Excellence and innovation in research policy – external steering and internal responses

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Abstract

The past two decades have seen a number of transnational governance instruments aiming for excellence and innovation in research. This thesis examines three instruments adopted by several OECD countries: Centres of Excellence (CoEs), Centres of Excellence in Innovation and Research (CoEIRs), and third mission legislation. Reasoning primarily from institutional theory the thesis investigates how these instruments are translated and adapted to the public research systems of Norway and Sweden, and how and to what extent they affect university researchers' identities and practices. The thesis applies a multilevel analysis and a qualitative research design using documents studies and interviews.

The thesis shows that although policy aims and rhetoric have been the same in both countries, the instruments have had different impacts on the respective researchers. These differences are traced to the means and the goals of the instruments, the composition and design of the public research systems, and institutions conditioning the researchers' environment.

One general finding is that the third mission legislation has had little impact on researchers' identity and practices as it affords researchers room for their own interpretation of the legislation's content and what it means for them. Another finding is that centre schemes have the propensity to intertwine with researchers' identity and practices by imposing new ways of organising research, albeit under certain conditions. The thesis shows that the high level of block funding of the universities combined with a segmentation of research practices between the university and the research institute sector in Norway, has contributed to the legitimisation of the centres in the universities. By having the goal of excellence which complies with academic norms and values, the centre schemes legitimise a concentration of funding on the best research group – an otherwise highly contested action in a research system characterised by equality in the distribution of funds. The schemes furthermore provide the opportunity to cross organisational and institutional boundaries. Similarly, the centre scheme with the goals of excellence and innovation offers the opportunity to bridge the logics of innovation and excellence and therefore legitimise practices associated with innovation. The Swedish public research system is characterised by competitive funding and a relatively small research institute sector. The centre schemes have a relatively limited role in inducing collaboration across organisational and institutional boundaries. Rather, they compete with other grants for the researchers' attention, which seems to impede the institutionalisation process.

Other factors also explain the perceived variance in the impact of the centre schemes on researchers' identities and practice. These are, *inter alia*, the identity and the maturity of the academic field, the ripeness of the relationship between the university researchers and the industrial/public partners, and researchers' job descriptions.

Taking all factors together, the thesis demonstrates that the adoption of transnational governance instruments does not necessarily lead to convergence between national research systems; the instruments may rather strengthen the national characteristics. Furthermore, the thesis illustrates the importance of examining governance instruments on both the micro and the macro level in order to obtain a holistic picture of factors that enhance or impede the institutionalisation process. Concerning policy implications, the findings of the thesis underline the need for developing governance instruments that embed flexibility in terms of their adaptation to the institutional complexity inherent in the university and in national public research.

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List of abbreviations

BERD	Business Expenditure on R&D
CoE	Centre of Excellence
CoERI	Centre of Excellence in Research and Innovation
GDP	Gross Domestic Product
GERD	Gross Domestic Expenditure on R&D
GovERD	Government Expenditure on R&D
HERD	Higher education Expenditure on R&D
OECD	Organisation for Economic Co-operation and Development
PRO	Public Research Organisations
PRS	Public Research System
R&D	Research and Development
RCN	Research Council of Norway
SRC	Swedish Research Council

Table of Contents

1. Introduction

The purpose of this thesis is to investigate how transnational governance instruments for excellence and innovation in research are translated to the national context, and the extent to which they affect university researchers' practices and identities. It focuses especially on governance instruments – centre schemes such as centres of excellence (CoEs), centres of excellence in research and innovation (CoERIs) – and third mission legislation; and the process of institutionalising these in Sweden and Norway. These two countries are often perceived as rather similar, but the main findings of the thesis show that while policy aims and rhetoric have been the same in both countries, there are important differences in the institutionalisation of the instruments. The thesis shows that the instruments contribute to a reinforcement of existing national characteristics rather than leading to convergence. This is traced to the institutional framework and the organisation of the distinct public research systems.

1.1. Problem statement

Although neither excellence nor innovation is new to science or even to policies for steering science, in the last two decades these two concepts have achieved an unprecedented importance in national and transnational policies for research the world over (Hackmann and Rip 1999; OECD 1995; Orr et al. 2011, European Council 2000; European Comission 2007; Lund Declaration 2009).

The increased interest in innovation as a direct output of science is usually linked to the launch of the knowledge economy as *leitmotif* for advanced industrial economies. Prior to this, innovation may arguably be said to have existed as an embedded value in science referring mainly to new discovery. Innovation in policy discourse appears however to relate to the Schumpeterian definition of the term, which is new combinations of knowledge resources in the form of new products, methods of production, new sources of supply, and attempts at the commercialisation of these (Schumpeter 1934 p. 35). The introduction of innovation as a goal of policies for science involves academics making a discursive shift from understanding innovation as invention or newness to adopting innovation as a third mission of the university. One of the core policy instruments to achieve this has been the introduction of third mission legislation.

Like innovation, excellence has a history in science that predates its role as a governance principle. Excellence has existed as an ex post evaluation of scientific work. Most academics find it hard to define the concept, but assume that they possess a tacit capacity to recognise excellent scientific work if they are confronted with it (Luukkonen 2012). While excellence has historically been considered as the responsibility of the academics (Hackmann and Rip 1999), we see that some European countries, Denmark, Finland, and the Netherlands amongst others, had already at the beginning of the 1990s introduced policies which were accompanied by instruments aiming at excellence, more specifically centres of excellence (Aksnes et al. 2012; Hackmann and Rip 1999). At the transnational level we see the first introduction of excellence as a principle for governing research in the European Union's Sixth Framework Programme (FP6), one decade ago. FP6 featured a new instrument which received remarkably little attention at its launch: the networks of excellence. Although the FP6 networks differed in some respects from the centres, which are the most common means, the policy ambitions are similar. The EU described the aim of FP6 networks of excellence in the following way:

> NoE are designed to strengthen scientific and technological excellence on a particular research topic through the durable integration of the research capacities of the participants. They aim to overcome the fragmentation of European research by:
>
> - gathering the critical mass of resources
> - gathering the expertise needed to provide European leadership
>
> NoE also have to spread excellence beyond the boundaries of its partnership.[1]

One decade later, centres of excellence have become *de rigeur* in national research and innovation policies the world over (OECD 2014). Excellence has gained prominence observable in the gradual evolution in the way excellence has been dealt with in important policy documents of the EU (Luukkonen 2010). One example is the present EU strategy 'Horizon 2020' which has three areas of priority - excellent science, industrial leadership and societal challenges.[2]

[1] See Cordis on FP6: http://cordis.europa.eu/fp6/instr_noe.htm

[2] http://ec.europa.eu/research/horizon2020/index_en.cfm?pg=h2020, last viewed 08.04.2013

These changes in research policy over the last two decades are the point of departure of this thesis which studies the implementation of governance instruments with the goals of excellence and innovation, and their potential impact on university researchers.

1.2. Research questions

The emphasis on innovation and excellence is present in nearly all national research polices, but considerable differences exist at the level of implementation (Paradeise et al. 2009). Likewise, the impacts of the instruments differ radically. One principal reason for this difference is that research systems differ across nations, another is that science itself is heterogeneous. Thus, an instrument can have different impacts within the same university. In order to explore these differences, the thesis focuses on two empirical sites, the nation state and the individual researchers exposed to the policies and instruments. It compares the research systems of Sweden and Norway – two neighbouring Scandinavian countries with rather different public research systems in terms of the composition of public research organisation and the funding of research.

To capture differences between instruments targeting innovation and excellence respectively, the thesis focuses on third mission legislation, university-industry collaboration centres and centres of excellence. These are seen as the main representatives of innovation and excellence policies in the last two decades and they differ in terms of means and goals; they represent legislation and the organisational concept "centre", and are either dedicated to innovation and/or excellence.

The overall research questions guiding the thesis are:

- *How are transnational governance instruments for excellence and innovation adapted and implemented in Sweden and Norway?*
- *In what ways and to what extent do they affect university researchers' practices and identities?*

These questions are addressed by reasoning from institutional theory and principal-agent theory. These two theories differ in their view on rationality, structure and action, but they are used here as theoretical tools for examining respectively the impact of governance instruments in terms of compliance and incompliance between norms and values inherent in the instruments and researchers' environment, and the (contractual) relationship between the funding agency and the centres. Of the three papers that compose the second part of this

thesis, two apply respectively institutional theory and principal-agent theory. This introduction, however, reasons primarily from institutional theory. The focus here is to provide some overall insights and reflections on the contributions from the three papers. Underlying the two research questions above is the question of why similar governance instruments have different degrees of institutionalisation in Sweden and Norway: this is one of the main concerns of this introduction.

Institutional theory was chosen because it assumes that cognitive and normative institutions guide material and symbolic practices and prescribe appropriate behaviour, and that these institutions condition and influence the individual and the organisation's response to external pressures (Friedland and Alford 1991; Scott 2008). It further underlines the institutional complexity of the university and its commitments arising from its multiple missions (research, teaching and knowledge transfer); its several cultures (administration *vis a vis* academics, the different academic disciplines); and heterogeneous group of stakeholders (government, region, students and business) (Clark 1983; Greenwood et al. 2011; Kraatz and Block 2008). Another important dimension is the highly institutionalised environments in the national public research systems where norms, traditions and national peculiarities produce path dependencies that sustain national variations which affect the translation and institutionalisation of governance instruments (Ben-David 1971; Bleiklie and Lange 2010; Clark 1983; Kogan et al. 2006; Whitley 2003). The institutional complexity inherent in the university implies that policies and associated instruments might have different impacts on the diverse cultures of the university (Reale and Seeber 2011), not being equally institutionalised into the whole organisation. There is therefore no one-to-one relationship between external pressures from policies and adhering instruments and change in university researchers' practices (Colyvas 2007; Maassen and Stensaker 2005; Meyer and Rowan 1977). Thus, the degree of institutionalisation of the government instruments depends upon the existing institutional environment's compliance with the instruments' goal (e.g. excellence and/or innovation), and the means (organisation (CoEs), legislation (third mission)) (Greenwood et al. 2011; Pache and Santos 2010). To explore this, the thesis pays attention to the characteristics of the means, the institutionalisation of legislation versus organisation, and applies the perspective of institutional logics to study the degree of compliance between the goals of the instruments and the researchers' institutional environment.

The term "governance instrument" is used in the thesis to describe funding schemes and legislation implemented to coordinate and control particular kinds of activities, such as

conducting research and the output of research (Whitley 2011). Governance broadly conceived has to do with questions of organisational purpose and control (Kraatz and Block 2008; March and Olsen 1995) and the instruments used to control activities can represent both external and internal governance (Leisyte 2007). External governance refers to the institutional arrangements on the macro- or system level, while internal governance refers to institutional arrangements within the university. Governance as such can be understood as the external and internal coordination of higher education organisations.

To investigate the research questions the thesis applies a qualitative approach. It compares the institutionalisation of the three governance instruments in two distinct national public research systems in two Nordic countries – Sweden and Norway. These countries were selected on the fact that Norway, broadly speaking, represents a country that still provides considerable block funding to the universities – at least compared with many other countries (Lepori et al. 2007). It further has a large research institute sector that has institutionalised collaboration with industry and the public sector. In comparison, universities in Sweden are the main collaborating partner for industry and the public sector as the institute sector is relatively small, and Sweden has as most other countries reduced block funding to universities and increased competitive resource allocation. An initial assumption of the thesis is therefore that these conditions lead to differences in terms of the degree of institutionalisation of the instruments. Another important factor motivating the country selection was that both countries had implemented the governance instruments at around the same time.

The other comparative dimension of the thesis is disciplinary differences. The institutional complexity embedded in an organisation that has different missions, several cultures and various stakeholders, means that researchers' response to the governance instruments might differ across academic disciplines. Research on the impact of governance instruments on researchers' practices have tended to make generalisations on institutional changes based on perceived changes in some selected disciplines (Etzkowitz and Leydesdorff 1997; Gibbons et al. 1994; Ziman 2000). Studies of the third mission especially have paid considerable attention to technology transfer in life science and natural science, leaving large parts of academe outside of the discussion of the institutionalisation of the third mission.

To study the variations in the institutionalisation of the governance instruments and their potential impact on researchers' identity and practices, the thesis applies a case study approach and the methods of semi-structured interviews and document analysis.

1.3. Structure of the thesis

The aim of this present part is to discuss the findings of the papers in the second part of the thesis in a broader context than the paper format allows. To achieve this, the thesis first expands upon the main theoretical framework – institutional theory. Although only one of the papers applies institutional theory explicitly, the two others can be read into it as well. The chapter provides a definition of the key concepts "institutions", "institutionalisation", "institutional carriers", "organisations" and "institutional logics", and links these to the study of policies, universities and individual researchers. These concepts provide the basis for discussing the institutionalisation of two different forms of institutional carriers – in the form of organisations, such as CoEs, and in the form of legislation – the third mission, and the extent to which these can affect researchers' practices and identities. The chapter further discusses the differences and complementarities between institutional theory and principal-agent theory.

Chapter 3 describes the main research strategy and methods; chapter 4, *The public research systems and policies for excellence and innovation in Sweden and Norway*, expands upon the main differences between the public research systems in Norway and Sweden by applying Whitley's (2003) notion of public science systems as a conceptual and analytical framework. It focuses particularly on national variations in employment structures, research funding arrangements and the organisation of higher education to show how these factors affect the degree of institutionalisation of the governance instruments and the extent of the impact they may have on researchers' practices and identities. The chapter also includes a description of the countries' developments in research policies for innovation and excellence and adhering instruments from the 1990s and onwards. This chapter constitutes an empirical backdrop to the thesis and aids in contextualising the findings.

The thesis then provides an overview of the papers and the main findings in chapter 5, while the following chapter 6 analyses and discusses the findings. The main findings of this thesis are that centre schemes appear to affect the Norwegian research system to a greater extent than the Swedish. Centres in Norway represent opportunities for crossing organisational and institutional boundaries in a research funding landscape otherwise characterised by being based on the principle of equality. Furthermore, the centres are few and substantially funded and appear to be strong identity markers for the Norwegian researchers. In contrast, the Swedish centres are one out of several and somewhat similar funding opportunities which

means that creating organisational identity is more difficult. The findings further indicate that the third mission legislation seems to be more institutionalised in Sweden than in Norway, and this is here explained by research funding in Sweden being highly competitive and encouraging collaboration with actors external to the university. Additionally, universities are the main collaborative partner for the industry; in Norway this task is dedicated to the research institutes.

The final chapter of the introduction *Conclusion and policy implications* gives some final concluding remarks and offers two policy recommendations concerning the institutionalisation of third mission legislation and centres of excellence.

2. Theory

This thesis applies institutional theory and principal-agent theory as theoretical frameworks. While both derive from rational theory, they are rather dissimilar in their view on organisations and organisational behaviour, especially in terms of organisations' rationale for acting on external pressures. Thus the theories illuminate different relations between on the one hand policies and funding agencies, and on the other hand research units and university researchers. However, in order to answer the research questions of the thesis, this chapter will apply institutional theory as an overarching framework for the whole thesis. It was chosen because it can be applied at multiple levels of study - both macro and micro level – and because of its focus on the institutionalisation process. In the following I will explain the reasons for this choice by first reviewing alternative approaches to the study of the impact of research policies and then provide a more detailed account of concepts drawn from institutional theory that are used in the thesis. In the end of the chapter I will elaborate on the differences and complementarities between institutional theory and principal-agent theory.

2.1. Alternative approaches

A wide range of conceptual and theoretical perspectives have been applied in studies of science and innovation policy, including institutional theory (e.g.Berman 2011; Colyvas 2007; Gumport 2002; Powell et al. 2007), innovation systems (e.g.Freeman 1987; Lundvall 1992; Nelson 1993), triple helix (Etzkowitz and Leydesdorff 1997; 2000), Mode 2 (Gibbons et al. 1994; Nowotny et al. 2001), post-academic science (Ziman 2000) and science and technology studies (e.g.Jasanoff 2008; Knorr-Cetina 1999; Latour and Woolgar 1979).

Both innovation systems and the triple helix are conceptual approaches which focus on the interaction between policy, university and industry, and are often applied in cross-country comparisons. They emphasise that innovation is an interactive process which involves different actors and offers the possibility to map different actors in the system and the relationship between them. The university's role in these two approaches is to contribute to economic development through collaboration with industry, commercialisation of research and education of knowledgeable workers. Given policy's increased interest in innovation as a direct output of science and the emphasis on the knowledge economy as a *leitmotif* for advanced industrial economies, both approaches have become influential in policy circles - evident in both transnational and national policy communities (e.g.Godin 2006; Jacob and

Orsenigo 2007).[3] Beyond these commonalities one might claim that the innovation systems approach primarily focuses on firms/industry and/or technology and the triple helix approach focuses on the university, and is thus perhaps closer to the subject of this thesis. Although both approaches are useful frameworks for studying innovation, and more specifically technology transfer between university and industry, they are perhaps less adequate for studying the impact of governance instruments that have other goals beside innovation – such as excellence and critical mass. Moreover, they provide neither the tools nor the vocabulary to link the macro level with the micro level, despite the fact that they are influenced by institutional theory (e.g. economic institutional theory, see North 1990).

Mode 2 (Gibbons et al. 1994) can also be considered as a policy-related approach as it seems to have influenced research and innovation policies (Fisher et al. 2001; Hessels and Van Lente 2008). The core argument of the perspective, which it shares with Ziman's (2000) post-academic science, is that we are witnessing a historical shift from one mode of knowledge production to another, involving considerable change in scientific institutions (norms, practices and values) and organisational structure of academic work. While knowledge production used to be primarily located in scientific organisations (like universities, government labs and research institutes) and structured by scientific disciplines (Mode 1), its locations, practices and principles are now much more heterogeneous (Mode 2). Science is contextualised with the demand for innovation, new regulations and multiplication of user-producer interaction (Nowotny et al. 2001). Several factors have contributed to the growth of Mode 2 research, both internal and external to the academic organisation, including policy. One problem of the framework, however, is that it presupposes that the instruments have an impact; another - emphasised by several critics (e.g. Hessels and Van Lente 2008; Jacob 2000), is that it is primarily descriptive and has loose empirical foundations as the concepts are largely based on secondary data – a critique also pertaining to post-academic science. A third issue is that it neglects the importance of the national context.

Others have investigated the relations between science and policy with an emphasis on how researchers adapt to local circumstances and how this adaptation affects knowledge production (Knorr-Cetina 1999; Latour and Woolgar 1979), and the co-production of knowledge through researchers' involvement in other organisations such as corporate board

[3] Triple helix has gained a significant stance in Swedish policy discourse and functions as a legitimising device for introducing governance instruments targeting academic entrepreneurs (Jacob and Orsenigo, 2007).

and advisory committees in, for instance, funding agencies (Jasanoff 2008). These studies are found within the broad interdisciplinary field of Science and Technology Studies (STS). The role of many STS studies is to "open(s) up the categories of 'science' and 'policy' to critical reflection and empirical exploration" (Irwin 2008 p. 584), meaning that science and politics are mutually embedded and co-constituted. This allows STS researchers to entail "a more fluid and 'hybridised' exploration of development, emergence, and resolution of particular problems – and without 'purifying' discussion into predetermined categories as 'science' or 'politics'" (Irwin 2008 p.592). This implies that STS will have difficulties in exploring and explaining the relationship between research policy and the potential impact of these on research practices and identities, because there are no structural boundaries between science and politics. While the close interaction or co-production of science and policy is an important aspect it is not the focus of this thesis.

Perhaps the closest alternative to institutional theory is Resource Dependence Theory (RDT) and some might claim that RDT is a more appropriate framework for studying the impact of public policy (Phillips and Malhotra 2008; Thornton and Ocasio 2008). RDT assumes that organisations have strategic autonomy to negotiate the uncertain resources available in their environments in the interests of organisational survival and power (Pfeffer and Salancik 1978). Resource providers in the environment are other organisations, and if there is a sole provider, organisations have little power to bargain, and their dependency is characterised as high. For instance in public research systems where the state is the central funder of research and steers the direction of research, the universities are supposedly highly dependent upon the state and have less bargaining power compared with systems characterised by multiple funding opportunities.

The research funding system is a central aspect in the thesis, and it is assumed that the structures of resources create capabilities for acting as they empower and constrain university researchers and make them more or less capable of acting according to prescriptive rules (Olsen 2007). However, rather than analysing and discussing how the university, research units and researchers strategically target resources, one purpose of this thesis is to show how the funding system, together with the different public research organisations, influences the translation and institutionalisation of transnational governance instruments. Another is how

and to what extent the goals of the policies and associated instruments affect the practices and identities of the individual researchers already embedded in an institutional environment.[4]

Although the above alternative approaches provide important insights into potential impacts of policies and the diverse aspect of university research and researchers' roles, I will claim that the strength of applying institutional theory in this thesis is that it offers the possibility to reconcile research and innovation policy and the national context with the practices and identities of university researchers at the micro-level. It enables a study of the development of governance instruments through institutional theory's insights of how ideas travel and are adapted, and it provides a framework for analysing researchers' responses to the instruments. Furthermore, institutional theory's attention to institutions, the process of institutionalisation, institutional complexity and the existence of different institutional logics can illuminate how university researchers are not passive recipients, but actively respond to external institutional pressures by employing different strategies.

2.2. Institutional theory

Institutional theory was chosen because it enables a multi-level analysis by linking researchers' responses to external pressures to their institutional context, and because of its richness in theory. In the following I will outline concepts from institutional theory used in the thesis - institutions, institutional carriers, institutionalisation, organisations and institutional logics. The aim is to create an overarching theoretical framework that enables a discussion of the process of institutionalising governance instruments in terms of their means (legislation, organisation) and how researchers respond to them by applying different institutional logics.

2.2.1. Institutions

Few studies in institutional theory attempt to provide a definition of the term "institution" and there are several on-going discussions of what should be included in such a definition (Greenwood et al. 2008; Scott 2008). For instance, the disciplinary variations of institutional

[4] However many studies have combined institutional theory with RDT (Oliver, 1991; Gornitzka, 1999; Greenwood and Hinings, 1996; Leisyte, 2007), arguing that the two are compatible since both perspectives stress that organisations relate to their environment and that choices and actions are limited by various external pressures and demands.

theory (economics, political science, anthropology and sociology) emphasise different aspects of institutions. Another confounding factor is that the term "institution" is often applied to describe macro structures such as "higher education institutions" or "economic institutions". This thesis draws upon the sociological variant which emphasises the normative and cognitive aspects of institutions and characterises institutions as being "more-or-less taken-for-granted repetitive social behaviour that is underpinned by normative systems and cognitive understandings that give meaning to social exchange and thus enable self-reproducing social order" (Greenwood et al. 2008 p. 4-5). This implies that institutions guide actors' material and symbolic practices and prescribe appropriate behaviour for specific actors in specific situations; they are relatively resistant to change and tend to be transmitted through generations (Friedland and Alford 1991; Jepperson 1991; Scott 2008). Moreover, institutions operate at all levels; they guide the behaviour of individuals (e.g. a handshake), the organisations (e.g. accounting routines) and the organisational field and the society. The insight that institutions are found at every level means that institutions pervade every part of our daily life (Berger and Luckmann 1966) and that it is difficult to change the practices of individuals and organisations.

Although institutional theorists see institutions as relatively persistent, they also acknowledge that institutions may vary in their normative power and impact on behaviour. The influence and strength of the institutions depend *inter alia* on how widely and deeply members of a collective accept the institutions (Tolbert and Zucker 1996). Institutions vary therefore in their strength and power, while some are highly legitimised and taken for granted in an organisation, others can for instance affect the behaviour of only one part of the organisation. This is especially true for institutionally complex organisations such as universities.

While the above primarily defines the normative and cognitive aspects of institutions, institutional theory also applies the label "institution" to regulations, laws and sanctions (Scott 2008). The extent to which they are institutionalised depends on the degree of legitimacy and their cognitive and normative match with the existing institutional environment (March and Olsen 2004). For instance laws and regulations can be issued without being institutionalised in the whole group which they target. This is an important distinction and insight in terms of one of the arguments of this thesis – that the institutional complexity of the university should be taken into account when studying the potential impact of governance instruments, as their impact may differ between disciplinary fields.

Taken together, the cognitive, normative and regulative institutions can be said to "form a continuum moving from the conscious to the unconscious, from the legally enforced to the taken for granted" (Hoffman 1997 p.36) and they impact upon one another. Institutions are thus at once means for external pressures while they also guide the responses of the target group, here being the university researchers. Furthermore, institutions operate at multiple levels of analysis – the individual, organisational, field and societal (Friedland and Alford 1991; Greenwood et al. 2008; Scott 2008; Thornton et al. 2012), and these are highly interrelated. The researchers' institutional environment is constituted by a larger institutional context involving institutions of the public research system, the different stakeholders (students, industry), the market and the academic profession (cf. Clark 1983; Thornton et al. 2012).

2.2.2. Institutional carriers

Regulations, laws and funding schemes devised to reform organisational behaviour are often guided by fashion, i.e. fashion guides imitation and actors' attention to specific ideas, models and practices (Czarniawska-Joerges and Sevón 2005). Both Sweden and Norway follow international policy fashions and have established instruments to increase innovation and excellence in research (this is expanded in chapter 4). Governments and funding agencies adopt and translate ideas into their social and cultural context through various imitation mechanisms which can be mimetic, normative or coercive in character (DiMaggio and Powell 1983).

It is generally recognised that institutions (norms, values, practices) can be conveyed through various carriers (Scott, 2008). Carriers are never neutral modes of transmission, but affect the content and the ways that the message is received. They can come in such forms as formal organisations, regulations and laws, relations/network, symbols, ideas or artifacts (Barley 1986; Jepperson 1991; Sahlin and Wedlin 2008; Scott 2008). While legislation is normative, ideas can represent values. Central carriers in this thesis are third mission legislation, centres of excellence and centres of excellence in research and innovation. The perceived success of third mission legislation in some countries, such as the US (Mowery and Sampat 2005; Powell et al. 2007) for enhancing innovation from the universities, and of the centres of excellence, in for example Denmark, in concentrating basic research funding on the best research groups to achieve high quality research, have led to several countries imitating the instruments (Mowery and Sampat 2005; OECD 2014).

However, several studies have underlined that institutional carriers do not remain unchanged as they flow, but are subject to translations (Sahlin and Wedlin 2008 p. 219). Their circulation is not only ceremonially adopted, as asserted by Meyer and Rowan (1977), but can result in both organisational and institutional change (Sahlin and Wedlin, 2008). But, in order to be institutionalised, the institutional carrier must become legitimate and embedded in the social order (Colyvas and Powell 2006). Institutionalisation of the instruments is thus an essential factor, and in the following I will outline how this thesis comprehends institutionalisation.

2.2.3. Institutionalisation

Institutional theory acknowledges that organisations affect and are affected by their environment - they are not isolated units. For instance, government affects universities through new institutions such as regulations and laws, and together with funding agencies they provide material conditions of financial, organisational and infrastructural character (Braun 1998). The extent to which regulations, laws and other governance instruments are institutionalised depends on several factors, since institutionalisation is a complex and multi-level process and an outcome (condition) (Colyvas and Powell 2006; Zucker 1977). If organisations are to respond to and institutionalise governance instruments, there has to be a normative and cognitive match between the values in the instruments and the identity and traditions of the organisation, i.e. the normative and cognitive institutions (Brunsson and Sahlin-Andersson 2000; Gornitzka 1999; March and Olsen 1989; Meyer and Rowan 1977; Suchman 1995). Take for instance the increased emphasis on "excellence" in research policy. Excellence has in itself always been an epistemic value of the scientific community, and by endorsing the notion, although adding other steering ingredients to the list such as the organisational aspects, policymakers have through CoEs created an instrument that alludes to values and identities in academia (Fisher et al. 2001; Rip 2011). Governance instruments targeting "excellence" may meet less resistance in the researcher community compared with instruments with the goal of "innovation", which in past decades have targeted the potential commercial value of research – an often controversial topic (see Paper 2 for examples).

Universities and research units can respond to external pressures such as governance instruments in a number of ways (Oliver 1991). They can prioritise, adapt or eliminate the tensions of institutional complexity elicited by the governance instruments by striving to balance the various institutional demands through forging links, or decouple by giving ceremonial and symbolic commitment to certain institutions while preserving a core identity

(Greenwood et al. 2011; Meyer and Rowan 1977). If decoupled, an instrument can apparently be institutionalised while it in reality is only symbolically adopted. If we take third mission legislation as an example we see that universities in several countries have established technology transfer offices (TTO), but offer few other incentives for researchers to pursue third mission activities (Geuna and Muscio 2009; Krücken 2003). The TTOs assist researchers in the commercialisation process but few incentives exist for encouraging the researchers to report their results to the TTO. As such one may argue that the universities have given ceremonial commitment to the third mission by establishing the TTOs to satisfy stakeholders, however without changing their core practices.

Institutionalisation is, as mentioned above, a multi-level process and an outcome. The degree of institutionalisation can vary from high to low, meaning that some instruments may enjoy a high degree of legitimacy and taken-for-grantedness, thus being institutionalised, whilst others might meet resistance and be low on institutionalisation (Colyvas and Powell 2006; Zucker 1977). The degree of institutionalisation can vary between organisations (in the same field) and within an organisation, like the university, characterised by institutional complexity (Greenwood et al. 2011; Pache and Santos 2010). For practices low on institutionalisation, direct social control is claimed to be necessary (Zucker, 1977). One example here is government's and funding agencies' increasing use of monitoring and evaluation of their instruments.

When a regulation or instrument is considered institutionalised we can expect changes in material and symbolic practices and identities of the target group. However, institutionalisation of instruments is often an incremental, path-dependent and evolutionary process, since time is required to adapt them to existing norms and practices - illustrated by several historical studies of institutional change in an organisational field (Berman 2011; Colyvas and Powell 2006; Rao et al. 2003; Thornton 2002). This is an important observation that the thesis builds upon: it sees institutionalisation as an incremental process. That being said, time required to institutionalise goals and means may vary between different governance instruments. Therefore this thesis investigates the institutionalisation of the governance instruments in two highly interrelated ways (cf Pache and Santos 2010). The first is how the instruments influence the researchers at the ideological level, prescribing which goals are legitimate to pursue. Here the central issue is the overlap between the norms and values inherent in the governance instruments – excellence and innovation – and the institutional environment of the researchers. The researchers' responses to the instruments are here

examined at a given moment in time, and the thesis provides a snapshot of an ongoing institutionalisation process. However, this snapshot signals the compliance or incompliance between the existing institutional environment and the goals of the institutional carrier. To examine this the thesis applies the perspective of institutional logics (I will return to this below) and the institutionalisation of the instruments is as such explored in terms of degree of legitimacy. This is addressed in Papers 2 and 3.

The second way is how the instruments exert pressures at the functional level through the means they prescribe, i.e. legislation and organisation (DiMaggio and Powell 1983; Oliver 1991; Pache and Santos 2010; Scott and Meyer 1994). Functional and process pressures are material and peripheral and are potentially flexible and negotiable (Pache and Santos, 2010). One assumption of the thesis is that regulations and laws, on the one hand, are often ambiguous and political in nature and leave room for the organisation and its members to engage in decision making, sense making and collective interpretation (Suchman and Edelman 1996; Thornton et al. 2012). Organisations (or centres) on the other hand, although flexible and negotiable (Meyer and Rowan, 1977), are means which may have a stronger and/or immediate impact on the organisation given the right institutional context. This is addressed in Papers 1 and 3.

These two approaches to the study of institutionalisation of the governance instruments are highly interrelated, as one cannot separate means and goals. While third mission legislation targets the goal of innovation and the funding scheme, CoE targets excellence; the CoERI scheme targets both innovation and excellence (however with an emphasis on the first goal). The diverse combination of means and goals together with different institutional contexts in terms of public research systems and academic disciplines generate, as we will see in the discussion, a difference in the degree of institutionalisation of the instruments in Sweden and Norway. To enable this discussion I will in the following first expand upon the organisational aspect of the means and then outline the perspective of institutional logics, applied in the study of researchers' responses to the goals of the instruments.

2.2.4. Organisations

Important features that characterise an organisation are, *inter alia,* structure, authority, rationality and identity (Brunsson and Sahlin-Andersson 2000; Rao and Kenney 2008). Concerning structure, institutional theory assumes that organisational design is not a rational process but a result of external and internal pressures (DiMaggio and Powell 1983). This

means that establishing a formal organisational structure such as a centre does not necessarily lead to institutionalisation of the means, since internal factors need to be present as well. Structures are developed over time and by various mechanisms (ibid.).

Organisational authority involves co-ordination and control of activities through either ownership or governance, and an organisation's response to external pressures will be affected by its dependence upon important actors (Greenwood et al. 2011; Oliver 1991). This implies that organisations or centres, in this case, in order to become institutionalised must be able to control their own activities. Furthermore they have to be rational and intentional in the sense that they work towards specific goals or purposes (Brunsson and Sahlin-Andersson 2000). Here leaders play a central role in that they are expected to forecast goals, objectives, preferences and alternative actions. The rationality of an organisation is highly interrelated with the compliance or incompliance with the goals of the governance instruments.

Regarding an organisation's identity, Selznick (1984) postulated that institutionalisation (which he defines as the infusion of value in organisations) produces a distinct identity for the organisation, and that maintaining the identity is important for organisational survival (Glynn 2008). Identity serves as a filter for organisations to interpret and respond to strategic issues and external pressures (ibid.). To construct identity, an organisation must have a certain degree of autonomy, i.e. it is hierarchically subordinated to only a small part of the environment (Brunsson and Sahlin-Andersson 2000), and it must have authority and power through the control of the collective resources and its own boundaries. In addition it has attributes which define the organisation as different from others (ibid., Greenwood et al. 2011).

Institutional carriers and means such as centres of excellence can be considered as organisations although they only partially exert the characteristics above. They are so-called not fully-fledged organisations (Brunsson and Olsen 1997; Brunsson and Sahlin-Andersson 2000). Centres of excellence rely upon their relation to the host university and the funding agency, where the latter determines the existence of the centres through the monitoring of their activities. Moreover CoEs are impermanent organisations, unless they come to exhibit all aspects characterising a fully-fledged organisation, having authority, boundaries, and a clear identity, and achieve permanence. Most centres investigated in this thesis have unclear boundaries as researchers are only affiliated to the centres for a certain percentage of time while having their core position in their home department.

However, the universities are primarily organised into faculties and departments reflecting the main disciplinary fields, and these institutionalised structures have been created and developed over a long time to support the collaborative goal of education and research and are difficult to change (Rip 2011; Jacob 2000). The CoEs represent the opportunity to cross the organisational structures of the universities since most centres incorporate researchers belonging to different universities, departments, faculties and even organisations – centres may also include representatives from industry partners or public agencies. This means that the centres represent an increased opportunity for intellectual pluralism (Whitley 2003).[5] These characteristics of the centres have led Rip (2011) to claim that we now see the emergence of a new way of organising research in a university, as the centres enable a move away from the traditional departmental structure. But the impact of these institutional carriers – CoEs and CoERIs – depends, as we will see in the discussion, upon the degree of institutionalisation (high/low) and upon the wider institutional context.

2.2.5. Institutional logics

Universities embed multiple institutions in terms of their missions (research, teaching, and knowledge and technology transfer), diverse academic disciplines and occupational functions, and a heterogeneous group of stakeholders (students, industry, regional authorities etc.). In addition to these general organisational characteristics, universities are embedded in the wider national institutional context. This means that universities are typical sites of institutional complexity, implying that policies and governance instruments for excellence and innovation can have a different impact on individual university researchers. To analyse the institutional complexity residing in organisations, institutional theorists often use the institutional logics perspective (Friedland and Alford 1991; Greenwood et al. 2011; Lounsbury 2007; Meyer and Hammerschmid 2006; Thornton and Ocasio 2008; Thornton et al. 2012). According to Friedland and Alford (1991 p. 248) who launched the perspective, an institutional logic is "a set of material practices and symbolic constructions which constitutes its organising principles and which is available to organisations and individuals to elaborate". They exemplify this by pointing to the multiple institutional logics inherent in western capitalist societies; the capitalist market, bureaucratic state, democracy, nuclear family and religion – areas spanning from the macro to the micro level, involving both symbolic and material practices. Institutional logics thus exist in the organisational field and within the organisation

[5] I will return to this in chapter 4

(Lounsbury 2007; Thornton et al. 2012). The perspective enables analysis of the relations between different institutions, their compatibilities and incompatibilities and the possible outcome of these interactions (Greenwood et al. 2011). As such it provides a micro perspective for studying inter-organisational behaviour, which can make evident the presence of multiple sets of institutions conditioning the social environment of the individual researchers, and how these are applied in response to external pressures and the goals of the instruments.

Some studies of universities and university researchers have focused on the dynamics between the institutional logics of the market and the institutional logic of academia at various levels of analysis, depicting the market logic as slowly overtaking the academic logic (e.g. Berman 2011; Gumport 2002; Powell and Colyvas 2008). Rather than discussing the invasion of the market sector in universities, this thesis identifies and focuses on the institutional logics of excellence and innovation. These are seen as important for the governance of the university and how the researchers respond to the instruments. They are identified at the macro level in policy documents and the development of governance instruments, and at the micro level in interviews with university researchers (see chapter 3 for the methods used in the thesis). The point of departure is that these two logics are not new, but have always, and to various degrees at different times, been a part of the institutional framework of and within the universities. For instance, examinations of developments in research policy show that it goes through certain phases or layers where excellence and innovation have been given different weight at different times (e.g. Edqvist 2003; Ruivo 1994). Chapter 4 and Paper 1 show that in the past decades there have been tensions between the two logics in the development of policies and adhering instruments for excellence and innovation. The increased emphasis of excellence as a policy goal resulted at the same time in a separation between the goals of excellence and innovation by the introduction of the centres of excellence and the centres of excellence in research and innovation, and in a stronger emphasis on the synergies between the logics in terms of quality on output, especially in CoERIs which target high quality in scientific publications and innovation in industrial partners. At the micro level, studies show that university researchers have been participating in practices and activities associated with the institutional logics of excellence and innovation for a long time (e.g. Kline and Rosenberg 1986; Martin 2003; Tijssen 2003). This thesis, and especially Papers 2 and 3, studies the compatibilities and incompatibilities between the goals and means of the governance instruments and researchers' practices and identities.

The findings of the thesis show as other studies, that in most situations there are different degrees to which institutional logics are incompatible; that this varies between disciplines (Hessels and van Lente 2011; Weingart and Stehr 2000; Paper 2), and that sometimes the logics may even reinforce one another and generate productive tensions (Greenwood et al. 2011; Murray 2010; Paper 3). Logics can be combined and reconfigured to create hybrid forms (Greenwood et al. 2011) such as hybrid practices (Gulbrandsen et al. forthcoming; Murray 2010), hybrid identities (Lam 2010; Lok 2010; Meyer and Hammerschmid 2006; Owen-Smith and Powell 2002) and hybrid organisational forms (Pache and Santos 2010; Thune and Gulbrandsen 2011). Paper 3 shows that the goal of excellence legitimises tension-filled practices, such as commercialisation, associated with the institutional logics of innovation, and that the means CoERIs contribute to hybrid practices and identities.

Another issue pertaining to the degree of incompatibility between the logics is the specificity of the goals of the instruments, the means used, and the opportunities for organisations to exert discretion (Greenwood et al. 2011). A low degree of specificity in the goals provides organisations with relatively more discretion in their efforts to alleviate the tensions of complexity (Greenwood et al. 2011 p. 334). The ambiguity of goals and low degree of specificity can leave room for individual researchers to selectively appropriate and negotiate the logics. As such the presence of multiple logics and potential contradictions can leave room for individual agency (Thornton et al. 2012), meaning that we can find different impacts of the instrument on researchers' practices and identities even within one disciplinary field. It is important to note, however, that institutional logics are not constant but in flux and continuously developed through exogenous and endogenous influences. Hence, policy and its governance instruments, play an important role in the filtering and framing the logics (Greenwood et al. 2011).

2.3. Institutional theory and principal-agent theory

Institutional theory serves as the main theoretical framework of this introduction and in Paper 3; it can also be read into Paper 2 which examines why researchers commercialise research, an activity filled with institutional tensions. Paper 1, however, uses principal-agent theory as the analytical framework. Why is it purposeful to use these two theories for the study of governance instruments and their potential impact? As mentioned in the introduction to this chapter both theories derive from rational theory, but they have different objects of analysis

and thus both contribute to illuminate the relation between policies and the target group in different ways. Institutional theory focuses on institutions that condition organisational and individual behaviour and so is purposeful for the study of how researchers respond to external pressures. Principal-agent theory focuses on the interaction between two parties, or the contractual relationship between them (Eisenhardt 1989a; Guston 2000; Van der Meulen 2003), and hence is purposeful for analysing the relation and interaction between the funding agency and the CoEs and CoERIs. The key argument of principal-agent theory is that the relation between the principal and the agent is haunted by problems that stem from an information asymmetry. This enables the agent (the centres) to pursue its own interest and engage in opportunistic behaviour at the cost of the principal's (funding agency's) interest. Thus the principal, often ignorant of the content of research, has to make sure it is getting value from its investment and the agents have to make sure they can demonstrate the sufficiency of their performance (Guston, 2000 p.4). In order to scrutinise, the principal develops a set of control mechanisms to measure the effect of its investment. Since the centre schemes differ from other grants in terms of size and length of funding and conditions, they are perhaps subject to more extensive monitoring from the funding agency evident in the production of evaluations and annual reports.

A common feature of both theories is that they posit that organisations/agents may buffer external pressures. However, they do so for different reasons. Institutional theory emphasises the ways action is structured, and order made possible by shared institutions that both constrain the inclination and capacity of actors to optimise (DiMaggio and Powell 1991). Due to institutional persistence organisations may only symbolically adapt to external pressures (Meyer and Rowan 1977; Oliver 1991). They may do so by decoupling structures from ongoing activities thus preserving their core and at the same time gaining legitimacy in the environment. Principal-agent theory, on the other hand, assumes that agents/organisations deviate because the agents engage in opportunistic and reward-seeking behaviour which results in a problem of moral hazard in that the agent might not fulfil the task delegated by the principal.

Hence, principal-agent theory assumes that the agent has agency and can choose freely among institutions (DiMaggio and Powell 1991). One shortcoming of the theory is that it does not consider the cultural and historical frameworks in which the agents are embedded; another is that it is concerned with refining the sanction and monitoring mechanisms to achieve optimum efficiency of the funding (Kraatz and Block 2008; DiMaggio and Powell 1991).

Likewise, institutional theory has a persistence bias since it assumes that institutions are difficult to change, they evolve glacially and leave relatively little room for agency (Greenwood and Hinings 1996). The issue of agency has been one of the key challenges in institutional theory; especially in macro-structure approaches which emphasise the primacy of structure, persistence and continuity of institutions over agency and change (DiMaggio and Powell, 1983, Scott, 2008). Lately, as shown above, we have, however, seen an increase in studies that theorise on individual agency in organisations (Powell and Colyvas 2008; Greenwood et al. 2011; Thornton et al. 2012).

In conclusion, although the theories are rather different in many aspects, they complement one another in this study of the operationalisation and impact of governance instruments since they offer different frameworks to examine both the interaction between the funding agency and the centres, and the potential impact of the governance instruments on the institutional environment of the researchers.

2.4. Summing up

The purpose of this chapter has been to provide an overarching theoretical framework for the whole thesis. The main aim is to discuss the institutionalisation of three governance instruments in two different countries, in their universities and in different disciplinary fields. Institutionalisation is seen as an incremental process, and thus the thesis provides a snapshot of an ongoing institutionalisation process and does not contribute to the discussion of potential institutional change. Rather, the aim is to discuss institutionalisation in light of the instruments' means - legislation and organisation - and goals – excellence and innovation. The chapter has particularly outlined organisations as a means for affecting the institutional environment of the researchers and the university structure. Authority and identity are seen as important characteristics for the institutionalisation of the organisations. This implies that creating a formal structure (rational design) does not necessarily lead to institutionalisation of instruments such as centre schemes; the above elements have to be present as well.

The other approach in discussing institutionalisation is the perspective of institutional logics. Universities are characterised by institutional complexity (their missions, disciplines, multiple stakeholders), and the assumption is that researchers devise different institutional logics in response to the governance instruments and their goals. The logics have different degrees of compatibilities and incompatibilities and these are assumed to vary between the countries

(institutional climate) and the disciplines. Nevertheless, the goals and means of the instruments are highly interrelated.

3. Research strategy and design

This chapter attempts to clarify the research strategy and design of the thesis. The thesis includes three papers which all examine governance instruments but include different instruments or methodological approaches. Since methodological considerations are addressed in each paper this chapter will not repeat them. Rather, it provides some overall reflections and discussion on the choice of methods, and expands upon choices made that are not made evident in the papers. The chapter concludes with some reflections on validity and reliability of data.

3.1. Purpose and choice of research strategy

The overall purpose of this thesis is to investigate the operationalisation and impact of governance instruments aiming at excellence and/or innovation, and thus contribute to increase our understanding of the ways in which national institutional frameworks affect the adaptation of governance instruments and the impact these instruments may have on the daily life of university researchers. The thesis focuses on centres of excellence (CoEs), centres of excellence in research and innovation (CoERIs) and third mission legislation in Norway and Sweden, and I will elaborate upon this choice below.

The choice of this subject was motivated by the observation that several OECD countries have introduced similar instruments, but there seem to be few comparative studies on the adaptation of the instruments to the national context and their impact on university researchers. More specifically, CoEs have received relatively little attention in general from scholars in the field of research policy (Orr et al. 2011). CoERIs, or so-called university-industry centres, have received attention in the US (e.g. Bozeman and Boardman 2003; Corley et al. 2006; Etzkowitz and Kemelgor 1998) and to some extent in Europe (Thune and Gulbrandsen 2011). To my knowledge there are no cross-country studies of CoERIs. In comparison, third mission legislation, and more specifically, technology transfer activities such as patents, spin-offs and licences, have received considerable attention (Agrawal and Henderson 2002; Mowery et al. 2001; Rothaermel et al. 2007), often at the expense of other knowledge and technology transfer activities (Bekkers and Bodas Freitas 2008; Cohen et al. 2002; Litan et al. 2008; Schartinger et al. 2002). The majority of studies of third mission legislation and activities provide empirical knowledge on the organisation of technology transfer, practices and institutional frameworks within one country. Comparative evidence in

terms of the role of national policies is limited (Perkmann et al. 2013), but there are some exceptions (e.g. Haeussler and Colyvas 2011; Henrekson and Rosenberg 2001; Klofsten and Jones-Evans 2000). While this thesis conforms to the tradition of concentrating on one country through the study of Swedish researchers' commercialisation practices in Paper 2, the thesis as a whole provides insight into the relation between the institutional frameworks, the legislation and researchers' identities and practices in Norway and Sweden.

To investigate the adoption and impact of the governance instruments the thesis applies a qualitative approach, more specifically, it uses comparative case study as the main methodology. A case is an instance of a class of events (George and Bennett 2005). The class or the phenomenon of scientific interest in this thesis is governance instruments with the goal of excellence and/or innovation. Case studies are appropriate for exploratory research objectives where, how, and why questions are posed (Yin 2009), as in the papers which compose this thesis. Case studies include single cases and within-case analysis of single cases and comparison of a small number of cases (multiple case study) (Yin 2003; George and Bennett 2005). While single cases provide in-depth information, the combination of within-case analysis and cross-case comparison provides the strongest means of drawing inferences from case studies and to create more theory-driven variance and divergence in the data (George and Bennett 2005; Pauwels and Matthyssens 2004). Following this, an important decision of the research strategy of the thesis was to apply a multiple case study design which allows for sensitivity to case complexity and historical specificity, and a comparison among cases with a focus on diversity and the patterns of similarities and differences (Ragin 1987; Stake 2006; Yin 2009). This is here seen as important due to the hypothesis that different institutional contexts, i.e. the countries with their historical developments and the different disciplines, contribute to a variance in the degree of institutionalisation of the governance instruments. These institutional contexts, or levels, are however highly interrelated; what goes on at one level affects the others. I will return to the selection of variables in the next section.

Studying policies and the institutionalisation of governance instruments at the national and organisational level is a challenging task, which is probably why most studies adhere to one level of analysis. The challenge lies in establishing what types of relationship, if any, can be ascertained between policies and researchers' practices, and to identify the impact of one instrument and isolate it from other aspects (Gläser and Laudel 2007; Nedeva et al. 2012). Case studies are appropriate for exploring causal mechanisms (George and Bennet 2005). The contextual aspect of case studies helps to identify what conditions the process of

institutionalisation of the governance instruments, an issue which might have proven difficult by applying quantitative methods, as the codified variables leave out many contextual and intervening variables. A limitation of case studies, however, is that they can make only tentative conclusions on how much gradations of a particular variable affect the outcome in a particular case. Case studies are stronger at identifying what variables favour a specific outcome rather than generalised causal effects or causal weight of variables across a range of cases (ibid.). Thus case studies are better at assessing whether and how a variable matter rather than how much. This is also true for the studies in this thesis. I will return to this below when considering the challenges and limitations if the studies.

3.1.1. Case selection

Case studies provide the opportunity to find the conditions under which specific outcomes occur, and the mechanisms through which they occur (George and Bennett 2005). Thus selecting representative cases is important. Informed by theory (Eisenhardt 1989b) four criteria have guided the selection of cases.

Governance instruments

As stated in the introduction, the thesis examines "innovation" and "excellence" - two common goals in research policy – both at the transnational (EU) and national level (Orr et.al. 2011). These goals have been translated into governance instruments, and the most prominent and common ones introduced the last two decades are centre schemes with scientific and/or innovation rationales and third mission legislation.[6] The first is dedicated primarily to excellence, the second to both excellence and innovation while the third concerns innovation. The instruments are fashionable institutional carriers (Czarniawska-Joerges and Sevón 2005; Jepperson 1991), and they represent different means. These were considered as important variables in the process of designing the research project. As the previous chapter has emphasised already, they come in the means of organisations (centres) and legislation (third mission), and here these are assumed to constitute different institutionalisation processes. On the one hand, legislation is often ambiguous and political in nature and can leave room for the university management and researchers to engage in sense making and collective interpretation (Suchman and Edelman 1996; Thornton et al. 2012). The means organisations (or not fully-fledged organisations in terms of CoEs), on the other hand, often include

[6] Herein the Professor's Privilege

demands for formal structures and measurement of goal accomplishment - factors that the researchers actively have to relate to and act upon - either by complying with the demands or symbolically relating to them (Meyer and Rowan 1977).

Country selection

Studying governance instruments in one country offers the opportunity to give a rich account of local and national processes. However, exploring cross-level effects and comparing them with other countries might offer information about how the system operates as a whole (Leisyte 2007; Morris 2004). Thus it was decided to compare two neighbouring Scandinavian countries with rather different research systems in order to capture the potential differences relating to the national context. This was motivated by several researchers' observations that the implementation of similar governance instruments results in different (if any) outcomes in different countries (Braun and Merrien 1999; Paradeise et al. 2009). One example is the Bayh-Dole Act[7] introduced in 1980 in the US, seen, *inter alia*, as a means to increase commercialisation of research results from the universities. Several studies have pointed out that the emulation of the Act, which in the European context can be said to involve transfer of the right to exploit research results from the university researcher to the university, has been done without recognising local contingencies (Powell et al. 2007; Mowery and Sampat 2005). Since there are often great varieties in the institutional environments which constitute the public research system, there is therefore also great variety in the national translation of transnational governance instruments.

The differences between the national institutional environments are traced to the peculiarities of each national context, the historical development of the organisational field of public research organisations, the composition of the actors, the authority relations between the actors and funding of research - whether mainly competitive or through block grants (Hessels and van Lente 2011; Lepori et al. 2007; Whitley 2011). Norway and Sweden differ especially on diversity in public research organisations and degree of competitive funding. One initial assumption was therefore that there would be different degrees in the institutionalisation of the governance instruments between a country with a highly competitive funding system

[7] The Bayh-Dole Patent and Trademarks Act of 1980 gave permission to those performing federally funded research to file for patents and to grant licences to others

(Sweden), and one that has a mixture of block grant and project-based funding and a relatively large institute sector (Norway). Chapter 4 will expand on these differences.

Selection of universities

A third criterion informing the selection process was characteristics of the universities. Studies of universities and the third mission have underlined the often different roles played by non-university types of higher education such as university colleges, universities of applied sciences, polytechnics etc. compared with large and multi disciplinary universities (Arbo and Bennerworth 2007). Other characteristics seen as important are the size and the age of the universities. Size in terms of breadth and depth of academic activities; age in terms of historical events and institutionalised formalised structures and institutions (norms, values, identities) (Clark 1972; Kraatz and Block 2008).

Characteristics of the universities are a key criterion in the studies informing Papers 2 and 3, but for different reasons. In Paper 2 it was important to select universities that represented variety in terms of the young versus old universities and region versus urban location. The hypothesis informing this selection was that perceptions of commercialisation and the rationale for engagement would vary between researchers affiliated to the universities due to differences in the institutional context. The same hypothesis informed Paper 3, but here it was important to select similar universities, large and old, in Norway and Sweden to ensure a somewhat comparable institutional context.

Selection of disciplinary fields

A fourth criterion informing the research design is disciplinary differences. Extant research on the impact of governance instruments on researchers practices has had the tendency to make generalisations on institutional changes based on perceived changes in some selected disciplines (Gibbons et al. 1994; Ziman 2000; Etzkowitz and Leydesdorff 1997). Studies of third mission legislation and commercialisation of research results especially have paid considerable attention to technology transfer in life science and natural science (e.g. Haeussler and Colyvas 2011; Owen-Smith and Powell 2001). We know that the disciplines socialise the researchers through education and training, which means that researchers are embedded in a highly institutionalised environment that can affect researchers' identities and practices (Becher and Trowler 2001; Weingart and Stehr 2000; Whitley 1984). Moreover, we know that individual characteristics are strongly moderated by the effect of group-level norms (Haeussler and Colyvas 2011; Louis et al. 1989). An important part of the research design

was therefore to select centres and informants that represented a wide range of disciplines – both "hard" and "soft" sciences (Biglan 1973), in order to incorporate the institutional complexity of the universities (Kraatz and Block 2008; Greenwood et al. 2011).

3.2. Method

In general, studies within institutional theory tend to use historical data to study the interplay between policies and organisations and between different institutional logics (Greenwood et al. 2011). Historical data can make evident the incremental process of institutionalisation and change in behaviour. For instance, concerning the Bayh-Dole Act, Berman's (2012) historical research reveals that policy was the prime driver in transforming the policy arena and eventually universities' own understanding of their missions. To use historical data at the micro level is, however, according to Barley and Tolbert (1997) a formidable task since archives rarely contain the level of specification to document the link between everyday action and changing institutions.[8] They suggest that one can rather focus on specific events introduced to an organisation that are perceived as elucidating reactions and responses from the individual members of an organisation. Accordingly, the assumption behind the focus on the governance instruments in this thesis is that they are events introduced to the researchers' community that evoke different responses and logics among researchers, and that the responses can be elicited by using the methodological approach of document analysis and interviewing. Tracking the process of institutional change is therefore not a core issue of the thesis. The central tenet is rather the adaptation of the instruments to the national context, the researchers' response to the goals of the governance instruments and the interplay between the institutional environment and the governance instruments at one given moment in time.

Case studies allow for multiple sources of evidence under the rationale of triangulation (Yin 2009). This thesis uses different sources of data: documents, literature, and semi-structured interviews. Document analysis informs Paper 1 while both documents and semi-structured interviews inform the two others. To explore researchers' perceptions and connotations concerning the goals of the governance instruments, and the extent to which the goals seem to comply or create tensions with researchers' identities and practices, semi-structured

[8] One notable exception is Colyvas' (2007) historical study of the institutionalisation of commercialisation practices at Stanford University

interviews were selected as the prime method for collecting data, a method also suggested by other researchers studying identity and organisations (e.g. Alvesson and Willmott 2002). By using open-ended questions, interviews offer the informants the opportunity to speak freely and openly and give the interviewer the opportunity to follow up on answers. This is especially important when investigating researchers' perceptions of governance instruments, as the way they formulate their answers is used to indicate compliance or incompliance with the goals of the instruments. This would not have been possible in a survey, although it would have given the subjects the opportunity to respond without the influence of the researcher. However, surveys do impose predetermined meanings onto the subject unless they are designed in a manner which gives the subject the opportunity to comment upon the questions themselves. Admittedly, surveys like this have been used in studies of competing institutional logics and identities in the public sector (Meyer and Hammerschmid 2006). In this thesis, however, the multiple institutional contexts in terms of discipline, university and national public research system are considered as containing important explanatory variables and in order to take these into account interviews were perceived as the proper method, because they offer the subject the opportunity to disagree with the questions and to go beyond the scope of the interview protocol.

There are however pitfalls to this method. One is that the interviewer might steer the conversation to influence the informant to answer in a certain way; another is that there might be a gap between what the informants say and what they actually do. For instance in order to appear in a good light, researchers might want to downplay the potential tensions and challenges they experience in collaboration with other researchers or firms. Or they might want to understate the applicability or relevance of their research, because another researcher interviews them. To cope with this bias, I interviewed several informants within one case (discipline and centre), and studied available documentation such as evaluation reports.

3.2.1 Overview of the papers

The three papers making up the thesis include different empirical referents and methods. Table 3.1. provides an overview.

Table 3.1. Overview of the papers in the thesis

Study	Description of case	Research problem	Data Sources	Output
Paper 1	The governance instruments Centres of Excellence and Centres of Excellence in Research and Innovation in Sweden and Norway	*How is excellence operationalised into a governance instrument and in what ways do the particularities of the national research system influence this?*	Document study: White papers Calls Requirements Evaluation reports	Four impact dimensions of excellence: international, social, local and organisational
Paper 2	Third mission legislation. 64 university researchers representing diverse academic fields 24 technology transfer personnel in Sweden	*What meanings do researchers ascribe to commercialisation and what are their rationales?*	Interviews White papers	Researchers' response to third mission regulation
Paper 3	33 individual university researchers within 4 Centres of excellence, 4 centres of excellence in research and innovation in Sweden and Norway	*How do funding schemes aiming at excellence and innovation affect researchers' role identity and practices?*	Interviews White papers Evaluation reports	Four researcher identity types

While Papers 1 and 3 examine CoEs and CoERIs in Sweden and Norway, and 3 includes two similar universities but different disciplinary fields, Paper 2 examines the impact of third mission legislation on different universities and different disciplinary fields in Sweden. As such each paper addresses at least two of the referents above, Paper 3 addresses all. This means that the thesis does not fully investigate the impact of the third mission legislation in Norway and Sweden. The reason for including one paper that concerns only Sweden was a

change of path during the work with the thesis. Initially the focus of the thesis was third mission legislation, and the intention was to compare the impact of this on researchers in Sweden and Norway. The scope of the thesis expanded however, to include CoEs and CoERIs for reasons already presented at the beginning of this chapter. These instruments were perceived as organising and incorporating the third mission.

Together the three papers contribute to a more comprehensive understanding of the process of institutionalising the governance instruments in the two countries.

3.2.2 Challenges and limitations

The research strategy of comparing CoEs and CoERIs across two countries and disciplinary fields in Paper 3 poses some methodological challenges. The study is based on a "most different case" approach (George and Bennet 2005) since all the centres are found within different disciplines. The background for choosing different disciplines was that I decided to only include centres that were hosted by one large university in each country to secure a somewhat similar institutional environment. This decision, however, limited the range of centres, although both universities host the largest number of centres in their respective countries. At that time in the process of designing the study, this was not considered as a problem. Rather, it was perceived as important to include centres that represented different disciplines in order to include the institutional environments of the different fields.

During the process of analysing the data it became clear that the most different case study approach underplayed to some extent the national differences. In order to fully exploit the country dimension I could, in retrospect, have selected centres representing the same academic fields in each country, pursuing a strategy emphasising similarities between centres in the two countries, through for instance selecting a centre representing the academic field of philosophy. Pursuing such a strategy could however have compromised the criterion of investigating the institutional environment of *one* university in each country. However, it might be that this criterion is of less importance. The study informing Paper 2 finds that there are no significant differences in terms of university characteristics (old/young, regional/urban) in how researchers understand commercialisation, but great differences between the academic fields. This illustrates perhaps one weakness in the research design.

Another critique of the research strategy of the study is also viable. It applies to the informants in the study making up Paper 3 being embedded in a larger institutional context.

They are affiliated to the centres for a certain percentage of time and are as such members of other research projects/groups and have teaching obligations in their home department. This presents a limitation in explaining the relation between the instrument and researchers' activities. However, the thesis does not posit that the CoEs or CoERIs represent a unique institutional environment, rather it studies the dynamics between the goals of excellence and innovation and the variation of the responses from the perspective that researchers are embedded in a wider institutional environment.

3.3. Validity and reliability

Like many other qualitative researchers I have asked myself several times "Did I get it right?" (cf Stake 1995). This refers to the validity of the thesis. Validity is an issue of establishing the credibility of the researcher's interpretations. Construct, and internal and external validity are common criteria in quantitative research, but these can be difficult to apply in qualitative research (Yin 2009). Kvale (1995) has developed corresponding criteria for social research which emphasise validity in terms of craftsmanship, communication and pragmatism. Craftsmanship validity implies that the study investigates the phenomena intended to be investigated i.e. the correspondence between the research questions and the data. Communicative validity refers to how the research is communicated to the reader, and pragmatic validity refers to the effects of the knowledge claims. The first two are important to this thesis; the notion of pragmatic validity includes measures that are not a part of this thesis such as the possibility of directly affecting the object of study (action research being one such method).

Concerning the correspondence between the research questions and the data, all the interviews were recorded and thereafter transcribed in order to reduce the risk of forgetting or disregarding important data. Since much of this thesis is based on interpretation of researchers' views and perceptions of concepts and institutions through their statements and use of language, an important part of the research process has been to check and re-check the interpretation by frequent reference to the empirical material as the work developed. This was done to ensure that I had not imposed my own beliefs on the phenomenon being studied and disregarded data and other alternative interpretations (Miles and Huberman 1994). Furthermore, in terms of the study informing Paper 3, evaluation reports of the centres have been important as a means of triangulation (Yin 2009).

The papers have been presented at conferences and seminars with colleagues which resulted in several modifications of initial claims, illustrating the communicative validity of the thesis (Kvale, 1995). Another strategy to ensure validity has been to participate in other research projects addressing similar research questions in order to accumulate additional knowledge on the phenomenon of study and to validate my own interpretations. Three projects have been of importance; i) an evaluation of the added value and financial aspects of the Norwegian Centres of Excellence by (Langfeldt et al. 2010) ii) a research project addressing policies for excellence in four Nordic countries and how these affect the researcher community (Aksnes et al. 2012; Langfeldt et al. 2013) and iii) a research project on researchers' outreach activities at the University of Oslo, Norway, resulting in, amongst other things, three master theses (Hauan 2009; Standal 2009; Westvig 2009).

In terms of ethical considerations I approached all informants by e-mail where I introduced the purpose of the study and asked for an interview (see appendix). In the interviews I expanded upon the project and I granted all informants anonymity. They also had the right to withdraw from the project at any time without any consequences. I further assured them that if they could in any way be identified I would give them the opportunity to read and comment.

Reliability refers to the level of transparency and consistency in the way data are collected and recorded and is usually judged in terms of whether the study can be replicated (Yin 2009). The studies comprising this thesis are case studies embedded in specific institutional contexts and time which make them difficult to replicate. First of all, time has passed since the interviews were conducted, and there might already be changes in how researchers relate to the governance instruments considering the incremental process of institutionalisation. Second, some of the centres in this study are no longer granted funding, and third, in Sweden other governance instruments have apparently replaced the CoEs and CoERIs (cf chapter 4). I have however made all choices in the research process explicit so that others might pursue the same research strategy and design.

4. The public research systems and policies for excellence and innovation in Sweden and Norway

The purpose of this chapter is to explore the main differences between the research systems and policies in Sweden and Norway to a broader extent than the paper format allows. This is seen as important in order to contextualise and discuss the findings of the three papers. The chapter aims at providing the explanatory background for why some instruments seem to achieve a higher degree of institutionalisation in one country than in the other. Therefore the chapter first gives a brief overview of the public research systems, i.e. financing of research and the public research organisations in Norway and Sweden. A brief overview because the intention is to illustrate the differences and not to give an in depth description of each research system, as this would require a thesis in itself. Thereafter the chapter gives a description of the core developments in the policies for excellence and innovation in each country. This is included to reveal policy arguments and rationales for introducing the governance instruments.

4.1. Public research systems

To compare and explain the main differences between the two countries' public research systems the thesis draws upon Whitley's (2003) framework for analysing different public research systems. The framework offers terminology to compare different research systems, in terms of their organisational set-up. To Whitley (2003 p.1016) the PRS is:

> …the set of organisations whose employees undertake research primarily for publication together with the institutional arrangements governing their operation, including their funding, establishment of priorities, evaluation of performance and allocation of rewards. Research in the public sciences is largely oriented around the competitive pursuit of collegiate reputations for published contributions to collective intellectual goals.

He argues that a country's ability to innovate depends upon how the PRS is organised, and emphasises factors such as employment structures, research funding arrangements and organisation of higher education. These factors are seen as affecting two important dimensions: i) the degree of intellectual pluralism and flexibility, and ii) reputational competition. Intellectual pluralism and flexibility refers to "the ease of gaining public

reputations for different kinds of contributions to a variety of intellectual purposes and being able to change these in relatively short term" (p.1019). If intellectual pluralism is high, researchers can pursue a wide variety of intellectual projects with distinctive goals and approaches, and can develop competing research projects. In countries with a high degree of intellectual pluralism researchers will be more tolerant of work that contributes to a variety of goals, for instance both fundamental understanding and the consideration of relevance/use (cf Stokes 1997), or the goals of excellence and innovation. In addition, new fields of research can become institutionalised as legitimate areas relatively easily due to the openness, one example being information and communication technology (ICT), another biotechnology. Countries with a low degree of intellectual pluralism and flexibility are characterised by relatively centralised control over research programmes and resources. Researchers' careers are often highly segmented between different kinds of knowledge production – such as a division between basic and applied research. In the following I will argue that Sweden has a high degree of intellectual pluralism and flexibility and Norway a low degree which here is primarily seen as a result of segmentation of practices between different public research organisations.

Reputational competition refers to the extent to which researchers seek recognition from their intellectual peers for the significance of their research results (Whitley 2003). In countries where research funding is highly competition-based and the funding agencies make extensive use of peer-review of research proposals, the intensity of reputational competition will be high. The greater the competition, the more researchers have to convince their colleagues of the importance of their work, and "ideas and results have to contribute to collective intellectual goals and fit into current research programmes" (p.1018). In these systems new ideas and findings become quickly communicated. Conversely, in countries with low reputational competition, the importance of national and international reputation for career prospects and rewards is limited, and perhaps more local. For instance, in some PRS there can be a high dependence upon local employers, since they control the organisation and dominant research programmes. This means that reputational competition affects the extent of intellectual integration of research goals and results across organisational boundaries, indicating that a PRS with a low degree of reputational competition will have a low level of integration.

Whitley further contends that factors influencing these two dimensions are i) the extent of public research organisations' (PRO) control of employment opportunities and promotion, e.g. the job description of employees, ii) the use of peer-review and thus the control of the scientific elite for distributing funds, iii) whether intellectual prestige and control over the allocation of resources are concentrated in a few PROs and in the hands of a small elite – often common in countries with low degree of pluralism in funding opportunities, and iv) the degree of organisational segmentation of goals and resources between different PROs, which refers to the division of labour between the PROs (Whitley 2003). These factors illuminate national differences between the PRSs and in the following I will illustrate and argue that Norway, broadly and crudely speaking, has a PRS with a relatively low degree of reputational competition and intellectual pluralism and flexibility, mainly due to the fixed job description of tenured employees, segmentation of goals and resources between the research institutes and the universities, and funding opportunities. Sweden, on the other hand, has a relatively high degree of intellectual pluralism and reputational competition. Although this is a caricature of the research systems since the nuances are many, Whitley's analytical framework aids in making the differences between the countries explicit. The differences serve as a variable for analysing and explaining how and the extent to which apparently similar governance instruments such as the centre schemes and third mission legislation are operationalised differently in the countries, and have different impacts on university researchers.

4.2. The public research systems in Sweden and Norway

Both Sweden and Norway are among the leading OECD countries in terms of R&D expenditure in higher education per capita (together with the other Nordic countries). In 2011 this was €367.5 in Sweden and €371.9 in Norway (Eurostat, science and technology indicators). However, measured in terms of percentage of gross domestic product (GDP) the countries are rather different in both amount of expenditure and sector of performance. Sweden's annual R&D expenditure is among the highest in Europe. In 2013 it amounted to 3.41 per cent of GDP. In comparison, expenditure in Norway was at 1.65 per cent (OECD

Main Science and Technology Indicators 2013[9]). These numbers comprise expenditure in the business enterprise sector, the higher education sector and the public sector (see table 4.1.).

Table 4.1. R&D expenditure as a percentage of GDP in 2012 by sector of performance

	Business sector (BERD)	Higher Education (HERD)	Public sector (GovERD)	Total (GERD)
Sweden	2.31	0.92	0.16	3.41
Norway	0.86	0.52	0.27	1.65

Source: OECD Main Science and Technology indicators 2013

From the table above it is evident that the R&D expenditure of the Swedish business sector is considerably higher than in Norway (2.31 versus 0.86 per cent of GDP). Furthermore, in terms of GERD Sweden's R&D expenditure in higher education is much higher than the one in Norway (0.92 versus 0.52). However, measured in per capita terms this is approximately at the same level (see above), thus indicating that the difference observed here might be a result of a skewed picture caused by Norway's high GDP. Concerning the public sector, expenditure in Norway amounts to 0.27 per cent of GDP whereas in Sweden this is 0.16 per cent. This latter difference relates among other things to the difference in the size and the funding of the institute sector in the two countries.[10] I will return to this below in the description of the public research systems. Although the numbers are relative and give a skewed presentation, they nevertheless paint a picture of the country differences in terms of the R&D intensity in the business sector and patterns in public funding of R&D.

With this in mind I will in the following expand upon the composition of the public research systems by describing the public research organisations and the funding system in each country. The description of the systems serves as an important backdrop for understanding the developments in the countries' research policies and the accompanying changes in the funding system and funding instruments.

[9] http://www.oecd-ilibrary.org/science-and-technology/data/oecd-science-technology-and-r-d-statistics/main-science-and-technology-indicators_data-00182-en?isPartOf=/content/datacollection/strd-data-en

[10] GovERD is the nearest approximation to state spending through research institutes that is available in international R&D statistics (Arnold et al., 2007)

4.2.1. The public research system in Sweden

Research in Sweden is performed at 16 universities,[11] 20 public colleges and 17 private colleges (Universitetskanslersämbetet 2013). In addition Sweden has seven university hospitals and a research institute sector[12] numbering 26 research institutes.[13] The relatively small research institute sector is primarily a result of i) a decision taken in the midst of the World War II to ensure co-location of education and research (Jacob and Orsenigo 2007; Sörlin 2005), ii) the expansion of the higher education sector in the 1970s (Sörlin 2005) and iii) a policy of increased collaboration between industry and university from the 1990s and onwards (Arnold et al. 2007; Jacob and Orsenigo 2007). Until the 1980s there was a growth in the number of research institutes, but this stopped with a parliamentary decision that the universities should undertake sector-related research and the universities were seen to have the "function as research institutes for the whole society" (Arnold et al. 2007). In conjunction with this, the institutes' state funding was also reduced. This means that universities and colleges constitute the centre of the public research system with the responsibility for innovation capacity as research performers and providers of knowledgeable workers (Bienkowska et al. 2010). However, the "institute role" of the universities has been questioned and criticised. Arnold et al. (2007 p.78) claim that there is no evidence to support the "Swedish model", and that industry does not make greater use of universities in Sweden than in other countries, nor do Swedish universities in practice supply the same services as the institutes. Yet, there are other claims that universities cater for the needs of the largest private companies while the research institutes play an important role in the Swedish innovation system by occupying specific niches and interacting especially with small and medium sized

[11] These includes the private Chalmers University of Technology and Stockholm Business School

[12] The term "research institute" is here defined as an organisation involved in research and development but outside of the higher education sector and often in close cooperation with users (Gulbrandsen, 2011). It includes public and semi-public research institutes and government research laboratories. It excludes government agencies with R&D that have other activities as their prime task (such as the national statistical bureau or meteorological institute). Note, however, that there are more governance agencies with R&D in Sweden than in Norway, and that some of these might have the role of research institute.

[12]This includes the Research institutes of Sweden (RISE) which are primarily technical and industrial research institutes. Note however, that these are companies but owned by the state. It further includes research institutes with public missions, identified at: http://www.forskning.se/forskningutveckling/aktorerao.4.20d108fa1138968b15c8000546.html?groupId=8&roleId=0&fieldId=0&financierTypeId=0&ministryId=0&FoU_searchQuery=Fritexts%C3%B6kning. 17.10.2014. These are Institutt for framtidsstudier, FOI, IFAU, IRF, IVL, NAI, Santa Anna, VTI, Sipri and UI. Government agencies with R&D are excluded.

firms. (Bienskowska et al. 2010). Scholars call for an enhanced role of the institute sector in the Swedish system.

The government funds the Swedish universities to a large extent; 78.8 per cent of their respective budgets come from public funds. However, only 46 per cent of these are in the form of block grants (SCB 2013[14]). The remaining 32.8 per cent is primarily allocated via the research council system through competitive calls, some are direct funds from other government bodies. In addition, 9.2 per cent of the R&D expenditure comes from private foundations (including universities own foundations). Thus, Swedish academics have to a large extent to fund their research through external competitive grants. Other sources of funding are industry (4.9) and international sources such as the EU, where Swedish researchers have been more successful in EU applications than Norwegian researchers (Nedeva et al., 2012).

The competitive grants in Sweden are mainly distributed by nine government funding agencies and five public foundations of various sizes. In addition there are 33 private foundations,[15] some relatively prominent such as Knut and Alice Wallenberg foundation, which grants a total of approximately €151 million annually.[16] In 2010 it was estimated that private foundations allocated €290 million to research in the higher education sector.[17] The design of the financing system and availability of private funding means that Swedish academics can apply from a great variety of funding bodies.

Concerning tenured positions and job description, each researcher has to negotiate the amount of teaching in his/her position. A tendency seems to be that those who are successful in achieving external funding teach less. Therefore the highly competitive funding system has by some been characterised as that time for research has become a new value in itself, it is “an

[14] Downloaded June 24, 2014
http://www.statistikdatabasen.scb.se/pxweb/sv/ssd/START__UF__UF0304__UF0304C/UoHDriftLaroNatAmFi/?rxid=59ab128c-ad74-4bb2-9d5a-2df05b506b4e

[15] Figures taken from the national website on research and research findings www.forskning.se

[16] Knut and Alice Wallenberg foundation: http://www.wallenberg.com/kaw/en/foundation/knut-and-alice-wallenberg-foundation

[17] www.forskning.se

indication of performance in the system or of the ability to attract resources from industry" (Jacob and Orsenigo, 2007 p. 40).

4.2.2. The public research system in Norway

Currently, Norway has eight universities, 25 public colleges, 23 private colleges,[18] six university hospitals and a large research institute sector – 54 research institutes.[19] The Norwegian institute sector has been a central part of the public research system since the end of World War II, and the guiding idea of establishing the institutes was that they should be something else than the higher education organisations in terms of research and competence (Gulbrandsen et al. 2012). The technical and industrial institutes are to a large extent a result of formalised interactions between the public and business sector, and the first institutes were often co-funded by government and industry (Gulbrandsen and Nerdrum 2009). Other institutes were established to handle a specific public mission (geography, geology etc), specific tasks related to nature and natural resources and particular national interests (energy, defence etc) (Gulbrandsen 2011b). The role of the research institutes in the Norwegian public research system is that they are rather specialised, applied, and interact closely with their users such as industry and public agencies. The universities are on the other hand given the main responsibility for basic research. This may be said to have resulted in a segmentation of practices in the research system where the universities are primarily given the responsibility for basic research while the research institutes are more applied. Note however, that both research organisations perform applied and basic research.

The division of labour between universities and institutes in Norway is (even) clearer when it comes to the public funding of research. Research institutes have a small block grant from the state and most of their income stems from contract research or competitive grants. Research at universities, university hospitals and public colleges, however, is mainly financed by direct allocation of block grants from government and grants administered by the Research Council of Norway (RCN). Another distinctive characteristic of the universities is that tenured researchers (professors and associated professors) have as a general rule 45 per cent research

[18] Figures 2014-05-23. http://www.regjeringen.no/nb/dep/kd/dep/underliggende-etater/statlige-universiteter-og-hoyskoler.html?id=434505

[18] Figures from 2014, taken from the Ministry of Education and Research and the Research Council of Norway, see: http://www.forskningsradet.no/no/Instituttsektoren/1182736860722 . These research institutes receive block grants from the RCN and from the departments.

and 45 per cent teaching in their position, with the remaining 10 per cent for administration (Forskerforbundet 2012). This means that the university has little space of action in terms of distributing time for research, education and knowledge and technology transfer.

Compared with other European countries (and especially Sweden) the Norwegian universities are privileged in terms of their large block grant allocation from the state, adding up to approximately 63 per cent of research expenditure (OECD Main science and technology indicators, 2011[20]). 28 per cent of Norwegian research expenditure is distributed directly through the Ministries or by competitive grants administered by the RCN, the only public funding agency (RCN, 2013[21]). Altogether, the universities and colleges in Norway have 91 per cent public funding (ibid.). The remaining 8 per cent stems from funding from industry (4), EU and other sources. Within the latter group, we find the private research foundations, but they contribute relatively little to research funding. They are primarily within life science, and the largest agency, the Norwegian Cancer Society, contributes a yearly funding budget of approximately €20.5 million.[22]

4.2.3. Country comparison

Common to both countries is the large amount of public funding of R&D. The above shows, however, that Sweden and Norway differ in terms of public research organisation and number of funding agencies. Table 4.2 and 4.3. provide a comparison.

[19] In June 2014, 2011 figures were the latest available figures

[21] Figures from 2011

[22] There are several private foundations and private contributors, but the contributions vary from year to year. Six other foundation contribute between €1.25-3m, and the foundation Extra stiftelsen funded R&D in life sciences with €8.75m in 2011.

Table 4.2 Public research organisations in Sweden and Norway in 2014

	Sweden	Norway
Universities	16	8
Public colleges	20	25
Private colleges	17	23
University hospitals	7	6
Institutes	26	54

Source: Universitetskanslersämbetet, Swedish national agency for higher education, NIFU and the Norwegian Ministry of higher education

Table 4.3 The main financing bodies in Sweden and Norway in 2014

	Sweden	Norway
Government funding agencies	9	1
Public foundations	5	
Private foundations	10	8

Source: forskning.se and NIFU

Table 4.2 illustrates the differences between the countries in terms of public research organisations. We see that Norway has a large institute sector compared with Sweden, and the claim made in this thesis is that this leads to a greater segmentation of practices in the research system, since the institutes mainly perform applied and contractual research and universities are the main providers of basic research. According to the Swedish model, universities are supposed to take the role of the institutes. While the extent to which this happens is debatable, the idea that the universities are the main performers of all types of research may affect the way Swedish researchers perceive and categorise their research. For instance, research has shown that Norwegian university researchers, to a larger extent than their international colleagues, categorise their research as basic (Gulbrandsen and Kyvik 2010). Thus, the differences between the countries can indicate that there is more intellectual flexibility and pluralism in the Swedish system compared with the Norwegian one, because researchers' careers are not segmented between different kinds of knowledge production. Note however that this distinction does not hold true for all cases, for example the technical universities.

A scrutiny of the R&D expenditure of the different public research organisations shows that universities and colleges in Sweden are the main actors in the system. In 2011 universities in Sweden accounted for 94 per cent of the R&D expenditure (SCB 2013). Comparable numbers

for Norway are difficult to obtain since research expenditure is measured differently in each country. However, 30 per cent of the research expenditure is found within the institute sector,[23] indicating that the universities and colleges account for less of the expenditure than they do in Sweden (RCN 2013). The size of GovERD (table 4.1) in each country further confirms this picture.

Concerning the high amount of R&D expenditure in the Swedish business sector, one might expect that industry finances research expenditure in the higher education sector to a larger extent than in Norway. In Sweden industry finances 4.9 per cent of R&D expenditure in higher education while this is 4 per cent in Norway (SCB[24]; RCN 2013). This indicates that a small research institute sector does not necessarily induce more collaboration between university and industry, an argument also put forward by Arnold et al. (2007). One interpretation of these numbers can be that research practices are segmented between the business sector and the higher education sector in Sweden, where the former performs the majority of applied research; this differs, however, between industry sectors (Bienskowska et al. 2010).

The description of the systems further reveals that Norwegian and Swedish universities have varying degrees of flexibility. Tenured researchers' time for research and teaching is fixed in Norway, while time for research varies in Sweden; but Norwegian university managers may have, because of the block-grant funding, more space for action than Swedish university managers. As already underlined several times in the above, reputational competition can be considered high in Sweden due to the funding system (table 4.3.), while lower in Norway since tenured researchers may perform research without external funding, and we can thus assume that they experience less reputational competition. Another sign of this is that Norwegian researchers have won few grants from the European Research Council (ERC) both at the overall level and in comparison with Sweden (which is the leading Nordic country) (Nedeva et al. 2012) - indicating perhaps a lesser need for external funding to perform research. These insights into the differences between the PRSs are, as we will see in the

[23] This includes public institutes with R&D

[24] Statistikdatabasen, forskning och utvekling, figures from 2011

discussion, of importance for the process of institutionalising governance instruments aiming at excellence and innovation.

4.3. Policies for excellence and innovation

Scholars in research policy have pointed to the congruence of different countries' research policies and instruments, with some national variations (Ruivo 1994). Ruivo calls it the "internationalisation of science policy" (p. 161). Studies show that research policy goes through certain phases also known as "paradigm", (Ruivo 1994), "layer" (Edquist 2003) and "regime" (Rip 2004). I will here use the term "layer" when referring to the phases as this implies that one phase builds upon the former and is not replaced by another. Although research policy in Sweden and Norway can be claimed to proceed through the same layers, there are considerable differences in the rationale for introducing the policies and associated governance instruments. To describe this and other important developments in policies for excellence and innovation in the two countries, the thesis takes its point of departure in the developments in research policy in Norway and Sweden from the 1990s and onwards. 1990 is chosen because "innovation" became a central topic in international research policy around the end of the 1980s and the beginning of the 1990s. While innovation prior to this also was a topic in research policy (e.g. Gulbrandsen 2011a), it is in the 1990s that we first see the inclusion of innovation in research policies. Partly as a result of an upsurge of interest in innovation in the OECD where concepts such as the "knowledge economy" and "national innovation systems" dominated the policy agenda and rhetoric (Godin 2006), and partly through advances in new technologies such as information and communication technologies, and bio- and nanotechnology (Mowery and Sampat 2005). Although research policies now include innovation policies they do however target somewhat different outcomes, although not mutually exclusive. A "crude" definition of the two is set up in Jacob and Orsenigo (2007 p. 84) where research policy is: "intended to guide and steer the production, dissemination and expansion of scientific knowledge with the overall objective of contributing to human welfare and economic growth", and innovation policy is "intended to promote the generation of research, technology and development that stimulates innovation and economic growth". These differences are illustrative of the developments in policies that seek to stimulate excellence and innovation. They converge, but also emphasise different outcomes.

Another layer in research policy becomes evident at the beginning of the 2000s with an increased emphasis on the role of basic and autonomous research in policy in the OECD countries, and the development of instruments aiming at high scientific quality, emphasising internationalisation of research and critical mass (Orr et al. 2011). Some few pioneering countries, including Canada, Finland, Denmark and the Netherlands, developed already at the beginning of the 1990s instruments targeting "excellence", labelled as "centres of excellence" or "networks of excellence" (Fisher et al. 2001; Hackmann and Rip 1999; Aksnes et al., 2012). Other countries followed at the beginning of 2000. While collaboration with non-university actors and relevance of research were previously an inherent part of most instruments, a trend in the 2000s seemed to be that governments separate innovation from the goal of high scientific quality through dedicated funding schemes targeting excellence. The popularity of centres as governance instruments is amongst other observable in their spread throughout OECD countries (Orr et al. 2011).

4.4. The developments in policies for excellence and innovation in Sweden and Norway

The following descriptions of the developments in policies for excellence and innovation in Sweden and Norway illustrate the trends described above. The intention here is to reveal the arguments and rationales for introducing the governance instruments studied in this thesis. The descriptions begin with an outline of policies for innovation and excellence. This is followed by an overview of the implementation of central governance instruments with goals of excellence and/or innovation. Instruments targeting research groups and critical mass are emphasised as they are considered here as one of the most important instruments introduced the latter decade. At the end of each country description the chapter provides an outlook on new trends in the national research policies which indicate that the centre means are institutionalised to different degrees in Sweden and Norway. Norway continues the CoE and CoERI schemes while these seem to be replaced by other instruments in Sweden.

4.4.1. Policies for innovation and excellence in Sweden

Innovation

The first step towards an inclusion of innovation policy in research policy in Sweden was the reform of the financing system by the introduction of the research foundations in 1994 (Jacob

and Orsenigo 2007). One of the rationales behind the establishment was the expansion and massification of universities and a perceived need to concentrate research resources on strong research environments (Sörlin 2005). Another was the economic recession in the 1990s, which fostered a reorientation in research funding that emphasised the role of the university in economic development. The research foundations were, compared with previous funding agencies, not dependent on annual budget allocations. This meant that they were and are rather autonomous actors. Altogether, ten research foundations were introduced, with various rationales and of various sizes,[25] covering fields such as general strategic research, allergy research, environmental research, internationalisation of research, and one that was set up to specifically bridge the gap between university and industry (Jacob and Orsenigo 2007). Characteristic of the foundations was the preference for programme funding and large grants spread over a period of at least four years; an emphasis on collaboration across organisational boundaries (between universities and universities and industry/public sector organisations); evaluation and quality control of the outcome in terms of scientific quality and relevance; involvement of targeted stakeholder in the design and management of the programmes; and an emphasis on building strong research environments in areas considered to be of strategic significance for the Swedish economy and society (Jacob and Orsenigo 2007 p.92). Of the more specific innovations of the foundations is the development of research schools for doctoral students - a form which has spread to other countries such as Denmark and Norway. The research schools are now included as a central part of the Linnaeus grant, the Swedish version of centres of excellence. I will return to this below in the description of the developments of the centre schemes.

The introduction of the foundations made a large difference in the Swedish research landscape, because they provided new sources of funding at a time when government reduced the block-grant allocations to the universities and the budgets of the research councils. One of the significant moves of the research foundations to meet the goals of the knowledge economy was their large emphasis on increased collaboration between universities and industry, inducing universities to collaborate with others in order to obtain research funding. This has, according to Benner and Sandstrom (2000), generated a change in academic practices and norms towards an increased awareness of the social relevance of research and the third mission of the universities.

[25] For an overview of the research foundations see Benner (2005).

A second reform of the Swedish research system came at the beginning of 2000 with the reorganisation of the research councils. The research councils were reduced from eight to three and resulted in a much simpler council structure with one council for basic research (Swedish Research Council) and the two others for more applied research in the areas of environment, spatial planning and agriculture (FORMAS), and working life and social sciences (FAS). Two other agencies were created during this period: the Swedish innovation agency Vinnova and the Swedish agency for economic and regional growth[26] (formerly known as NUTEK now Tillväxtverket). Both comprise however former councils and agencies.[27] The mandate of the Swedish innovation agency, Vinnova, is to promote sustainable economic growth by fostering effective innovation systems and to fund university research of relevance to innovation. While this cannot be said to be something new (collaboration and relevance have always been important), the establishment of Vinnova illustrates the move from industrial policies to innovation policy.

A third and important element in this brief description of the developments in policies for innovation and reforms in the research system, is the reform of the university charter to include the third mission in 1997. This stated that the university should collaborate with the broader society and inform about its activities (although this had already been the role of universities for a long time given their additional assigned role as research institutes). The rationales behind the amendments to the university and university colleges legislation were increased support to the innovation system (commercialisation, R&D support to companies, etc.); civil education (promoting democracy, sustainable development and gender equality); and increasing student employability. No special funding was designated for this third mission (Jacob and Orsenigo 2007). In the light of the research policy climate dominating the 2000s, emphasising increased commercialisation of research results, the third mission has increasingly been associated with support to the innovation system. Paper 2 analyses and discusses this issue more thoroughly. However, while a majority of the OECD countries have chosen to transfer the ownership of intellectual property to the universities to enhance their

[26] This agency has primarily the mandate of regional development.

[27] Vinnova comprises the Swedish transport and communications research board (KFB), some parts of NUTEK and part of the research council for working life research (RALF). NUTEK was a result of a merger of three public agencies (Statens Industri, Styrelsen for teknisk utveckling and Statens energiverk)

engagement in commercialisation of research results, Sweden has kept the so-called "Professor's Privilege" from 1949, which retains the academics' right to explore potential commercialisation. The Professor's Privilege has been the subject of many and often agitated public debates, but the government hesitates to make any decisions on this matter. While it is argued that the Professor's Privilege is an incentive to commercialise research results, it is also argued that the universities lack the incentives to facilitate the commercialisation process and that the system in general lacks both competence and funding to support this activity.

Excellence

In the work of introducing the research foundations (1991-94) the Swedish government emphasised the importance of a strong research environment and academic excellence, and that this could be organised in the form of centres of excellence (Prop. 1993/94; Sörlin 2005). It was also claimed that research should be interdisciplinary and in the forefront of international research. The research foundations preferred four years' programme funding, but emphasised collaboration between different sectors. Some however, such as the Foundation for Strategic Research (SSF) intended to support research environments of the highest international standards conducting research at the absolute cutting edge (Benner and Sörlin 2007) and MISTRA, which supports interdisciplinary research on the environment, had excellence and interdisciplinarity on the agenda. The lack of attention to academic excellence in the other foundations might be explained by that they were formed and influenced by the research policy climate at that time (Benner 2005).

However, in alignment with trends in other OECD countries, the white paper in 1998 "Research 2000" called for more basic research (SoU 1998). It stated that the balance between free basic research and research of relevance has been skewed to the detriment of basic research and that the long-term Swedish R&D resources are insufficient and recommended an increase. As mentioned in the previous section, a research council for basic research, The Swedish Research Council (SRC), was established in 2001 as a result of the reorganisation. It was established "in order to support basic research of the highest academic quality within all areas of knowledge."[28] The need to separate basic research funding from other kinds of research points to the increasing difficulty in distinguishing basic and applied research (Jacob and Orsenigo 2007). Perhaps it indicates that the pendulum has swung too far

[28] SRC, 2012 http://www.vr.se/omvetenskapsradet/historik, last viewed 20.03.2012

in the direction of small and project-based funding in the quest for increased innovation. This assumption is fortified by the SRC which estimates that one-fifth of Sweden's R&D budget funds basic research (including block grant), and a large majority of these funds are distributed by the SRC through national competition (SRC 2012). Yearly the SRC receives a high number of applications, but only approximately 25 per cent of these are granted (Jacob and Orsenigo 2007). Although it was warned of a skewed balance between basic and applied research already at the beginning of the 2000s, there is still great discontent in the research system regarding the funding of basic research. This is perhaps not just typical for Sweden, but rather an ongoing debate in most countries.

Central governance instruments targeting research groups

Although the foundations had prioritised strong research groups and the first centre scheme in Sweden – the 'Competence centres'- was launched already in 1995 by Nutek (now a part of Vinnova), it is at the beginning of 2000 that we first see an increase in these types of instruments. Competence centres (now called VinnExcellence centres) were inspired by the university-industry centres in the US, and offer funding for a ten-year period based on the condition of matching funds from the university, industry partners and/or public agencies. The perceived success of the centres has influenced the programme design in other countries like Norway.

In 2000, with the research foundations at the core, new instruments were launched to concentrate and coordinate research efforts (Aksnes et al. 2012). The first was SSF's "strategic centres in the life sciences" aiming at strong research environments with clear leadership. Altogether six centres were granted. A few years later the government followed up on the issue in the White Paper on research (Prop. 2004). Here "strong research environments" was the lead theme, and in 2005 two new instruments were launched: the Linnaeus environments and the Berzelii centres. The Linnaeus environments are the Swedish version of centres of excellence. Compared with other instruments the scheme does not require collaboration with non-university actors, but is primarily dedicated to research of international standard (see Paper 1 in the thesis for a more thorough description). The scheme is governed by the Swedish Research Council and was announced in 2006 and 2008. It has granted in total 40 centres for a ten year period. As already mentioned, the research schools are coupled to some of the centres, implying that PhD education is perceived as an important activity of the centres. The Linnaeus scheme serves together with the VinnExcellence scheme as case studies in the thesis.

Concerning the Berzelii centres, this is a joint programme administrated by Vinnova and the SRC. The scheme is similar to the VinnExcellence scheme in that it demands collaboration with industry and/or public agencies, but differs in that it has perhaps a stronger emphasis on excellent *basic* research. However, there has been only one call in 2006 where four centres were granted and it seems that there will be no further calls.

One of the latest initiatives to support strong research groups was “the strategic research areas” introduced in 2010. Here, research support in collective form took an impressive jump (Aksnes et al. 2012). The areas, 20 altogether, were a mixture of all types of fields and were, unlike the grants/centres which were bottom-up applications, top-down driven and specified by parliament. Within the areas 43 research environments were granted; they are grand in scope and organisationally distributed as they span two or more universities. Interestingly most of the strong research environments are located with groups that have been supported by other large schemes such as Linneaus and VinnExcellence. Table 2.4 summarises the central schemes and their main characteristics.

Table 4.4. Overview of central and general funding schemes in Sweden

Funding agency	Instrument	Characteristics
Vinnova	VinnExcellence Centres	Established 1995 (Competence centres).Collaboration between university, industry and/or public agencies. 10 years, 1/3 funding from Vinnova. Total funding* for the scheme in 2010 ca €12.7m.** Last announced in 2006. Currently 19 centres.
	Institute Excellence Centres	Established 2005. Collaboration between institutes, universities and industry. 6 years. Total funding for the scheme in 2010 €7.6m. Announced once in 2006.
Together with the KK-foundation	Industry Excellence Centres	Established 2010. Collaboration between university and industry. High share of co-funding from industry (50%). 10 years. Total funding for the scheme in 2010 ca €1.45m. Currently 8 centres, last announced in 2010.
Together with the SRC	Berzelii Centre	Target basic research with commercial potential. Close relation with industry and public agencies. 10 years, 4 centres. Total funding for the scheme in 2010 ca €4.1m. Announced once in 2005.
The Swedish Research Council	Linnaeus environments	10 year grant, announced in 2006 and 2008. Total funding for the scheme in 2010 ca €27.6m. Currently 40 centres
	Strategic research areas	5 years funding. Total funding for the scheme in 2010 €137.2m. Currently 43 research environments.

*Total funding from the agency
**Exchange rates (1 July 2014):SEK

New trends

The focus on supporting strong research environments and large constellations appears to have gradually been replaced by other excellence initiatives. Although the government has decided to continue the strategic research areas, there have been few calls for new centres or areas since 2010. The rather top-down process of the strategic research areas seems to have exhausted the research system concerning polices aiming at a concentration of resources on research groups. Furthermore the programmes and the schemes have been criticised for primarily favouring senior male applicants (Sandström et al. 2010). The future of the described instruments thus seems rather uncertain, much because of the new research bill of 2012 which signals an alignment with funding mechanisms of the ERC (Prop 2012) where individual researchers are granted instead of research groups. One of the key themes in the latest research bill is that funds target promising young researchers and individual researchers. It is explicitly stated that while previous policies have targeted strong research environments and groups, it is now recognised that certain individuals' visions and ideas are the prime driving force for generating excellent environments and groups, and that these individuals should enjoy the best conditions for pursuing their research, especially by obtaining long-term funding (ibid.p.18). This tendency is already observable among the research foundations and some private foundations; they seem to target individual researchers and smaller research constellations. As such there is a move from means supporting critical mass towards individual support, the goals remain however the same.

Another change is the allocation of funding through performance-based indicators. This implies that the government increases the allocation of direct funds to the universities and colleges, some sort of a countermove to the policies of the 1990s. Currently there is considerable discussion concerning the development of the indicator system, one interesting element being the government's emphasis that one of the indicators should be based on third mission activities (ibid.p.17).

In the same bill the government introduces a new instrument - the strategic innovations area. This signals an emphasis on areas perceived as important to the Swedish economy. More specifically, the instrument will support long-term and embedded collaboration between university, institutes, industry, public agencies and others. The projects that receive funds will use societal challenges as a starting point, maintain high scientific standards, have a level of co-financing and be able to show new or interdisciplinary collaboration. This resembles the

different instruments already targeting collaboration between universities and others, and as such is a continuation of policy and instruments from the past two decades, but now within the frame of social challenges – a key topic of transnational policies (Cf. Horizon 2020[29]).

4.4.2. Policies for innovation and excellence in Norway

Innovation

As in Sweden, policies and instruments for enhanced collaboration between university and industry in Norway are not something new. In research and industrial policies such collaboration has always been perceived as something positive, and the research council NTNF established in 1946 with industry representatives and funding, had this as one of its dedicated tasks (Gulbrandsen 2011a). Moreover, the research institutes embody the very interaction between the research sector and industry.

At the end of the 1980s and beginning of the 1990s the Norwegian research system was reorganised. In the first round the research institutes were to a large extent made independent from their owners - the research councils - to increase industry financing of research. In the second round the Research Council of Norway (RCN) was reorganised. Originally being five separate councils[30] these were in 1993 merged into one. The rationale behind the merger was i) the perceived benefit of the government to have one organisation to provide research policy advice, ii) increased co-ordination of research and innovation policy, iii) the integration of basic and applied research and iv) developing a more efficient strategic actor. Concurrently with the reorganisation, the Norwegian government, as the Swedish, made cuts in the direct allocations to universities, colleges and especially the research institutes in order to push forward more external funding of research from industry and others. The reorganisation of the RCN thus embodies a move from science and industrial policy to a research and innovation policy.

The need for increased interaction between the universities and industry was followed up in the white paper on research policy (St. Meld 1992-1993). Here it was stated that the era of the

[29] http://ec.europa.eu/programmes/horizon2020/

[30] These were: NTNF (funding scientific and industrial research), NLVF (funding agricultural research), NAVF (Funding basic research in science and humanities), NORAS (funding applied social sciences) and NMF (funding environmental research)

linear model was over – that basic research would automatically benefit society (Gulbrandsen 2011a). This was further developed in the next white paper on research in 1998 (St. Meld 1998-1999), which underlined the importance of innovation and the research sector's role in economic development by putting commercialisation of research results and broader knowledge and technology transfer on the agenda. Universities became the centre of attention for research and innovation policies (in line with international trends) and in 2003 Norway added the amendment of the third mission to the act on university and university colleges,[31] which stated that universities and colleges have a responsibility to disseminate knowledge about their organisation and to develop understanding for, and the use of, methods and results in science. Further it is stated that universities and colleges shall collaborate with the larger society and industry. Concurrently, the Professor's Privilege was removed and the rights to exploit research results were transferred from the researchers to the universities and colleges. This was perceived as a potential instrument to provide the universities with an incentive to engage in and encourage commercialisation of research results. Although most universities had relationships with research parks and other commercialisation actors, we see in the years following the removal of the Professor's Privilege a growth of new technology transfer offices, financed by the programme for research-based commercialisation in RCN, FORNY, established in 1995 (Borlaug et al. 2009). The amendments resulted in an increase in the budget of the FORNY programme.

These developments in research and innovation policies indicate that, although Norway to a large extent already had close collaboration between the institute and industry sector, the international trend of focusing on university-industry collaboration and commercialisation of research diminished the role of the research institutes, and increased the emphasis on the university's role in economic development (Gulbrandsen et al. 2012). Lately, the institute sector has regained attention and its importance in the research system is underlined in several reports and policy documents (e.g. Arnold and Mahieu 2012; Gulbrandsen et al. 2012).

Excellence

Policies for excellence became explicit in the research policy bill of 1998 with the idea of launching centres of excellence (St.Meld 1998-1999). However, prior to this there were several debates on Norwegian research policies and the role of quality versus equity in

[31] www.lovdata.no paragraph.4

research. In the 1990s evaluations of Norwegian funding programmes emphasised that although Norway had several cutting-edge research groups, there was a general uneven quality in research; a lack of strategic awareness and scientific leadership; unused potential in international publishing; recruitment problems and a lack of long-term and stable research funding (DNVA 2007). These insights contributed to the decision to support the best research groups.

The 1990s had two instruments that can be perceived as the forerunners to the centres of excellence scheme established in 2002. One of the instruments was the Centre for Advanced Studies established in 1992 and modelled on the Princeton Centre for Advanced Studies. This was a countermove to the egalitarian Norwegian research policy, the perceived average quality of Norwegian research and the lack of opportunities for the very best researchers to work under optimal conditions (Aksnes et al., 2012). The instrument still exists and offers researchers the opportunity to gather international and national researchers to work together for one year on their research alone. Given the job description of tenured academics this is an attractive means as it levers time for focusing on research.

The other initiative was the "Top-level" research programme launched by the sub-council of medicine and health in RCN in 1998. Its ambitions were more selective and included long term research funding (5 years) of the very best researchers in order to achieve research no less than of Nobel-prize quality (Aksnes et al. 2012). It remained a relatively small programme and existed only for six years. It paved the way, however, for other instruments such as centres of excellence and a scheme for supporting "Young Excellent Researchers" (YFF) introduced in 2003.

Other contributing factors to the introduction of the CoE scheme included the establishment of the Research Fund in 1999, which was the government's response to the critics concerning the lack of long term and stable funding. Approximately one third of the Fund is allocated directly to the higher education sector, and the remaining two thirds are earmarked for specific programmes in RCN, among which are centres of excellence. Due to fund conditions and interest rates the Fund was closed down in 2012, but this does not affect the centre grants as The Ministry of Higher education is now responsible for securing the level of funding. Nevertheless, the Research Fund enabled the RCN to engage in long-term planning of funds and to achieve continuity in governance instruments.

Another important change in the funding system in the mid 2000s was the introduction of performance-based indicators. Part of the rationale was to increase the number of publications, their quality and internationalisation of research. The indicators are based on publications in journals and the publication of books at two different quality levels. Albeit the performance-based funding makes up only 2 per cent of the total budget of the universities (Hicks 2012), it has generated considerable impact, not least because of the controversies and competition that it has created in the researchers' environment. Taken together with other circumstances, the number of Norwegian research publications in journals has increased considerably the last decade and the performance-based system has been credited for this growth – it can be said to have contributed to institutionalising publication practices. It has increased the reputational competition, to use Whitley's (2003) terminology.

Central governance instruments targeting research groups

The first call of the Norwegian Centre of Excellence scheme came in 2002, and was inspired by the perceived success of the Danish Centres of Excellence scheme, established already in 1993. In late 2002/early 2003 13 centres were appointed, and in 2008 eight additional centres were established. The centres are awarded a substantial ten-year grant. The period of the first generation centres has expired and in 2012 13 new centres were granted - which means that there at all times are 21 centres in the scheme. The scheme has become one of the most important instruments in Norwegian research policy and is one of the schemes examined in this thesis. A more thorough description of the scheme is provided in Paper 1. The prime goal of the scheme is to raise the quality of Norwegian research. However, the first call also warranted relevance in addition to scientific quality. This met considerable resistance from academics who claimed that the criteria would come at the expense of academic fields without close relation to potential users. Alongside other circumstances this led to the establishment of the Centres for Research-driven Innovation in 2005 to cover the relevance aspect. The scheme was inspired by the Swedish VinnExcellence scheme, and is the other Norwegian scheme studied in this thesis. It offers an eight-year grant and requires collaboration between universities/institutes and industry partners and/or public agencies, matching funds, and targets scientific quality and innovation. The schemes illustrate the general trends in research policies and point to the need for diverging basic and applied research by dedicating one scheme solely to scientific quality.

The perceived success of the Centres for Research-driven Innovation contributed to the establishment of a similar scheme – the Centre for Environmentally-friendly Energy Research. This was a result of the so-called climate agreement between all political parties in 2008, which entailed an increase in the R&D budget for clean energy and carbon capture storage. In 2010/2011 11 centres were granted funding for a period of eight years. They differ from the other centre schemes in that they focus on enabling a network of research groups and industry partners to work on a common research question, where the strongest research group functions as the node.

A fourth scheme, the Norwegian Centres of Expertise (NCE), is administered by the RCN in collaboration with the innovation agency in Norway – Innovation Norway – and SIVA. Established in 2006, it targets collaboration between regional colleges and firms and supports 12 clusters over a ten-year period. Innovation Norway is more similar to the Swedish Agency for Regional and Economic Growth than Vinnova, and it primarily supports entrepreneurship and firms. These schemes together with the Arena programme (see table 4.5) represent a decade of policies for centre development and consolidate both policies for excellence and innovation. Table 4.5. provides an overview of the different funding schemes aiming specifically at innovation and excellence in Norway. All schemes are general and not discipline-specific.

Table 4.5. Overview of central and general funding schemes in Norway

Funding agency	Instrument	Characteristics
The Research Council of Norway	Centres of Excellence (SFF)	Established in 2001. Announced last time in 2012. Total funding* from scheme in 2010 €30.2 m.** 10 years. Currently 21 centres.
	Centres for Research-driven Innovation (SFI)	Established in 2005. Collaboration between university/institutes and industry/public agencies. 25% co-funding from partners. Total funding for the scheme in 2010 €19.1m. 8 years. Currently 21 centres, last announced in 2010
	Centres for Environmentally-friendly Research	Established in 2008. Collaboration between PROs and industry/public agencies. 25% co-funding from partners. Total funding from scheme in 2010 €21.6 m. 8 years. Currently 11 centres.
Together with Innovation Norway	Norwegian Centres of Expertise (NCE)	Established 2006.Clusters of colleges, industry and public agencies. 10 years. 50% co-funding from partners. Total funding of scheme in 2010 €7.45 m. Currently 12 centres.
	Arena	Established in 2002. Clusters of colleges/universities/research institutes and industry. 3-5 years. 50% co-funding from partners. Total funding in scheme in 2010 €4.5m. Currently 28 projects.

*Total funding from the agency
**Exchange rates (1 July 2014): NOK 0.1224

In addition to these the Norwegian ministries have the opportunity to directly establish and support so-called ministry centres. So far four centres have been established. These receive direct and substantial funding from their owners. However, they seem not to be part of a deliberate strategy to concentrate resources on specific areas in a top-down manner like the strategic research areas in Sweden. Apparently there is no systematic process in selecting these centres; it rather seems like lobbying has been a central activity. Two centres received this type of funding last year, and both were first generation centres of excellence.

New trends

While Sweden appears to align with the policy developments in the ERC and move away from centre programmes towards supporting individual researchers, the latest white paper on research policy in Norway (St. Meld 2012-2013) signals a continuation of the existing programmes, especially the centre schemes - Centres of Excellence (SFF) and Centres for Research-driven Innovation (SFI), which are perceived as major successes. Nevertheless, measures have been taken to increase support to young and excellent researchers as well, one strategy being awarding the silver medallist applying for ERC-grants (Nedeva et al. 2012), another is the dedication of a certain share of the responsive mode funding to young researchers – introduced in 2013. The descriptions above show that compared with Sweden, it seems that Norway takes a more incremental approach to achieve change in academia through a more cautious policy mix of new and old instruments.

4.5. Concluding remarks

The chapter has shown that the public research systems in Norway and Sweden are relatively different in their composition. Broadly speaking Norway has a greater segmentation of practices between public research organisations compared with Sweden, by having a relatively large research institute sector. This can be said to result in a division of work between the universities and the institutes, where the former is responsible for fundamental research, often with the consideration of use (cf Stokes 1997), while the latter primarily performs applied research. In Sweden both types of research are considered as the responsibility of university researchers; however, it might be that the business sector performs the majority of applied research. Nevertheless, the reforms of the funding system and the universities being the main performers of public research might induce greater intellectual flexibility and pluralism in Sweden, as researchers will be more responsive to the

establishment of new research fields. Another significant difference between the countries is the degree of reputational competition. As we have seen, reputational competition is perhaps stronger in Sweden compared with Norway due to its highly competitive funding system. Norwegian universities and academics still enjoy a high level of block-grant funding compared with other European countries and especially Sweden, implying that they do not have to chase funds to the same extent. Moreover, tenured academics have a fixed job description involving time for research and teaching, while Swedish academics negotiate and fund their research time individually – with the consequence that those who are good at attracting funds often have few teaching hours.

These differences contribute to three important insights for the topics of this thesis. The first concerns the institutionalisation of third mission legislation. Universities in Sweden are the main collaborating partner for a rather large and R&D intensive industry sector. Although the system saw some specialisation where the universities were seen as the main provider of basic research and the industries the main provider of applied research, we see in the 1990s an increased focus on innovation in research policies, a reorganisation of the funding system and an increased emphasis on instruments targeting enhanced collaboration between university and industry such as the third mission. The same trends are also evident in Norway, but changes are more incremental in scale, which can relate to the role of the PRS. As in Sweden, universities in Norway were the centre of attention for policies targeting collaboration between researchers and industry and commercialisation of research results at the beginning of 2000. However, the policies and accompanying instruments seem to have had less impact on university researchers in Norway than in Sweden, as one of the findings of this thesis indicates that Swedish university researchers appear to be better aquainted with the third mission legislation compared with their Norwegian colleagues.

The second insight relates to the degree of competition-based funding and the institutionalisation and impact of governance instruments like centres of excellence on the national research landscape, host organisation and researchers affiliated to the centres. The last decade has seen the introduction of several centre schemes targeting strong research groups in both countries, where Sweden has introduced more schemes than Norway. As the funding system in Sweden is highly competitive and block-grant funding is low, researchers need to fund their research from multiple grants and sources. These circumstances may imply that the degree of institutionalisation of centres of excellence can be lower in the Swedish context, at least in terms of building their organisational identity. Hence this thesis proposes,

which relates to the third insight, that the relatively low degree of reputational competition in Norway – at least compared with Sweden, which according to Whitley (2003) affects the intellectual integration of research goals and results across organisational boundaries – means that the centre schemes offer an opportunity for increased intellectual integration and reputational competition in the Norwegian system.

5. Overview of the papers and the main findings

The central theme of this thesis is the relationship between research policy, institutional frameworks and researchers' practices and identities. The main research questions are: *How are transnational governance instruments for excellence and innovation adapted and implemented in Sweden and Norway? In what ways and to what extent do they affect university researchers' practices and identities?* All three papers address the first research question, while Papers two and three address the second. This chapter will give an overview of the papers and the main findings.

Paper 1: "*Governing excellence"* studies how the governance instruments and institutional carriers centres of excellence and centres of excellence in research and innovation are operationalised in the two distinct public research systems of Sweden and Norway. The paper investigates the extent to which the national public research systems affect the design and implementation of the schemes. It does so through a document analysis of calls, requirements and evaluations of the schemes in the period 2002-2012, and develops a conceptual framework which identifies four evaluative dimensions of "excellence". These are: i) *international impact* which primarily refers to that the funding agency weights international publications of high quality and the centre's ability to attract foreign researchers and international research grants; ii) *social impact* which illustrate the funding agency's expectations of scientific breakthroughs that can benefit society; iii) *local impact* which implies that the funding agency expects that the centres and the prestige of the scheme will influence the strategic priorities of the host organisations and increase competition and specialisation among higher education organisations. It also involves the host's ability to integrate and cater for the centre in such a way that excellent research can result; and iv) *organisational impact* which refers to the opportunity to create a new research unit that can cross organisational and institutional boundaries especially emphasising organisation of research and management of the centres.

To examine how the centre schemes are translated and tailored to the national context, and in what ways the peculiarities of the two distinct public research systems affect this, the paper applies principal-agent theory as an analytical framework with a particular emphasis on the problems of adverse selection and moral hazard.

The main findings of the paper are first that the Swedish funding agencies, due to the design of the public research system in Sweden, primarily evaluate the local and organisational

impact of the schemes in order to prevent the problem of moral hazard. Recall that funding of research in Sweden is highly competitive, and this induces the funding agencies to monitor that the granted centres behave according to contract and that the funding is not used to supplement other project grants. Thus the funding agencies expect the centre to develop a unique organisational identity and authority. Second, the structure of public research system in Norway leads to a primary emphasis on the international impact of the centres. Tenured positions are fully funded and the centre grants do not compete with other types of funding. This contrasts with the situation in Sweden where university researchers have to fund their own research through external grants. For the Norwegian funding agency the prestige and the generous funding of the schemes generate primarily the problem of adverse selection; it has to ensure that the right research environment has received the grant. This might lead to a reluctance to close down centres which do not perform according to the contract because the principal is concerned by its own credibility as a capable selector. We see that in contrast to the Swedish funding agencies, the Norwegian one has not developed any positive or negative sanction mechanisms to control the centres. Moreover, the safeguarding strategy might be said to have led to a concentration of resources on research groups whose research is characterised by low risk, i.e. that the research already has gained recognition as excellent by its peers. In comparison the Swedish CoE scheme, by downplaying the international impact dimension, allows for the possibility of high risk and innovative research.

Paper 2: "*Who commercialises research at Swedish universities and why?*" investigates the impact of third mission legislation on Swedish university researchers' practices. The main goal of the third mission is to affect the institutional context of public science to include to a broader extent collaboration between science and industry, commercialisation of academic research and enhanced dissemination of research to the society. Although third mission legislation includes knowledge and technology transfer to society in a broad sense, it is often found in policy rhetoric to be interpreted as commercialisation of research results and academic entrepreneurship. The study takes its point of departure in this assumption and through an interview study with technology transfer personnel and university researchers representing various disciplines, including humanities and social sciences; it investigates how researchers perceive commercialisation and what motivates them to commercialise their research results.

With regard to theory the paper discusses the concepts of knowledge and technology transfer and commercialisation. While knowledge transfer includes all activities in which knowledge

from academe diffuses to other non-university actors, technology transfer is defined as a transaction involving codified knowledge in the form of patents, licences and spin-offs. Commercialisation is defined as the exchange of knowledge for money, thus involving more activities than technology transfer. The study shows that the majority of the informants define commercialisation as technology transfer. Thus, although humanities and social science researchers commercialise their research results, they do not identify the practice as commercialisation. Rather, and corroborating the view of their colleagues in natural and life science, they perceive commercialisation as a practice belonging to the natural sciences, thus buffering the third mission legislation. This finding underlines the institutional environment of the diverse disciplines and the institutional complexity of the university.

In terms of motivation and rationale for engaging in commercialisation of research results, the study finds that establishing a spin-off creates considerable tensions between the researchers' identity of being a public servant and an academic entrepreneur. It seems like the particularities of the funding system – that most research funding is project-based and the keeping of the Professor's Privilege – can to some extent explain this tension in Sweden.

In general the study finds a high level of knowledge transfer from Swedish universities, involving diverse forms of knowledge transfer. Researchers are highly aware of the third mission and use the expression themselves alongside "triple helix" (cf Etzkowitz and Leydesdorff 2000). The material shows that there is a general tendency to include knowledge transfer as a mission of the university together with research and teaching. This might be a result of the combined effects of the national funding practices and the universities being the main collaborator for both industry and the public sector.

Paper 3: "*Researchers identities and practices inside Centres of Excellence"* investigates the impacts of the schemes Centres of Excellence (CoE) and Centres of Excellence in Research and Innovation (CoERI), and third mission legislation on university researchers' identities and practices at one university in Norway and one in Sweden. The point of departure of the study is that excellence and innovation can be perceived as two different institutional logics in academia, where the first resonance norms, values and practices long-embedded in the academic community – perceived as the ideal of academic work, while innovation involves practices and research of an applied character and is closely linked to concepts such as knowledge and technology transfer and commercialisation. The overarching goal of the

centres in this study is either excellence alone or the combination of excellence and innovation.

Based on interviews with 33 researchers affiliated to CoEs and CoERIs within different disciplinary fields, the study finds that the schemes have different impact on the researchers' identity and practices and identifies four different researcher identity types; *the autonomous agent, the traditionalist, the approved innovator, and torn in two directions*. The first type bridges the two institutional logics of excellence and innovation. The CoE brands the researcher as "excellent" and the researcher experiences few incompatibilities in pursuing practices and goals associated with innovation. The traditionalist is affiliated to a CoE and buffers the institutional logics of innovation, although they can have extensive collaboration with partners outside of the academic sphere. Practices associated with innovation have a low degree of taken-for-grantedness. The approved innovator affiliated to a CoERI experiences that the governance instrument legitimises practices of innovation by its emphasis on both excellence and innovation. A researcher who is torn in two directions experiences incompatibilities between the logics and buffers one or other of them. He/she is affiliated to a CoERI that is based on unripe relations between the researchers and the involved industrial or public partners, or the field is relatively new and emerging and associated with applied research and the researchers are striving for academic recognition.

The paper further shows that the schemes affect researchers differently in Norway and Sweden. In general a bridging of the logics seems to be more common in Norway, whilst buffering apparently prevails in Sweden. This is explained by the differences in the funding system and the size of the schemes. The centre identity appears to be weaker in Sweden, which relates to the fact that the Swedish researchers often are funded by plural grants. Another issue is that the heterogeneity of public research organisations and the strong position of the institute sector can be said to make basic research a more important identity marker among Norwegian university researchers, at least in the old and multi-disciplinary universities, compared with Sweden.

6. Analysis and discussion

The main findings reveal that the institutionalisation process of the three governance instruments, Centres of Excellence, Centres of Excellence in Research and Innovation and third mission legislation, have had different impacts on researchers in Sweden and Norway. On the one hand, we see that the CoEs and CoERIs seem to have gained a stronger foothold in Norway, in terms of continuation of the instrument in research policy and the impact of the instruments on the researchers. On the other hand the findings indicate that the third mission legislation is institutionalised to a greater extent in Sweden than in Norway. This chapter will analyse and discuss these findings by focusing on the means (centres and legislation) and the goals of the instruments.

6.1. Institutionalisation of Third mission legislation

Third mission legislation has been adopted by both countries without any specific translation to the national context as shown in chapter 4. It has, however, been received differently by researchers in the two countries. One assumption of this thesis is that introducing new legislation such as the third mission[32] is rather tension-free, as it does not generate any immediate consequences for researchers' practices. There are neither any sanction mechanisms to ensure that these activities are pursued nor do they have any considerable additional funding.[33] However, although the main goal of the third mission is increased knowledge and technology transfer, the very policy rhetoric which accompanied the introduction of the legislation has meant that is has been associated primarily with commercialisation of research results through establishing spin-offs and licensing (Cohen et al. 2002; Litan et al 2008). This is seen to generate considerable tensions in the researcher environment as these practices often are perceived as incompatible with other institutionalised academic practices and logics. The third mission legislation thus embeds ambiguities and offers the opportunity for researchers to engage in both collective and individual sense making (Suchman and Edelman 1996) in order to bridge or buffer the pressure to commercialise research results.

Swedish researchers seem to be more acquainted with the legislation and here three central factors seem to serve as important explanations. First, both Norway and Sweden took

[32] This does not include the Professor's Privilege which is seen as more controversial

[33] Except for the increase in the budgets of the FORNY programme in Norway which primarily funds the TTOs

measures in the 1990s to include innovation in research policy by, *inter alia*, reforming the funding system. However, Sweden also introduced competitive-based funding where several of the funding programmes required collaboration with such non-university actors as industry and this seems to have contributed to legitimise and increase the consciousness of the importance of university-industry collaboration (Benner and Sandström 2000; Owen-Smith and Powell 2002). Second, the removal of the Professor's Privilege alongside the amendment of the third mission in Norway seem to have reinforced the perception of the third mission as primarily concerning technology transfer and commercialisation of research results. Third, the segmentation of practices between the universities and the research institutes in Norway where the latter embody the third mission means that this provides an opportunity for university researchers to buffer the legislation by allocating the responsibility to the research institutes.

However, while external pressures, such as funding schemes requiring collaboration between university and industry, may increase researchers' awareness of the third mission legislation, it does not mean that the legislation is legitimised and thus institutionalised. As paper 2 shows, the institutional complexity of the university represented here by the diverse disciplines means that the legislation is legitimised to various degrees in the different disciplines. Furthermore, the fact that there are no other incentives contributing to researchers' reputation and credibility-building practices (cf Latour and Woolgard 1979; Whitley 2003), such as including knowledge and technology transfer as part of the job description and/or part of the curriculum for tenured positions, means that the researchers have been able to preserve their institutional environment (cf Meyer and Rowan 1977). Other studies have also underlined that the lack of incentives and job descriptions for tenured academics pose challenges for institutionalising the third mission (e.g. Krücken 2003; Geuna and Muscio 2009).

Although most university researchers partake in diverse knowledge and technology transfer activities with various motives and rationales, it is the part of the third mission legislation which focuses on commercialisation of research and innovation that has generated tensions and non-compliance between different institutional logics. A major reason for this is that commercialisation is perceived as incompatible with other institutionalised and remunerated practices of university researchers. This means that a complete institutional change in the scientific institutions proposed by Ziman (2000) has not yet taken place, at least not in

Sweden despite the reforms of the funding system. The picture is certainly more diversified and complex. Although the changes in the funding system and policies for innovation expand the opportunity for researchers to cross disciplinary and organisational boundaries (Owen-Smith and Powell 2002), the thesis shows that researchers, especially in the humanities and social sciences, buffer the institutional logic of innovation. This finding underlines the importance of including the institutional complexity residing in universities in the study. It furthermore aligns with other studies that have examined the impact of changes in the funding system on researchers representing different disciplines and their identities and practices (Henkel 2005; Hessels and van Lente 2011; Ylijoki 2003). An increased market orientation does not displace traditional academic norms, values and practices. There are, however, incremental changes - institutional logics in academia are not constant but are in flux and continuously developed through exogenous and endogenous influences, and instruments such as the third mission legislation plays an important role in filtering and framing the logics (Greenwood et al. 2011). The fact that Swedish researchers are well acquainted with the third mission indicates a consciousness of these activities and an impact of research policy.

6.2. Institutionalisation of Centres of Excellence and Centres of Excellence in Research and Innovation

Commercialisation of research is a contested practice and this is also evident in the studies of the CoERIs. However, here we see that the means itself – the centre – contributes to legitimise commercialisation in Norway, as it bridges the institutional logic of innovation and excellence. This is also evident in the CoEs where the researchers pursue practices associated with the institutional logics of innovation without experiencing any pronounced tensions much because the CoE brand already marks them as excellent researchers. This supports the assumption that the means centre, as opposed to legislation, may intertwine with researchers' daily practices. The scheme provides relatively substantial funding of research for a longer period, the possibility to achieve critical mass, and a status that signals both innovation and excellence, contributing to researchers' credibility and reputation building practices.

That being said, the centres *may* intertwine because introducing a centre does not necessarily necessitate change; other factors have to be present as well. The Swedish cases show that imposing formal organisational structure does not necessarily lead to institutionalisation (DiMaggio and Powell 1983; Greenwood et al. 2011; Scott 2008; Meyer and Rowan 1977).

Despite the funding agencies emphasising local and organisational impact, the centres exert a low degree of organisational identity and authority compared with those in Norway. This observation is based on the responses of the interviewees which reflect their identification with the centres that can be said to be construed by their perceptions of its identity (Glynn 2008; Greenwood et al. 2011).

Additionally chapter 4 revealed that CoEs in the Swedish system seem to be ruled out to the benefit of new instruments and strategies with a focus on individual researchers rather than the research group. This fortifies the perception of a lack of a successful institutionalisation of the centres.[34] This means that although both countries have introduced centre schemes there are large differences in the degree of institutionalisation. The thesis sees two main explanations for this.

The first concerns funding. Due to the competitive funding system, Swedish researchers have the opportunity, and often the need, to fund their research through grants from various funding bodies which often require some sort of evaluation, monitoring or reports on the use of the grant. Thus the researchers have to relate to various stakeholders and their demands. Furthermore, most researchers participate in other research projects involving other researchers who do not take part in the CoE. This implies that the plurality of funding sources may impede the process of creating an organisational identity corresponding to one particular funding scheme. It further reduces the centres' organisational authority because of monitoring by the granting agencies.

Although not all of the Norwegian researchers are fully funded by the scheme, and do participate in other research projects, a majority of the central researchers spend most of their research time in the centres. One reason for this is that Norwegian tenured academics have approximately 45 per cent of their working time dedicated to research. Another reason is that the Norwegian CoE scheme is substantially funded. It is the only scheme providing substantial funding of basic research to research groups in a research landscape otherwise characterised by relatively flat funding and equality – much due to the block funding of the universities. Accordingly, the scheme is exclusive and prestigious in the Norwegian context – an important aspect concerning the development of organisational identity. Furthermore,

[34] Note however that the centre scheme has had an impact on the organisation of research (VR, 2012). This thesis is not an evaluation of the scheme.

research shows that Norwegian researchers, to a larger extent than their international colleagues, characterise their research as basic (Gulbrandsen and Kyvik 2010). This might relate to both the segmentation of practices between the research organisations and the block funding of research. Thus, the fact that the CoE scheme funds basic research means that it complies with institutions prevailing in Norwegian universities. In comparison, the CoEs in Sweden receive less funding and are the double the number of the Norwegian scheme. In addition to the CoE scheme, Sweden has "competing" schemes such as the Strategic Research Areas which provide considerable funding to different research environments.[35] Hence from the above we might reason that the size and role of the scheme in the public research system (PRS) condition the opportunity to develop the centres' organisational identity.

The second main explanation concerns the degree of intellectual pluralism and flexibility and reputational competition in the public research system (PRS) (cf Whitley 2003). Given that the Norwegian PRS can be considered as low on intellectual pluralism and flexibility due to the segmentation of practices between the public research organisations and the job description of tenured academics, and low on reputational competition due to the funding system, it might be that the centres represent the opportunity to generate new fields of research otherwise opposed by the university structure and the funding system. As such the means centre offers the opportunity to cross organisational and institutional boundaries. This might contribute to strengthening the organisational identity, especially in centres which physically co-locate researchers. Although the latter point is not specifically discussed in the papers, the work for the thesis indicates this. This is also supported by research on the dynamics of research groups (Heinze et al. 2009). Similarly, Swedish university researchers are more exposed to muliti disciplinarity due to the composition of the research system. This relates especially to the competitive funding which may create opportunities for researchers to cross organisational and institutional boundaries (Owen-Smith and Powell 2002). As such the CoE scheme does not represent a newly-gained opportunity for achieving multi disciplinarity in Sweden.

The findings of this thesis indicate that centre schemes may have a potentially large impact on the organisation of research at the university, and on research itself. Rip (2011) claims that the CoEs have the propensity to change the universities from a modern university based on

[35] Note however that one of the criteria in the selection process was that the research should have links to Swedish industry

disciplinary structures to a postmodern university based on centres, which dissolves the traditional structures by crossing disciplinary and organisational boundaries. The findings of the thesis reveal that such change presupposes that the centres are institutionalised and become fully-fledged organisations. It further shows that the extent to which this happens depends upon several internal and external factors and the interaction between them. Three are emphasised here: the composition and development of the public research system, compliance between the goals of the means and researchers' institutional environment, and the opportunity for developing an organisational identity.

7. Conclusion and policy implications

Both Sweden and Norway have in the two last decades introduced policies and instruments aiming for excellence and innovation, and this introduction shows that while the policy aims and rhetoric have been the same in both countries, there are important differences in the implementation and institutionalisation of the governance instruments, which further have various impacts on the university researchers' identities and practices. In this last chapter of the introduction I will provide some concluding remarks and comment upon the policy implications of the thesis.

7.1. Concluding remarks

The thesis shows that the instruments "Centres of Excellence" (CoE), "Centres of Excellence in Research and Innovation" (CoERI) and "third mission legislation" differ in the way they are translated and tailored to the national context, because they represent different means and goals. Policymakers adopted and introduced the third mission legislation without any specific adaptation to the national context. It is the national public research system and the institutions embedded in the system and in the researchers' environment, which influence the way the third mission legislation is received and given meaning in the researchers' community. In comparison, The CoEs and CoERIs are adapted to the national context by the policymakers as well as given meaning by the institutional environment of the researchers.

The findings of the thesis show that implementing transnational governance instruments does not necessarily lead to convergence between the public research systems in Sweden and Norway. Rather, the process of operationalising and adapting the instruments to the public research system show that they contribute to fortify the national characteristics. Both the funding system and the plurality of public research organisations are important factors that affect the institutionalisation of the instruments. The thesis shows that the block funding of the universities combined with a segmentation of research practices between the university and the research institute sector in Norway, have contributed to legitimise the centres in the universities. By having the goal of excellence which complies with academic institutions, the centre schemes legitimise a concentration of funding on the best research group – an otherwise highly contested action in a research system characterised by equality in the distribution of funds. In Sweden, the competitive funding system and the minor research institute sector have led to centre schemes competing with other types of funding and researchers' attention, thus impeding the institutionalisation process.

Another important finding is that the instruments affect the researchers' practices and identities. However, the thesis demonstrates that researchers respond to the governance instruments aiming for excellence and/or innovation in various ways due to the institutional complexity inherent in the university, the differences between the disciplines and compliance with academic institutions. Other factors in the institutional framework that stand out as explanatory variables for this perceived variance are, *inter alia*, the identity and the maturity of the academic field, the ripeness of the relationship between the field and its industrial/public partners and researchers' job descriptions. Taking these factors together, the thesis illustrates the importance of examining the governance instruments at both the micro and the macro level in order to obtain a holistic picture of factors that enhance or impede the institutionalisation process.

7.2. Policy implications

Findings of the thesis underline that policymakers have to consider to a greater extent the link between the means and the goals of the instruments, the institutional complexity of the university and the potential impact of the public research system when they introduce new instruments. This forms the basis for the suggestions this thesis proposes to research policy.

The first suggestion concerns the goal of increased knowledge and technology transfer from the university. Although supporting structures at the universities such as technology transfer offices have been established in order to enhance the process of commercialising research results, there are no other internal incentives for increased knowledge and technology transfer. Findings of the thesis indicate that legislation in itself has little impact on university researchers. To increase and enhance the process of institutionalising knowledge and technology transfer activities one may introduce incentive mechanisms which make knowledge and technology transfer activities an important part of researchers' reputation and credibility building practices. One mechanism can be to include knowledge and technology transfer activities as part of the curriculum for tenured positions, another is to include them in the job description along with the two other missions, teaching and research. This seems especially important for countries characterised by high level of block funding and a segmentation of research practices between different research organisations.

Furthermore, all academic fields transfer knowledge and technology to the broader society in various ways. Still, the sciences and life science, and the potential economic benefits of these

researchers' results, have received considerably more attention – especially due to the focus on commercialisation and technology transfer – thus underplaying the value of other types of research and their benefits for society. This means that the rhetoric at the policy level should take into consideration the institutional complexity of the university, and to a greater extent communicate the importance of knowledge and technology transfer in the broad sense in order to emphasise the societal and economic value of all academic fields.

The second main suggestion concerns the goals of centre schemes. Where one goal is to increase research excellence and the internationalisation of research, in another the centres are means to influence the universities in terms of research strategy and structure and the organisation of research. These are rather grand objectives which may, as the thesis illustrates, elicit various responses in the researchers' environment – resulting in both compliance and incompliance with the goals. Hence, a measure to increase the impact of the governance instruments examined here can be to clarify the intention of the instruments and to develop this/these. This requires a cultivation of one of the objectives above.

One path is to emphasise scientific excellence. In many cases the centre seems to be built around one or two outstanding researchers and the other members may have various academic track records. Although critical mass is important, a viable strategy could be to grant one researcher instead of a group. The researcher then has the opportunity to build a viable research group after receiving the grant. This strategy may have several benefits. For instance, by granting a researcher one may cultivate scientific excellence without imposing organisational challenges and tensions into the process. Moreover, the idea of the research group as a critical factor for developing scientific excellence affects the various disciplines differently. Research groups are important in certain fields such as the sciences and the life sciences, whereas in the humanities research is often characterised by rather individualistic practices and the faculties host heterogeneous and often small research units/fields. As such a CoE scheme with the goal of organisational impact may cause more tensions and challenges in the humanities than in other fields, and it might be that a scheme with the goal of scientific excellence, similar to ERC grants, may be more appropriate given the characteristics of the field.

Another path is to emphasise the organisational dimension. One of the main intentions of the Swedish CoE scheme is to alter the organisation of research and increase the competition between higher education organisations. However, given the competitive funding system and

the relatively low block funding of the universities, the universities have limited resources and few opportunities to alter their own conditions and to influence the process of institutionalising the centres. In addition, one of the preconditions of the grant is that the centres should be self-sustaining in terms of attracting other external grants after the termination of the funding. However, the termination of long-term and substantial funding will necessarily affect the possibility of continuing the research in the centres, or at least the extent of the research. Therefore, the funding situation, both in terms of researchers' need for applying for other grants in order to fund their research, and the lack of similar funding possibilities after the termination of the grant, hampers the institutionalisation process.

Another similar issue concerns the fact that the funding agencies evaluate the centres on organisational issues after a year and a half. This might have a backlash effect. The focus on developing formal organisational structures in response to the demands of the financing agency, might come at the expense of developing an organisational identity in accordance with local conditions and circumstances. A research group may need time to develop its goals and to find its direction. This is perhaps the strength of the Norwegian schemes as the centres have time to establish themselves before the mid-term evaluation. Thus one contribution of the thesis to policy is that the potential for developing an organisational identity on its own terms and providing the opportunity for a prolongation of the successful centres after the termination of the grant, might contribute to enhancing the institutionalisation of the centre schemes.

For some centres, the schemes with several goals have been highly important because the emphasis on organisational conditions has been crucial in order to achieve scientific excellence. Here we see that the overlap between the excellence goal and academic institutions implies that other measures also can be introduced. As such we can speak of the organisational dimension of institutions where the centres bring about the possibility of organisational and institutional change. However, this sort of impact depends upon the conditions inherent in the public research system, in specific universities and in the disciplines.

In conclusion, the findings of the thesis underline the need for developing governance instruments that embed flexibility in terms of adapting them to the institutional complexity inherent in the university and in the national public research system.

8. Appendixes

Appendix 1: Interview guide for the study in Paper 2

1. Please describe your background and present job
2. Whom are your most important contacts for your job (both within and outside the university)?

    a. Where are these (organisational, geographical, knowledge area)
    b. How long have you known your contacts?
    c. How did you get in contact?

3. Which role do they have for your job?
4. How have your background influenced your network which you use today?
5. Do your contacts have relations with other persons/ units at your university?
6. How do you use the university in your work? (name, infrastructure etc)?
7. What is commercialisation of knowledge?
8. How do you perceived the university's attitude towards commercialization of research?
    a. Which role does the university have in the commercialisation of knowledge?
9. Does your university provide any incentives for commercialisation of research?
10. Do you have any perceptions of the system barriers for the commercialisation of research?
11. In which activites at the university do external actors participate?
12. Which units attract external interest?
    a. How have these contacts developed?
13. Which arenas are the most important for networking?

Appendix 2: Letter of invite and interview guide for the study in Paper 3

Letter of invite (e-mail)

Subject: Interview request - research excellence

Dear xxx

I am contacting you in your capacity as a researcher at (insert name on centre).

I am a PhD-fellow at the Centre for technology, innovation and culture at the University of Oslo and I am carrying out a project on scientific excellence in Norway and Sweden. Excellence has become a prime objective for national research policies. However, there appears to be no coherent definition of the concept. I therefore want to illuminate researchers' understanding of excellence and its contents through interviews with researchers from different disciplines and centres. I plan to interview researchers at eight Centres of excellence in Sweden and Norway.

I hope that you will be able to take part in such an interview in either week x or x. The interview will take approximately one hour of your time. You can at any time withdraw from the project

I am looking forward to hearing from you.

Yours sincerely

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Interview guide: centre leaders

1. Background information

Can you describe your background?
(Discipline, position, previous work experience and affiliations (inside and outside the university))

How will you characterise your research? (basic/applied/relevance driven, multi dimensional)

2. Characteristics of Excellence

How would you define excellence or what would you say constitutes excellence?
(research, teaching, relevance)

What in your view characterises an excellent researcher?

What are important factors for fostering excellence? (Is it the management, design of organisation, external contacts (relevance), publications?)

Do you think that the researchers in your field are agreed on what is excellence? How much do you think your own standards conform/differ from the majority opinion?

3. Relevance

How do you normally communicate your research findings?

Has the centre developed guidelines or strategies for disseminating research results? And what are these? (If so: opinion)

Can you give examples of practical utility of your research?

Have you patented or established a start-up as a result of your research?

4. About the centre

If the person has established the centre:

Why did you initiate the centre?

If the person became leader after the centre was established:

How were you recruited to the centre?

How was the centre's research programme developed? (Was it a totally new programme or a result of combining existing individual research?)

How did the different partners (institutes and firms) get involved in the centre?

5. Recruitment and structural issues

What is the size of the centre and what is the background for this size?

Has the centre the critical mass in terms of research and the goals of the centre?

Can you say something about the recruitment process?

What are the greatest challenges in managing a centre?

What is your most important job as a leader of the centre? (motivation, role model,)

What are the benefits of having a status as a centre of excellence? (Could you not have achieved this without the CoE status?)

What are the detriments of having a status as a centre of excellence?

6. Internal organisation and interdisciplinarity

Are the researchers co-located or situated within their own departments /institutes?

Why was this form of organisation chosen?

How is the interdisciplinarity organised?

How would you describe the climate of collaboration within the centre? (Open and sharing culture, the role of trust and reciprocity. Sense of solidarity and belonging)

What is the relation between the disciplines and institutions represented in the centre? (Does one leading institution take the lead?)

(For CoERI) How do the different partners relate to one another and what are the roles of the firms?

How does the centre relate to the rest of the university? (Challenges? Support or critique)

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PART II

Governing excellence

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Under review by Science and Public Policy

Abstract

The past two decades have seen an increase in the use of funding mechanisms such as 'centres of excellence' in several OECD countries. This paper examines how centres of excellence are operationalised in two distinct national public research systems – Norway and Sweden. The paper then develops a conceptual framework, involving four dimensions of excellence: international impact; social impact; local impact; and organisational impact. Together with principal-agent theory the conceptual framework is used to investigate and explain which dimensions are given the most emphasis in the two countries. The main findings are that in a country with a highly competitive funding system (Sweden), the financing agencies emphasise local and organisational impact to overcome the problem of moral hazard, while a country characterised by relative high block grant funding of the universities (Norway) tends to emphasise international impact and investment in strategies to overcome the problem of adverse selection.

Key words: centres of excellence, public research system, principal-agent theory

Introduction

'Excellence' is today a common goal in both national and transnational research policy, and recent decades have seen the introduction of several research excellence initiatives of which 'centres of excellence' seem to be the most common instrument in the OECD countries (Luukkonen et al., 2006; Orr et al., 2011). A main characteristic of centres of excellence (CoEs) is that they combine aspects of block grant and competitive funding by giving research groups often substantial, flexible and long-term funding for a period of 6-10 years (Orr et al., 2011). Depending on the size of the grant and the size of the centres, these funding schemes might affect the research system in several ways. An important one is that, at the national level, CoEs may legitimise a concentration of resources on the best research groups by focusing on excellence (Fisher et al., 2001), thus enabling a possible restructuring of the national research landscape. At the organisational level, CoEs can influence the strategic priorities of the host organisation through a concentration of resources on the best research groups which have the potential to obtain a CoE grant. A related impact is an increased emphasis on the form of the centre, which often entails a formally defined organisational structure that enables the establishment of a distinct research unit outside of the university's ordinary departmental structure. In this manner the centres can be instruments to break up the sedimented structures of universities and have the propensity to change the university from within (Rip, 2011).

Despite the potential impacts of the CoEs, they have hitherto received relatively little attention from scholars in the field of research policy (Orr et al., 2011), though there are studies investigating similar instruments. Centre schemes with the goal of innovation facilitating university-industry collaboration have received attention in the US (e.g. Etzkowitz and Kemelgor, 1998; Bozeman and Boardman, 2003; Corley et al. 2006) and to some extent in Europe (Thune and Gulbrandsen, 2011). Excellence as a goal and means has been discussed in studies of Networks of excellence addressing structural issues (Luukkonen et al., 2006) and impacts on individual researchers (Atkinson-Grosjean, 2006). I intend to add to this literature by discussing how two relatively similar schemes, centres of excellence (CoE) and centres of excellence in research and innovation (CoERI)[1], in two Nordic countries, Sweden and Norway, differ in terms of how excellence is translated into operational and

[1] Also known as Competence centres

measurable goals. This is motivated by the observation that although centre schemes have some generic characteristic across countries, their impact may be substantially enhanced or modified by the way a research system is organised, funded and coordinated in different national contexts (Whitley, 2010). The research questions guiding this paper concern how excellence is operationalised into a governance instrument, and in what ways do the particularities of the national research system influence this operationalisation.

A framework incorporating the dimensions of international impact, social impact, local impact and organisational impact was developed to investigate these two questions. Principal-agent theory is applied to the analysis of the differences and similarities between the centre schemes and how the specific features of the national research systems can explain these differences. The theory asserts that the principal requests the agent to perform certain tasks, and depending on the degree of goal conflict of the requested task, the relations between the principal and the agent can be infused by problems of information asymmetry (Guston, 2000). This can lead to the problem of selecting the best centres (adverse selection), and to assure that the grant is spent in accordance with the contract (moral hazard). To investigate the relations between the principal (funding agency) and the agent (the centres), I use documents such as calls and evaluations of the schemes. These indicate the principal's strategies for monitoring and assessing the centres and which impact dimension is given priority.

The paper is structured as follows: First, the concept 'centre of excellence' is explained by linking it to existing literature on centres, the organisation of research and how excellence is evaluated. Then it gives an outline of principal-agent theory and how it is used in the paper. This is followed by a description of the research context and the methodology. The subsequent section presents the mapping of the criteria found in the document study and the extent to which these are used in the Norwegian and Swedish schemes. These are then discussed and analysed in the light of principal-agent theory. The paper concludes by illuminating some implications for policymakers.

What is a centre of excellence?

In general 'centre' refers to an organisational form and structure on the micro level, while excellence can be used on several levels to characterise, for instance, the research quality of

individual researchers, research groups and universities, most often through international comparison. This conceptual division is the starting point for a literature-based reflection.

A centre in the university structure

Although centres of excellence are relatively new instruments, centres as a means to organise research are not new. Centres may emerge through a variety of channels, including: pushed through dedicated funding schemes; emerging in their own right; or created separately with contributions from various actors such as public agencies, industry and universities (Rip, 2011). This paper is concerned with the first group.

The spread of the centre format can be assumed to have some of its inspiration from the US model University-Industry Research Centres (UICR) introduced in the 1980s. These are often located outside of the traditional university department structure, and perceived as promoting multidisciplinary, problem-driven, strategically formed and focused research teams which can solve complex problems (Boardman and Gray, 2010; Etzkowitz and Kemelgor, 1998). This applies to a certain extent to the current CoE schemes as well. The centres are often multidisciplinary and located outside the departmental structure, although some are integrated in one department (Langfeldt et al., 2010). CoEs are often open to all scientific fields and topics, but funding schemes that also target innovation may require external partners. This means that the centres (most often) are generated through bottom-up initiatives.

Centres are heterogeneous: they vary in size from small concentrated units to centres with large budgets and in organisational structure; from a virtual centre to an institutionalised co-located organisation (Popp-Berman, 2012; Aksnes et al. 2012). This means that a centre in this context is a multifarious phenomenon, crossing diverse organisational boundaries such as the department, faculty, university and even sectors - elements that funding agencies have to take into account when designing and implementing their funding schemes.

The notion of a centre moreover emphasises the importance of the research group. Studies of excellent and creative research organisations underscore variables such as the social composition, organisation and location of the research groups (Zuckerman, 1996; Carayol and Matt 2006; Hemlin et al., 2008; Hollingsworth, 2008). Organisational conditions for stimulating academic productivity have been identified as autonomy and flexibility, interaction with colleagues, the balance between basic and applied research, small research group size, stable research sponsorship, access to extramural skills and resources and facilitating leadership (Pelz and Andrews, 1966; Carayol and Matt, 2006, Heinze et al. 2009;

Salter and Martin, 2001; Hollingsworth, 2008). Wider contextual variables are good collaboration and relationship with the hosting department and university management (Langfeldt et al., 2010). Another important factor is that centres may include one or several research groups – the latter is perhaps most common. The research groups can be a result of new constellation or an expansion of existing groups.

Moreover, centres often have formalised organisational structures (Boardman and Gray, 2010); they can have a board of directors and an advisory board[2], a dedicated centre leader, primary investigators (PIs) and a small administration. However, they are not legal units and are subject to university jurisdiction and as such have limited authority. In addition they are often funded for a limited time period. This means that they are not fully-fledged organisations, but dependent upon other actors for their existence (Brunsson and Sahlin-Andersson, 2000). Centres can thus be considered as agents that serve the specific purposes of a principal. Characteristic of agents is that they are often seen as instruments for other organisations - a higher level controls resources.

Another aspect of centres is that they gather researchers who usually have their main affiliation in their home department, and thus the formalised organisational structures may be a result of symbolic compliance rather than a new organisational structure. In other words the centres may ceremonially adopt the required formal structures without adhering to them in practice (Meyer and Rowan, 1977) – implying that some centres can function as large project grants rather than new organisational units and the 'centre' label might therefore be somewhat misleading (Langfeldt et al., 2013). Taken together, the above shows that a ‘centre’ can involve various constellations and can be relatively heterogeneous in terms of size, structure and the goals it serves. More specifically, what goes on in a centre might not be what is communicated to the outside, which can increase the need of the funding agency for monitoring and evaluating the activities of the centre.

Research excellence – international comparison and a reputational building concept

While the centre concept denotes certain organisational conditions important for creating a good research environment, the notion of excellence alludes to the international scientific community by incorporating a comparison of the research with international standards. One

[2] Studies of centres of excellence show that this is not necessarily common in all centre schemes, for instance the Finnish and Danish CoE schemes do not require a board of directors, while the Swedish and the Norwegian schemes do (Langfeldt et al., 2013).

core feature of research is that researchers engage in reputational competition by seeking recognition from their intellectual peers for the significance of their results (Whitley, 2003). One channel for recognition is evaluation of research through peer review. This is also used by funding agencies behind the CoE scheme to evaluate proposals and their potential for research excellence, and in the evaluation of the centres during their period of operation. This method adds biases of importance to the evaluation of 'excellence'.

Research shows that excellence in academia is often associated with groundbreaking, innovative, original, interdisciplinary and risky research (Heinze, 2009; Luukkonen, 2012). Scientific breakthroughs are often identified ex-post, and the challenge in evaluating research proposals lies in identifying these ex-ante. This is a challenge for two reasons: first, excellence is often conducive to controversy, and research on peer-review processes reveals that the notion of excellence, like the term 'quality' (Gulbrandsen, 2000; Kekale, 2002), might elicit considerable disagreement in the researcher community (Lamont, 2009; Zuckerman, 1996). Identifying excellent research is contingent upon prior perspectives and individual perceptions on the nature and rationale of research activities (Tijssen, 2003; Langfeldt, 2001; Lamont, 2009; Luukkonen, 2012). Research proposals integrating multiple disciplines which seek to combine research in new ways, can as such be perceived as difficult to evaluate. Second, academic research and peer review can be highly stratified (Cole and Cole, 1973), and there is a tendency for applications by already renowned scientists to get more attention than those of the less renowned, also known as the Matthew effect (Merton, 1968). Taken together the use of peer review in evaluating research proposals can increase the propensity for funding agencies to concentrate resources on research organisations and groups that have a reputation for past excellence, leading to conservation of fields at the expense of risky research that might represent innovation (Molas-Gallart and Salter 2002; Hicks and Katz, 2011; Luukkonen, 2012). Both funding agencies and evaluators may be more comfortable supporting proposals perceived as feasible, rather than risky and perhaps controversial proposals that might not generate the expected outcomes (Luukkonen, 2012).

Another feature of the CoE schemes is that excellence in itself is a reputation-building concept (Balderstone, 1995). It signals prestige in terms of its beneficial conditions (long-term, flexible and substantial funding) and that the research group has achieved it in strong competition with other groups. For individual universities the global competition for the best researchers and students implies that the status of hosting centres is an important means to

attract these (Tijssen, 2003). Most universities therefore market the centres on their website, often on the front page, and they are important for the competitive profile of the university (Rip, 2011).

A third feature is that the large investments in basic research are expected to benefit society in terms of new knowledge, skills and innovations (Salter and Martin, 2001). The correlation between excellence and innovation has long been emphasised by scholars in innovation studies (Geuna and Nesta, 2006; Gulbrandsen and Smeby, 2005). These assert that excellent researchers, those with a high rate of high-quality publications, have the capacity, curiosity and intrinsic motivation to engage in entrepreneurial activities and with society. Hence, although innovation and excellence can be considered as two separate goals - the first targeting innovation in the local/national community while the other is measured in the international research community - they are nevertheless highly related.

The above shows that excellence is a rather complex notion – on the one hand it is embedded in the scientific community, but avoids a clear definition and is difficult to assess ex-ante; on the other hand it is a concept that might provide legitimacy to research groups and organisations through the branding the governance instruments represent. Additionally, the CoEs and the relatively substantial funding embed wider expectations of research contributing to innovation and societal benefits. These aspects of the excellence concept represent some of the considerations that funding agencies have to take into account when designing and implementing the CoE scheme. Altogether, the term ‘centre of excellence’ embeds multiple levels on which the funding agency can evaluate the performance and the outcomes of their investments. This will be further elaborated in the result section where the four dimensions of excellence are introduced.

Analytical framework

There is considerable prestige and substantial funding in the two schemes investigated in this paper, Centres of Excellence and Centres of Excellence in Research and Innovation, and the funding agency most often invests resources in monitoring and evaluating the centres. To analyse how excellence is operationalised into a governance instrument, and in what ways the particularities of the national research system influence this operationalisation, this paper applies principal-agent theory. Principal-agent theory, also known as ideal contracting theory,

examines organisational relations as if different parts of an organisation made contracts with one another (Guston, 2000). Although principal-agent theory originates in economic theory, studies of research policy have demonstrated the value of applying the theory to describe and analyse the social and organisational relationship between government and science (Guston, 2000; Braun, 2003), the role of intermediary agencies (Braun, 1993; Rasmussen and Gulbrandsen, 2012) and the role of funding agencies (Van der Meulen, 2003).

In this paper the funding agencies are modelled as the principal and the centres are the agents. They are, however, part of a broader chain where for instance government serves as the principal of the funding agency and the centre is the principal of the individual researchers affiliated with the centre. Moreover, the host organisation is a principal of the centre. The relationship studied in this paper is thus affected by other parties in the chain.

Depending on the degree of goal conflict of the requested task, the relationship between the principal and the agent can be infused by problems of information asymmetry (Guston, 2000). This theory asserts that the agent sometimes has an interest in hiding relevant information from the principal, and the principal can only observe inadequately the actions of the agents. The principal faces therefore two fundamental problems:

- Problem of adverse selection
- Problem of moral hazard

The problem of adverse selection implies that '…the principal has difficulty selecting the appropriate agent because of an original lack of expertise or information. It is difficult and costly for the principal to discover which potential agent most completely shares the principal's goals' (Guston, 2000; 21). Hence, finding the right agent for the CoE grant might pose challenges, since it is difficult to identify excellent research *a priori* (Lamont, 2009). The principals, in this case the funding agencies, therefore give considerable attention to the process of selecting the right agent/centres, relying on the judgements of scientific peers to ensure that the grant is allocated to the best research groups. This strategy might have some drawbacks. For instance, it can favour proposals by already strong research groups within an institutionalised field over proposals regarded as more risky in an emerging interdisciplinary field (Langfeldt et al., 2013). Another potential problem of adverse selection concerns the choice of organisational model. Centres can either physically co-locate researchers or operate through virtual collaboration, and each form may have its benefits and detriments for research

(Langfeldt et al., 2010). As such, it is difficult for the funding agency to select the best organisational model before establishing the centre.

The problem of moral hazard indicates that the agent not only has an incentive to perform the delegated task, but also to act in unacceptable ways. It is difficult for the principal to know if the agent performs in accordance with the contract after the delegation has been made (Guston, 2000). Even though the agents are given operational freedom of action, the principal can monitor the agents through the contractual relationship. Regarding research financing schemes, there has been a considerable increase in the number of evaluation procedures as well as indicators for measuring output (Whitley, 2011). These are established to avoid the problem of moral hazard. Despite these monitoring procedures, it is not certain that the agent will, or manages to, perform according to the contract. Therefore to avoid breach of contract, the principal can develop positive and negative sanction mechanisms to ensure that the agents follow the contract (Braun, 2003).

A third problem in principal-agent theory is the presence of a goal conflict, where the principal and the agents have conflicting or only partly overlapping goals. The goal conflict between the funding agency and the centres concerning excellence can be assumed to be low. The very notion of excellence appeals to researchers as it resonates with values and norms long held by the academic community (Merton, 1973; Fisher et al., 2001). Different interests and problems may arise, however, concerning three other goals. The first is the request for a 'centre' and a new organisational structure. Given the impermanence of the centres and the researchers' external affiliation, it can be difficult to develop an integrated new research unit. This is not only dependent upon the commitment of the individual researcher but also on the conditions provided by the host. The second goal is that of innovation, and relates especially to the CoERI scheme which involves networks of knowledge providers and users that can complicate the contractual relation between the principal and the agent. To achieve results the principal depends upon the actions of and collaboration between the scientists and a third party, i.e. public agencies or companies. This increases the potential for moral hazard. Although one part aims at performing in compliance with the contract the other may, for various reasons, not be able to contribute to reach the goals. A third goal that may pose a problem relates to the CoERI scheme and challenges of fulfilling goals of innovation *and* excellence. From research on university-industry relations it is known that the goals and the logic of university researchers and industry partners may diverge (e.g. NN and NN, work in progress). Whereas academics are primarily occupied by reputation-building activities like

publications (Whitley, 2003), industry is primarily occupied by the prospect of financial revenues, and this divergence can generate tensions and challenges in the selection of research questions and collaborative projects, resulting in difficulties to fulfil the contract with the principal.

The type of information that the principal can obtain about the agents' behaviour will therefore influence the content of the contract (Eisenhardt, 1989). Hence, to reduce goal conflict and the problems of adverse selection and moral hazard, the financing agencies develop evaluation and monitoring procedures. The extent and scope of these procedures depend, as we will see in the following sections, on the composition of the national research systems.

Research context and methodology

Norway and Sweden are country cases in this study on how excellence is operationalised into a governance instrument and how the different national research systems influence the design, operationalisation and implementation of the Centres of Excellence (CoE) and Centres of Excellence in Research and Innovation (CoERI). They are so for two reasons: the first is that there are rather substantial differences between the national research systems; and the second is the similarities (at least on the surface) between the countries' CoE and CoERI schemes.

Of interest for the analysis in this paper are the divergent funding systems in Norway and Sweden. Table 1 illustrates a key difference.

Table 1 Number of main R&D funding sources in Sweden and Norway in 2013

	Sweden	Norway
Government funding agencies *	9	1
Public foundations	6	
Private foundations	10	8**

Source: forskning.se and nifu.no

*of which four are the main agencies (Formas, FAS, SRC, Vinnova)

**These have budgets above 100 000 NOK (approximately 12 500 Euros)

In Norway block funding to the universities made up 63 per cent of the R&D funding in 2011 (RCN, 2013). Additional public funding from the only government funding agency, the Research Council of Norway (RCN), was 20 per cent. The remaining funding sources are direct funds from ministries, some from industry and the EU. Private foundations are relatively small and support primarily research in life sciences. All in all, research funding in Norway is mainly public, comprising approximately 91 per cent of the research funds.

In contrast the funding system in Sweden is more competitive and highly diverse. Block funding has been reduced to 46 per cent[3], and funding is instead channelled through competitive programmes administered by 14 public financing agencies. Of these, nine are government agencies and four public foundations, some multi-disciplinary and some sector oriented. Additionally there are 33 private foundations of various sizes whereof the 10 most important allocate yearly approximately 2.5 billion SEK (243.75 MEUR) to research organisations. The pluralism in funding agencies makes it possible for researchers to fund a project with multiple sources. Altogether approximately 79 per cent of Swedish research is funded by public sources – but highly diversified compared to Norwegian research funding.

Centres of Excellence and Centres of Excellence in Research and Innovation

Turning to the funding schemes, excellence became an important goal of research policy in both countries at the end of the 1990s (SoU, 1998; NoU, 1999) and financing schemes targeting excellence were introduced in the beginning of 2000[4]. Although the schemes are similar, the course of action was different. Compared with Norway, Sweden has longer experience with centres as a governance instrument, being one of the pioneering European countries in establishing centres for university–industry collaboration, also known as 'Competence Centres'. The Centre of Excellence scheme was established on somewhat different rationales in the two countries.

In Norway policies for excellence were a result of a long conflict between the concentration of funds on the best research groups versus the need for spreading resources. Several evaluations of Norwegian research have concluded with the need for concentrating research

[3] SCB Downloaded June 24, 2014 http://www.statistikdatabasen.scb.se/pxweb/sv/ssd/START__UF__UF0304__UF0304C/UoHDriftLaroNatAmFi/?rxid=59ab128c-ad74-4bb2-9d5a-2df05b506b4e

[4] Both countries had already some initiatives targeting excellence which can be considered as the forerunners to the CoEs, although smaller in scope and scale than the current schemes

resources (cf Walløe, 2005), as the resource distribution was seen to contribute to a relatively flat research landscape. The introduction of the CoE scheme enabled and legitimised a concentration of research resources, since the goal – excellence - appealed to the norms and values of the research community. There are still, however, ongoing debates on concentration of resources versus equality.

In Sweden, one rationale for emphasising excellence was a realisation by the government that the change in the financing model from block grant to competition-based funding in the 1990s, had mainly promoted small, project-oriented and targeted strategic and applied research, and there was a need for instruments supporting basic research (SoU, 1998). The characteristics of the CoE scheme embedded these needs. This means that Norway introduced the CoE scheme to sharpen the research system; while this also was a rationale in Sweden, it was in addition used to pull the policy pendulum back from applied towards basic research.

The introduction of excellence as an important goal became evident in the establishment and renaming of governance instruments in the beginning and mid-2000s. The two Swedish schemes in this study are the Linnaeus grant (CoE) and VinnExcellence Centres (CoERI). Even though the Swedish CoERI scheme[5] was established in 1995, it gained its present form in 2005, i.e. excellence as a component was introduced in 2005, and from being 'Competence Centres' they are now 'VinnExcellence Centres'[6]. The Linneaus Centres[7] were first established in 2005. These two schemes are operated by the public financing agencies Vinnova and the Swedish Research Council (SRC) together with the Swedish Research Council Formas (hereby referred to as SRC). Besides these two schemes Sweden has currently four other schemes that provide substantial and long term funding, but the two represented in this study are the ones that are most similar to the Norwegian schemes.

The two Norwegian schemes in this study are Centre of Excellence (CoE) and Centre for Research-Based Innovation (CoERI) (see Table 2 for a comparison of the schemes). The first call for a centre of excellence was launched in 2002. While excellence was the main focus in this scheme, thematic priorities and applied objectives were taken into consideration during

[5] It is called Competence Centres, but is in this paper labelled CoERI

[6] 'Vinn' is from the funding agency – Vinnova

[7] These are called Linneaus environments by the SRC, but most environments have labelled themselves 'centre'.

the selection process. This met strong objections from scientists, and the next call in 2005 addressed research excellence only. In order to incorporate both excellence and innovation in one scheme the CoERI scheme was launched in 2005, modelled partly on the Swedish CoERIs[8].

[8] Later, in 2008, Norway introduced a third scheme on the same model as CoERIs but aiming at environmentally friendly research (FME). As such Norway has three schemes: the open CoEs; the innovative CoERIs; and the strategic and targeted FMEs

Table 2 Main characteristics of the Swedish and Norwegian CoE and CoERI schemes

Schemes	Centres of Excellence		Centres of Excellence in Research and Innovation	
Country	Norway (SFF)	Sweden (Linné)	Norway (SFI)	Sweden (Vinnexcellence)
Established	2002	2005	2005	1995 (changed name in 2005)
Managed by	The Research Council of Norway (RCN)	The Swedish Research Council (SRC)	The Research Council of Norway (RCN)	Vinnova (The Swedish Governmental Agency for Innovation Systems)
Goal	Establish time limited research centres characterised by concentrated, focused and long-term research on a high international level.	Create national competition between universities and colleges for funding to research of international standard. In a long-term perspective: influence the university's strategic priorities	Build up and strengthen Norwegian research groups that work in close collaboration with partners from innovative industry and innovative public enterprises. To support long-term research that promotes innovation and the competitiveness of Norwegian industry	Create new competitive concentration of competence which shall conduct relevant and multidisciplinary research to gain new knowledge and technology which might generate new products, processes or services.
Participants	Universities, colleges and research institutes	Universities and colleges	Universities, colleges and research institutes, firms, public agencies, hospitals	Universities, colleges, firms, public agencies and other research organisations
Funding	Yearly funding 1-1.8 M EUR from RCN, Co-funding /in kind funding from host institution	Between 0.5-1 M EUR per year from SRC. Host institution must match at least 50% including cash	Yearly funding from RCN 1.25 M EUR. Host institution and partners must match at least 50% of the funding.	Yearly funding from Vinnova max 0.7 M EUR. Host institution and partners must match at least 66% of the funding.
Funding period (years)	10 1 mid-term evaluation	10 3 evaluations	8 1 mid-term evaluation	10 3 evaluations
Number of centres	21	40	21	19

Source: Programme documents: Calls and 'Requirements and demands', RCN , Vinnova and SRC webpages

The introduction of the schemes aiming at excellence and innovation reveals that policy first aimed at a hybrid model with a combination of excellence and innovation, followed by a scheme dedicated to excellence only, keeping up with the international trends of emphasising excellence (Orr et al., 2011; Kuhlman and Edler, 2006). Compared with other financing schemes, both CoEs and CoERIs represent substantial investments in research and long term funding. In 2010, the CoEs and CoERIs in this study represented 1.76 per cent of the total public R&D expenditure in Norway and 1.2 per cent in Sweden (Aksnes et al., 2012). Most centres are relatively large, with 50 – 150 affiliated researchers, which includes a large number of PhDs and postdocs.

Despite these similarities, there are three main differences between the Norwegian and Swedish schemes of importance for this study. The first concerns the number of evaluations: RCN performs *one* midway evaluation of both the CoE and CoERI, while SRC and Vinnova conduct *three* evaluations of the centres. The second difference concerns the funding of the centres. RCN‘s annual grant to both types of centres is approximately double that of the Swedish grants. This relates further to the third difference – the number of centres; there are 40 Swedish CoEs and 21 in Norway, while the number of CoERIs is about the same – around 20. Norwegian centres - at least the CoEs - are thus considerably better funded and more exclusive than the Swedish centres, but are subject to fewer evaluations.

Methodology

To investigate how excellence is operationalised in the centre schemes, I have studied central documents available for the period 2002-2012 – from the calls of the first generation of CoEs and up until 2012, which marks the end of the study. Apart from general white papers I have analysed:

- The calls
- Documents concerning requirements and demands of the schemes
- Criteria of evaluations
- Evaluations

The evaluations used here are:

Norway

- CoE: mid-term evaluation of the first and second generation of centres (RCN, 2006; 2011)
- CoERI: mid-term evaluation 2010 (RCN, 2010)

Sweden

- CoE: the first and the second evaluation of the first generation of centres (SRC 2008; 2012)
- CoERI: the first and the second evaluation of the first generation of centres (Vinnova, 2007; 2012)

The approach to the document analysis is derived from 'template analysis' (King, 2004). Through an iterative process of analysing available documents and referring to literature, I have identified four dimensions of excellence:

1. International impact
2. Social impact
3. Local impact
4. Organisational impact

These were identified by reviewing studies addressing 'excellence' on multiple levels, and a process of mapping all evaluation criteria for the Norwegian and Swedish schemes into a table and comparing them across cases. The next section elaborates the four dimensions.

The schemes differ in their presentation of the criteria and what they emphasise as important. Hence several iterations of the categories were necessary. One important issue is how a criterion in the document was identified. In some of the schemes some criteria are undercommunicated or taken for granted, while in other schemes they are explicit. This means that some criteria might be seen as more emphasised in one scheme and not in another. One such example is that the public documents for Norwegian CoEs pay less attention to the organisational dimension compared with the Swedish. But in the self-evaluation template which the centres have to fill out in front of the mid-term evaluation, organisational criteria are given space. This and similar instances have been taken into consideration in the mapping.

After several reiterations one aggregated table of specific criteria emerged as more or less common across all cases (Table 3). The table is by no means representative for each of the different financing schemes since some criteria are more emphasised in one scheme and less in another, which will be discussed in the result section. One example is the criterion of social

impact. This dimension is explicit in the two CoERI schemes, while it has received little attention in the Norwegian CoE scheme.

In the next stage, overlapping with the former, I went through all available documentation for identifying evaluative statements and comments on the derived criteria for each scheme.

It is important to note that the schemes also have a national impact since they enable a concentration of research resources on the best research groups. This is inherent in the scheme and also communicated as a goal of the scheme itself – at least in the Swedish CoE, and none of the evaluation criteria addresses this explicitly. The national impact dimension of excellence has therefore been left out.

By dividing the criteria into international, social, local and organisational impact, some factors might be lost or not thoroughly handled in the translation. Gender is one such variable. Most centre schemes underline the importance of gender, and call for female centre leaders. After a study of available documentation, it seemed like the quest for gender balance had little or no impact upon the selection of the centres or the issue of continuation of already-funded centres. Hence I decided to omit gender as a variable[9]. Nevertheless, the discussion of whether centre schemes are mainly supportive of older male researchers at the expense of female and young researchers is an important one. This relates to issues of stratification and conservatism in research, but the data in this paper are not sufficient to discuss consequences on the demography of researchers in the centres.

The four dimensions of excellence

The four goals of excellence resulting from the mapping are presented in Table 3. In short the dimensions concern:

International impact, referring first and foremost to international publications of high quality. It is also measured by the centres' ability to attract foreign researchers and international research grants. Keynote invitations to international conferences and international prizes and awards are also signs of international impact.

[9] Other studies have addressed gender issues in centres of excellence. They point to the skewed distribution between gender in the centres as the researchers are primarily male, making the centres into an 'old boys club' (cf Sandström et al., 2010).

Social impact, involving both the expectations of scientific breakthroughs which may benefit the public and incremental innovations. The substantial funding of the centres often includes an expectation of knowledge and technology transfer from the centres to the society and a contribution to economic development.

Local impact, implying that the centres are measures for influencing the strategic priorities of universities. The centre status signals the quality of the universities that have been granted centres. Local impact of the centres is further dependent upon the host's abilities to integrate and cater for the centres.

O*rganisational impact,* concerning several measures. The CoEs and CoERIs are means of restructuring the university through offering possibilities to establish new research units that span institutional and organisational boundaries. Other measures are how the centre is organised and managed both administratively and scientifically.

Table 3 Evaluative criteria in the financing schemes

International	**Social** *(innovation and social relevance)*	**Local**	**Organisational**
Scientific quality; publications, invitations to conferences Prizes / distinctions International research staff Research grants Participation in EU-funded projects and networks Competence profile (viz. international groups) International networks and collaboration	*Knowledge and technology transfer* Possible industrial or social dividends Dissemination strategy (quality of website, public outreach, media, organisation of workshops/conferences) Commercialisation of research results Industrial collaboration Consultancies *Relation to partner* Partner's profile and business interest aligned with centre Create a knowledge basis for innovation related to the partners' business areas	*Host* Increase the strategic capabilities of host *Profile* Value added for host Good visibility and strong identity *Relation to host* Status and role viz. other university units Engaged in education Clarity of formal organisational structure Mechanisms to ensure integration of effects into the broader university structure	*Networks* Cross-disciplinary and organisational developments / collaboration *Organisation* Clarity of day-to day organisational structure (money, research tasks, management, recruitment) Evidence that the structure works Transparency of decision making structure Critical size New technologies/infrastructure Communication strategies (internal in the organisation, to the university and external) Measures taken to stimulate mutual personal mobility Interaction and collaboration strategies with partners (workshop etc) *Leadership/management* Overall head of the project A leadership group Diverse leadership (upcoming/established/gender) Strategies to increase diversity The use of mentoring and leadership training Strategies to deal with risk management (critical people leaving) Advisory board Board of directors An administration with high professional and administrative skill

National differences in evaluating the centre schemes

The first national difference in the centre evaluations concerns the resources spent on evaluating the research proposals. RCN invests considerably more than the Swedish councils and the main emphasis lies on international impact in terms of the CoE scheme and social impact for the CoERI scheme. In the latter, industry joins scientific experts in the review panel. Compared with other project-based grants, the selection process is rather extensive, involving several stages in the application process, which perhaps illustrates the funding agency's efforts to avoid the problem of adverse selection.

Evaluation of on-going centres in Norway and Sweden differs in several ways, especially in terms of the number of evaluations. The three evaluations of the Swedish centres have different objectives. After a year and a half, both CoEs and CoERIs are evaluated on their ability to develop a clear and distinctive organisational structure; in the middle of the period they are evaluated on output dimensions such as international impact and social impact in addition to organisational issues; and the third evaluation is proposed to be an impact analysis of the centre[10]. In comparison, the Norwegian centres are exposed to only one mid-term evaluation during the whole period. The following presents the results of the document analysis according to the four dimensions, first organisational and local impact followed by social and international impact.

Organisational and local impact

In the Swedish schemes, the documents for the first and the second evaluation specify the criteria on a rather detailed level, especially the CoE scheme, of which the criteria by and large have informed the organisational dimension in Table 3. Important dimensions for achieving the goals of excellence in research and innovation here are the relations between the centre, department and host, the organisational structure of the centre and management – both administrative and scientific.

The funding agencies' need for scrutiny of the centres has at least two obvious explanations. First, the Swedish schemes do not require a co-location of researchers and most centres have virtual collaboration. This means that the majority of the centres involve researchers who are still located within their home department, which makes the centre grant reminiscent of a project grant. Accordingly, to distinguish centre activities from the 'ordinary' activities of the

[10] It has not yet taken place

researchers, the centres have to show the establishment of a formalised organisational structure. Second, and interrelated with the first, is the structure of the Swedish research system with its multiple research councils and funding agencies. The low degree of block-grant funding has, amongst other things, meant that grants from several funding agencies are used by researchers to fund their positions and research projects which sometimes overlap in goals and means. To ensure that the grants are used according to the contract, the SRC has incorporated mechanisms to penalise the centres that do not fulfil the intentions of the CoE scheme by a reduction of the grant. And conversely, if the obligations are fulfilled and the centres demonstrate a propensity to be and become even more excellent, they can be rewarded by an increase of the grant.

Regarding the local impact of the governance instruments, SRC emphasises the relationship between the host and the centre; it is important that the universities cater for the centres and give them the opportunity to excel. In the Swedish CoERI scheme, the commitment of the host is covered in the ex-ante evaluation of the proposals where the host has to complement the centre application by a description of its intention to integrate and cater for the centre. Compared with the Norwegian CoERIs, organisational impact is given more attention in the Swedish scheme. Yet the organisational impact dimension has few criteria, perhaps illustrating Vinnova's and RCN's difficulties in assessing or generating standards for the design of organisational structures and practices for interaction between university and industry. Another explanatory factor may lie in a research council's lack of control over the industrial partners. Therefore the central element in the first evaluation of the Swedish CoERIs is the innovation process and a linear description of how the ideas are developed into results.

Whereas the Swedish schemes are rather specific in their evaluation criteria, the Norwegian ones are open and less detailed. In the mid-term evaluation of the CoEs the main emphasis is on international impact, and social impact concerning the CoERIs. Regarding organisational impact, an interesting observation in the Norwegian CoE scheme is that the evaluators were asked to compare the different ways the centres were organised, but it was emphasised by RCN that this would not in the end 'be used in any decisive manner for the evaluation results of the individual centres' (RCN, 2006 p.50). However, the centres that have been ranked lower than 'exceptionally good' have received this score due to organisational matters (RCN, 2011; RCN, 2006). Despite RCN's downplaying of the importance of organisational and leadership dimensions, the evaluation group emphasises these as very important aspects of

excellence. This has not been taken into account in the evaluation criteria for the next generation of CoEs (RCN, 2011), reflecting that organisational impact dimension is less emphasised by RCN, although evaluated nonetheless.

RCN's seemingly 'laissez-faire' attitude concerning organisational issues might have its origin in the preferred model of physical co-location of researchers. A physical move of researchers out of their home department may be anticipated by the RCN to generate organisational and institutional dynamics in itself. As such the organisational dimension might be regarded as an implicit dimension in the scheme. Insofar as this might be the case, studies reveal that the model of co-location contributes to challenges and potential tensions at the host institution, generating *local impact* (Langfeldt et al.2010).

Contrary to the Swedish councils, RCN does not possess any control mechanisms for rewarding or penalising centres' achievements, even though the schemes are more exclusive mechanisms in Norway, with fewer entities and more substantial funding. This increases the pressure on RCN to select the right centres and might reduce the propensity to select proposals characterised by high risk, and raise the bar for terminating funding to centres which do not deliver according to contract.

Social and international impact

The second evaluation of the Swedish CoEs and CoERIs takes place after approximately five years of operation. Apart from scrutinising the organisational features, the CoE scheme also emphasises the local, social and international impact of the centres. It examines the relationship between the centre and the host institution thus emphasising the important role of the host in supporting the centres. The success criteria of the CoERI scheme are primarily preoccupied with social and international impact (Vinnova, 2012).

The demand for social impact is toned down in the Norwegian CoE scheme, evident in this quote from the mid-term evaluation: 'the centre's research results may also open opportunities for important industrial and social dividends' (RCN, 2011 p. 37). A possible explanation might be that this is perceived by RCN to be taken care of in the CoERI scheme and that high scientific quality should be the prime objective of the CoE. Another is that this is a result of the critique of the first call where relevance was a criterion. Yet, the Swedish CoE scheme has strategies for dissemination and outreach as a criterion and the second evaluation emphasises outputs like patents, licences, consultancy etc. It is argued that the substantial investments in

forefront research generate expectations for strategic science communication, dissemination and technology transfer.

Social impact is, however, an inherent part of the Norwegian CoERI scheme, as the research shall contribute to 'social ramifications over and above partners' participation' (RCN, 2009 p. 9). Relating to Table 3 above, both CoERI schemes emphasise social and international impact of the centres. The centres are research-driven and expected to deliver high scientific quality and at the same time contribute to innovations benefiting their partners and the wider society.

International impact is important in all schemes, and is perhaps most explicit in the Norwegian CoE scheme. Apart from being the main goal of the centre scheme, the guideline of the evaluation states that:

> The assessment will primarily focus on the scientific quality and science production of the centres, including the generation of original scientific ideas and the promotion of these ideas. Publications, impacts of publications, establishment of (international) networks and output of doctoral candidates and post docs are important criteria (RCN, 2010: 36)

All schemes emphasise the propensity for scientific innovation, but only one, the Swedish CoE scheme, has dedicated funding to proposals characterised by high risk. These are proposals submitted by, for instance, young researchers with few merits, or by researchers in an emerging field. They can be granted lower bulk funding and if research prospers, the SRC will increase the grant. Given that peer review processes and expert groups control for risk (Luukkonen, 2012), this flexibility can be an important mechanism to inhibit the potential bias of conservatism and stratification in the process of evaluating the proposals. In comparison the Norwegian schemes do not demonstrate such flexibility. Scientific innovation is, however, claimed to be more emphasised than previous scientific track record (NFR, 2005).

The above demonstrates that the schemes differ within and between the countries. Taken together the governance instruments, broadly speaking, target different dimensions of excellence. All impact dimensions are clearly articulated in each scheme, but some are more emphasised than others. Table 4 summarises the main differences between the national schemes

Table 4 The dimensions of excellence primarily emphasised in the different schemes

International	Social	Local	Organisational
The Norwegian CoE scheme	The Norwegian CoERI scheme	The Swedish CoE scheme	The Swedish CoE scheme
The Norwegian CoERI scheme	The Swedish CoERI scheme	The Swedish CoERI scheme	

In the next section I will discuss the ways in which the national funding systems influence the funding agency's emphasises on the four dimensions of excellence.

Discussion

From the above it is apparent that both the national research system and the size (funding and numbers of centres) of the governance instrument affect which dimensions are emphasised by the principal (funding agency). To analyse the differences and similarities between the centre schemes and how the specific features of the national research systems can explain these differences, principal-agent theory is here applied, with special attention to the potential problems of moral hazard and adverse selection. Based on the results above, Table 5 provides an overview of the impact dimensions of excellence and the potential principal-agent problems they pose. It further underlines the prime goals inherent in the dimensions and the potential consequences, both negative and positive, of emphasising the impact dimension. The table is elaborated and discussed below.

Table 5 Possible principal-agent problems of the impact dimensions

Impact dimension	**Prime goal**	**(potential) Consequence**	**Principal Agent problem***	
			Adverse selection	Moral hazard
International	High quality scientific publications International key-note speaker and awards International research staff	Stratification Conservation Renewal International recognition	Principals guard the selection by prioritising centres characterised by low risk	Centres include all members publications not only those financed by the centre
Social	Knowledge and technology transfer Innovation	Tension between research excellence and innovation Synergies between excellence and innovation	Selecting centres which have innovation potential	Low interaction between the partners Prioritising one practice over the other (publication vs innovation)
Local	Strategic priorities Branding of the university profile	Universities become strategic actors		Universities do not take their host responsibility seriously and centres are not given the opportunity to grow
Organisational	Networks Organisation Leadership	Potential to span organisational and institutional boundaries No new research units, a continuation of existing research	The choice of organisation model (co-location vs virtual collaboration)	Does the grant generate new activities and new organisational structures, or a continuation of already existing activities?

The centre schemes in Norway represent relatively substantial investment in a research system where this type of funding is rather uncommon, at least compared with Sweden, where the schemes are one of several potential funding sources. Furthermore, centres are half the number of the Swedish ones and these two factors seem to contribute to the Norwegian CoE scheme having a significant impact on national research landscape (Langfeldt et al., 2010). The CoE scheme is a means of concentrating research funds on the best environment independent of scientific field, a previously highly controversial goal in Norway, due to a

political climate which is largely based on equality. Fortifying this perception is the principal's emphasis on the international impact of the centres, a goal characterised by a low degree of goal conflict between the principal and the agent. Few scientists will disagree with this goal since they need reputation-building and seek recognition from their intellectual peers for the significance of their research results (Whitley, 2003; Latour and Woolgar, 1987). Yet, emphasising primarily international impact has some potential (negative) consequences. As Table 5 shows, to ensure the selection of the best candidate, and to avoid the problem of adverse selection, this strategy can lead to stratification and a conservation bias in science at the expense of innovation (Merton, 1968; Luukkonen, 2012). This is perhaps even more salient since the principal has not developed any control mechanisms to allow for high-risk blue-sky research like its Swedish colleague SRC. Nor does it have any sanction mechanisms, which implies that closing down a centre is unlikely because that would mean that the principal did not select the best candidate, thus questioning the abilities of the principal.

Another issue is that the principal might run into the problem of moral hazard if emphasising international impact. Several CoEs and CoERIs experience cumulative advantages in terms of attracting other research grants (Langfeldt et al., 2010; Schmoch and Schubert, 2009). In addition the majority of the researchers are only affiliated to the centres for a certain percentage of their research time. Together this complicates the procedure of reporting publications resulting from the CoE/CoERI grant, since papers usually acknowledge more than one funding body (Rigby, 2011). To report all publications of the affiliated researchers seems to be an institutionalised practice, hence inflating the list of publications. However, this problem is not unique to the CoE and CoERI schemes and it is a practice that is well known to the principal.

One of the prime goals of the CoERI scheme is social impact. For the principal, this poses both the problem of moral hazard and the problem of adverse selection. Selecting the right centres is again important in order to legitimate public investment in the centres. As a safeguard, the principal might pursue a strategy of selecting proposals where researchers and the partners already have an institutionalised collaboration. Such a strategy can, as in the case of international impact, reduce the propensity to allocate centres to more risky areas and might in the end contribute primarily to incremental innovations. However, it is difficult to predict the strength of the relationship between partners, and the principal might run into issues of moral hazard if the collaboration in the centre is weak, which decreases the potential for knowledge and technology transfer between university and industry (NN and NN work in

progress). Moreover, the emphasis on both international impact and social impact might result in more attention to one dimension than the other – for instance the centres can target scientific publications instead of focusing on knowledge and technology transfer (NN et al. forthcoming).

In Sweden, local and organisational impact seems to prevail in the principals' operationalisation of excellence, and these goals are primarily characterised by problems of moral hazard. Regarding local impact, the Swedish CoE scheme is explicitly an instrument to restructure universities, to make them prioritise strong research environments and groups. However, to the universities the schemes are branding mechanisms and it is in their interest to maximise the number of centres. This strategy can have a negative impact on the centres and their working conditions since the universities have little room for action as a result of, amongst other things, a low degree of block grant funding.

The Swedish financing system seems to be an additional explanation for the principals' emphasis on organisational impact. Research is funded through plural grants and in order to prevent the problem of moral hazard - the agent might not pursue the proposed research project but rather invest the resources in other parallel projects and support already established activities and practices - the principal scrutinises the organisational structure. This further relates to the fact that the Swedish schemes primarily support centres based on virtual collaboration.

The principals' scrutiny of organisational and local impact has some potential consequences. In order to satisfy the requirements of the principal, the centre can symbolically adapt a new organisational structure while activities and practices continue as before (Meyer and Rowan, 1977). The evaluations of some of the centres indicate that the centres exert signs of organisational identity by having their own logo and a webpage, but that the affiliated researchers might not identify with the centre. Another consequence, and perhaps more important, is that the scrutiny might ensure that multi-disciplinary centres involving researchers from different departments, faculties, universities and sectors are closely followed up by the funding agency which can prevent or solve potential conflicts between the actors involved.

Although the Norwegian schemes emphasise international and social impact, the principal's preference for co-location of researchers in both schemes can contribute to institutionalising the centres to a greater extent than the virtual ones, as co-location reduces barriers for contact

and facilitates interactions among colleagues (Heinze et al, 2009). As such the principal can avoid the problem of moral hazard. However, a co-location of researchers who often represent different departments might need more scrutiny of organisational and local impact than appears to be the case. The mid-term evaluations of the centres show that establishing new units across departmental structures can cause organisational challenges and tensions between and within departments and the centres. In this process a scrutiny by the principal can be an important tool in securing the commitment of the hosting organisations.

Conclusion

The goal of this paper has been to show how apparently similar governance instruments aiming at excellence in research and innovation produce different outcomes in two distinct national research systems. By analysing how excellence is operationalised in the governance instruments Centres of Excellence (CoE) and Centres of Excellence in Research and Innovation (CoERI), a conceptual framework involving the dimensions of international impact, social impact, local impact and organisational impact has been developed. An examination of the Norwegian and Swedish CoE and CoERI shows that the specific features of the national research system have an impact upon both the design of the governance instruments and what funding agencies emphasise in their steering towards excellence. In Norway, international impact is given special emphasis along with social impact for the CoERI scheme. In Sweden, on the other hand, organisational and local impact are important together with social impact. These differences are explained here by applying principal-agent theory and the problems of adverse selection and moral hazard. Since Sweden has a highly competitive funding system compared with Norway, one explanation for the differences between the governance instruments in the two countries seems to be that the diversity of funding agencies, combined with plural possibilities of long-term grants, induce the funding agencies to primarily scrutinise the organisational and local impact dimensions of the centres in order to control for the problem of moral hazard, i.e. researchers' propensity to deviate. This does not pose a challenge in Norway, whose funding system predominantly comprises block grant funding and competitive funds are administrated by one research council. The prestige of the CoE and CoERI schemes, as they involve generous and long-term funding (more than the Swedish), seems rather to pose the problem of adverse selection - to ensure that the right agent is selected.

In conclusion, I would like to point out that the schemes are powerful instruments that have the potential to change the national research landscapes through their concentration of

resources and competitive aspect. They further have the potential of fertilising multi-disciplinary research over a long time period. Given these characteristics and potential impacts, findings of this paper indicate that policymakers and funding agencies may benefit from introducing some sort of flexibility into the criteria of the schemes in order to avoid potential negative impact and to lower the threshold for terminating centres that do not fulfil the expectations of the schemes. One measure is to introduce sanction mechanisms that increase and reduce the grants and this can control for the problem of adverse selection. Another, that might contribute to reduce a conservation of science, is dedicated funding to proposals that represent multi disciplinarity and high-risk research that otherwise most likely would be ruled out by the peer-review process.

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RESEARCH PAPER

Who commercialises research at Swedish universities and why?

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European universities have been increasingly pressured since the late 1990s to make a more visible contribution to economic development. This policy interest has produced an increasing focus on knowledge transfer generally, and more specifically on measures to promote a research culture which values patenting and firm formation. This paper presents results from an interview study of academic faculty views on knowledge transfer and commercialisation at five public universities in Sweden. Our results show that, despite the retention of inventor ownership at Swedish universities, there is a high degree of knowledge transfer of all kinds. The overriding driver of entrepreneurial behaviour among faculty appears to be the low level of direct funding for research in universities. We find that attitudes to firm formation vary from positive to ambivalent, and that faculty from the humanities and social sciences engage in a higher level of entrepreneurial and policy adaptive behaviour than they report. We conclude that faculty at Swedish universities perceive the role of public servant and entrepreneurial academic as conflicting. This perceived conflict may be one reason for reluctance to report instances of commercialisation of research.

Introduction

Research on research and innovation policy converges on the observation that there has been a shift in the policy perspective on the role of science in society. One of the more persistent manifestations of this shift is the increasing policy focus on changing the institutional context of public science in order to facilitate more collaboration between science and industry and the commercialisation of academic research. This is reflected in the upsurge of research on technology transfer and other issues related to the commercialisation of academic research. Research in this area may be divided into four categories: research on the changing perception of the role of science in society (Gibbons *et al*., 1994; Guston, 2000); empirical studies on the changing institutional context of science in specific fields or countries (Argyres and Liebeskind, 1998; Whitley *et al*., 2010); critiques of the impact of the ethos of commercialisation of science on the academy (Jacob, 2009; Kleinman, 2010; Biddle, 2011); and empirical studies of the impact of rule regimes for promoting commercialisation (Mowery *et al*., 2001; Agarwal and Henderson, 2002; Geuna and Muscio, 2009). The last is an increasingly heterogeneous area in which research on the micro foundations of university entrepreneurship is an emerging sub-specialisation.

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This paper takes its point of departure in this emerging tradition of the micro foundations of entrepreneurship in that it focuses on the factors that motivate individual researchers to commercialise their research results. The paper contributes to the analysis of entrepreneurship in universities by: (i) deepening our understanding of what meanings researchers ascribe to the commercialisation of research and their reasons for engaging in this activity; (ii) improving our knowledge of the variety of ways in which the commercialisation of research results occur; and (iii) providing insight into what types of knowledge transfer and commercialisation activities are undertaken in a context where academics still own the intellectual property derived from their research results. The empirical reference of the study is Sweden, a country with a high level of public and private investment in R&D and a tradition of inventor ownership of intellectual property.

Since the early 1990s, European governments have emphasised that public universities need to make a direct contribution to innovation and that an important goal of innovation policy is to facilitate this contribution. Inventor ownership of intellectual property was identified very early in the debate as an important obstacle to knowledge transfer and the commercialisation of research results from universities. One outcome of this was an upsurge in legislative activity aimed at removing 'professors' privilege'.[1] Germany, Austria, Denmark and Norway changed legislation to make arrangements for universities to own the intellectual property accruing from employees' research.

Sweden is one of the few countries that has retained inventor ownership, within a system that emphasises knowledge transfer and commercialisation of university research. The Swedish university sector is public, which means that state and regional policies that promote university participation in the innovation system are, other things being equal, important factors in shaping expectations of science in society. Taken together, these contextual factors make Sweden an interesting case for understanding the drivers of knowledge transfer and commercialisation from universities in cases where universities do not own the intellectual property of their employees. This information is useful in itself, but may also be of instrumental value to resource-strapped countries intent on promoting commercialisation but for various reasons wishing to forego the legislative route.

Data for this paper were collected through interviews with 88 Swedish university researchers and technology transfer personnel. The interviews allowed researchers to talk about the commercialisation of research results in their own words. The rest of the paper is divided into six sections, the first of which provides a description of the Swedish context in order to give the reader a point of reference for understanding the interview data. The second section features an overview of the literature with particular reference to studies of commercialisation of research results. This is followed by a description of the method used for collecting data for this study. The two following sections present and discuss the results and the final section concludes the paper.

The Swedish context: promoting commercialisation

Sweden spends just under 4% of its gross domestic product on research. Of this, about 65% is private corporate funding and about 28% is public funding.[2] The rest comes from non-domestic sources, including foreign firms and the European Union. The university sector receives the majority of available public money for research.

The main reason for this is that the university sector is the largest provider of knowledge in Sweden. Competing sources, such as research institutes, are less important than they are in other European countries and the US. The research financing sector is heterogeneous and includes major public research councils, several private charities and large established R&D-intensive companies.

In 1997, the Swedish government amended the university charter to include a third mission (apart from research and teaching) as a core task of universities and university colleges. This amendment was intended to promote faster and easier transfer of knowledge from universities to industry and the public sector. Initially, the third mission comprised three tasks: support of the national innovation system (commercialisation, R&D support to companies, etc.); civil education (promoting democracy, sustainable development and gender equality); and increasing student employability. No special funding was designated for this third mission.[3]

Higher education is free in Sweden[4] and the state remunerates universities per student. It is a monopsonic market in that the state is the largest customer and also the regulator. Fees are differentiated according to area of study, not service provider. University budgets are divided into two mutually-exclusive streams, research and teaching. However, students (particularly post-graduate students) are often enrolled in research activities. The bulk (over 60%) of research funding is allocated competitively through the research council system and the recipients are individual academics and research groups. The rest of the research funding goes to universities as a block grant. Since the 1990s, this allocation has increasingly been based on performance (mainly level of income raised in competitive research and publication performance).

Swedish researchers are also required to collaborate and/or seek funding outside the university context. Doctoral students are an important part of the research system in Sweden and the majority of them are funded through grants and projects rather than from institutional funding. Because direct institutional allocation of research funding is low, individual researchers may need to apply for funding to support activities that, in other research systems, are available through institutional allocation; for instance, conference travel and sabbaticals. This means that researchers will, of necessity, be more responsive to research policy signals. A third feature is that the small size of the research institute sector in Sweden, together with the historical struggle over sectoral research, has meant that universities perform a great deal of applied research.

In the wake of legislation on the third mission, many universities began to focus attention on organising their technology and other knowledge transfer activities and created holding companies for assisting faculty with these tasks. The holding company solution was necessary because, as Swedish universities are public authorities, they are not allowed to accumulate capital. For more than a decade now, Sweden has had an on–off debate about the removal of professors' privilege. Despite several commissioned reports on the subject, the state has made no decision on this issue.

Transferring knowledge and commercialising research

Several authors have called attention to the fact that studies of third mission activities at universities have been narrowly focused on technology transfer. This is seen as especially problematic for a number of reasons. Of these, two are significant for this paper. The first is that patents, licences and spin-offs account for a relatively

small part of knowledge transfer from universities (Cohen *et al*., 2002; Schartinger *et al*., 2002; Bekkers and Bodas Freitas, 2008). Second, the formal rationale for introducing the third mission is knowledge transfer and while this does not rule out technology transfer, the two are not identical. In fact, technology transfer is only one of several potential mechanisms through which academic inventions diffuse to the rest of society (Litan *et al*., 2007). Some significant others include collaborative and contract research (Meyer-Krahmer and Schmoch, 1998; Perkman and Walsh, 2007; D'Este and Patel, 2007), personnel exchange (university faculty working in industry and *vice versa*) (Gübeli and Doloreux, 2005), informal networks and communities of practice (Meyer-Krahmer and Schmoch, 1998; D'Este and Patel, 2007), and paid and unpaid consultancy (Amara *et al*., 2013). Bekkers and Bodas Freitas (2008) argue that the type of knowledge transfer preferred is dependent on a number of factors. For instance, the more codifiable the form of knowledge, the more dependent knowledge transfer will be on patents, publications and other codified modes. Similarly, informal contacts and networks are more common in areas where knowledge is tacit and uncodified. Given the foregoing, this paper defines knowledge transfer to include all activities in which knowledge from academe diffuses to other actors. Technology transfer is defined as transactions which involve the diffusion of codified knowledge (e.g. patents and licenses). Commercialisation of knowledge is defined as the exchange of knowledge for money. Thus, technology transfer is one type of commercialisation.

Faculty in European public universities have traditionally performed all kinds of knowledge transfer tasks, but not as part of their core obligations. Despite evidence of attitudinal changes, the majority of European researchers still regard teaching and research as their main duties. Knowledge transfer beyond that embodied in education, scientific publication or popularisation is gradually increasing, but the role of academics here is a contentious issue (Foray and Lissoni, 2010; Kyvik, 2013).

European policymakers have therefore seen the primary challenge in innovation policy as one of getting university academics to accept that they have an obligation to make a direct contribution to innovation. A direct contribution to innovation refers primarily to: (i) providing industry/the public sector with services, technical solutions and devices; (ii) providing expertise to actors outside the university (primarily firms); and (iii) doing applied research that contributes to meeting societal challenges. The wide range of activities that is implied by the above definition is one of the reasons it may be useful to use the term 'knowledge' rather than 'technology transfer' to describe these activities.

The effort to promote the above activities in European public universities may be seen as an ideological exercise involving both policy and research. Policy was able to draw on other policies and the example of the Bayh Dole legislation in the United States played an important rhetorical role in legitimating imitative legislation. Policy also drew on research which argued that the linear model was no longer a viable inspirational guide for science policy, and that if science was to contribute to public welfare, it had to collaborate with other actors. The case for collaboration also found resonance in other academic perspectives. Gibbons *et al*. (1994), for instance, argued that academe had already moved towards what they called Mode 2 knowledge production. One of the defining characteristics of Mode 2 is that academics produce knowledge in collaboration with other actors.

These and other arguments provided the resources for creating a case that the academy had an obligation to engage in knowledge transfer that would make a direct contribution to innovation. Efforts were made to institutionalise this in universities via incentive schemes that promoted collaboration with industry and pressured universities to include indicators such as the number of patents produced in their performance appraisal routines for academic staff. The focus on patents and collaboration may arguably be said to have taken on an exaggerated importance in relation to other aspects of knowledge transfer, mainly because of the ease with which they could be counted. Regardless of its origin, however, the shift from knowledge to technology transfer challenged the received view that university science is at its best when kept in the public domain and when faculty are not pressured to fashion their research agenda to market factors (Chorafakis and Pontikakis, 2011).

While faculty are not against technology transfer and other types of commercialisation of research results, they do tend to be rather guarded about attempts to promote the commercialisation of research (Martinelli *et al*., 2008). However, few studies have investigated researchers' reasons for involvement in commercialisation and collaboration with non-university actors (Lam, 2007; Bodas Freitas *et al*., 2012). A notable exception is Lee (2000), who, in a study of university–industry research collaboration, found that faculty collaborate with non-university actors for a variety of reasons, the most predominant of which include securing funds for research assistants and Ph.D. students, gaining insights into their own academic research, testing/applying theory, and supplementing funds for their own research (see also Duberly *et al*., 2007). Researchers, particularly those affiliated with technical universities, tend to treat commercialisation as a natural part of their activities (Jacob *et al*., 2003), while others treat commercialisation as a necessary evil that can increase their revenue flows, especially in the light of reduced block-grant funding to universities (Whitley *et al*., 2010).

Commercialisation is not a new phenomenon, even for European universities, despite the received view among European policymakers that their universities are far from efficient at commercialisation, at least when compared to their US counterparts. Thus, given the substantial ambiguity about the outputs of commercialisation and the ambivalence that surrounds the activity, there is an increasing interest in ascertaining what are faculty's views of commercialisation and why they engage in it. By treating commercialisation as just one aspect of a broader set of activities – knowledge transfer – we believe that we can provide a nuanced understanding of faculty views on the subject.

Method

We interviewed researchers and staff engaged in technology transfer at five Swedish universities. The five universities chosen reflect the heterogeneity of the national university structure in terms of age, location of the university and range of disciplines. The sample excludes technical universities and business schools that are not part of research universities.

The sample of interviewees includes researchers from all disciplines engaged in knowledge transfer activities and personnel working in this area. We identified and cross checked interview candidates through a number of procedures. First, we asked personnel from the research administration offices at the respective universities to provide an initial list of potential interviewees. This list was checked with univer-

sity web sites and with the Swedish research councils. We targeted in particular those councils that explicitly profiled themselves as promoting collaboration. In addition, we asked interview candidates to identify other potential interviewees. Our final list of interviewees was 100 divided equally across the five universities. Of these, 88 agreed to be interviewed; 14% of those interviewed were women, the majority of these staff who worked specifically in technology transfer and third mission activities. Senior academics in Sweden are still generally male and male faculty are more likely than female to take risks, such as engaging in commercialisation (Link *et al*., 2007). The final sample included 64 researchers and 24 administrators. Table 1 shows the distribution across the different disciplines of the researchers interviewed.

We used a structured interview guide, including such questions as 'What do you consider to be commercialisation of research results?' and 'What incentives are there at your university for promoting the commercialisation of research results?'. All interview data were recorded and transcribed. Two people coded the data independently and three dominant themes were identified. The first had to do with the definition of commercialisation and what activities faculty perceived to be included in this category. The second related to the motivation of faculty to commercialise. The third theme is the role of faculty ownership of intellectual property in determining faculty attitude to commercialisation. We grouped the answers into dominant categories and looked for within-group similarities coupled with inter-group differences (Eisenhardt, 1989). We used interviews with technology transfer personnel to check background variables that can differ across universities, such as differences in technology transfer office policies and in the organisation of responsibility for third stream activities.

Results

What is commercialisation?

Several of the interviewees had difficulty defining commercialisation, despite the intensive debate that exists around the subject nationally and despite their own strong views on the subject. We have managed to put their responses into five categories (Table 2). Table 3 shows how these categories are distributed among the various scientific fields.

From Table 2 it is evident that the majority of the interviewees, independent of field affiliation, perceived commercialisation as products, patents and spin-offs. However, there is great variance in the answers; some interviewees emphasise the importance of collaboration with industry while others are rather limited in their definition. One illustrative response is: 'Commercialisation happens in many ways;

Table 1. Distribution of interviewees by discipline

Disciplines	Interviewees
Life sciences	9
Science	19
Social sciences and humanities	17
ICT and technology	19
Total	64

Table 2. Categories and definition of commercialisation

Categories	Definition includes
Technology transfer	Products, patents, licences and spin-offs
Consultancy	Consultancy
Knowledge transfer	Diverse activities, including technology transfer, educational programmes, books
General	Books
Other	Education and 'document effects'

Table 3. Researchers' definition of commercialisation

Fields	Technology transfer	Consultancy	Knowledge transfer	General	Other
Life sciences	4	1	2	2	
Science	9		4	3	3
Social sciences and humanities	8	3	4	2	
ICT and engineering	7		9	3	
Total	28	4	19	10	3

one is through collaboration with industry, and then one can exploit the knowledge gained in the collaboration through commercialisation of products and services'. Another said: 'This must be unique knowledge which can be protected through a patent and then you need a commercialisation strategy', and a third responded that: 'I think it is only spin-offs that can commercialise, to use knowledge and technologies to generate a product'. These quotes are representative of all fields. Faculty that employed technology transfer as a definition of commercialisation tended to regard commercialisation as exchanging knowledge for money. Consultancy was not widespread as a definition of commercialisation, but those who used it employed consultancy as their only definition of commercialisation.

The other major group comprised those who employed a broad definition of commercialisation, which included both codified and tacit knowledge transfer. An illustrative response is:

> That is product development, of course, and concept development and consultancy …. We do sell executive training programmes as well. But for us it is more about knowledge transfer which affects the industry's working methods.

The majority of interviewees in the fields of ICT and engineering are found in this group. One possible explanation may be that researchers in these fields have a tradition of close collaboration with other sectors, such as industry. Only three of the interviewees (all within the field of science) employed a definition of commercialisation that did not correspond at all to the major categories. These three perceived commercialisation as education of students and 'documenting effects', and did not include anything else in their definition. We treat these answers as outliers.

Few of the interviewed faculty were negative towards commercialisation and those who were came from all faculties and had different reasons for their attitude.

Some perceived applied research as less academic than other research and some reacted negatively to the term 'commercialisation' itself. However, several of the interviewees in the humanities and the social sciences groups were reluctant to define their own work as commercialisation – even though they performed activities that they had defined as commercialisation. In general, academics in the humanities and social sciences shared the view that commercialisation and third mission activities were easier for natural scientists as they could protect their work. This view was held by the natural scientists as well. According to one respondent:

> … [commercialisation] is necessary so that the knowledge will have a continued life. If not, you will end up in some sort of humanistic faculty that will die slowly. And this is the strength of the natural sciences – that it has been possible and still is, to commercialise large portions of the knowledge.

Generally, faculty from outside the humanities perceived their colleagues in the humanities to be uninterested in, and negative towards, commercialisation. Many held the view that faculty from the humanities do not participate in third mission activities or knowledge transfer activities, and that research in the humanities is very specialised, narrow and of little interest to society at large.

Incentives and motivations for commercialisation

The general consensus among faculty was that there were few incentives for university researchers to participate in third mission activities. Some interviewees at one regional university claimed that third mission activities were integrated in the evaluation of candidates for professorships, but this appears to be the exception rather than the rule. The general view is that the university is rather poor at handling commercialisation, as the incentive mechanisms are more or less absent.

Some faculty perceived a change in the attitude of their peers, who had become more positive towards non-university actors. One quote is illustrative:

> When I started working here, if I went to one colleague and said, 'Can you work with a report?', I got the response, 'Why should I do that?' Today they meet me more often with a 'Yes, that is interesting'. Well, first you have to see how you might exploit this in your daily work. You'll get living examples for teaching or you might use the empirical data in your own research, and I think that is great. … More and more share this perception.

Almost all of the interviewees had contacts with non-academic organisations. The majority of those in the humanities and social sciences had networks consisting of public organisations and research councils. Less than half of these interviewees had industry contacts, and of these, all maintained that the contacts were important for obtaining projects for Ph.D. students. The major motivations for contacts with public organisations and industry were obtaining data and feedback into ongoing research, and identifying new research areas and research questions. However, many faculty members from the humanities and social sciences had companies which they used for consultancy. These companies and the activities associated with them were seen as separate from their research at the university. Natural scientists shared the need to get access to other environments to fund or provide research problems for their students. They reported theory testing and documentation of effect as

additional reasons for collaboration. Those working in the applied sciences and engineering often reported that without collaboration with industry, they would be unable to perform research at all.

Intellectual property and spin-offs

All the researchers interviewed approved of Sweden's arrangements for intellectual property rights in universities. However, those working with technology transfer in an administrative capacity cared little for a legal regime which gives researchers the right to intellectual property arising from their research. The rationale for this position was that academics should not be treated differently from employees in other sectors of working life and should not have the opportunity to earn revenue at the expense of the tax payers. Researchers cite the professors' privilege as the single most important incentive to engage in commercialisation of their research: 'If the university should own the IPR, commercialisation of research would be of no interest for the individual researcher, if so it would be better to pursue the academic road'. However, pursuing research that might have commercial potential is both risky and time consuming:

> You have the Swedish problem in that we get too little technology transfer out of the research. But, there is a simple reason for this; there are too many risks in spinning out research …. You might lose your job, your income, and you will put yourself in a situation where your income will be insecure even though you succeed in getting external financing from day one, and you lose the prestige within the career which you originally chose.

The general view was that firm formation and commercialisation are not for everyone and was best left to risk takers. Some entrepreneurial researchers were actually criticised by their peers: 'You should not be doing extracurricular activities that compete with ordinary activities'. There were further dangers: 'What is research and what is commercialisation? You might get suspected for doing product development, when you are supposed to be devoted to research'. Nevertheless, many reported higher credibility in the university and in industry as a result of having been successful in establishing firms.

Discussion

Our initial concern in this paper has been to establish how researchers define commercialisation and what motivates their participation in commercialisation. Our results show that faculty from the humanities, social sciences and natural sciences tend to define commercialisation as technology transfer, but there are important differences beyond this shared definition. The difference is first and foremost related to the significance attributed to intellectual property rights in faculty understanding of commercialisation and what is desirable commercialisation. The coupling of commercialisation with intellectual property rights poses more problems for those in the humanities than it does for researchers in the social sciences, natural sciences, medicine and engineering. Much of the commercialisation activity associated with knowledge transfer in the humanities is so well integrated into the everyday work of researchers and their students that it would be difficult to distinguish between knowledge with a commercial purpose and knowledge that is fundamental in

teaching and research. This is certainly not to say that knowledge creation in the humanities has no commercial relevance; researchers in the humanities do a great deal more consultancy and other types of commercially-oriented knowledge transfer than is commonly believed.

Researchers from all areas give disproportionate attention to patents in defining commercialisation of research. This may reflect the fact that policy signals and incentives give considerable weight to patents. Or it may be that arguments advanced by researchers about commercialisation are deliberately crafted to position the researcher and third mission activities in a space that is protected from the problems associated with commercialisation. This may be for a number of reasons that go beyond identity issues, such as the grey zone in which commercialisation of research exists in a context where researchers are themselves public servants.

Why commercialise research results?

While the official policy arguments for commercialisation in Sweden are linked to growth and dissemination of knowledge, universities and their faculty have other reasons for engaging in knowledge transfer and commercialisation. The most common reason advanced by faculty, regardless of subject area, is that they need funding for their research and their students. This is a consequence of the national research policy in Sweden, which favours competitive project or programme-based funding to the individual researcher or research group rather than block allocation to the university. A second reason is that commercialisation is simply an artefact of collaboration, which is necessary for access to problems, data and so on in some research fields. While this situation is more common in the biological sciences, engineering and nanoscience, it is also evident in areas of the social sciences and humanities. A third explanation may be found in the public R&D structure of Sweden, and this is that Sweden is an R&D-intensive country with a high level of corporate and public R&D expenditure. The university is seen as the main provider of knowledge, and there is much interest in collaboration with universities. The fact that all doctoral students have to be fully financed in order to gain admission to doctoral programmes also provides strong incentive for collaboration.

Faculty ownership of intellectual property and commercialisation

The debate in Europe about the university's role in society gives a great deal of attention to intellectual property rights and firm formation. Sweden conforms strongly to this norm with one exception and this is its retention of the right of researchers to own the intellectual property that accrues from their research. Our results show that this is a contested issue. The main difference of opinion is between technology transfer personnel (who are convinced that the incidence of firm formation would increase were universities rather than individual faculty to own intellectual property accruing from research) and researchers (who see their continued ownership as an important incentive for engaging in commercialisation activities).

The ambivalence reflected in researchers' accounts of firm formation in particular may be attributed to such issues as the conflict between the ethos of open science and the personal income that may accrue from firm formation. This ambivalence is also related to faculty ownership of property derived from public

investments and is the retention of professors' privilege. However, this is only a small part of the picture, as both our research and that from other Nordic countries show that a host of other conflicts arise from attempts to establish spin-offs from university research (see Tuunainen, 2005). This is understandable given that the financial model for university research in Sweden transfers a significant percentage of the costs of doing research to the research group. Faculty may thus perceive research materials that are collectively owned as not belonging to the employer *per se*, but to the research group because of the large overhead costs that are levied on research grants. Spin-off creation separates the group which forms the company from the wider research community and this may spark disputes over who has rights to what in a way that other types of commercialisation may not.

Second, there is a tension between the researcher and the university. The majority perceived the university as positive to commercialisation in general, but recognition of commercialisation as part of the role of a researcher was not uniform. Some departments provide explicit, though few, incentives (such as temporary leave of absence and credit within the merit system), but not all. There are similar variations among universities. Further, it is unclear what kind of weighting this factor is given *vis-à-vis* the more traditional outputs (such as number of Ph.D. students supervised and publications) when one is applying for new jobs. Third, tension arises because policy favours spin-off creation primarily for its potential positive externalities (e.g. developing the regional and national economy). Personal and career risks involved in firm formation do not figure in such policy considerations.

Conclusions

In summary, this paper has sought to deepen understanding of what meanings researchers ascribe to the commercialisation of research and why they engage in this activity; to improve our knowledge of the variety of ways in which the commercialisation of research results occurs; and to provide insight into what types of knowledge transfer and commercialisation activities are undertaken when academics own the intellectual property derived from their research results.

Our results confirm existing research in so far as they show that there is a variety of different reasons for university faculty to engage in commercialisation. In the Swedish case, although inventor ownership is cited by researchers as an important incentive to engage in the commercialisation of research, it seems that the peculiarities of the funding system are an overriding determinant of researcher behaviour. The policy implications of this finding are difficult to ascertain without further research. However, there is reason to believe that the structure of the Swedish R&D system may be another determinant of significance at this level.

We found that researchers engage in a diverse range of knowledge transfer activities, many of which are so deeply embedded in their everyday work that they have difficulty retrieving them when reconstructing what they do. This embeddedness may go some way towards accounting for another finding, which is that of all knowledge transfer activities, it is technology transfer (and, more specifically, creating firms) that appears to be the most difficult activity to integrate into the everyday lives and practices of researchers. These perceptions appear to be independent of who owns the intellectual property arising from research. Swedish researchers cite inventor ownership as the only incentive for engaging in firm creation. An important caveat in this regard however is that faculty perceive the personal risks

involved in firm formation to offset the potential benefits that may be derived from ownership. Further research is needed here to determine what aspects of these risks may be amenable to policy intervention.

We have given particular attention to the views of researchers from the social sciences and humanities in our sample because of the general perception that they have been ignored by the body of research on university entrepreneurship. Our data show that faculty from the social sciences and humanities are perceived by their colleagues in other faculties to be largely irrelevant to the knowledge transfer debate because the knowledge they produce is of little relevance to the economy. Further, faculty from the humanities and social sciences are assumed to be particularly negative towards the commercialisation of research results. Our findings in this regard are significant, given that our sample was of researchers who do engage in knowledge transfer activities. Faculty from the social sciences and humanities were not overly positive, but they were not negative towards commercialisation activities. In fact, many of their reservations about commercialisation were to a great extent echoed by interviewees from the natural sciences. These researchers confirmed the view that starting firms was not a relevant form of knowledge transfer in the humanities and social sciences, though we found instances of researchers from these areas who had started firms on the basis of their research. Faculty from the social sciences and humanities generally under-reported their engagement with commercial activities or were unwilling to characterise their activities in these terms, even when allowed the opportunity to define commercialisation broadly to include all types of market-based knowledge transfer. This may be explained by the fact that it is still unclear in the university generally, but particularly in these knowledge areas, how colleagues will perceive commercial behaviour. Another potential explanatory factor is that Swedish researchers belong to the public service; thus, in addition to the reputational issues actualised by commercial activity, there are formal problems arising from the dual role of the public servant as private entrepreneur.

Finally, we found that there was a high level of knowledge transfer from Swedish universities and that researchers were engaged in diverse forms of knowledge transfer. Firm formation appeared to be the type of knowledge transfer and commercialisation of research that presents most challenge to academic life. Our study found that this challenge was, in part, grounded in substantive structural aspects of university life, such as who owns what in a publicly-funded system. Two aspects of the conflict observed may be explained by factors internal to the university as an institution and its attempt to grapple with the changing demands of society. One is the tension produced as a result of the creation of a new cadre of administrative staff charged with promoting technology transfer. This group sees inventor ownership as a significant obstacle to its work. This, together with the fact that Sweden is an outlier in this respect, makes it difficult for technology transfer personnel to compare their practices with those of counterparts outside Sweden.

A second aspect of the conflict lies in the identity conflict experienced by researchers. On the one hand, pressure from society and changes in science itself introduce commercial considerations in more and more aspects of science. On the other hand, researchers, particularly those from the humanities and the social sciences, feel that their identity and the tradition of science as open-ended would be undermined if they admitted the extent of their engagement with the more commercial aspects of academic life. Despite these tensions, we observe a general tendency towards a changing understanding of the content of the core missions of

teaching and research to include knowledge transfer. This may suggest a gradual mainstreaming of third mission activities and may be explained in the Swedish case by the combined effects of national funding practices, the structure of the public R&D system and adaptations to global changes in research practices.

Notes

1. Professors' privilege is a legal arrangement by which academics at public universities in Europe were allowed ownership of intellectual property arising from their research results. This is a practice that has its roots in the German university system of the 1800s. It is also sometimes referred to as professors' exemption because it gives academics rights that other employees do not possess.
2. These figures are based on 2011 data on R&D spending from Statistics Sweden.
3. This has changed incrementally as funding for infrastructure for technology transfer was made available to universities via a competitive open call, starting in 2000. Later the third stream ruling was revised to focus almost exclusively on innovation support.
4. Students from non-EU countries have had to pay tuition fees since 2011.

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Researcher identities and practices inside Centres of excellence

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Abstract

Many new and revamped science support mechanisms that aim to fund excellent research with more or less explicit expectations of contributions to innovation in society have appeared in recent decades. Mechanisms which fund temporary research centres have been popular in the whole OECD area, supporting "Centres of Excellence" or "Centre of Excellence in Research and Innovation" or similar names. They – and the researchers in them – are expected to contribute to research that creates future economic benefits and solves societal problems. In this paper we ask how and to what extent such centres do affect individual researchers' identity and scientific practice. Based on interviews with 33 researchers affiliated with eight centres in Sweden and Norway and institutional logics as analytical framework, we find four broad types of identities with corresponding practices. Individuals in two of the categories attempt to bridge the institutional logics of excellence and innovation, while the other two make buffering statements and try to keep the two logics separate. Engagement in innovation seems unproblematic and fairly common in research-oriented centres, while individuals in centres devoted to both science and innovation more frequently expressed tension and dissatisfaction.

Key words: Research centres, excellence, innovation, institutional logics, identity

Introduction

In this paper we ask how and to what extent research funding mechanisms affect researcher identities and practices. We look in particular at two different centre funding schemes: Centres of excellence (in research) and Centres of excellence in research and innovation. The two centre schemes have the goal of respectively 'excellence' and 'excellence and innovation', and they are interesting as they provide substantial, flexible and long term funding, usually for a period of approximately ten years. Earlier studies have looked at centres as mechanisms for university-industry partnerships (Boardman and Gray 2010) and for promoting cross-disciplinarity (Corley and Gaughan 2005). Individual-level investigations have investigated the effect of industry experience on scientific activities for researchers in such centres (Lin and Bozeman 2006). There are many types of centres and the distinction between them may be hard to draw (Boardman and Gray 2010); our paper looks at centres with an explicit goal to promote world-class scientific activities alongside other aims.

We see excellence and innovation as two different institutions in academia, and we use the framework of institutional logics to analyse how they influence individual researchers (Friedland and Alford 1991). Excellence and innovation can initially be perceived as sometimes in conflict but also overlapping, resulting in different degrees of synergy, negotiations and tensions. This offers an opportunity to study how researchers relate to and identify with the two logics (Meyer and Hammerschmid 2006) as well as for understanding the two logics in themselves.

We address two issues that have received relative little attention in the literature. The first concerns the potential impact of funding mechanisms on individual researchers (Nedeva et al. 2012). It is likely that the impact depends, for example, on the match between the characteristics of the funding instruments and the professional values and norms (Dooris and Fairweather 1992) and on wider societal conditions such as the funding system of universities (Whitley, 2003). The second issue is the interplay between the goals of excellence and innovation (Hessels and van Lente 2011), including the institutional and organisational conditions under which such research is conducted (Heinze et al. 2009; Jain et al. 2009). We make a contribution to the literature through an analysis of the professional identity and activities of 33 researchers in eight centres (four of each type) in two countries and in different professional settings. The analysis ends with four idealised identity categories which reflect how researchers relate to excellence and innovation in their research activities. Only one of the categories is clearly tension-dominated, and this is most often found in settings

characterised by immature university-industry relations, new fields and dependency on many sources of funding. For most researchers, however, the affiliation with a centre involving excellence either creates legitimacy for their pre-established choice of researcher identity or a space for experimentation with new activities.

The paper is organised as follows: First we discuss issues related to the concepts of excellence and innovation, as well as institutional logics and questions of identity. Thereafter we present the methodology and the data upon which we draw. This is followed by an analysis of different aspects of identity and practice, a description of the four ideal type identities emerging from our empirical data, and finally conclusions and suggestions for further research and policy.

The institutional logics of excellence and innovation

Academia and commerce have been treated as two incompatible spheres that through different exogenous and endogenous mechanisms now are ever more overlapping where actors in one sphere take roles previously found only in other spheres (Etzkowitz and Leydesdorff 2000: Gibbons et al. 1994). Several studies show that it is now more appropriate for university researchers to engage in entrepreneurial activities. Powell and Colyvas (2008:287) claim that:

> 'As the world of science came into contact with the world of commerce, the identity associated with a university scientist expanded to include entrepreneurship. As more high-status elite scientists participated in such activities, commercial involvement transitioned from unfamiliar an unusual to plausible and appropriate, and finally to a core component of a scientific career'.

This is a description of a historical transformation where one sector impacts the other (Greenwood et al. 2011). Much of the literature concerning the role of academia puts forth similar arguments, differing in the relative emphasis on positive and negative consequences of this development (Slaughter and Leslie 1997; Ziman 2000). Other authors have argued that innovation and entrepreneurship (or commerce) always have been a part of the university's mandate alongside more 'typical' academic practices (for instance Martin 2003), but that they have been given different prominence by shifting policy regimes or waves (Rip 2002). While quality was high on the agenda in the 1980s, innovation dominated much of the policy rhetoric in the 1990s (Godin 2006). Presently, we witness the prominence given to *excellence* through the establishment of Centres of excellence in several OECD countries (Orr et al.

2011). Rip (2011) has labelled this the *return to excellence*, indicating a return to values and norms residing in policy and the academic communities in the decades after the World War II.

These trends and accordingly changes in science policy can be said to appeal to different institutional logics within academia. An institutional logic is, according to Friedland and Alford (1991:248) "a set of material practices and symbolic constructs which constitutes its organising principles and which is available to organisations and individuals to elaborate". Institutional logics thus contribute to identity (Rao et al. 2003), legitimacy, a sense of order and ontological security for the actors (Thorton and Ocasio 2008). In other words, logics provide guidelines for actors on how to interpret and function in social situations (Greenwood et al. 2011). Organisations often face multiple logics that may be incompatible (Greenwood et al. 2011; Kraatz and Block 2008; Friedland and Alford 1991). For instance, a hospital is entrenched in the institutional logics of the market, of the public sector and that of the diverse professions (with their cognitive and normative orders) which it embodies. The plurality of logics evidently generates challenges and tensions for the organisation and the individuals that are exposed to them. Conflicting institutional demands may differ in terms of either the ideological goals that deem them legitimate, or the means or courses of action they prescribe (Pache and Santos 2010). This means that one of institutional theory's core concepts – 'legitimacy'– is important. Legitimacy is "a generalised perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs and definitions" (Suchman 1995: 574). Legitimacy refers as such both to the actions of the individual researcher or that of the organisational entity – in our case the legitimacy of the individual centres with goals of excellence and innovation.

We contend that *excellence* and *innovation* in academia can be characterised as two separate institutional logics. Excellence is associated with forefront research evaluated by discipline specific markers (cf. Luukkonen et al. 2006). Previous research has argued that the notion of excellence in academia relates to a fairly traditional form of basic research (Gulbrandsen and Kyvik 2010; Hollingsworth 2008). Basic research within academia is often made synonymous to academic freedom and curiosity-driven research (Calvert 2004), frequently linked with a public-good model (Slaughter and Rhoades 2004). Excellence is further associated with high quality research, measured as scientific reputation based on peer judgment (e.g. Lamont 2009). Innovation, on the other hand, is often related to research of an applied character closely linked to concepts such as knowledge and technology transfer (Geuna and Muscio 2009). Excellence can thus be claimed to correspond to the deeply

embedded institutions in the backbone of academia, such as professional autonomy, ideals of freedom and collegial self-governance (Clark 1983), while innovation denotes activities that are not always perceived as the core of academic life, but nevertheless important external expectations and possibly sources of new and important knowledge

Centres and researchers identities and practices

In the past decade we have seen an increase in the use of centre as research council funding instruments. Characteristic of centres are that they take the form of new units which span institutional and organisational boundaries. The result is multi-organisational and multi-institutional research centres that mesh together participants representing different disciplines and diverse organisations such as university, industry and public agencies (Boardman and Bozeman 2007; Boardman and Gray 2010). Centres can be established in both mature and emerging fields. According to institutional theory (cf. Greenwood et al. 2011) emerging fields are often characterised by a high degree of incompatibility between different institutional logics. In contrast, mature fields, are more likely to have evolved stable priorities between the logics and enjoys legitimacy of practices and identities. We can translate this to academic fields, where mature fields are academic fields characterised by few incompatibilities among the involved disciplines or partners representing different sectors, while emerging fields, on the other hand, often experience challenges related to collaboration between both disciplines and partners. They are therefore highly dependent on others recognition to make the field legitimate (Whitley, 2000).

If organisations and individuals experience institutional pressures which conflict with their cognitive and normative framework they can apply two strategies. One is to de-couple or *buffer* the institutions, keeping them apart, while the other is to merge or *bridge* institutional pressures which comply with their institutional framework (Meyer and Rowan 1977; Oliver 1991). The choice of strategy depends upon several aspects. The first concerns the role of the researcher in the innovation process; it can be indirect or direct, indirect in terms of participating in cross-sector collaboration with industry and/or public agencies, or direct through commercialisation of own research results which often also involves collaboration with others (Cohen et al. 2002; Rosenberg and Nelson 1994). Researchers most often participate in collaboration with industry only if it complements their research (Perkmann et al. 2011), and their decision to affiliate with a centre designed for industry collaboration is a value-laden one (Boardman and Bozeman 2007). The second concerns the

characteristic of the academic fields, where the tendency to engage in cross-sector collaboration seems most frequent in technological disciplines (Perkmann et al. 2011; Gulbrandsen and Smeby 2005). One reason is most likely that it is easier to find research problems of mutual interest in some disciplines than in others and that disciplines more generally vary in their norms and values (Merton 1973; Dooris and Fairweather 1992; Whitley 2000).

The dualisms presented in the institutional logics of excellence and innovation and especially the basic/applied dichotomy, have been criticised for creating an artificial divide between the diverse forms of knowledge production (Calvert 2004; Ziman 1994). Stokes (1997) argues that some of the best research and researchers have been inspired by both practical needs and fundamental contributions to the stock of knowledge. In his view, most research is a combination of basic and applied. Yet the distinctions between concepts such as basic (excellence) and applied (innovation-oriented) research appear to be vivid among university researchers, indicating that the concepts function as normative identity markers (Gulbrandsen and Kyvik 2010).

The concept of identity is important in order to understand how individuals respond; it forms a central link between the behaviour of the individual and (multiple) institutional logics (Lok 2010; Friedland and Alford 1991). Different institutional logics can thus entail different social identities with diverging positions. The notion of identity has received considerable attention in organisational studies (Alvesson et al. 2008; Glynn 2008). Identity can be understood as matters encountered by individuals, i.e. social beings embedded in organisational contexts, referring to subjective meanings and experience (Alvesson et al. 2008). Identities are thus located in social space and the individuals are positioned in relation to other social groups and categories that are associated with a range of social expectations for appropriate behaviour (Berger and Luckman 1967). Social identity "refers to an individual's perception of him or herself as a member of a group, particularly in terms of value and emotional attachment" (Alvesson et al. 2008: 10).

Previous research on the role and identity of academics has highlighted the experiences of entrepreneurial researchers in pursuing activities outside of the realm of academia as they cross boundaries and break with social expectations. Atkinson–Grosjean (2006) identified two main researcher identities in a large government sponsored programme aimed at enhancing innovation and excellence in life science: 'settlers' and 'merchants'. The first category describes researchers that conform to the fairly traditional conception of an academic – one that is preoccupied with autonomous and basic research, whereas the latter

describes the researcher that unites the world of science with industry. Atkinson–Grosjean found that having a position as a 'settler' in academia is relatively unproblematic and tension free, whilst a 'merchant' position is a common source of conflict and resentment. Similarly, Gulbrandsen (2005) found that many entrepreneurial academics are liminal, i.e. they operate in the boundary between university and industry resulting in buffering processes towards both worlds. Buffering may imply normative signalling that they are 'different' and that they do not belong to traditional academics or industrialists. Although the innovation literature generally recommends a bridging strategy between innovation and research excellence when it comes to collaboration with industry, and a buffering practice for commercialisation of research (Rosenberg and Nelson, 1994), this may be a hard distinction to draw in practice. Moving away from the dichotomies of academia/commerce and old/new school academics, Owen-Smith and Powell (2002) study faculty responses to a changing institutional environment. Their informants "simultaneously partake of multiple logics to justify their activities" (p. 5). The authors found four identities of life science researchers, arguing that there is a complex array of positions that faculty can take in response to changes. They emphasise the hybridity of the researchers and propose as such a blending of logics (Murray 2010).

Other studies reveal that entrepreneurial academics have a strong propensity to preserve their academic role identity (Jain et al. 2009), thus they buffer practices and activities that are not perceived legitimate according to their perception of their role as a researcher. We believe that these buffering or bridging processes of the institutional logics of excellence and innovation can be readily observed in the 'new' funding mechanisms, i.e. centres targeting excellence and/or innovation. These centres are focused on research rather than teaching, and many of them formally incorporate multiple logics to a much greater extent than traditional university departments since they span institutional and organisational boundaries in that they enable the establishment of a new organisational unit. For our purposes, we will look at practical aspects of identity: how do researchers characterise their own role and activities, how do they select problems, and how do they exchange knowledge with external partners?

Methodology and context

Studies of university-industry collaboration often use the university or the department as the analytical level (Bozeman and Gaughan 2007), disguising differences between the individual

researchers. Some studies have shown that researchers within the same department can have multiple behaviours and practices with regards to commercialisation of scientific results (e.g. Colyvas, 2007). We have chosen to study the researchers affiliated with two types of Centres of excellence in Sweden and Norway through a qualitative interview-based approach. This allows us to study how funding schemes and their goals may affect researcher identity and practices, taking three important contexts into account: the centres themselves (the funding mechanisms), the wider national system, and disciplinary characteristics.

Centres of Excellence (CoE) and Centres of Excellence in Research and Innovation (CoERI) constitute a direct embodiment of the two institutional logics. They represent opportunities to study how researchers draw upon the repertoires of excellence and innovation within two similar but also rather different organisational frames. Similarities between the two funding schemes include rather generous and long-term funding, temporality (limited to eight to ten years in our cases) and that researchers most often are affiliated with the centre part-time. The centre types differ, however, in their formal/informal collaboration with actors outside of the university. Whereas CoEs generally are made up of researchers from academia, CoERIs are obliged to collaborate with actors from industry and/or public agencies. The members of the CoERIs are therefore to some extent embedded in different institutional work environment. Still, the core of both centres rests within academia since universities most often host the centres. They are thus legitimated first and foremost in the academic environment.

We have chosen to study centres in Norway and Sweden as these countries differ significantly in their research funding systems and intellectual property legislation. Norway has one research funding agency and a fairly high level of basic funding to universities, while Swedish researchers are subject to a highly competitive research funding system with nine government research funding agencies. As such Swedish researchers often fund their research from multiple sources. Sweden has furthermore decided to continue the professorial ownership of the rights to commercialise research results, while Norway gave this right to the higher education institutions in 2003 in a legislative change partly emulating the U.S. Bayh-Dole Act. Whether this has had any effect on researchers in technology transfer-oriented centres has to our knowledge not been investigated.

Another motivation for the country selection was that increased interaction between university and industry has been on both countries policy agenda for a long time and that the countries have introduced similar financing mechanisms the last couple of decades. The

CoERI scheme was introduced in Sweden in 1995, while Norway introduced it in 2005[1]. Lately, policymakers have emphasised the importance of generating concentrated, world-class research centres that can attract and train excellent researchers and this ambition is expressed in the CoE scheme, launched in 2002 in Norway and 2005 in Sweden.[2] As policy instruments, the centres that combine excellence and innovation are at least as old as the purely research-oriented ones. Finally, the Norwegian schemes provide more funding to each centre and the CoE scheme includes fewer centres than the Swedish one – Norway has 21 CoEs while Sweden has 40.

The third contextual aspect is discipline. We selected four CoERIs and four CoEs, two of each in each country for study. They represent different disciplines in mature scientific fields and emerging ones. The expectation guiding this selection was that mature scientific fields would have had close contact and collaboration with external partners prior to the centre formation. Table 1 provides an overview of the different centres and the character of their relations with other non-academic actors.

Table 1. Overview of the centres where the respondents are based.

Centre	**Established year**	**Level of external relations**	**New / long-term relations**	**Emerging/ Mature field**
Centre of Excellence				
Humanities	2007	Individual	Fluctuating*	Mature
Natural sciences	2003	Centre/individual	Long	Emerging
Social sciences	2006	Individual	Long	Mature
Medicine	2006	Individual	Fluctuating	Mature
Centre of Excellence in Research and Innovation				
Natural sciences	2006	Centre	Long	Mature
Mathematics	2006	Centre	New and long	Mature
Medicine and natural science	2007	Centre	New	Emerging
Engineering	2007	Centre	New	Emerging

*Varies, the relations are not permanent

We chose centres which had been operative for at least two years to ensure that respondents had ample experiences with being a 'centre researcher'. All centres are located at one university in Sweden and one in Norway. Universities could have constituted another context

[1] They are called VinnExcellence in Sweden and SFI in Norway, the centres are also known as 'Competence centres'

[2] They are called Linneaus Grant in Sweden and SFF in Norway. Note, however, that Sweden has prioritised concentration of resources for at least a couple of decades focusing on strong research environments without using the label of 'excellence' and having one dedicated scheme (Aksnes et al. 2012). There are also some smaller earlier excellence initiatives in Norway dating back to the beginning of the 1990s.

for how funding mechanisms affect the micro level, but to avoid further complexity we chose two very similar universities –broad, large and fairly old research universities. We have interviewed 3-5 researchers in each centre, in total 33 in the period April 2009 to February 2010. This includes all centre leaders and other researchers in central or project leader positions. Except the centre leader whose position is normally financed by the scheme, they all have formal employment in other departments but are affiliated with the temporary centre. We used a semi-structured interview guide that included categories such as definition of own research, organisation of collaboration and knowledge and technology transfer. The interviews lasted from one to one and a half hours. All interview data was recorded and transcribed.

We developed the characteristics of the institutional logics of excellence and innovation based on the literature review and themes that seemed recurrent in the interviews which specified the differences between the logics. Table 2 gives an overview of the categories.

Table 2 The characteristics of the institutional logics of excellence and innovation

Characteristics	**Logics of excellence**	**Logics of innovation**
Goal	Forefront research	New/improved technology, products, processes, services
Source of identity	Basic research Autonomy	Applied research External collaboration
Source of legitimacy	Research community	Industry, society, research community
Core practices	Publication	Publication, technology and knowledge transfer

We further selected categories for analysis and looked for within group similarities coupled with intergroup differences (Eisenhardt 1989). Among these are issues such as characteristics of own research, problem choice and collaboration practices. In the analysis of the data we have weighted researchers' description and use their language as interpretations for confining to one or both institutional logics. We looked for cues such as how they talk about their research, how they characterise knowledge and technology transfer and how they manage collaboration with participants representing other disciplines and firms. To develop the identity categories we followed the suggestions of Rao et al. (2003) and Meyer and Hammerschmid (2006) and did not use binary identity codes but allowed for the development of potential hybrid forms. Limitations to the study include the many differences in disciplinary affiliation and the part-time association with the centres. We have tried to deal

with this by elucidating some of the values and beliefs of the disciplines (Dooris and Fairweather 1992) and by focusing on the actual work in the centres.

Analysis of researcher identities and practices

The aim of the paper is to illuminate and analyse how the goal and the expectation of Centres of excellence (CoEs) in research and Centres of excellence in research and innovation (CoERIs) might reinforce or generate conflicts for the affiliated researchers and how individuals negotiate between and draw upon the institutional logics of excellence and innovation. Our analysis is structured under these headings: the perceptions of and goals of funding mechanisms, problem choice, practices of collaboration and technology transfer. Under each heading we first illuminate CoERIs and then CoEs.

Perceptions and aim of funding mechanism

The incompatibilities between the different logics were highly visible in both centres in terms of perception and aim of the centres.

Centres of Excellence in Research and Innovation

In the CoERIs, the informants' responses differed first and foremost on the country level. Most of the Norwegian researchers emphasised the basic orientation of their research: "I have a typical basic researcher's head. (…) My role in the centre is to assure that the academic output holds high quality." (senior researcher, mathematics). Even though this informant was active in the centre's research he distanced himself from its dual mandate. Instead he emphasised the institutional logics of excellence through autonomy, long time frames and publication in journals. A researcher in another centre indicated that the norms and values in academia are often incompatible with the perception of what counts in a centre with goals of innovation. This was confirmed by another member of the same centre: "We do fundamental research at the university while our partners do the applied". In this manner, the division of labour in the research system serves to sustain the perception of university researchers' core research activities.

However, the Norwegian CoERI centre leaders, whose network had been vital for the establishment of the centres, had a more instrumental perspective on collaboration with industry. These were typical boundary-spanning actors, who juggled the different roles with few problems, having a solid conviction of the quality of their own research. Hence, within

the same centre there are multiple logics at work at the same time represented in the heterogeneous personnel that populate the centres (Kraatz and Block 2008; Colyvas 2007).

The emphasis on basic research was much less evident in Sweden, and we see two important explanations. First, one of the centres represents a relatively new and emerging academic field created at the intersection of industry and the university. The centre is thus accustomed to applied work. The other Swedish CoERI is also found within a speciality that is highly applied in its research orientation. The two Norwegian centres are within mature and institutionalised academic fields. Second, several of the Swedish researchers claimed that the strong applied dimension in the centres was a product of the funding system. One stated that "It is difficult to get money for basic research now. It is easier to obtain funding when industry is involved". Some of the centres in this study have difficulties finding funding opportunities outside of the research council that manages the CoERI scheme.

The applied dimension of the CoERI combined with the quest for excellence generated incompatibilities between the logics in the researchers perception of the funding mechanism. One said: "This is a CoE which is expected to deliver high quality scientific research and at the same time include the innovation component, which is extremely challenging" (Centre leader, Norway). The challenge lies in the task of motivating and stimulating the university researchers to participate in innovation. Encouragement and resource rewards are not always enough, and some informants told of researchers resigning from CoERIs in some cases due to the lack of success in developing interesting research questions. Membership in such a centre is for some unattractive and not coherent with their researcher identity.

Several researchers affiliated with CoERIs further emphasised the lack of recognition and acknowledgement in the wider researcher community and society for the CoERIs: "Nobody says 'it was really good of you to achieve centre status'; I never hear that about our type of centre" (senior researcher, Sweden). Another CoERI member claimed that a CoE is more exclusive than a CoERI, because in the latter the participation threshold is lower: "anybody can join". Researchers in mature academic fields adhere to practices and norms of conducting basic research, and it is difficult to get these researchers involved in the centres projects, a Swedish CoERI representative argued. Such perceptions were shared in both countries.

Centres of Excellence

In the CoEs the majority of informants as expected emphasised the importance of basic research: "What we do in the centre *should* be basic research. We do not take on contracts and especially not confidential ones" (centre leader, Sweden). For researchers like this one excellence is synonymous with basic research, similar to the findings of Gulbrandsen and Kyvik (2010). Several researchers also underlined that the research should in the end 'have relevance' and that they had an obligation to broader dissemination, including the representatives from the humanities and social sciences, thus invoking a weak and traditional academic form of the institutional logic of innovation.

Contact with public agencies and industry were frequent but often individual in character – only one case, the CoE in natural science, saw several of the affiliates involved in a collaboration project organised at the centre level. These researchers emphasised the feedback value to their own research and their role in participating in knowledge dissemination – experiencing few tensions as boundary spanning actors (Youtie and Shapira 2006). This implies that the strong weight given to basic research in the CoE creates legitimacy for researchers that engage in innovation activities. The researchers are already embedded in a logic of excellence and experience a high degree of compatibility with the logic of innovation. As such the financing mechanisms contribute to sustain and reinforce the normative identity of the researcher.

Researchers affiliated with the CoERIs confirmed this perception. They underlined that the CoEs were often perceived as the 'A-team' in the research system. The credibility offered by a CoE affiliation is attractive for ambitious researchers regardless of professional profile. Unlike CoERIs, CoEs are not bound by a contractual agreement to work out joint research questions with representatives from other sectors and they can therefore interact with industry on their own terms and conditions.

In Table 3 we have categorised the answers into groups denoting whether the informants were bridging the logics of excellence and innovation or buffering them. The matrix also takes into account the researchers affiliation with a CoE or a CoERI.

Table 3. Researchers' perception of own research

	Bridging logics	**Buffering logics**
CoE	**Good research is useful** "I do basic *and* relevant research"	**Not getting your hands dirty** "What we do in the centre *should* be basic research"
CoERI	**Expanding the tradition** "We are a Centre of Excellence *plus* Innovation"	**Respect us for who we are** "I have a basic researcher's head"

Both logics were present in both centre types, but with some patterns of variation. We found informants who bridged the logics and ones who buffered them side by side. This does not imply that buffering and bridging were found to an equal extent in all cases. All the informants in the CoE in natural science made statements that bridged the logics and exposed a rather tension free attitude, compared to their colleagues from social sciences who largely made statements that excellence and innovation are/should be separate (buffering), even though they themselves collaborated with public agencies.

We see that the goal of the CoE comprises institutions that correspond to the academic heartland – to paraphrase Burton Clark (1983). Excellence alone is more recognised than a combination of excellence and innovation since it incorporates a notion of autonomy which is highly valued in academia. The interviews indicate that researchers define themselves through the social spectacles of their peers and the importance they attach to their social community – revealing here the high currency of excellence compared to innovation. CoERIs sometimes create challenges related to scientific recognition.

Problem choice and research practice

Incompatibilities between the two logics became further evident when researchers described the processes of selecting research topics and moving from research questions to collaborative practice.

Centres of Excellence in Research and Innovation

Challenges arise in harmonising demands from academics and perceived demands from industry about which research to perform. One informant in a Norwegian centre claimed:

> What if I go to these people and ask them: which problem would you like to have solved in 5 years? What would you like to have in 5 years? […You] don't get an answer. […T]hey have a perspective that is (…) the industrial perspective is maybe a year.

This highlights the problem of research that simultaneously is expected to have a long-term perspective, drive the research frontier and produce innovations. Problems escalate when the collaborating partners are small and their need is immediate problem solving. The selection of research questions also depends upon the perception of the character of the research. There are different degrees of basic and applied research: "If you ask industry my research would be characterised as basic; I think of it as more applied" (researcher, Sweden). Different understandings of goals and the character of the means to reach them can often create difficulties in achieving an agreement in research projects.

The logics of excellence and innovation further revealed themselves in the practices of the researchers. Even though they invoked the language of innovation, their own practices contradicted the innovation logic (cf. Lok 2010). The centres are research-driven which implies that the centre leader and the majority of the project leaders come from academia. Industry has more or less the role of a contractor and/or simply a recipient of research. Most of the interaction between industry and the academics was in the form of workshops or seminars where the researchers communicated their ideas and results to the audience, i.e. traditional academic communication/dissemination patterns. Academic practises steered the interaction between the different stakeholders in the centres. The very format of the financing scheme seems to contribute to make the interaction converge on fairly traditional academic practises. All CoERIs are monitored and evaluated during the centre period and the main emphasis is on scientific outputs in terms of publications.

According to some of the informants, conservative academic practices could be a barrier to developing original research. One Swedish researcher asked: "How can we move the research frontier? In academia we are [only] preoccupied with publishing in journals, participating at conferences and developing theories." Another in a Norwegian centre stated:

> I train the scientists here to work in the innovation arena, which is new for them. Very very new. (…) I have to tell them every day: This is not the usual paper. It's

> something else. (…) I support this [centre] which is completely new for them and forces them to do innovation-based research [which would not happen without the centre]

These informants are affiliated with CoERIs that have relatively embryonic relations with industry partners, and one represents a mature academic field. The institutional logic of innovation may pose challenges in both mature and emerging academic fields. Another centre with a tradition for collaborating with industry, experienced few tensions in practices related to the goal of innovation. Some of their research was based directly on the industrial partners' patents. For those who a priori had well establishes ties to their partners, the CoERI scheme represents a golden opportunity to formalise, concentrate and legitimise this type of research. A Norwegian project leader who initiated a CoERI application said that the researchers were strongly motivated when industry had put its most interesting research problems into the project. This was not tension free, especially concerning secrecy and publication delays, but the benefits were judged to be a lot higher than the costs. Although the funding mechanism provides a home for the somewhat marginalised scientists (Gulbrandsen 2005) and ease the conflicts between the logics, the career path of academia may still pose challenges if this type of work leads to fewer publications for younger researchers. CoERI leaders in general also mentioned challenges convincing 'basic researchers' to devote time to the projects, but they tried to solve it through negotiations and rewards such as new equipment.

Centres of Excellence

CoE researchers, on the other hand, did not experience challenges in developing joint research questions with industry. This was purely opportunity-driven, indicating synergies and overlap between the logics of excellence and innovation. The leader of a Norwegian centre said: "We discuss research questions with industry and if they and we find something common and interesting we kill two birds with one stone". This centre came to life due to a joint project between the university and a large company, and one of the centre's core research questions emerged through this collaboration. Moreover, some of the most cited research from this centre stems from a project initially developed by industry. The centre is characterised by a high degree of perceived and experienced compatibility between the logic of excellence and innovation. One possible explanation might be that the interactions were a result of the individuals' motivation and not because of conditions inherent in the financing scheme.

Many of the research practices found in CoEs are undistinguishable from normal scientific work, and since the CoE scheme does not require anything else this does not imply a tension between the logics. Still, many of the interviewed researchers were clearly motivated by practical concerns and engaged in collaboration with non-academic partners. But even for these, as long as they satisfy demands for supervision of graduate students and publication in prestigious journals, the CoE constitutes a space where they have a large degree of freedom in shaping their practices as researchers.

In Table 4 we have summarised these findings. Informants who bridged the logics in their characteristics of own research also did the same concerning practices. In terms of buffering in the CoERI cases, this may be due to the newness of the collaboration with a low degree of institutionalised practices.

Table 4. Collaboration practices and problem choice

	Bridging logics	**Buffering logics**
CoE	**Mutual interests** "We kill two birds with one stone"	**Keeping distance** "We decide upon our own agenda"
CoERI	**Integrated collaboration** "The researchers work on interesting research problems generated by the industrial partners"	**Traditional academic practices** "I continually have to train the scientists to work in the innovation arena"

Technology transfer

Technology transfer is an outspoken goal of the CoERI scheme. The attention to these practices varied in the centres. Regardless of centre affiliation the individual researchers seem rather autonomous in their behaviour in terms of technology transfer practices. Even when this is a clear goal, the individual researchers and the centre leaders selectively adhere to this practice. A possible explanation for reluctance among the leaders is that they prefer to emphasise other innovation practices, since technology transfer and the property rights discussions that follow most often may conflict with the institutional logics of excellence.

Centre of Excellence in Research and Innovation

Two of the CoERI leaders (one Norwegian, one Swedish) declared that patenting was not interesting and that they did not emphasis these activities: "Our solutions are more incremental and it is the firms that commercialise them. As a leader I have not weighted patenting as important." However, researchers in the same centre were involved in patenting processes or had established their own firm. Thus the centres contain a dissonance between the technology transfer practices of its different members. This may create an incompatibility in the innovation logic with regards to how the centre is managed and which types of activities that are given priority. One researcher in a Swedish centre perceived that his endeavours to patent and commercialise a technology was overlooked by the management, resulting in some discontent. Others affiliated with the centre in natural science and medicine echoed this message and underlined the relative poor competence and expertise of the university management and support structures to facilitate patenting and technology transfer. They argued that the support structures served a symbolic function to satisfy external pressures on the university to commercialise research results. This opinion was however not shared by all. A Norwegian CoERI had positive experiences with the support structure and the informants claimed that technology transfer was an inherent part of the centre's activities.

Centres of Excellence

All CoE leaders were indifferent towards intellectual property rights matters albeit some CoE researchers were engaged in technology transfer. The leaders emphasised that patenting may be too resource demanding in terms of time and money. Some researchers recognised the commercial potential of their own research but were reluctant to pursue it. One Swedish CoE researcher feared it would limit future opportunities for asking research questions, and the excellence logic was given priority in a decision-making situation. Several of the informants affiliated with a Norwegian CoE had experiences from technology transfer either from patenting or from firm formation and for them these activities were compatible with the goal of the centre.

Four identities

As seen, there are diverse reactions and identifications with the institutional logics of excellence and innovation among researchers affiliated with centres dedicate to excellence or

excellence and innovation. Four somewhat idealised identity categories can be created (Table 5) that reflect the alternative combinations of the logics which are at play within the different centres.

The categories are developed out of the individual researchers' response and this is thus not a matrix about the centres, but rather connected to how the identity and practices of the researchers is moderated by the goals of the financing schemes.

Table 5. Four identity categories

	Bridging logics	**Buffering logics**
CoE	**The autonomous agent** Tension free 'branded as excellent'	**The traditionalist** One scale of excellence and basic research
CoERI	**The approved innovator** Legitimating innovation logics through long-term funding	**Torn in two directions** A clash of logics in practice and perceptions

The autonomous agent

This researcher is typically affiliated with a CoE and bridges the two logics. The centre or the researcher has close ties to non-academic actors, be it industry or public agencies. Having an identity integrating both logics is relatively unproblematic for researchers affiliated with a CoE. They enjoy the stamp of being 'excellent' in the wider scientific community and can pursue many different opportunities without losing the excellence brand. The researchers experience few incompatibilities in their quest for pursuing practices and goals associated with the institutional logics of innovation. They operate in an environment where the innovation logic is legitimate precisely because they enjoy the recognition as excellent. There is therefore no need for identity regulation or negotiation. Opportunities can fairly easily be exploited, at least as long as they are not too remote from a rather linear model of innovation or if they can be inserted into pre-existing external collaborative relationships.

The traditionalist

This researcher is affiliated with a CoE, she renounces the innovation logic and adheres to the

logics of excellence, resembling the characteristics of Atkinson-Grosjean's (2006) 'settler' label. The emphasis is on the basic character of the research and she underlines that the research is free of external constraints and influences, despite the fact that her unit may have external partners. Boundaries between the logics are well-defined with few overlaps. In these centres the practices of innovation appear to have a low degree of taken-for-grantedness (Colyvas and Powell 2006). Researchers work in a rather tension free environment, at least in the centres which provide them with a shelter where their type of preferred research is the overarching goal.

The approved innovator

This researcher is affiliated with a CoERI and bridges the logics, i.e. highlights successful combinations of academic practice and external utility. The CoERI scheme offers an opportunity to legitimate practices of innovation logic in an academic setting. Typical of these researchers' centres is mature relations between the partners. The involved stakeholders perceive CoERI as a window of opportunity to finally formalise collaboration (Bennich-Björkman 1997). The financing mechanism is a visible and fairly exclusive bridging of the logics of innovation and excellence; and it creates a visible organisational space inhabited by large numbers of PhD students and postdocs like any other leading research environment. Enjoying a stamp of excellence alongside the activities and aims of innovation seems to be an important issue in contributing to identity regulation and 'finding a home'. Even though the two logics overlap, they are subjects of constant negotiation and thus not free of incompatibilities (compared to the autonomous ones in the CoEs). Property rights, openness and other issues are central topics of debate, but the first steps have been taken towards innovation being taken for granted (Colyvas and Powell 2006).

Torn in two directions

This researcher is affiliated with a CoERI but buffers one or the other of the logics. The centres are often based on unripe relations between the involved firms and academic researchers, and roles and activities are not well elaborated and integrated. Furthermore, our interviews indicate that the informants represent emerging fields associated with applied research striving for academic recognition. These conditions contribute to difficulties in establishing good and close collaboration practices and to develop good and uniting research questions, creating challenges in involving both firms and researchers. Researchers that distanced themselves from the innovation logics emphasised the 'basicness' of their research and were seemingly not actively involved in the centre's innovation activities. Researchers

adhering to the innovation logics claimed that their research probably was perceived as applied by their peers and they perceived their peers as negatively tuned to the research in the centre because of the innovation component. For these researchers the financing scheme contributes to making the incompatibilities between the logics even more explicit.

These four identities indicate that the funding schemes affect researchers' identity and practices in different ways. The overarching pronounced goals of the centre (excellence and/or innovation) have implications for the compatibility of the logics. It seems like the synergies between research excellence and innovation, emphasised by researchers on innovation and the interaction between university and industry (Geuna and Nesta 2006; Salter and Martin 2001) excel in CoEs as these researchers do not need to adjust their identities – the collaboration is much based on the researchers own intrinsic motivation (Perkmann et al. 2011). This is also evident in CoERIs based on prior collaboration where the funding mechanisms provide 'a home' and legitimacy for boundary spanning practices. Furthermore, in centres characterised by weak ties between the collaborating partners the goals of the funding schemes (both CoEs and CoERIs) make the incompatibilities between the logics more explicit. These researchers buffer institutions immanent in the two logics of excellence and innovation, resembling the identity conflict observed by Atkinson-Grosjean (2006) and Gulbrandsen (2005).

We also see that the funding schemes affect researchers differently in Norway and Sweden. The bridging identities are primarily based on the Norwegian cases, whilst buffering practices seems to prevail in Sweden. This could be explained by the funding system; Swedish researchers are often funded by plural external grants and the centre identity is weaker than in the Norwegian cases. The tension-filled dynamics between the two logics in Swedish centres might have been there without the CoE or the CoERI, but the interviews indicate that incompatibilities between logics in the Swedish CoERIs are made more explicit by the goals of the scheme. We find little evidence that the divergence in intellectual property legislation can explain these country differences. In general, the informants did not view the legislation as important, highlighting the continuity of practices (in Norway) from before the removal of the teacher exemption clause or how there are numerous ways to negotiate collaboration agreements that bypass the formal system (both countries).

Previous research on academics identity in university-industry collaboration has resulted in two different research types or different hybrid identities (Atkinson- Grosjean 2006; Owen-Smith and Powell 2002; Lam 2010). The categories developed here are to some extent all hybrids. It is the degree of compatibility between the two logics (Greenwood et al.

2011; Friedland and Alford 1991) which makes up the categories, none can be said to be really 'pure'. Furthermore, our results contribute to the discussion on whether researchers embedded in both logics experience conflicting and dual identities. The very affiliation to a centre branded as 'excellent' diminishes and even resolves many types of conflicts.

Conclusion

Our research question in this paper has been how and to what extent funding schemes with the goal of excellence and/or innovation can affect researchers' identity and practices. The analysis has been based on 33 in-depth interviews in eight centres representing different countries and different academic disciplines.

Previous research on university researchers' identity and roles has emphasised the liminality and tensions for researchers occupying boundary spanning positions between academia and commerce (Atkinson- Grosjean 2006; Gulbrandsen 2005). Others have underlined the hybrid identity of the researchers moving away from the dichotomy 'new' and 'old' school researchers (Owen-Smith and Powell 2002, Lam 2010). By applying the institutional logics of excellence and innovation as the analytical framework, our results indicate that researchers affiliated with respectively Centres of Excellence (CoEs; research-oriented only) and Centres of Excellence in Research and Innovation (CoERIs; incorporating goals of innovation) evoke different identities that can be related to types of overlap and tensions between the two logics. 'The traditionalists' are basic research-oriented academics working in a centre whose goals at least partly harmonise with the traditionalist identity. 'The approved innovators' are researchers with innovation/technology transfer experience affiliated with a centre which is formally set up to support these activities. 'The autonomous researchers' are individuals often found in CoEs but who often are engaged in other activities than basic research, having the freedom to do so without challenging their image as excellent. Finally, the ones 'Torn in two directions' are found in CoERIs where the relations between firms and academics are poor.

Three further findings can be highlighted. First, the funding schemes themselves work quite differently. A Center of Excellence seems rather tension-free, regardless of whether its researchers are oriented at only basic research or a combination of this and other activities such as innovation, technology transfer and societal engagement. Centres of Excellence in Research and Innovation, on the other hand, see many tensions. Traditionalist researchers

here are under constant pressure to do ‘something else’, but even innovation-oriented researchers have many challenges here.

Overall the funding mechanisms seem to have rather conservative effects. For example, if technology transfer activities exist prior to the centre establishment, they continue regardless of the goals of the centre. Second, these patterns may partly be explained by characteristics of the disciplinary context. Our study indicates that CoERIs may not work very well in situations where the academic discipline is not very well established or when the relations between the discipline’s researchers and external partners are immature. Third, national characteristics such as research funding systems also seem to moderate the effect of funding mechanisms on individual researcher’s practices. The interviews indicate that when the centres have low funding or the funding competition is very high, especially the CoERIs may have little effects on practice because the individuals will also strive to adapt to the goals of other sorts of funding and support.

Our main contribution has been to nuance the perceptions of researcher identities and practices, and to show how many different identities can exist side by side in a single research centre. The effects of the long-term funding of the centre mechanisms must be understood in the context of disciplinary characteristics and the existing overall funding system, but demands of the centre funding itself also matter, such as the required number of partners and evaluation criteria. Later studies may want to look more closely at other contextual factors like characteristics of the academic organisation. For instance, could it be that some leading research universities offer the brand of excellence that we see in many of our CoE cases that create a large freedom of choice of research practices for the individuals? It would also be useful to get more in-depth studies of centre support and their co-effects with other funding mechanisms.

A few policy implications should be mentioned. First, centre schemes seem to have fairly conserving effects at the individual level (they may have other effects on universities, though). This means that these instruments are not very well suited to changing individual behaviour but appropriate for those who are already doing fairly well, whether they are engaged in technology transfer or not. Second, although some CoERIs work very well, especially for those who are already engaged in a combination of research and innovation and gain legitimacy through the centre, this is clearly not the right solution in all cases. Especially when the academic discipline is poorly established or when the industry relations are very weak, other ways of improving relations or raising the quality of the research may need to be found.

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