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The 'Negotiated Space' of University Researchers' Pursuit of a Research Agenda

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Abstract The paper introduces a concept of a 'negotiated space' to describe university researchers' attempts to balance pragmatically, continually and dynamically over time, their own agency and autonomy in the selection of research topics and pursuit of scientific research to filter out the explicit steering and tacit signals of external research funding agencies and university strategies and policies. We develop this concept to explore the degree of autonomy researchers in fact have in this process and draw on semi-structured interview material with research group leaders in Finland and the UK, in the former in seven research fields, in the latter in two fields. First, the analysis reveals that topic selection is strongly filtered by the intra-scientific factors. In topic selection researchers have more leeway, a broader negotiated space than in research content, that is, in the ways in which they pursue their research, which are more affected by funding opportunities and other contextual matters. Second, the ways which affect researchers' agency include individual- and more aggregate-level acts and factors: at the individual level, researchers resort to different strategies to create a negotiated space, but at the more aggregate level field-specific factors play a role. In fields with multiple funding opportunities, which we call 'shopping mall' fields, researchers can have a broader negotiated space than in fields where funding is more based on 'lottery'. In the

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latter, the researchers' negotiated space is narrow and contingent on the outcome of the funders' decisions.

Introduction

Political direction of research has from time to time attracted interest in studies of science. The "finalization" debate in the late 1970s and early 1980s was an expression of this interest by drawing attention to development in science in relation to responsiveness to problems external to the cognitive domains of the research fields (Weingart 1997; Schroyer 1984). Proponents of the 'Mode 2' thesis claim to describe changes in the production of science that have fundamentally transformed the modes of pursuing research and in the ways in which science is organised as a response to close interaction between scientific developments and practical and political problems (Gibbons et al. 1994). Both theses have been criticised as being normative and Mode 2, despite its long list of changes, for not being a description of the new forms of science but rather, a product of normative, "wishful" thinking (Weingart 1997) or a self-fulfilling prophecy (Gläser 2000). While proponents of these two theses have tended to postulate the responsiveness of science to external knowledge demands as desirable, there have been opposite views emphasising that too far-reaching responsiveness poses a threat to the development of science itself, that 'Mode 1' is the archetype of science, and that it deserves to be defended (Weingart 1997; Gläser 2000).

Changes in the funding environment of science in recent decades, especially those concerning moving gradually away from block grant to discrete project support in university research, has again turned the pendulum and provoked new concerns that it will detrimentally influence the progress of science by giving funding organisations more influence over research goals and contents (Bourke and Butler 1999; Langfeldt 2001; Laudel 2006; Heinze 2008; Whitley 2010; Nuffield Council on Bioethics 2014). At the same time, authority, that is, steering and governance, relations inside universities have changed and led to increasing state coordination and direction of the research activities and strategic and administrative agendas of universities as well as political and bureaucratic monitoring of performance in public research organisations (Whitley 2010; Whitley and Gläser 2007). University-based researchers are now faced with an increasingly complex and changing environment affected by the behaviour of external funders and by national university policies. Funder priorities are changing, such as requiring impactful research (e.g., Witty Review 2013; Nuffield Council on Bioethics 2014) and university policies increasingly emphasise performance evaluations, including both individual and activity unit research profiling (Pietilä 2014), thus changing university governance relations such that university managers have generally gained more relative power. These conditions set new requirements for academic

researcher activities and researchers' ability to control the design and execution of their own research goals and particular research agendas.

The degree to which and through what mechanisms external funders, university management or government administration actually control the goals and/or contents of research is a question that has been empirically under-explored. Most scholars seem to assume that external funding or policy objectives set for universities do have impact on the contents and direction of research, though the degree to which this happens can vary (e.g., Whitley 2010; Wang and Hicks 2013). There is also evidence of a certain 'nostalgia' for a (most likely imagined) time or setting where scientists enjoyed freedom from external financial pressures and concerns about the timescales to which research projects are expected to bear fruit that exist in the 21st century Western (and increasingly global) scientific and scholarly world (Whitley 2000; Pielke Jr. 2014).

An underlying assumption of contemporary research policy is also that funding agencies, on the one hand, and the management of universities and research institutes, on the other, *can* and *do* influence the content and direction of research in a reasonably direct fashion. Accordingly, research funding programmes are launched with the aim to generate research on specific topics and themes (e.g. on specific global challenges like climate change, or with specific dissemination and engagement aims like producing research that is utilisable by non-academics) or research is expected to be pursued in a specific manner, for example, as 'frontier' or path-breaking research (e.g. the pivotal principle of European Research Council, ERC) in collaboration with non-academic partners and/or across disciplines, and to answer to specific practical or policy challenges.

Changing university governance[1] and external funding arrangements do, of course, create important framework conditions for research topic selection and pursuit of research, but it has been recently emphasised that their role is strongly *mediated* by researchers' perceptions of the most fruitful research lines, research objects and methodologies (Laudel and Gläser 2014). Furthermore, researchers may have multiple ways to adapt, respond to and cope with the requirements of funders or university managers, such as superficial 'window dressing' re-branding of traditional research activity to give it the *appearance* of fit with changing funding requirements and funder preferences (Leisyte et al. 2010; Laudel and Gläser 2014).

Our starting assumption here is therefore that the relationship between external research funding conditions and various research practices is more complicated, dynamic and mediated than often presumed. We assume researchers engage in pragmatic 'negotiation' over time with their funders, their university strategic and administrative research management and other parties as well as their scientific and scholarly colleagues, students and other parties 'internal' to science, about their research lines and contents. They aim continually to 'negotiate' a space, 'a negotiated space', where they attempt to balance their own agency and autonomy to select topics and to pursue scientific research in a manner that is to a varying degree

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[1] In this paper, the term 'governance' mainly refers to the governing modes and structures within the university, though the national research policy and its governance structures also frame the context in which both the researchers and their university organisations operate.

Table 1 Explanation of the basic concepts in the paper

Research topic	Area or domain on which research is focused
Research content	The way in which the research is pursued, e.g., in terms of research questions, methodology, specific focus, fieldwork, materials, or conceptual orientation
Research line	A coherent direction of research content across one or more research projects
Research agenda	A research line or a suite of topics but involving a forward-looking element both in terms of content and funding; a planned research line
Portfolio of projects	A mix of research lines a researcher is pursuing at any one time, with some of them having higher or lower risk
Researcher strategy	A research and funding plan and decisions researchers make to be able to pursue the research lines and agendas they prefer
Negotiated space	Researchers seeking to select topics and pursue scientific research in an environment where external research funding agencies and university strategies and policies are sending explicit or implicit signals, in cases restrictions, affecting research conduct; researchers thus continually have to operate and dynamically 'negotiate' with several different parties with possibly contradictory goals over time

capable of filtering the explicit steering and tacit signals of external research funding agencies and university strategies and policies. In this 'negotiation' thus they can have several parties to deal with over time.

We focus in this paper on how researchers *negotiate* a space to select and pursue their research agendas and research lines (for the difference between the concepts used, see Table 1). We assume selection of research topics and formulation of individual and group research agendas are neither purely intra-scientifically nor extra-scientifically influenced but rather result from a mix of both. Furthermore, various intra- and extra-scientific factors make research lines increasingly a combination of locally and globally framed activities. The growth of inter-institutional and especially international collaboration, alongside application of increasingly universal norms (such as the production of scientific publications in international, peer-reviewed journals) in performance evaluations, makes the global context increasingly important over the local (cf. the knowledge claims of laboratory studies concerning the overarching importance of local context; see Knorr-Cetina 1983: 123). For this reason we collected data from interviews with scientists across several research fields, and in two countries, both of which are exposed to significant international pressures and influences. The following Table 1 gives the explanations for the most frequently used specific terms in this paper.

Influences on Research Topic Selection and Topic Pursuit

The potential influence of intra- and extra-scientific factors on research content can be understood and characterized in different ways. Influence can be understood as impact on the choice of a specific research topic or topic area that can then be pursued with different research approaches and knowledge interests. Influence can also be on the conceptual or theory/practice orientation and focus on specific themes or aspects of research content, what Knorr-Cetina (1982) refers to as reconceptualising substantial parts of the planned research such as methods or approach (p. 117) in reaction to or anticipation of organisational or funding requirements. The influence of organisational policies or funding requirements can be subtle and the outcome can reflect researchers' perceptions of what is expected rather than be a perfect mirroring of the external parties' aims onto the resulting research content.

Laudel and Gläser (2014) identified institutional conditions to funding allocation (specifically ERC funding) that promote epistemic properties present in 'frontier'/path-breaking/breakthrough research. They elaborated links between specific properties of this research (such as complex task-specific approaches and equipment) and funding conditions that enable it (uninterrupted research time and a long time horizon for projects). They highlighted that the relationship between funding conditions and research content is multidimensional and mediated by researchers' aims and expectations. It is this kind of mediation process within the *funder-funded* relationship that we label a 'negotiated space'.

Similarly, Leisyte et al. (2010) drew attention to the many ways in which researchers can and do react to being confronted with institutional or funders' expectations for research content. Researchers may resort to active or passive compliance, and can resort to decoupling and manipulation. In decoupling, researchers write grant proposals that *seem* to fit with the thematic area of the funder, but instead conduct research of their own choosing (*ibid.*, p. 268). Manipulation is researcher activity to influence the research agendas of funding bodies, such as research councils, either via university management roles or in their capacity as experts in evaluating proposals for various funders, including research foundations. Researchers thus have many roles in the funding and policy process where they can negotiate terms in their own favour so do not have to be simply passive recipients of funding policy actions, and to compromise automatically on their desired research agenda (e.g. factors such as research topic selection, research group size). In fact, in exercising their capabilities researchers can generate compromises for the funder, in that intended research properties (e.g. levels of risk-taking, utilisation of research insights/outcomes by non-academics) are not, or are only partially, realised.

We assume therefore that university governance and external funding arrangements create important framework conditions for research topic selection, but they cannot *directly* dictate research content. They play a role in advancing or hindering acquisition of resources that are essential to pursue research topics and projects, including both direct funding for project personnel costs but also for necessary infrastructure (which will play a larger role in more equipment-intensive research areas). The conditions are thus enabling and may advance or hinder specific

research areas and specific ways of pursuing research when they are selective. Their influence is, however, mediated by a host of factors, as will be elaborated in the following section.

Factors Mediating the Influence of Funding and University Environment

Researchers assess the value of potential research topics in interaction with their local and global scientific colleagues, and relate it to current cognitive developments in the research area, in their epistemic community (Braun 2012). This also involves the motivations of researchers (Lam 2011; Braun 2012). Lam (2011), for example, employed three concepts: 'gold' (financial rewards), 'ribbon' (reputational/career rewards) and 'puzzle' (intrinsic intellectual stimulation). These characterise academic scientists' motivation for pursuing commercial activities and for knowledge production behaviours. Lam's 'puzzle' is close to Lamont's (2010) 'pleasure and curiosity', Manathunga's (2009) 'intense emotional and intellectual rewards' or Åkerlind's (2008) 'satisfying the researcher's curiosity and enhancing the personal understanding' as fundamental motivational urges which scientists have to pursue novel research topics (Braun 2012). It is likely that such motives also influence the way in which researchers pursue their research agendas.

Furthermore, according to Gläser et al. (2010), high achievers among researchers may cope better than others with university and funding policy change pressures upon them and their research groups. They succeed more in competitive funding calls and with their track record can more easily obtain necessary resources. They are also more likely to sit on boards of funding bodies and of university organisations and thus may be able to influence university and funding policies and situations to their own advantage. The same can apply for those in a strong institutional position in their university's hierarchy, especially when it can lead to influence over university policies and the strategic choices that universities are expected to take (Tuunainen and Thomas 2014). Furthermore, university environments differ by the nature of infrastructure they offer, extra resources that can be allocated from various internal, university-based funds (e.g. seed funding for new and/or high-risk research areas) or in how their reputation can help researchers' own search for external funding.

The nature of the research field is a further influence on the inspiration of a researcher. In practice-oriented fields like many engineering fields or environmental domains, intellectual satisfaction may be achieved by solving puzzles originating from practical problems, including those suggested by industrial partners in research or those posed by societal challenges. However, as Gläser (2000) has pointed out, the contexts in which research is related to and embedded in practical problems can be multiple and the differences subtle. Epistemic factors in a researcher's field, and the field's stage of development – as generally assumed in the 'finalization' thesis – can be one of them, but as Gläser (2000) has pointed out, the relation between science and practice is multi-faceted and difficult to exhaustively classify let alone empirically to study.

Practice-orientation can not only influence the formulation of research problems and the way they are examined in a field, but also affect funding opportunities by

Table 2 Factors mediating funding and university environment influences in the 'negotiated space'

Epistemic community factors	Intra-scientific/motivational factors	Motivation and strategies pursued by researchers. This is closely associated with the varying importance paid to scientific developments, interaction with colleagues, and other intra-scientific factors
	Performance	High scientific/scholarly performance increases the likelihood of succeeding in competitive calls, but also provides a better position to influence the 'strategic' or other specific support inputs by the university (infrastructure and additional funding)
	Field	Resource intensity, applied vs. basic dimension, epistemic properties: in applied fields, more sources of funding; often also more resource-intensive
Organisational factors	University	High status and well-resourced university provides more funding opportunities for the researchers; university reputation can also be helpful when applying external funding

providing specific funding sources that wish to promote applied research, industrial collaboration or direct practical problem solving, such as applied funding agencies, government departments and industrial firms. A multiplicity of funding sources can provide alternative or complementary sources for the work of a research group: if one source fails to materialise, it is possible to resort to another (albeit there may be compromises for how the research line is pursued, if the topic has to be modified to match differing motivations from an alternative funding source). The question of finding specific project-related funding sources plays a different role depending on the field and the need of expensive equipment, appropriate research group size etc.

In practice, the degree of autonomy the researchers manage to obtain varies and can be contingent on the specific circumstances but also a result of individual researcher strategies.

Table 2 summarizes these important factors mediating the influence of funding and university environment in the 'negotiated space'.

We assume influence upon researchers is a *relative*, not an absolute concept. The question therefore should be the *degree* to which external funders or other policy actors or policies *influence* researcher topic selection choices and the ways in which field-specific characteristics and researchers' strategies mediate this process.

To highlight the mediation relationship, Figure 1 illustrates the relationships.

Our Focus

We focus on the mediation of the influence of external funders and university environment, especially governance, on research topic selection and the pursuit of research lines and through this process the creation of the 'negotiated space'. We pay special attention to intra-scientific factors in the formulation of research agendas
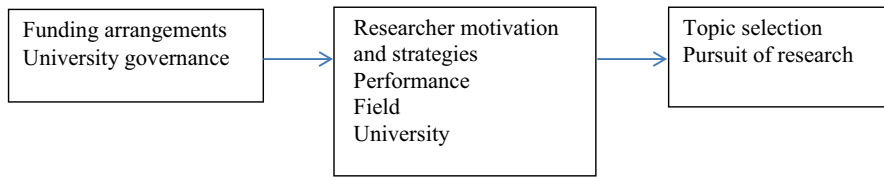
Figure 1 Mediation of funding arrangements and university governance on topic selection and research pursuit

and topic selection, the influence of the developments in the field and interaction with colleagues, and the motivations and strategies of researchers in this regard to pursue their research agendas. We also pay attention to the influence of the nature of the research field – in particular, its practice-orientation and funding opportunities – on topic selection and the pursuit of a research agenda. In spite of the potential importance of individual performance-related factors, we are unable to consider these empirically because it is difficult to establish objectively the scientific reputation of each studied person coming from different fields, and furthermore, our sample is to some extent biased since our interviewees consisted only of established researchers (research group leaders). However, we did select interviewees from different types of universities, both those with a high reputation[2] (elite) and those with less high reputation (non-elite) to get some variance in performance-related matters. We take this into account in some of our analyses, but more systematic consideration of this background matter was not possible because of our small sample sizes and to some extent different field compositions of our university samples.

Data and Methods

Our research focused on Finland and the UK. The choice of these two countries was dictated by the fact that funding came from a Finnish source[3] and the major country under study was Finland. The UK part was also funded by the Finnish funder in order to provide additional perspective for the Finnish circumstances, but the resources did not enable a larger study to be conducted in the UK. Therefore, the UK data is less intensive and does not allow us any systematic cross-country comparisons. The UK was, however, selected as a comparison country because it is one of the countries most advanced in terms of university management along the lines of New Public Management (e.g., Hood 1991) and is a context where most university researchers, and research group leaders in particular given their responsibilities for securing funding to support and advance their groups, should

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[2] We consider 'reputation' here as related to a subjective mix of issues such as research quality, standing of research topics pursued (say in terms of proximity to the state-of-the-art), intellectual culture (the presence of strong particular ways of working in terms of topic selection, method choices and publication practices), resources, as well as some considering of university rankings (publication and funding success related metrics).

[3] Tekes funded this project from its innovation research funding instrument.

be well adapted to the kinds of research topic selection influences we wished to explore. Finland, by contrast, is a newcomer and has as late as 2010 had a significant and large-scale university reform along similar lines as the UK, to create a more competitive and externally-steered university funding landscape. Another important difference between the two countries is the overall strength of university tradition given that UK universities perform much better in international comparisons such as the Shanghai ranking than the Finnish universities. For example, the University of Cambridge was 5th and Oxford 10th in the 2015 ranking, whereas the *best* Finnish university, the University of Helsinki, was 67th; Aalto University was in the group of the 401-500 band.[4] In our selection of interviewees in both countries we targeted universities that we felt represented both elite and non-elite universities in their own context (based on our understanding of the reputational factors of our study universities; see footnote 2).

We conducted 59 interviews with researchers in Finland; 21 in the UK[5] in 2012-2013. We also interviewed 20 university administrators and funders in Finland and two in the UK[6], so overall we undertook 102 interviews; we additionally reviewed policy and strategy documents, reports and statistics (Online Supplementary Material shows the number of interviewees by field and university).

Our researchers were primarily research group leaders, often senior researchers, who mainly were 'tenured' university professors with secure employment contract conditions. We consider them to be research 'portfolio managers', pursuing their own research interests and negotiating with their university and funding environments in developing their research topic selection, representing a unit of analysis that intersects *multiple* levels of research performance and bridging extra- and intra-scientific influences and interests in how they access multiple funding sources and attempt to satisfy both organisational and epistemic demands.

Our findings may therefore reflect our targeting already quite successful researchers that have become quite socialised to their academic environment by having survived and advanced to their present positions. Research group leaders may be exactly the kinds of high achievers who, as we have already noted from Gläser et al. (2010), can cope well with (changing) university and funding policy pressures upon them and their groups, and might influence university and funding policies in their own favour. However, we addressed this potential bias by interviewing researchers in different reputation universities, and in the two countries (Finland, UK) to represent more of a spectrum of 'successful' research group leaders and environments (for instance, in Finland having been successful in the pre-reform university environment might be no guarantee of continued success in the post-reform context). In practice, we realised that almost *all* of the researchers we interviewed were quite heavily dependent on external, project-based research funding.

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[4] http://www.shanghairanking.com/ accessed on September 11, 2015.

[5] See Luukkonen (2014) for a more thorough description of the data and methods as well as some preliminary findings on several questions explored in the study.

[6] These interviews mainly provided some background information on the university environment and policies as well as funder policies.

Additionally in some social science and humanities fields, research may not be conducted in (more or less loose) research groups but rather by individuals.[7] In these fields we focused on senior researchers who had varying collaborative relations with colleagues from and outside their field.

In Finland interviews with research group leaders were conducted in seven universities[8] and six fields: computer science, chemistry, cancer research, energy research, urban studies and archaeology. These fields were selected because most needed external funding to conduct empirical research. They provided us with clear examples of fields exposed to external funding change pressures and where research topic selection and research portfolio composition could be *expected* to be influenced to some degree by these kinds of external factors.[9]

The UK interviews covered two fields, computer science and energy, and two universities, Imperial College London and the University of Leeds. This limits any comparison of potential field-related differences across countries, so for our analysis we primarily address questions affecting Finland and the UK, and all fields, as a whole, whilst occasionally paying attention to specific differences between broad fields.

We selected one, in most cases an applied field per major field of science. Once again this was to increase the likelihood of external influence existing, in that expected utilisation of produced knowledge by non-academics suggests some kind of steering from external funder specifications. In each selected field, we wanted a sufficient number of interviewees preferably from several, but from at least two universities. This was not always easy as scientific and scholarly fields are structured differently from university to university, and in some, departments are multi-disciplinary and/or field-specific units are quite small. We therefore defined fields in a broad manner[10].

We used a semi-structured interview guide (see Online Supplementary Material). Our interviews explored how interviewees selected their research topics, factors affecting them, researcher views of different funding sources and whether they enabled breakthrough research, and how university governance affected pursuit of breakthrough research. We heard fairly structured narratives on the genesis of the research group leaders' research topics, portfolios and some of the intra- and extra-scientific influences that had steered them, without having to use extensive interviewing or observing approaches (Laudel and Gläser 2014; Knorr-Cetina 1982). All interviews were fully transcribed, then the transcripts were analysed thematically and qualitatively with straightforward, iterative post-coding of relevant

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[7] In our interviews with the archaeology field, for instance, empirical archaeological excavations were conducted by a larger group of people working on a temporary basis, but data analysis is done by individual senior researchers.

[8] Aalto University; University of Helsinki, University of Jyväskylä, University of Eastern Finland, University of Oulu; University of Turku; and Lappeenranta University of Technology. In our classification of 'elite' and 'non-elite' universities the University of Helsinki belonged to the 'elite' and the rest to the 'non-elite' group. Of the UK universities, Imperial College London represented the 'elite' universities.

[9] The nano-materials field was not in the end selected for the study but where possible, these interviews were used in the analysis.

[10] For instance, originally, we would have wanted to include organic chemistry, but in the end, included chemistry more broadly.
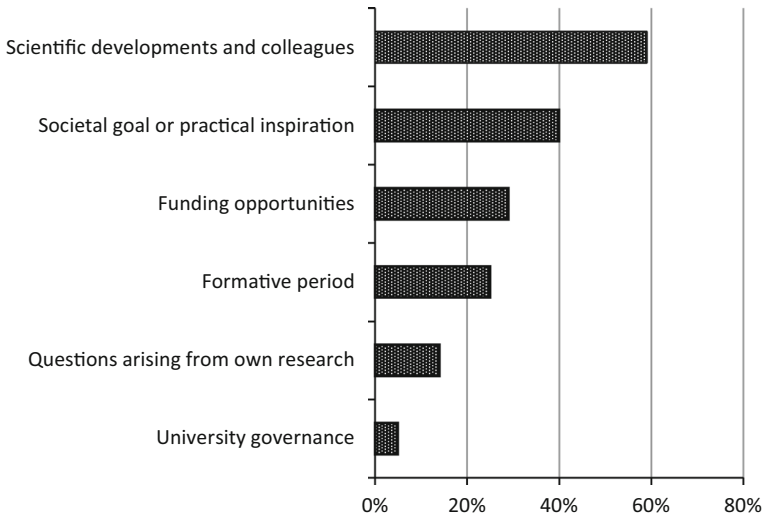
Figure 2 Interview responses on factors affecting researcher's topic selection; percentage of interviewees indicating the particular factor played a role (Finland and UK; N=80)

interview passages under major issues themes, but without extensive use of computer-aided analysis. Interviewee responses on factors affecting topic selection were post-coded and classified for compilation into simple percentage tables (see Figure 2). The number of our interviewees in each field and university (see Online Supplementary Material) was quite small, so the data did not give rise to any quantitative or further systematic analysis. The study is heuristic by nature and conducted to develop better understanding of factors affecting research topic selection and the pursuit of a research agenda.

Creation of the 'Negotiated Space' in Topic Selection – What is Researched

As indicated before, we make a distinction between topic selection and the way in which research is conducted. Topic selection is about the choice of a specific research area or research questions for study. The way in which the research is pursued in terms of conceptual or theory/practice orientation, the methodological choices made, theory vs. empirical research lines, and focus on specific themes, on the whole, the research content, is what we in this paper, for short, call the pursuit of research. We have made this distinction because it arose from our data. We will first draw attention to topic selection.

We asked interviewees about their research topic and how they got their research idea or how the topic was generated. We asked how this process was influenced by funders, university governance and changes in the research environment, as these are potentially major external influences on their research. The responses concerning topic choice were classified and are presented in Figure 2. This shows

Table 3 Factors affecting researcher topic selection; the four most common factors by field (Finland and UK; N=80)

	Computer science	Chemistry	Cancer research	Energy research	Urban studies	Archaeology
Scientific	52%	64%	90%	40%	70%	67%
Societal goal	38%	36%	50%	60%	30%	0%
Funding	19%	27%	0%	35%	50%	50%
Formative	29%	64%	20%	5%	10%	33%

the share of our interviewees indicating which of the six factors we found played a role in their research topic selection. Each interviewee's account typically included multiple factors having influenced either simultaneously or in a sequence the choice of their research topics.

We next comment on the general findings in Figure 2 with specific examples of how topic selection takes place, including how field-related factors are closely intertwined with the way research topics are defined and articulated.

Intra-Scientific Inspirations

Figure 2 shows factors related to intra-scientific developments and the scientific and scholarly communities play an especially important role in influencing topic selection. Three factors here are intra-scientific: 'formative period', 'scientific developments and colleagues/peers', and 'questions arising from own research'. First, 'formative period' addresses where an interviewee spontaneously mentioned that their research topic (broadly speaking) directly derived from their postgraduate research experience (Masters or PhD thesis) or from a topic discovered during their post-doctoral studies (which in our interviews with Finnish group leaders had typically been pursued abroad). A PhD thesis topic was often but not exclusively given by a supervisor. These cases often represented a *continuation* of the line of research.

Particularly in chemistry, researchers emphasised their research agenda was a continuation of what had started during their formative period (see Table 3). The research line had inevitably evolved later, but was described as still being in the same broader topic area. Some interviewees noted that what had originally been a fairly revolutionary topic had, over the years, turned into mainstream research because of the overall development of their research field, and not necessarily because of changes they had themselves made.

From Figure 2, 'scientific (and scholarly) developments and colleagues' is our shorthand for new opportunities and questions emerging from the scientific development of the field and/or discussions with research field colleagues. The high percentage in this category emphasises that inputs to researchers' topics and agendas were strongly mediated by their perception of the most fruitful research lines and filtered through discussion with colleagues (cf. Laudel and Gläser 2014); this factor was mentioned the most by researchers in every field we studied, except for those in energy research.

New opportunities and novel questions are a strong ingredient in notions of scientific excellence (Luukkonen 2012) and its relative position among the factors mentioned in the interviewees' accounts is not surprising, as one interviewee noted:

> "[D]iscussions within the scholarly community affect the topic choice both through the fact that topical issues will be funded; but also through the fact that researchers get inspired by and interested in the topics that attract interest within the scholarly community" (Archaeologist, Finland).

This comment probably reflects the fact that the researcher is either a relative latecomer or part of a late majority for an intellectual development, rather than a pioneer in the topic (Braun 2012). The speed of development of the field can also drive research topic selection, in that to remain novel a researcher has to be constantly moving in often hard to predict directions:

> "It is a fast working field … and it's difficult to predict exactly what you want to do best. … It's growing very fast, absolutely, we've got to move fast to keep up with it … globally" (Energy researcher, UK).

'Colleagues' in Figure 2 denotes scientists and scholars from the same field, and sometimes those in different, even remote (geographic and/or epistemic) research fields. It may reflect general inspiration from a respected senior researcher or daily discussions among colleagues. Often new research questions emerged when researchers met (accidentally or regularly) scientists or researchers from other research fields, and started talking about potential applications for ideas (or methods) from one field into another. Such trans-disciplinary collaboration often led to novel combinations of methods and research goals.

'Questions arising from own research' may be more frequently an inspiration than our data suggests, as it may have appeared self-evident, so was not mentioned by our interviewees or alternatively, the researchers we interviewed did not regard a continuation of questions that had arisen from their previous research activities as constituting a 'new' topic, for instance:

> "Even though most often the research projects are built upon previous research, the research themes will change/evolve gradually…" (Computer scientist, Finland).

Societal Goal or Practical Considerations as an Inspiration

Societal goal or practical inspiration includes two very different types of factors affecting topic selection. For instance, in cancer research it incorporates understanding the biology and mechanics of cancer and its prevention, improved diagnostics *and* finding ways to cure cancer. Such research can be quite fundamental, but nevertheless topic selection is still strongly connected with the overarching practical goal. Stating a societal/practical goal may also reflect a strong identification to the overall goals of the research area that integrates researchers in this particular field (Luukkonen and Nedeva 2010).

For energy research 'societal goal' means, e.g., improving environmental matters or solving energy efficiency or energy supply issues and so on. These aspects provide practice-related inspiration for research. Here societal goals and practical inspiration were mentioned more often than in any other field; over half of the 20 interviewees noted the importance of practice for generating their new research questions in this field where scientific problems are inspired by practical/societal questions (see Table 3). Close collaborations with industry and policymakers are also prevalent in this field as an interactive source of new research problems potentially to address:

> "Everyone's motivated by the opportunity for a technology application. … Most of the research … funding that I've been involved in has been reactive rather than proactive. Either reactive because of a funding called by a funder, or reactive because one of my colleagues said we should be applying for something. Or because a company comes and talks to us" (Energy researcher, UK).

However,

> "[T]he academic value of research may not be any smaller in areas that can more quickly lead to applications than the research that is theoretical and outside practical life…" (Computer scientist, Finland).

Societal goal or practical inspiration here also includes cases where researchers in, say, computer science observed potential and ongoing developments in the business world related to their field, such as internet uses and the emergence of social media, cloud services and so forth, and then pursued research questions relevant to these developments.

Nearly 90% of the researchers we interviewed across computer science (N=21), chemistry (N=10) and energy research (N=20) fields, 70% of cancer researchers (N=10) had collaboration with industry, whilst none in the social science (N=10) and humanities fields (N=6) did. Researchers collaborating with industry typically emphasised that their research topics were based on both scientific interest and industrial collaboration (industrial or societal collaboration included a wide range of activities varying from research projects to consulting) with some researchers having a clear steer from the intellectual culture of their university to ensure that both scientific value and industry value were balanced, for instance:

> "[A]t [our university] we don't necessarily try to be too focused on the application. … [W]e are focused on the application but we're trying to do research that could be applied to a multitude of different problems. But of course it's much more motivating in some sense and much more straightforward also to develop particular methodologies with an application in mind, but also at the same time being aware that that can be applied to a number of different applications. … [T]his is how most people run their research … They have some very underpinning research that gets you perhaps also the most credible publications" (Energy researcher, UK).

Funding Opportunities

Funding opportunities seemed to play a lesser role in researchers' topic selections. However, some noted the launching of specific funding programmes by funding agencies, especially by the public applied funding agency Tekes (in Finland) prompted their pursuit of a particular line of research[11]. This may have been only part of many influences but had steered their research content and epistemology (see also next section). This steering influence here is critical given that securing funding is an enabler for researchers to pursue their research agenda at all. As one interviewee noted:

> "Funding orients our research in such a way that when we need funding we apply for it and write our application in such a way that it fits [with the requirements of the funder]… However, the basis for our research does not change" (Chemist, Finland).

Another researcher stated:

> "I've tended to be quite flexible in what I will work on. So some of the major topics I will work on because they are where the funding is… I can work on a number of topics… where I am doing things for my own interest, I tend to focus much more heavily on particular areas where I am a world expert" (Energy researcher, UK).

The Academy of Finland, the country's major public sector basic research funder[12], seemingly influenced topic selection through its thorough proposal evaluation processes' requiring applicants to have already a considerable *publication track record* in the specific domain of their proposal. Thus, this might prevent researchers from suggesting areas that were radically novel to the field or to the researcher themselves, and perversely seems at odds with Academy policy to promote novel research ideas, instead promoting incremental science. This was also true for suggesting areas that are radically novel due to bridging existing research fields. An energy researcher from the UK working at a novel interface between physical sciences and social sciences complained that they felt a need to camouflage the radical, inter-disciplinary nature of their proposed research to make it appear more mainstream, and more in the safer core of either their main physical sciences or their main social science funder (but not both) to attempt to overcome the inherent conservatism they expected from the peer review processes of both these funders.

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[11] Tekes, the Finnish Funding Agency for Innovation has a broad agenda to promote the technological level, innovation capabilities, and innovation activities of Finnish industries. It has traditionally supported research conducted in universities and public research institutes, too, but on the premise that they collaborate with companies and conduct research of, at least, potential relevance to them. In the past two-to-three years the conditions of Tekes funding to universities and public research institutes have, however, become more demanding in terms of requiring closer interaction with and more short-term utilization of the research by companies. At the time of this research this change had only just started, and most of the interviewees had not yet had experience of the new rules of Tekes funding.

[12] It is a research council system with the members of different research councils coming mostly from academia or the research institute sector.

Both cases here are examples of 'window dressing' in topic selection and presentation, one of the strategies researchers may resort to in order to secure funding for their research/group.

We observed that the importance of funding opportunities for research topic selection also varied by field. Archaeology was a field where the Academy of Finland and private foundations were the two major funding sources. Failure to obtain funding from either source could spur abrupt changes in research agendas, could stop a particular line of research altogether (putting researchers out of a job) or cause displacement of research activity to alternate topics intimately connected with, e.g., a particular geographical area that would fall under the funding purview and interests of some local or regional foundation. National and larger private foundations did not set requirements concerning the topic to be pursued in research (unlike smaller and regional funds which tended to fund research related to the region), albeit individual grants or project funding from private foundations were usually quite small. Here researchers' dependence on external funding was exacerbated by the fact that there are no professorial chairs in archaeology in Finland and only a few university departments support archaeology research positions and teaching. Researchers in urban studies also felt strong dependence on funding opportunities so they might have to change their research agenda according to funding.

By contrast, researchers in the other fields we studied often had multiple funding sources to access, offering them various opportunities and perhaps making them less dependent and influenced by external funders. However, for those depending on only one or two funding sources, topic selection and researcher autonomy probably was still reduced. This more nuanced reality seems somewhat contrary to Whitley's (2000) claims that external funding alone reduces autonomy.

Proximity of a research area to practical applications was a further factor influencing access to multiple rather than single funding sources, again likely to influence the epistemic properties and practice of the research. Several chemistry interviewees, however, stated they formulated their research topics to merge *their own* research interests with the *usefulness* requirements of industry, or with the impact/usefulness research strategy ambitions of their university. Researchers also noted that 'basic' research could be pursued for many kinds of topics and that distance from application was not necessarily a criterion of excellence in research (i.e. application-oriented research could still be *excellent*).

Researchers maintaining a research group often had to combine funding from multiple sources at any one time. Research groups typically had multiple projects addressing closely related research questions, though possibly conducted somewhat differently and even representing different epistemological lines.

University Governance

University governance[13] changes in Finland entailed reform in 2010 that largely followed ideas of New Public Management (Tuunainen and Thomas 2014) and

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[13] Governance here refers to various forms of university administration, management and leadership.

formally separated the universities from the state and made them independent legal personalities (as either public corporations or private foundations). It also gave universities more power to steer their own activities, to pursue independent human resource policies, and to manage their own finances. Finnish universities are still dependent on the Ministry of Education and Culture for resources to cover their basic costs in teaching and research, but they have to negotiate their goals with the Ministry and are expected, i.a., to allocate resources to internationally competitive research and strategic focus areas.

The UK has operated a peer-determined research performance assessment since 1986, to determine part of the research income of universities, distributed via regional Higher Education Funding Councils[14] (HEFC, for England, Northern Ireland, Scotland and Wales). This process, which has the potential to steer the strategy and research activity of the universities (Witty Review 2013; Nuffield Council for Bioethics 2014) was originally known as the Research Assessment Exercise (last conducted in 2008) and was replaced by the Research Excellence Framework (REF, conducted in 2014). REF had an additional emphasis on the socio-economic 'impact' of university research compared to the RAEs, thus further potentially steers university strategy and governance to influence research content towards being more usable by non-academics.

University governance did not seem to play a significant role in topic selection. In spite of increasing centralisation of decision-making on a variety of matters, including internal pre-screening of certain external funding applications (e.g. high profile applications to funders such as the ERC), this did not seem to influence the research topics or areas in which researchers worked. However, at some universities where we interviewed there were specific programmes to fund research in pre-selected areas. If researchers were fortunate enough to be already working in these areas, or if they had influence over how university funds were used and could orient the programmes to their own interest areas, this was an opportunity to be seized, but still did not necessarily steer or influence topic selection. It simply provided one extra possibility to fund already intended research. Even though researchers might have to justify that their research agenda would cover the research area in question, this process did not affect the epistemic or other properties of the research.

Besides, these often multi-disciplinary programmes were typically defined in such a general way that it would prove easy to justify the fit of researchers' existing topics with the new funding initiative/programme. The benefits of these kinds of internal, university programmes were described as follows:

> "[O]ur research is in the strategic focus of our university. It receives university funding; two of our top projects are oriented to the priority areas of the university. An additional benefit is that when we apply for funding to external funding bodies and we mention that we are in the strategic focus of the university, it is a bonus…" (Chemist, Finland).

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[14] For the financial year 2013/14, for universities in England, HEFCE allocated £1.6 billion to universities for quality-related (QR) research funding, to provide among other things the underpinning infrastructure for research, determined by the results of this research assessment system.

"[I]nternal funding we put in between the faculties [provided] … some small research projects that have been a pilot for the bigger research … to bring in the external funding" (Energy researcher, UK).

The research infrastructure necessary in many scientific and engineering fields is also an enabler of research and influences the possibilities groups have to pursue a particular research agenda. If an institute has secured expensive infrastructure, this becomes one of the factors that influences the direction of research.

The full economic cost model[15], recently adopted both in Finland and in UK universities (earlier, in 2005) decreased the funding available for actual research (in researchers' eyes and also in reality[16]). Competition for resources has therefore increased, perhaps influencing topic selection *indirectly* through the potential impacts of tougher competition.

An important traditional area of university influence on research topic selection is human resource policy. This is how the research areas of university positions are defined and people are selected to fill positions. We left this aspect outside of our study to pay attention instead to a different, relatively recent policy tool of research profiling and to expectations of the Ministry of Education and Culture specifically upon how Finnish universities select different research and teaching profiles. This same policy requirement is also evident in the research policy of other countries (see OECD, 2014). So far, the Finnish universities have been quite slow in implementing such profiling and with specific departmental research agendas (Tuunainen and Thomas 2014). How these departmental research agendas are formed remains a largely distributed and bottom-up process, often reflecting an aggregation of existing research lines that have succeeded in obtaining external research funding.

In the UK, profiling by and large takes place through national research assessment exercises – currently the Research Excellence Framework (REF, undertaken in 2014; reported in 2015). Block research grant funding to universities is linked to the outcome of these assessments. Although the assessment and ensuing *de facto* profiling is effectively done by a wider, more distributed community of academics outside of the particular university being assessed, efforts to succeed in the exercise have increasingly led to stronger periodic *internal* profiling of individual researchers and research groups often well *before* formal external assessment takes place (Nuffield Council on Bioethics 2014). Interviewees indicated to us that the UK system's in-built emphasis upon linking quality *primarily* to publication in particular high 'impact factor' journals is resulting in more uniform, homogenous notions and ways of measuring research excellence that may limit overall system variety and novelty. This in addition to workload and career pressures, as indicated in the quote below:

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[15] Full economic costing in principle takes into account all the costs of a particular activity or project. In so doing it takes into account a number of factors that have previously been ignored by funders, including paying the higher education institutions for the time spent on a particular activity by the existing staff. The way such models calculate the costs can vary and the costing models are not identical in different countries, universities or funding agencies.

[16] Arnold et al. (2013).

"[M]y personal feeling is that academia devotes far too much time to the REF. … I don't have an objection to being judged every so often on the quality of research papers but then we've already had at least two mock REF exercises, and the amount of academic time that these things take I think is disproportionate. … I was asked if I would be part of one of these mock REF review things and I declined so… it would have meant reading large numbers of papers over the summer, only some of which I would have been interested in. … in practice it takes up far too much of people's time. … [W]hen you really interact with other researchers, they say 'Well you should have published in this journal for the REF', because it obviously has direct impact in the sense of job applications, people being judged on REF-able publications, and so it then sort of permeates down.." (Energy researcher, UK).

Performance

We took a tentative look, limited by the small group sizes in the fields and cases we interviewed, at differences in topic selection by university status, rather than as affected by the status of individual researchers (see Figures 3 and 4). The difference between the 'elite' and 'non-elite' universities was striking in the UK data (Figure 4) and the same tendency was noticeable, though less clearly, in the Finnish data (Figure 3): inspiration by scientific developments and colleagues and the influence of funding opportunities were more important in the 'elite' institutions than in the 'non-elite' institutions and by contrast, and societal inspiration less important. Our data does not suggest the reasons for this difference, but we could assume that norms and values concerning research questions worth scientific enquiry could play a role. Nevertheless, whether the importance of the funding
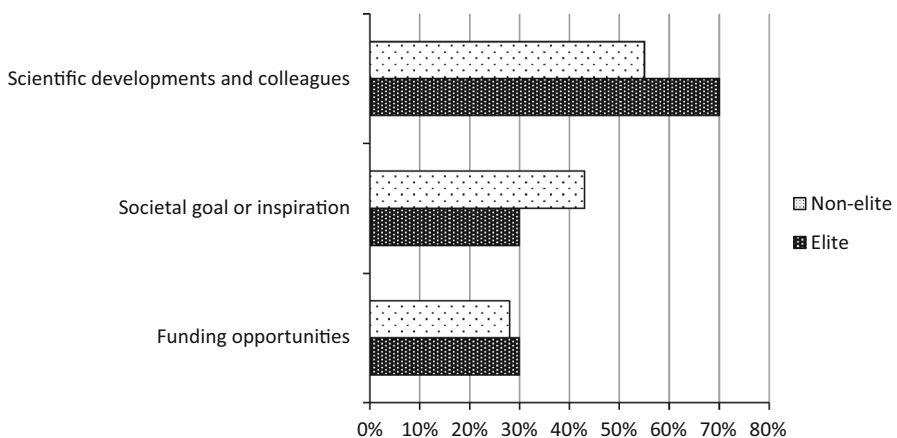

Figure 3 The most important influences on topic selection in our sample of elite universities in Finland (N=59; Note: The 'elite' university in this figure is the University of Helsinki)
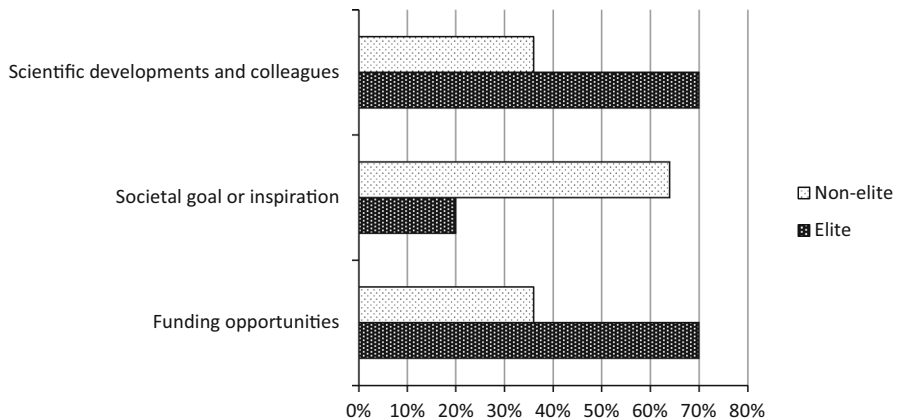
Figure 4 The most important influences on topic selection by the status of the university, UK (N=21; Note: The 'elite' university in this figure is Imperial College London)

opportunities in the 'elite' institutions reflect their better situation in this respect is difficult to judge without further enquiry.

To summarise, researchers' own narratives on their research topic selection emphasised their own active, deliberate choices and often continuity in their research lines, thus suggesting a 'broad' negotiated space where they could pursue their favourite topics. Nevertheless, they were constrained by many external, emergent factors, the influence of which they typically seemed to downplay, which may also indicate something about their personal values – the ideal picture – where science is not dictated or restricted by external factors. There were also field-specific differences in the number and significance of external funding sources (see Figure 5), with those accessing only a few sources seemingly more vulnerable to research topic selection pressures.
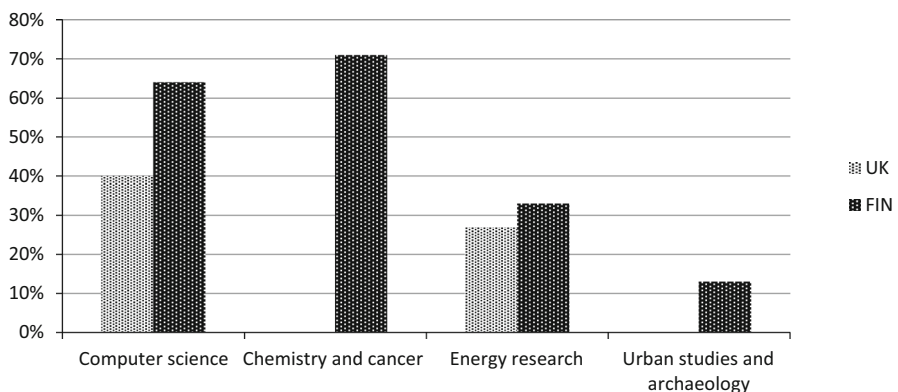

Figure 5 Share of research group leaders with several (five or more different) funding sources by field (Finland and UK; N=80)

'Negotiated Space' in the Way in Which Research Topics and Agendas are Pursued

We were able to reconstruct from our interview data researchers' views about the broader notion of the pursuit of a research *agenda*. Selection of topics (knowledge areas) for research was strongly influenced and filtered by scientific developments, and the negotiated space of research group leaders over their own micro-research activity decisions here seemed fairly broad. The way in which the research topics and the research agenda (that constituted a broader overall direction to a suite of research topics) were pursued seemed more susceptible to the external environment, and to collaboration and funding opportunities, thus constraining research group leaders. For instance, an archaeologist noted how funding influenced a decision in their group to move away from resource-intensive fieldwork:

> "I am not sure if the funds [that we had] directly affected the topic, but it did affect the way we set about to do it… we attempted to avoid resource-intensive fieldwork-oriented projects…" (Archaeologist, Finland).

In the broad evolution over time of their overall research agenda's direction vis-à-vis the state of (intra-)scientific developments in their field, researchers referred to the fact that some of their research topics may at first have been quite novel by nature. But the broader research agenda had, over time and for various reasons, undergone important epistemic changes as the research area had progressed, say more researchers had flocked into the domain. This had resulted in the emergence of new topics and research questions, but over time, the research had become more incremental by nature following the general developments.

Funding opportunities and other contextual factors may have shifted research focus or epistemic factors. If the research domain had become of practical or industrial relevance, this may have facilitated funding from new sources and led to new research groups allied to this particular industrial and/or national applied funding agency funding. This may also have changed the research into more practice-/application-oriented, shorter-term, and focused on topics relevant and useful for collaborating partner companies. In terms of the shift in the research agenda then, whilst industrial and practical relevance may have multiplied available funding sources and increased possibilities to pursue a suite of research topics, this was with a *changed focus* and *epistemic properties*.

Multiple funding sources were not only related to areas of practical applications, but also to scientific and scholarly fields. Social science and humanities areas in general had very few funding opportunities (see Figure 5). As referred to above, in such fields, a negative funding decision had at times completely blocked the pursuit of a line of research and had necessitated a move to another area where the researcher was lucky enough to have obtained funding (maybe after a period of unemployment or other non-research related work). In fields with more funding opportunities a negative funding decision may have temporarily blocked a research line, but would have led to further research later on with the opening up of new career or funding opportunities.

University funding programmes, as already indicated, were among the funding opportunities that enabled the pursuit of a research topic and line, but were not likely to change the way it was conducted.

Specific Mission Drift for Research Agendas in Finland

Funding agency conditions could also cause a kind of mission drift that is visible as a changing research agenda over time. We already noted how the Academy of Finland's track record requirements may favour incremental research; similarly, funding condition changes in Finland's applied funding agency, Tekes, have influenced the overall direction of research. Since 2012 Tekes has required its funded research projects to include stronger collaboration with companies, for companies to play an active role and co-fund the project to direct it more to application orientations with shorter term economic benefits. This is a major change, with companies no longer just searching for potentially interesting findings or new potential research openings (the case before the 2012 changes). Summarising one research group leader in chemistry in Finland:

> Since the late 1990s our research has been applied by nature because of our dependence on Tekes funded projects and the requirement of this funding to involve companies in the project. In some Tekes funded projects one can pursue basic research, too, depending on whether the partner company so wants, since firms cannot themselves conduct basic research; however, it is usually very narrow and does not lead to new innovations (Chemist, Finland).

A fairly recent Finnish funding programme since 2007, the SHOKs[17], mostly funded by Tekes, was reported to have become short-term in its outlook and in the nature of the research it funded. SHOKs' funding practices also had the outcome that funding allocations effectively took place annually since the sums paid to universities were linked to the ability of industry to expend the funds they had committed (SHOKs require industry match-funding). The requirements of industrial relevance in the short-term also influenced the ambition, time horizon, types and epistemic properties of research pursued, and such research was reported by our interviewees as not likely to produce scientific publications and merit or 'provide intellectually interesting puzzles' for academic partners. Nevertheless, doubtless due to differences in the research themes, personal attitudes and contingencies, and research field based variations within their particular 'negotiated spaces', a number of researchers we interviewed had had more positive experiences with SHOKs and were able to pursue their research interests through them.

Major organisational changes can also drift research agendas in particular directions that may not always be visible from looking just at discrete research topic

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[17] Strategic Centres for Science, Technology and Innovation (SHOKs) are strategic public-private partnerships and one of the principal innovation instruments of Finnish innovation policy, aiming to increase the competitiveness of the country's research and innovation system (Lähteenmäki-Smith et al. 2013).

selection matters. For instance, the recently reorganised Aalto University[18] in Finland aims to become an excellent research university as measured by scientific publications (Luukkonen and Thomas 2013). Its researchers are expected to conduct research leading to scientific publications. When this expectation is enacted via internal resource allocation – though still currently only to a small extent – it clashes with varying norms and practices that pre-date the merger of Aalto's three predecessor bodies. Researchers reported that since engagement with industry was less likely to lead to prolific scientific publishing they felt that Aalto's stance on publications de-motivated them to collaborate with industry, albeit this nevertheless remained an important goal for their institution. This caused them uncertainty for their research plans, albeit this influence varied from research area to research area.

In spite of the above-mentioned difficulties, industrial engagement clearly still provided opportunities for funding, not just through direct industrial funding, but also through the possibility of applying for national applied research funding, which required industrial collaboration, and through EU framework programme funding, which has also been heavily based on the idea of public-private collaboration. The resources thus gained enabled Finnish group leaders to pursue their research agendas; the research line might have had multiple goals and different epistemic properties in parallel.

Cases of such abrupt mission drift were less evident in our smaller set of UK interview data, seemingly limited to some impact from the decision by the main research council for the two UK field cases (computer science, energy research) – the Engineering and Physical Sciences Research Council (EPSRC) – not to allow funding of PhD candidates effectively as research assistants within externally funded projects. Some UK interviewees felt this removed the possibility to pursue some of the more path-breaking, higher risk-taking research topics within a research agenda within the lower risk setting of a PhD project. Additionally, it was clear that the longer history of research group leaders negotiating with external funders had led to practices that were more protective of epistemic community and university strategy expectations for prolific publication activity (as measured and required by the REF process). UK researchers reported to us that they routinely used clauses which agreed with their university administrations and protected and expedited their ability to publish from industry-supported research activities, for instance:

> "[W]henever we have an industrial collaboration, we always build a clause into the contract that says you can review any paper for publication, if we don't hear back from you within one month, then we assume you've agreed to it…" (Computer scientist, UK).

Researcher Strategies to Pursue Research Agendas

Researchers and research group leaders respond to research topic selection and research agenda formation influences and pressures in various ways and resort to different strategies. They may attempt to influence university policies and funder

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[18] Aalto University was established in 2010 through a merger of the Helsinki School of Economics, Helsinki University of Technology and the University of Art and Design Helsinki.

preferences (see Leisyte et al. 2010). Researchers may 'comply' with requirements by formulating their proposals to fit directly or indirectly with funder preferences. They may 'decouple' or 'window dress' their research activity (see Leisyte et al. 2010). Researchers may engage with policy-making or funder requirements to influence research funding programme formulation (as funders often need an active input from the scientific community to compose such programmes vis-à-vis the scientific state-of-the-art)[19]. Such programme formulation may not be transparent, and researchers can influence programme content. Even in application-oriented programmes, such as those of Tekes or the SHOKs, the scientific community is typically engaged.

Influencing a research programme requires a lot of time from senior researchers. As one interviewee pointed out:

> "In the SHOKs there are no longer specific programmes, and it implies that I will have to be involved in all kinds of preparatory tasks considerably more than in, e.g., earlier Tekes' programme preparatory work. … As a matter of fact, it is lobbying for the definition of what research themes will be regarded as important…" (Computer scientist, Finland).

However, only some – most often senior – researchers are *active* participants in such programme formulation and implementation.

Funding programme requirements seemingly do not affect all researchers equally. The most influenced are likely to be middle-performing researchers, as top performers generally obtain funding regardless, albeit sometimes hindered or delayed by funding conditions, and low performers often do not conduct research at all and thus are not affected (Gläser et al. 2010). In our interviews, increasing competition may leave some research group members without funding, adding to pressure for research group leaders to secure more funding or otherwise change the group's agenda – or have less time and energy to devote to developing it, for instance:

> "[I]t's completely choppy and in the years when you don't have anything to do it's great, you can actually…well, you don't have contract deadlines and that sort of stuff, you're fine, you can go along fine, no problems. But in the years when you've brought in too much you're absolutely screwed, because you can't really do anything properly, you're trying to dash around and secure [funding]… And you haven't got enough time to think" (Energy researcher, UK).

For some research group leaders, a research agenda pursued across several research lines was a strategy to secure funding for the research activities of their group. The different research lines might relate to different opportunities to obtain funding over time; thus, a multi-line strategy was advantageous. This multi-line strategy was important because the research was conducted in a group where the group leader

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[19] It is to be noted that the recent evaluation of the Academy of Finland (Arnold et al. 2013: 53–54) drew attention to the fact that the research programmes of the Academy are a result of a bottom-up process and reflect the research ambition of the fields which have representatives or are active in the process of forming of the programmes.

had the responsibility and felt the urge to keep the group's work ongoing and attempted to help secure funding for the group's members, for instance:

> "[A]ll of my team, if I don't write grant proposals, will be unemployed in between six months and three years… So that really puts the emphasis on wanting to write grant proposals. And we've got five under review right now. And if they all come through, I know they won't, let's face it, but if they do, you know, I've got no time to administer them. But if I don't, then my team will be out of a job" (Computer scientist, UK).

At the same time, some group members might leave if they get tired of the uncertainty or if they failed to get funding to what they deemed to be excellent research proposals; overall funding failure may also close a lab.

Another strategy was frequent research topic change. This was based on the expertise areas in a group. Research topic selection was not based on the group's own agenda, but on funding opportunities that arose. The research agenda was therefore an emergent result of an 'opportunistic' assessment of funding opportunities:

> "Some of the major topics I will work on because they're where the funding is…" (Energy researcher, UK).

> "[A certain energy topic] is very fashionable. … There's been a perception of a, in some sense of a bandwagon everyone's jumping onto. … Most of the research I've been involved in has, or the funding that I've been involved in has been reactive rather than proactive. Either reactive because of a funding called by a funder, or reactive because one of my colleagues said we should be applying for something. … I've done relatively little of [being] proactive in going out and getting money off my own initiative" (Energy researcher, UK).

Researchers may also have changed strategy from time to time:

> "[E]arlier topic choice was fairly opportunistic and depended on the availability of funding sources, like when there was a Tekes call, we started thinking what we could offer for it while now that we have fairly strong research lines …we try rather to think of what might be the direction in which we would like to develop our research and where we could find funding to accomplish it…" (Computer scientist, Finland).

To explore a higher risk, very novel research question, one strategy we observed multiple times was a research group leader pursuing this topic via willing postgraduate or postdoctoral students (cf. Gläser et al. 2010), albeit this strategy would tend to further the pursuit of the topic relatively slowly (and may be subject to funding condition drifts, as already noted for the UK EPSRC case above).

Conclusions and Discussion

Our findings suggest that, whilst remaining important, university governance and funding organisations have a subtle, more nuanced and mediated – what we have called 'negotiated' – influence on research topic selection and research agenda formation than is often suggested. In our interviews university governance had little direct influence on research topic selection, albeit it could be an enabler via specific university funds, programmes or infrastructures, and via the system of evaluating and rewarding performance (e.g. based on publications or collaboration expectations). External research funding, nowadays a necessity for most of our interviewees, seems to be the more influencing factor of which researchers have to take account.

Some new developments in science, including methodological advances, based on multi- or trans-disciplinary collaboration, featured a definitely 'negotiated' influence upon topic selection. Here topic selection may involve interaction with practice, e.g., industrial collaboration and needs or from societal partners. At the same time, topic selection is rarely divorced from a researcher's academic setting, and the setting can influence the epistemic properties of the research irrespective of whether it is use-inspired or academically-oriented research.

Topic selection is by and large an outcome of researchers' preferences, but how researchers conduct research is quite open/vulnerable to the – negotiated – influence of funders' preferences and requirements, and to the changes and chances of a researcher's funding success (where some fields with few collaborators and/or funding opportunities could experience research line discontinuities, research group failures and so on).

Researchers navigate their operating conditions by resorting to multiple strategies to negotiate with internal and external expectations and requirements. Group leaders may simultaneously pursue different lines and types of research in their research group, some more fundamentally oriented and potentially risky, even breakthrough research, some more routine type of tasks often within the same topic area (cf. Jordan 2006). The pursuit of a research agenda then would be a *continual compromise* between what is hoped for and what is feasible.

Laudel et al. (2014: 240) describe that researchers seek 'protected' space, i.e. an "autonomous planning horizon for which a researcher can apply his or her capabilities to a self-assigned task". Researchers could secure such a protected space by winning a particular, discrete grant. In our analysis, however, this kind of 'protected space' represents a micro-space of sorts or just one option within the broader, overall 'negotiated' space.

Various strategies make up a negotiated space that is constructed and continually revised over time as research group leaders balance their own research agendas with changing requirements from external policy and funding sources.

At an individual level, researchers may resort to deliberate (or proactive) and emergent (or more reactive and opportunistic) strategies for topic selection and pursuit. However, it is to be assumed that their negotiated space will be more limited if they are opportunistic since the success of their strategy is contingent on

Table 4 Different field types and scope of negotiated space in researchers' topic selection and topic pursuit

	Topic selection: what is researched	Topic pursuit: the way research is conducted
'Shopping mall' fields	Negotiated space is broad; multiple funding opportunities supporting a range of topics to select from	Negotiated space is moderate; multiple opportunities to pursue research but there are conditions attached
'Lottery' fields	Negotiated space is narrow; high dependence on individual funding decisions as to whether topic will be supported	Negotiated space is narrow; pursuit options highly dependent on individual funding decisions

emerging opportunities in their environment rather than on their conscious and continuous efforts to ensure a broader space for the pursuit of their research agenda.

Apart from these individual-level strategies, a negotiated space is influenced by more aggregate level factors beyond just the individual's actions. Research fields, of course, differ from each other in terms of funding opportunities. Researchers in fields with multiple funding opportunities – a 'shopping mall' – availed themselves of different funding sources simultaneously and in sequence and thus creating their research agendas. In our interviews, few funding sources provided large enough grants to enable the funding of the whole group for any length of period (even where groups and their members had more generous grants from bodies like the ERC). Group leaders spent a considerable time, along with their group members, preparing grant applications, with hard to predict degrees of success. The combination of several funding sources each with slightly different terms and requirements, however, could provide an opportunity to pursue simultaneously different research lines with different degrees of emphasis on scientific or practical considerations. A failure in one funding source did not cause a complete failure to pursue specific research lines. By contrast, in social science and humanities fields, researchers were faced with a win or lose situation – a 'lottery' – where research pursuit was completely dependent on success or failure with one or two funding sources. Table 4 summarises these findings.

To conclude, the everyday research life of an academic researcher appears more uncertain, dynamic, fraught, opportunistic and negotiated over time, at least in the fields we addressed, than either extreme where, on the one hand, researchers can and do pursue only their favourite research agenda or where, on the other hand, their research agenda is completely controlled by external funders or university policy factors. To an extent, the outcome is dependent on individual researcher strategies, but to a larger extent, it is contingent on the nature of the field, the university environment and the funding opportunities that are offered.

Indeed, future research could address the coping strategies of individual researchers to navigate the complicated terrain of funding policy and university conditions that we have outlined. Given the likely variance of local conditions, however, such research should build on the insights from the heuristic approach we

have adopted here to develop, say, survey-based indicators to allow for larger scale data collection to permit systematic comparison of country and field-specific factors, in particular, which might affect researchers' negotiated space.

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