunities to explore promising research topics. A majority (56%) say their opportunities to do so are inadequate (34%) or very inadequate (22%). A modest minority (29%) say their opportunities are adequate (19%) or more than adequate (10%). Is this a general pattern, or do respondents in some faculties see more or fewer opportunities than others? Table 6.3 shows that the only domain in which a majority of respondents claim to have adequate opportunities is Engineering & Agriculture. In the other domains, the majority say their opportunities are inadequate.

Table 6.3 Opportunities to explore promising research topics, by university (% of respondents)

	adequate	inadequate	neither	n
Engineering & Agriculture	56%	25%	19%	16
Behavioural & Social Sciences/ Economics [a)]	32%	55%	14%	22
Language & Culture / Law [a)]	28%	56%	16%	43
Natural Sciences	22%	68%	10%	41
Health & Life Sciences	17%	58%	25%	12
Total	**29%**	**56%**	**15%**	**134**

Note: a) Owing to the small number of respondents, Economics and Law have been grouped with Behavioural & Social Sciences and Language & Culture respectively.

Source: Rathenau Instituut, Survey of Academy and Young Academy members. Rathenau Institute

The responses of the Academy and Young Academy members to the open questions and their additional comments show that those who take a positive view see opportunities for themselves, but far fewer ones for others. Those who take a negative view of opportunities to choose their own research topics also refer to opportunities available to others, the teaching load, the need to frame research to suit the funding body, and the demand for more applied research.

In their responses to the open questions, the respondents blame this largely on insufficient funding, specifically for smaller projects undertaken by young researchers. The lack of support for small projects is also mentioned by the members who say they have adequate opportunities themselves. Many of the members in this latter group had recently won a major grant and therefore had a great deal of freedom.

Only a small number of respondents say that they are actually changing research topics. They say that they ‘frame’ their research differently, but not that they are switching to a different line of research. However, members do feel that they are being pressured to undertake applied and economically useful research (references to ‘valorisation’) and that resources are generally too limited to conduct sound research.

It is interesting to compare these outcomes with the results of a national survey of academic researchers carried out in 2014 (Goede, 2014). In the 2014 survey, the majority of researchers in fact thought they had enough leeway to choose their research questions. The survey was conducted among all researchers, but the outcome did not differ between academic positions. The difference between the two surveys may lie in the fact that the national survey asked researchers to describe their own situation, whereas we asked the Academy and Young Academy members to look at the situation in their research field. They may believe that other researchers have less freedom to develop their own research interests than they do. A further difference, between Academy/Young Academy members and non-members, may also explain the different outcomes. It may be that members have more new research ideas than non-members that cannot be developed

within the available budget and policy. Or perhaps their involvement in policy debates makes them more aware of potential negative effects.

We also explored a possible connection between opportunities to explore promising research topics and the impact of policy on the amount of money available and the choice of research topics. We used the statistical method of odds ratios to examine whether the respondents who claim that policy measures have an impact are also more likely to say that their opportunities to explore promising topics are inadequate. Table 6.4 shows the outcomes of our analysis, which reveal a number of significant relationships between the impact of a policy measure and the opportunity to explore promising research topics.

We see three notable results:

- Research priorities – and specifically the faculty-level research priorities – are the only factor that actually limit opportunities to explore promising research topics. Only 26% of the respondents associated the faculty-level research priorities with a reduction in available funds, but through this effect, these priorities appear to be correlated with opportunities to explore promising research topics.
- The respondents associated the Top Sectors, Horizon 2020 and the sector plans with a reduction in available funds, and through this reduction, with their having inadequate opportunities to explore promising research topics.
- Almost 60% of the respondents associated the discontinuation of FES funding with a reduction in available funds, but there is *no* significant relationship between this and opportunities to explore promising research topics.

Table 6.4 Relative strength of correlation between impact of policy on available funds and researchers' choice of research topic and opportunities they perceive to explore promising research topics

Respondents who indicate that the policy measures below lead to a reduction in available funds / have a greater impact on choice of research topic...	...are *[designated odds ratio]* times more likely to say that their opportunities to explore promising research topics are inadequate than respondents who indicate that the policy measure does not lead to a reduction in available funds / has little or no impact on choice of research topic	
	reduction in available funds	impact
University-level research priorities	1.7	1.9*
Faculty-level research priorities	4.4***	2.8***
Top Sectors (excl. NWO calls)	3.7***	0.8
Shift in NWO budget towards Top Sectors	5.5***	1.6
Performance agreements on teaching	1.5	0.8
Discontinuation FES funding	1.2	1.1
Horizon 2020 programme	2.0*	0.9
National sector plans	2.3**	1.6

Note: Strength of correlation measured by chi-square. *** = significant at 99%, ** = significant at 95%, * = significant at 90%.

Source: Rathenau Instituut, Survey of Academy and Young Academy members. Rathenau Institute

6.4 Conclusion

In this chapter we analysed what impact Academy and Young Academy members believe policy measures have on research in their own field, in terms of funds, choice of research topic and opportunities to explore promising research topics. Researchers say that the three most important sources of funding are the first funding stream, NWO and Horizon 2020, in that order. They are relatively negative about the impact of policy on the funding made available from each of these sources. They also see policy linked to these sources as causing local and national contraction of research fields. The policies regarding university-level research priorities and the Top Sectors have the biggest impact on the choice of research topics.

Virtually all researchers identify NWO as one of the three most important sources of research funding. The members expect to receive much less money from NWO now that it has shifted funding to the Top Sectors. Most of the respondents identify the first funding stream as the most important source of money for research. Relatively few researchers expect policy measures linked to the first funding stream to result in extra money, whether through their faculty, the university or government. The same applies for the university- and faculty-level research priorities. Strikingly, researchers also expect the faculty-level research priorities to limit their opportunities to undertake promising research.

More than half of the Academy and Young Academy members say that their opportunities to explore promising research topics are inadequate. A majority of respondents in the Behavioural & Social Sciences, Language & Culture, Natural Sciences, and Health & Life Sciences say their

opportunities are inadequate. Contrary to expectations, it is not respondents in the Behavioural & Social Sciences and Language & Culture who see the fewest opportunities to explore promising research topics.

Another notable point raised in this chapter is the mismatch between the size of differing funding streams as calculated in Chapter 2 and their perceived importance and impact. The first funding stream pays for 59% of the research carried out at universities, while the second funding stream pays for 12%. A maximum of 40% of NWO grants are allocated to the Top Sectors, and a portion of that only after the grants have been awarded in open competition. Nevertheless, researchers perceive the Top Sectors policy to have major negative effects.

One of the reasons for this is confusion concerning the funding streams. In Chapter 2, we saw that the classification into first, second and third funding streams no longer accurately reflects the evolution and dynamic nature of sources of university research funding. We look at this more closely in our next chapter.

7 New classification system for university funding

One recurring problem in science policy discussions is that many people find the research funding system confusing. In Part 1 of this report, in which we estimate the size of the various funding streams, we saw how difficult it is to make such estimates. In some overviews, the first, second and third funding streams also consist of very different types of funding (e.g. block grants, competitive, public, private, project-based, and so on). An increase or decrease in a certain funding stream thus says little about any potential effects. The previous two chapters further showed that there is a mismatch between the size of funding streams and the perceived impact of policy.

In this chapter, we present a new classification system for the funding streams as they now stand. We are not advocating to change the existing funding streams, but rather to represent them in a new way. We hope that our classification makes it easier to see the impact of the various types of funding on the science system. It corresponds more closely to the various ways in which research funding is allocated and obtained. We have also taken note of various discussions of research funding, for example concerning the competitiveness of the research system, perverse incentives, the privatisation of research, and the pressure to provide matching funds. Our classification system makes the relative size of certain funding streams clearer.

It differentiates between public and private funding and between funds disbursed directly as a block grant and funds distributed competitively to projects. This functional classification provides a clearer picture than the present system of the level of competition and the contribution of private sources of funding. One important aspect of the new classification system is that it is consistent with existing methods of data collection and reporting.

7.1 Analysis of the current system

The current funding stream classification system has several major shortcomings.

It is not being applied consistently. While the Ministry of Education, Culture and Science, the universities and researchers refer to the same funding streams, they all use slightly different definitions. The UMCs have their own classification system, with four funding streams. The co-existence of different definitions for the funding streams has led to major differences in estimates of their relative size. That is an especially important factor for the relative size of the first and second funding streams.

The funding streams are not homogeneous. Each of the funding streams has public and private funds that are allocated directly or in competition. For example, the government block grant is grouped together with student fees and the Gravitation Grants. The direct government funding consists of a block grant to finance the universities' and UMCs' statutory tasks. Student fees can be

regarded as students' private investment in higher education.[31] And the Gravitation Grants differ from the government block grant in that they are awarded to competing consortia of outstanding researchers to support innovative and influential research. The third funding stream is even more diverse. It covers a multitude of different funding sources, including EU funding, which is gaining ground as a strategic factor among universities and faculties.

There is much confusion about the underlying principles, especially with reference to the second funding stream. The second funding stream is often described as competitive public funding, but the present definition covers all NWO and Academy funds. These funds are meant to support NWO and the Academy in all of their tasks, including the institutes that they govern and the advisory reports that the Academy issues. Also grouped into the second funding stream is the basic institutional funding that NWO and the Academy give their institutes, a provision that is not based on the assessment and selection of research proposals. When the second funding stream is identified with NWO, the funds distributed by STW (an NWO domain) and ZonMw (only the 'Mw' part falls under NWO's budget) are often disregarded.

The Academy can scarcely be regarded as a second funding stream organisation. It allocates a relatively modest sum (2.6 million euros in 2014), equal to 1.8% of its overall expenditure, to universities under the Academy Professor Prize, a lifetime achievement award for researchers at the top of the world league table in their field. The award is furthermore based on nominations rather than funding applications. Finally, a notable omission in the second funding stream is the ERC, even though its budget is now larger than the Talent Scheme and is distributed according to the same principles.

7.2 Functional classification into four types of funding

In this section we introduce a new functional classification of university funding as it now stands that is based on the principles underpinning the funding of university research. Here, funding is classified along two dimensions: (1) the source of the funding and (2) the apportionment method.

Source refers to the difference between public and private funds.

- **Public**: The purpose of the funding has been publicly determined and laid down in the law, for example the Higher Education and Research Act (WHW). The availability of funding is the outcome of a political process whose results are announced each year on the third Tuesday of September (Budget Day). Funding is then made available to public bodies (such as the Ministry of Education, Culture and Science or NWO) charged with distributing the monies among institutions and researchers. Public funds have a significant historical component: the availability of funds is budgeted a number of years in advance (both by the funding bodies

[31] The Ministry of Education, Culture and Sciences regards student fees as public funds because until the 1990s students paid their fees to the Ministry, which then dispersed the money to the universities. Because this system led to an unnecessary circulation of money, it was decided to have students pay their fees directly to their university.

and the recipients) and decisions taken in the past have a considerable impact on the present.

- **Private**: The purpose of the funding is determined by the funding body. The funding provider (the commissioning body or client) is commissioning research to serve its own needs, mission or objective. Private funding is more volatile than public funding in terms of availability. It is, for example, sensitive to student preferences, to company R&D strategies, and to the generosity of the public.[32]

The apportionment method refers to the distinction between direct funding paid out as a block grant and project funding that is distributed in competition.

- **Direct**: This type of funding is meant to cover tasks laid down by law or in some other manner. It is disbursed to the institutions in the form of a block grant. The recipient is free to allocate the funds as it sees fit. The initiative lies with the funding body: the relevant ministries decide which institutions will receive a specific block grant and which institutes they will charge with a statutory task; students choose their study programme and university. Accountability is ex post facto and based on evaluations.
- **Competitive**: Funds are allocated to projects that have a specific aim and that run for a limited period of time. The initiative lies with the applicant, who competes with others for a share of the 'market'. Competitive factors may be the quality of the proposed research, applicant characteristics (e.g. number of years since earning a doctorate) or the content (e.g. a focus on translational research when applying to health fundraising organisations, knowledge relevant to enterprises and authorities in the market for contract research, topics that tie in with the 'Grand Challenges' in Horizon 2020). Funds are disbursed mainly but not exclusively to individual researchers and consortia. Exceptions are very large grants, such as QuTech and the EU's Flagship Initiatives, for which agreements are made with institutions. Evaluation and monitoring are ongoing processes, i.e. during the application procedure (*ex ante*), during the project itself (*ex durante*), and after its conclusion (*ex post*).[33]

Combining the two dimensions – public/private and direct/competitive – produce four different types of funding. This functional classification has three advantages:

1. In each case, there is a direct relationship between the functional nature of the funding, the purpose of the funding, and how it is used by the recipient. This makes the financial incentives explicit and reveals which research and which study programmes are being funded through that funding stream.
2. The functional classification provides clearer information for discussions about the level of competitive funding and the pressure to produce matching funds.

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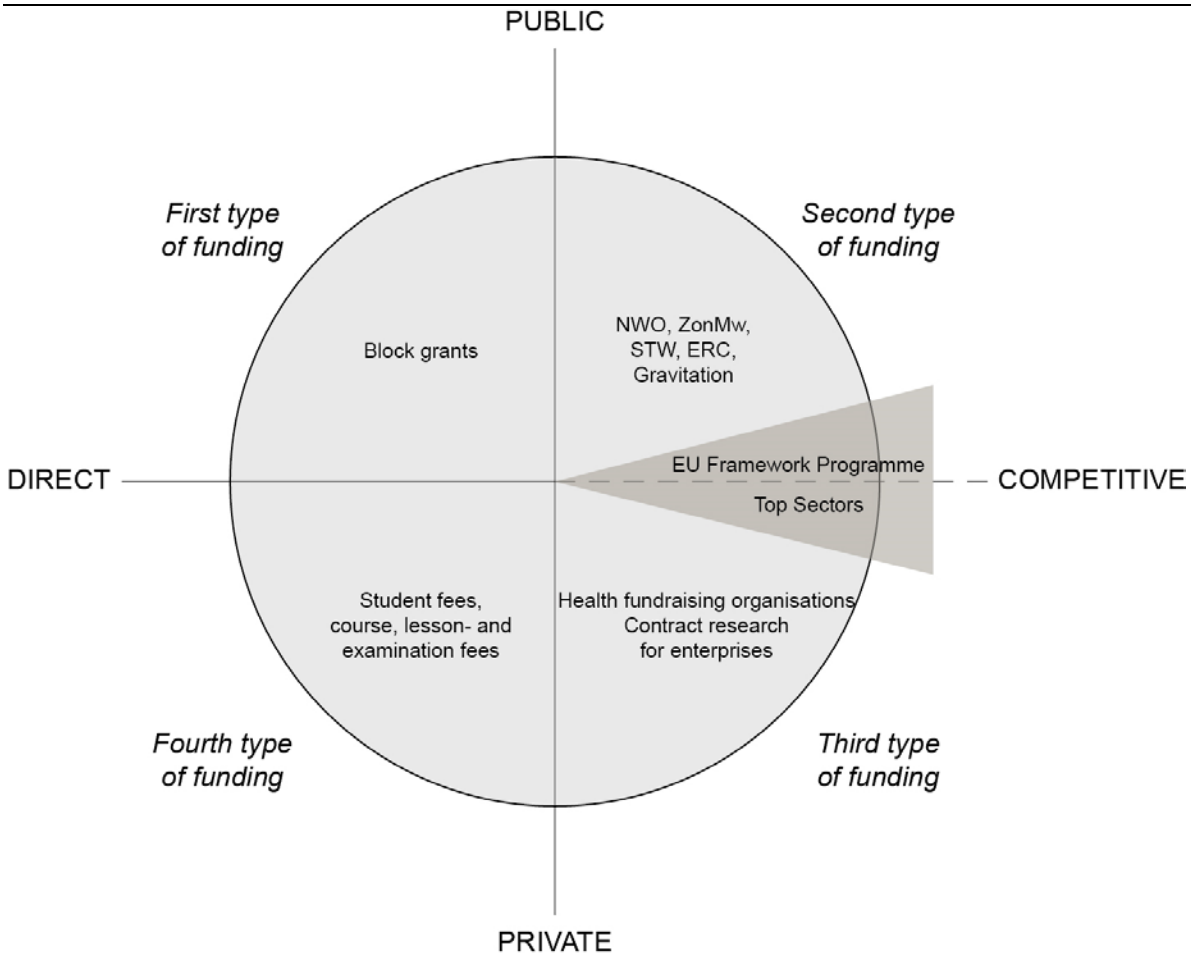
32 An example taken from the health fundraising organisations: in 2013, the Alpe d'HuZes fundraising initiative was the talk of the town. Having solicited 29.2 million euros worth of donations for the Dutch Cancer Society in 2013, it raised only 13.5 million euros in 2014 (Source: Jaarverslag KWF 2014, p. 146).

33 STW, which funds research in technology, tracks the outcomes of projects that it supports for a number of years after their conclusion in its 'Utilisation Reports' (*Utilisatierapporten*).

3. If we can indicate, for each funding instrument, the extent to which the recipient is free to spend or reallocate the funds as it sees fit, then we can have an informed discussion about the financial scope for investigator-driven research and the ratio between basic and applied research. Are funds earmarked for a specific purpose or programme, or can the recipient decide how they will be used? Are certain outcomes expected, must the recipient report on them, and if so, in what way?

Figure 7.1 depicts the new functional classification into four types of funding.

Figure 7.1 Functional classification of funding streams according to allocation principles



Source: Rathenau Instituut. Rathenau Institute

1. Direct public funding (block grant)

The first type of funding in the new classification system is direct public funding. It consists of public funds paid out directly to institutions as a block grant to support their statutory tasks. The Ministry of Education, Culture and Science (twelve universities) and the Ministry of Economic Affairs (Wageningen UR) provide this basic institutional funding from their budgets. The University Medical Centres receive five ‘service provision contributions’ for training doctors and specialists, carrying out research, and teaching students. The Ministries of Education, Culture and Science and Health,

Welfare and Sport furnish these amounts from their budgets. The sums are distributed according to the same principles, although for different purposes.

We have expanded what is now often regarded as the first funding stream by adding to it the funding that the Ministry of Health, Welfare and Sport disburses to the UMCs. We exclude funding provided through the Gravitation Programme as well as student fees. In our new classification system, direct public funding is restricted to funding provided to universities, but conceptually speaking it should also include the basic institutional funding that goes to the NWO and Academy institutes.

2. Competitive public project funding

The second type of funding concerns government funding of academic research that is dispersed among competing applicants. There are, roughly speaking, two types of competition.

- The first is the **open competition**, in which the applicants themselves define the research and applications are compared and selected based on scientific quality and relevance to society. Any researcher who satisfies the funding instrument's participation criteria (e.g. for a VENI, the applicant must have received his/her doctorate no more than three years previously) may submit an application. All applications are treated the same: they follow the same procedures, are judged according to standard criteria (prominent among these are the quality, innovativeness and feasibility of the proposal, the applicant's CV, and the valorisation section), and are subject to peer review and selection. This type of competitive funding, which is common across the globe, is meant to encourage quality in research. The money is not allocated to the university as an organisation, but to researchers as professionals within that organisation.
- The second is the **closed competition**, in which the funding body defines the objectives in advance. Contract research carried out for government is the most obvious example, with competition not being limited to university researchers in many cases.

We have decided to group these two forms of competition into a single type of funding because they increasingly overlap. We are seeing this in certain NWO programmes, for example some of the pre-defined programmes for the Top Sectors, health research and educational research. Another example is the share of the Horizon 2020 funding that is not allocated by the ERC.

The largest subcategory of public competitive funding consists of the grants awarded by NWO, Technology Foundation STW and ZonMw. STW is an NWO domain allocates the NWO Engineering Division's funds. ZonMw is an alliance between Netherlands Care Research and NWO's Medical Sciences Division.[34] STW and ZonMw are funded to some extent by other public and private sources, including the Ministries of Economic Affairs and Health, Welfare and Sport and the private business sector.

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[34] NWO's annual accounts only report the funds that STW and ZonMw have received through NWO.

Box 5: The European Research Council
The European Research Council (ERC) was set up under the European Commission's Seventh Framework Programme for Research and Innovation. Its mission is to support investigator-driven frontier research across all fields of science, scholarship and engineering by allowing researchers to identify new opportunities and directions in any field of research. The ERC encourages the highest-quality research in Europe through competitive funding. In doing so, it adheres to the principles of scientific excellence, autonomy, efficiency and transparency.

Source: European Commission, Commission Decision of 2 February 2007 establishing the European Research Council (2007/134/EG). https://erc.europa.eu/about-erc

The functional definition also means that budget of the European Research Council (ERC) and the Gravitation Grants should be regarded as public competitive funding. Researchers who satisfy the participation criteria may apply, and their applications are reviewed and selected by panels of peers.

The Gravitation Programme is meant for consortia of outstanding researchers who conduct innovative and influential research in their fields. The purpose of the programme is to encourage world-class research that constitutes a genuine international breakthrough. NWO organises the selection procedure. The Gravitation Grants are distributed as part of the government block grant, but in functional terms they belong under competitive public project funding.

The European Framework Programme is competitive and distributes public funding. The funding it provides does not cover the total costs of all the participants. That is especially true when the participants are private parties. For example, enterprises participating in an Innovation Action have 70% of their direct and indirect expenses covered. This means that public funds are supplemented by private funds. In other words, this is a hybrid type of funding. Since the largest share of the programme is funded publicly, however, we have classified the European Framework Programme as public competitive project funding.

3. Competitive private funding

The third type of funding consists of private funds awarded in competition. This includes contract research carried out for enterprise, and the funds distributed by the health fundraising organisations and other private (non-profit) foundations. The funding criteria and procedures vary from one provider to the next. The health fundraising organisations resemble the organisations that supply public project funding in several respects, except that the funding decisions are taken not by researchers but by the fundraising organisation itself. The market for contract research is by no means an 'equal opportunity' market: those who wish to compete must invest in social networks and acquisition.

4. Direct private funding: student fees

The fourth type of funding consists of student fees. Besides the statutory student fees, we also count all additional fees and any lesson, course and examination fees. A university distributes its student fees and government block grant internally through its own allocation model. However,

student fees differ from the government block grant in that they are provided by a private party whose specific expectations are distinct from those of the block grant provider, i.e. a proper academic education. But as in the case of the block grant, students have no say in how the university spends their student fees internally.

A fifth type of funding?

Competitive funding can also be divided into three types. As we saw in the foregoing, in addition to competitive public and private funding, there is also competitive public-private funding. Various funding instruments allow for co-financing, whether in cash or in kind. Applicants are often expected to introduce partners who will fund part of the research. Examples are the programmes that received FES funding, the Horizon 2020 Joint Technology Initiatives, and the Academic Collaborative Centres funded by ZonMw. The Top Consortia for Knowledge and Innovation (TKIs) can also be put in this group.

There are arguments for classifying competitive public-private funding as a fifth type of funding, but we have chosen not to do so. In practice, it is difficult to quantify public-private partnerships and co-financing. Much of the information is not documented in the universities' and research funding providers' annual reports and annual accounts. Therein lies the most important reason for our decision: the functional division of funding streams must be consistent with the current data collection practices of all the various parties.

7.3 Size of the four types of funding

Table 7.1 indicates the size of the four types of funding for universities and UMCs in 2014, based on the calculations presented in Chapter 2. The table also indicates the size of the three funding streams according to the old classification system. When we apply the new classification system to university funding as it now exists, we see that competitive public funding (formerly the second funding stream) is much larger than competitive private funding (formerly the third funding stream). In the old classification system, the opposite was true. We also see that direct public funding is smaller than the first funding stream in the old system.

Table 7.1 Size of four types of funding for universities and UMCs in totals and as spent on research in 2014 (in millions of euros; %)

New classification system	teaching and research	research	Old classification system	teaching and research	research
Direct public funding	4,616	2.433	First funding stream	5,172	2,770
Direct private funding	556	337			
Competitive public funding	1,252 [a)]	1,252	Second funding stream	533	533
Competitive private funding	883	883	Third funding stream	1,781	1,602
Other operating revenue	920	0	Other operating revenue	920	0
Total	**8,405**	**4,906**		**8,405**	**4,906**
Direct public funding	55%	50%	First funding stream	62%	56%
Direct private funding	7%	7%			
Competitive public funding	15%	26%	Second funding stream	6%	11%
Competitive private funding	13%	18%	Third funding stream	21%	33%
Other operating revenue	11%	0%	Other operating revenue	11%	0%
Ratios					
Public	70%	75%			
Competitive	28%	44%			
Ratio direct/competitive	2.24	1.30	1st / 2nd funding stream	9.70	5.20
Ratio private/public	0.28	0.33			
After matching					
Direct funding after matching		1,190	First funding stream after matching		1,190
Competitive funding after matching		3,716	Second funding stream after matching		927
Ratio direct/competitive after matching		0.32	1st / 2nd funding stream		1.28

Note: a) Includes contract teaching.

Source: Tables in Chapter 2 and Table 4.5. Rathenau Institute

Of the funds spent on research, 44% are distributed through competition. In the old classification system, the ratio between the first and second funding streams was often used to indicate the scale of competitive funding and the level of competitive pressure. The ratio in the old system is 9.7:1. If we look only at public research funding, our new system gives us a direct/competitive ratio of 1.94:1. The ratio is even lower for public and private research funding combined, i.e. 1.3:1.

When we follow the method used in Chapter 4 to set off the matching requirement against these outcomes, then the pressure to compete becomes even stronger. After matching the funds awarded in competition, universities and UMCs spent a total of 3,716 million euros on competitively funded research. Competitive funding therefore accounts for more than triple the amount spent on research out of the remaining direct funding.

The third funding stream is often associated with the privatisation of public research. In the old classification system, a third of research was thought to be privately funded. Our new system corrects that picture. Only 18% of research is funded through competitive private funding. Student fees account for an annual 7% of research funding. Private funding thus accounts for approximately 25% of all university research funding.

7.4 Conclusion

The outcomes of the new classification system for the existing funding streams explain the difference between how policy statistics are interpreted and what researchers perceive. The first funding stream allocation models focus on stability and continuity. Viewed from the perspective of policymakers, the funding amounts actually linked to some form of priority-setting are limited. Deans therefore see relatively few policy effects, and in so far as policy *is* having an impact, they expect it to generate more revenue rather than less. Researchers focus more on competitive funding, which is unreliable. Competitive funding in fact represents a larger share of university revenue than the old classification system suggests. Changes in this type of funding, such as the Top Sectors policy and the transition of the 7th Framework Programme to Horizon 2020, lead to uncertainty and instability. With regard to the financial scope for investigator-driven research, much of the discussion revolves around the shifts in NWO funding. What are not being considered are the rise of the ERC, which also funds investigator-driven research, and the impact of matching obligations on non-designated funding within a faculty.

8 Conclusions: how the plates spin

Prioritisation is a constant in Dutch science policy. Although the language of policymaking has changed over the course of time – from ‘task allocation and concentration’ and ‘selective contraction and expansion’ to ‘focus and mass’, ‘priority-setting’, ‘strategic positioning’, ‘top sectors’ and ‘research agenda’ – the thinking behind that policy has remained the same: as a small country, the Netherlands cannot excel at everything. It must be selective. The assumption is that concentration and competition are good for the quality of research.

The main purpose of this report is to examine how the government’s prioritisation policy affects researchers. We have analysed the mechanisms that determine the relationship between the prioritisation policy and research practice, identified both the size and the allocation of the various sources and types of funding, and queried the perceptions and practices of deans and researchers.

We have taken information from the central government’s national budgets and annual financial reports and the annual reports and annual accounts of universities, university medical centres, funding bodies and institutes. We supplemented this information with data taken from the University Hospital Interdepartmental Policy Study and with information about the universities’ internal allocation models collected within the context of the Science Policy Interdepartmental Policy Study (Ministerie van Financiën 2014). The most detailed information came from two surveys, one of deans and the other of Academy and Young Academy members, carried out at the request of the Academy’s Advisory Committee on ‘Blank Spots’ in University Research.

In this concluding chapter, we combine all the results to explore the potential impact of policy. We highlight a number of results in an effort to clear up discussions about university research funding, and address a number of unanswered questions.

8.1 The dean as a juggler

Science policy often comes down to funding, and priority-setting in research is often stimulated by changes in funding. The Dutch Ministry of Education, Culture and Science encourages the strategic positioning of university research by awarding performance-dependent funding from the first funding stream. The Ministries of Economic Affairs and Education, Culture and Science use the competitive allocation of funding by NWO and other channels to align university research more closely with the requirements of the Netherlands’ top economic sectors.

Many science policy initiatives and many of those participating in public debate assume that government policy incentives are passed on directly to researchers. Our findings contradict this assumption. In Chapters 2, 3 and 4, we describe as precisely as possible how government funding of university research is allocated. Our analysis shows that stakeholders are constantly required to choose anew and to coordinate the government’s policy incentives with their internal strategies, with the desire to maintain some continuity in teaching and research, and with other changes. University

executive boards make choices in line with the principle of university autonomy. The deans then make further choices. Researchers seek to chart their own course between all the various funding sources and policy incentives.

In Chapters 5 and 6 we discuss the effects of policy as witnessed by deans and perceived by researchers, based on the results of two surveys. Deans are reasonably positive about the financial effects of the government's prioritisation policy. Researchers generally expect this policy to reduce their funding. They believe that policy is largely responsible for the contraction of research fields, but attribute their expansion to dynamic internal processes. The blend of funding sources for research varies considerably, both within faculties and within research fields.

One notable point is that the hallmarks of funding tend to differ less between domains (e.g. Language & Culture, Health & Life Sciences, and Engineering & Agriculture) than within them. The domains are much less homogenous then we thought they were at the start of this study. That means that we must exercise caution when generalising about the effects of policy on certain domains. What we have noticed is that researchers in the Engineering & Agriculture domain are more positive about the possibility of undertaking promising research, and that they feel more disadvantaged by the discontinuation of the Economic Structure Enhancing Fund (FES). We have also noted that virtually all researchers in the social sciences and humanities expect their funding to be cut owing to the government's policy of prioritising the top economic sectors (Top Sector policy). These differences are not apparent between faculties, however. There are many different sources of revenue within the domains, and the anticipated and perceived policy effects also diverge widely.

Policy incentives are quickly absorbed into the broader dynamic of the faculty and of university-level teaching and research. Government allocation parameters should thus not be viewed as policy incentives, in particular when we consider the principle of university autonomy and the associated block grant funding system. The one exception appears to be the number of doctorates awarded. It is a relatively influential factor in the Ministry's allocation model and has made its way into all university and many faculty allocation models. As a result, many see this parameter as a 'bonus' – which it is not; technically speaking it is an apportionment formula – and regard the sharp focus on doctorates as a perverse effect.

The dynamics of research funding are clearest if we consider the role of the dean in research funding allocation. Direct government funding, funding channelled through NWO and the European Research Council (ERC), other forms of competitive funding, and the rise and fall of student numbers all converge within the faculty. To keep all the faculty plates spinning, the dean must constantly seek balance and stability. A notably large number of deans had amended their faculty's research strategy and/or internal allocation model in recent years, or were actively doing so at the time of the survey.

Deans amend the faculty allocation model and research strategy for three important reasons:

- To improve the faculty's strategic profile in order to attract outstanding researchers and/or develop new research fields
- To assist efforts to obtain competitive research funding

- To adapt to changes in student enrolment in study programmes and in student preferences for certain majors within study programmes.

The most important reason in virtually every field was to improve the faculty's strategic profile.

This brings us to two key observations regarding our question about the dynamics of strategic positioning. The first is that strategic positioning clearly takes place, but that it is fuelled mainly by local interaction between different trends and opportunities. The second is that the first funding stream appears to play mainly a facilitative role in the above. The first funding stream allows the dean to key into the dynamic forces of research and teaching and into external funding opportunities. The national policy of strategic positioning can legitimise the dean's efforts to improve the faculty's strategic profile. But national priorities – whether or not linked to the Top Sector policy, sector-specific plans or positioning agreements – are virtually never a decisive factor. Their facilitative role fits in flawlessly with the principle of university autonomy and the block-grant nature of direct government funding.

The importance of the facilitative role increases as the balance between direct and competitive funding tips towards the latter. Viewed from the national government's perspective, the first funding stream (direct funding) for universities is almost ten times the size of the second funding stream. If that were the case, then it should be enough to allow the universities to use part of their direct funding for prioritisation purposes. However, the distinction between the first and second funding streams and the terminology used are antiquated and confusing. In Chapter 7 we presented a new, functional classification of the current funding streams and saw a more balanced relationship between direct funding and competitive funding. In 2014, direct funding was 2.2 times the size of competitive funding, and 1.3 times when it came to the portion spent on research. The matching requirement that year was 1,580 million euros or 65% of direct public funding used for research. When the ratio between the two funding streams is this even, deans can only improve their faculty's strategic research profile if they allow for the specific local situation.

8.2 Towards a better informed discussion of research policy

One of the most important initial results of this study was our observation that there is a major shortage of hard data on the allocation of research funding. There is no clear and complete description of how the first funding stream is apportioned between universities. There is no full overview of how NWO allocates its funding. There is no proper description of how universities distribute their funding internally. And there is no understanding of how important the various funding streams are within faculties.

That shortage makes it virtually impossible to develop informed policy, estimate policy effects and know whether the priorities set by a funding body will have an impact. If we toss a rock into a small, tranquil pond, we expect to see a circular pattern of waves. Dutch universities are no small, tranquil ponds, however. On the contrary, they are highly dynamic places, and neither their researchers nor policymakers in The Hague can predict the patterns that will emerge upon the heels of new policy.

We will therefore conclude this study by clarifying a number of discussion points, in the hope of facilitating a more evidence-based discourse about research policy and funding. We hope this will end the confusion about the size of the first funding stream, about perverse effects, about the Top Sectors, and about strategic positioning. At the very least, we hope that discussion of these subjects will henceforth be supported by the best data available.

Size of first funding stream/direct public funding

In Chapter 2 we gave a reasoned definition of the first funding stream and refined that definition in Chapter 7 by referring to direct public funding. In our definition, direct public funding includes all direct funding received by the universities and UMCs; this therefore includes the amounts allocated by the Ministries of Economic Affairs and Health, Welfare and Sport. We did not include student fees because, in the present system of student aid, they can be regarded as private funding. The same is true of the grants awarded through the Gravitation Programme, distributed by means of a competition (organised by NWO). The size of the first funding stream/direct public funding then comes to a total of 4,616 million euros; of this sum, the universities and UMCs spend 2,433 million euros on research.

Allocation of first funding stream/direct public funding

The Ministry of Education, Culture and Science uses an allocation model for its share of direct public funding. That model applies a number of parameters for research and teaching, special facilities and performance. In the 2014 model, teaching and research were allocated approximately the same amounts. Both the teaching provision and the research provision contain a *fixed budget* (the teaching provision and the research provision), which is allocated to the institutions on a percentage basis, based on historical grounds. Other parameters allow for the number of students and degrees awarded, the number of doctorates, and vulnerable study programmes. Universities compete with one another on those parameters. If a university lags behind the others in terms of student enrolment or doctorates awarded, then it receives a smaller share of the government block grant.

The ‘PhD bonus’ is not a bonus at all. The number of doctorates awarded is, in fact, one of the parameters in the Ministry’s allocation model. Because there was no ceiling on the amount allocated on the basis of this parameter, however, doctorates became an increasingly important factor in block grant allocation. As from 2017, a 20% ceiling has been imposed for this parameter.

The parameters in the allocation model say little or nothing about how the funds are ultimately spent. The only purpose of the block grant allocation model is to furnish a responsible system for distributing the total budget for the universities between the various institutions. Universities and UMCs receive direct public funding in the form of a block grant. Universities are autonomous organisations and their executive boards are authorised to use a different internal allocation system for the block grant monies than the model used by the relevant Ministry (Economic Affairs for Wageningen UR; Education, Culture and Science for the other universities). Our study shows that university allocation models usually differ from the national model. In turn, the faculties – the

beneficiaries of the university executive board's largess – are free to decide how to allocate their funds to their units and researchers.

Our results show that there is no clear relationship between the university executive board's allocation model and the faculty allocation model. Faculty allocation models and strategic research profiles are extremely dynamic in nature. That also means that perverse effects cannot be blamed on government (alone) and also that government (alone) cannot prevent perverse effects.

Size of second funding stream/competitive public project funding

There is much confusion about the size and allocation of the second funding stream. In our study, we came across a great many implicit definitions of the second funding stream. In Chapter 2, we presented a reasoned calculation of the size of the second funding stream, i.e. the sum that NWO, STW, ZonMW and the Academy award to researchers in the form of competitive grants. The size of the second funding stream then comes to 683 million euros in all. This does not include the basic institutional grants meant for the NWO and Academy institutes. In 2014, the universities and UMCs received 533 million euros through the second funding stream, according to their annual accounts. In Chapter 7 we narrowed our definition of the second funding stream to competitive public funding. This also includes EU funding and government contract funding. Competitive public funding then amounts to 1,252 million euros.

Grant pressure and competition

In discussions about 'grant pressure' (i.e. pressure on researchers to compete for grant awards), the only factor often considered is the award percentages at NWO. In 2004, the total award percentage for all types of funding was 35%. By 2014, that had declined to 24%. The percentages were even smaller in the Talent programmes and the Open Competition that year, i.e. 17% and 20% respectively.[35] If we use the narrow definition of competitive public funding, as we did in Chapter 7, then it becomes clear that in order to understand grant pressure among Dutch researchers, we must also consider the award percentages at other competitive funding providers. At the ERC, the award percentages for Starting Grants and Advanced Grants were 11.7% and 8.5% respectively.[36] The award percentage for the Horizon 2020 programme in 2014 was 14% for the first 100 calls, whereas it was 20% for the entire 7th Framework Programme.[37] In addition, to understand grant pressure, it is important to know what share competitive funding accounts for. The size of the second funding stream is not a good indicator. In our new classification system, total competitive funding amounts to 2,135 million euros (44% of total research expenditure); a significant share of this requires matching funds. After matching, the ratio between direct funding and competitive funding is 0.32:1. In other words, researchers depend much more on competitive funding than the size of the second funding stream suggests.

35 Source: http://www.ocwincijfers.nl/wetenschap/inhoud/instellingen-wetenschap/honoreringspercentages-nwo
36 Source: https://erc.europa.eu/statistics-0.
37 Source: https://ec.europa.eu/programmes/horizon2020/en/horizon-2020-statistics

Humanities versus Engineering

It is commonly thought that the prioritisation policy is bad for the humanities and good for engineering. After all, the policy focuses on economic returns and engineering offers greater economic benefits. In our study, however, we did not find this distinction. We also did not find any more general distinction between humanities, science, and social sciences. Every domain has deans with positive and negative expectations of the policy's financial impact. Every domain has researchers who associate the contraction of research fields with the policy and the expansion of research fields with internal dynamism and the quality of researchers. Statements about ‘typical’ differences in policy impact within and between research domains are probably untrue, and the situation in one faculty should not be taken as typical for the research domain as a whole.

8.3 Unanswered questions

In this report, we have used the best information available to describe the size and allocation of research funding in 2014. When information on 2014 was unavailable, we used information on 2013. Some matters remain unclear because data was unavailable, because 'it depends on the situation’, or because the topics went beyond the remit of this study. We discuss two of those matters here.

Internal allocation of funding

We did not reconstruct the actual allocation of funding within universities and faculties, but looked more generally at the parameters that they use. That revealed a considerable diversity. Some research groups can fund most of their research with direct public funding, based on their performance on teaching parameters. Some research groups depend on competitive public funding. Some research groups use a broad mix of different types of funding. All this means that we must be careful not to generalise about how money is distributed in the Dutch research community and how researchers obtain funding. We must also exercise caution when making assertions about the impact of policy through funding.

Trends in research funding

This report looks at the situation in 2014. Claims have been made in many policy discussions that certain funding streams or types of funding are increasing or decreasing in size. This report is not a longitudinal study. Additional and detailed research is needed, for example to determine whether:

- direct public funding in the new classification system has declined over time. Many perceive it that way, but the calculations produced by Statistics Netherlands and the Rathenau Institute do not back up those claims for the first funding stream.
- competitive public funding has increased. It is indeed higher than expected, based on figures concerning the second funding stream. The discontinuation of FES funding may have meant a reduction in the past five years. EU funding, on the other hand, may have caused competitive funding to grow.
- private funding from enterprise has increased. Private funding of research at research universities and universities of applied sciences came to 650 million euros in 2014, according

to the OECD. That is less than 13% of the total. But our report does not calculate whether the Top Sector policy is leading to an increase or a decrease in this share.

- the financial scope for investigator-driven research is decreasing or increasing. We can define that scope as the total sum in NWO funds destined for the Talent programmes and the Open Competition, the budget that the ERC awards to Dutch researchers, and the amount in direct public funding that remains after matching.

8.4 Final remarks

What does this mean for policy? While the findings of this report tempted us to analyse the government's current science policy, changes in NWO and university research policy, we have refrained from doing so. Our main aim is to improve our understanding of research funding and policy effects. In addition, we propose a better classification system for research funding. This new system makes plain why there has been such a huge disparity in recent years between data available on research funding and policy based on that data on the one hand and researchers' perceptions on the other. We sincerely hope that our findings and new classification system will lead to a new understanding between researchers and policymakers.

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Who was Rathenau?

The Rathenau Instituut is named after Professor G.W. Rathenau (1911-1989), who was successively professor of experimental physics at the University of Amsterdam, director of the Philips Physics Laboratory in Eindhoven, and a member of the Scientific Advisory Council on Government Policy. He achieved national fame as chairman of the commission formed in 1978 to investigate the societal implications of micro-electronics. One of the commission's recommendations was that there should be ongoing and systematic monitoring of the societal significance of all technological advances. Rathenau's activities led to the foundation of the Netherlands Organization for Technology Assessment (NOTA) in 1986. In 1994 this organization was renamed 'the Rathenau Instituut'.