

Small Mighty Centers in the Global Academic Capitalist
Race: A Study of Systemic Factors Contributing to
Scientific Capital Accumulation in Nordic Higher Education
Systems

by

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Department of Leadership, Higher and Adult Education
Ontario Institute for Studies in Education
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Abstract

In the global academic capitalist race, academics, institutions and countries' symbolic power results from the accumulation of scientific capital (or research production), as acknowledged by rankings and other bibliometrics. Previous studies suggested Anglo-Saxon higher education systems (HES) dominated the academic field, but *per capita* analyses show that Nordic HES achieve comparatively higher results in terms of world-class universities, publications and citations. The objective of this thesis is thus to identify systemic factors contributing to the accumulation of scientific capital in Nordic HES.

Following a hypothetical-deductive problem approach and a falsification process, seven systemic factors were hypothesized as having an impact and tested in Denmark, Finland, Norway and Sweden according to a multi-governance framework, and a convergent and parallel mixed-method design. The seven factors are: academic traditions, societal beliefs, public authorities,

early-career researchers, funding streams, networking with non-academic actors and internationalization.

First, a deductive thematic analysis was performed on transcripts from fifty-six interviews, with saturation as a criterion to assess theme saliency. Second, an exploratory factor analysis was processed on a survey completed by 324 participants. The Kaiser-Meyer-Olkin measure verified the sampling adequacy for the analysis ($KMO = .85$). The analysis resulted in an internally consistent eight-factor structure ($\alpha = .89$). Saturated themes, items' average score and multiple comparisons based on a one-way repeated-measure ANOVA (and pairwise post-hoc t tests) revealed that the hypotheses regarding the impact of academic traditions and internationalization could not be falsified. Third, the thematic analysis and a multivariate analysis of variance also showed that societal beliefs are perceived to have a stronger positive impact in Finland than in Denmark and Norway, while internationalization is perceived to have a stronger impact in Finland than in Denmark.

This thesis lays down foundations for a “varieties of academic capitalism” (VoAC) approach, which would distinguish between Nordic, Continental European and Anglo-Saxon HES. This new approach could facilitate a more systematic comparison that includes the influence of political-economic structures on the comparative advantage of HES in the global academic capitalist race.

Résumé

Dans le capitalisme universitaire international, chercheurs, établissements et gouvernements luttent pour l'accumulation de capital scientifique qui, lorsqu'il est avalisé par des classements internationaux et d'autres mesures bibliométriques, leur assure un pouvoir symbolique important. Des études ont déjà conclu que les systèmes d'enseignement supérieur (SES) anglo-saxons étaient les plus performants. Or, des calculs per capita révèlent que les SES nordiques comptent un nombre important de publications, d'université de rang international et de citations. L'objectif de cette thèse est donc d'identifier les facteurs systémiques qui contribuent à l'accumulation de capital scientifique dans les SES nordiques.

Grâce à une approche par problématique, un processus de falsification basé sur une méthode mixte parallèle convergente et grâce à un cadre d'analyse multi-niveaux, l'importance perçue de sept facteurs fut mesurée au Danemark, en Finlande, en Norvège et en Suède. Ces facteurs sont : les traditions universitaires, les croyances sociales, les pouvoirs publics, les chercheurs en début de carrière, les sources de financement, les collaborations non-universitaires et l'internationalisation.

Une analyse thématique déductive a été menée sur cinquante-six entrevues et l'importance des facteurs fut évaluée par le niveau de saturation des thèmes qui leur étaient associés. Trois-cent-vingt-quatre participants ont complété un questionnaire maison ($\alpha = .89$). En s'appuyant sur les résultats de l'analyse thématique, les scores des items et des comparaisons multiples (suivant une ANOVA par mesures répétées et tests t), cette étude montre l'influence des traditions universitaires et de l'internationalisation. L'analyse thématique et une analyse multivariée de variance ont aussi montré que les participants Finlandais considéraient plus positivement

l'internationalisation et les croyances sociales que les participants Danois, ainsi que plus positivement les croyances sociales que leurs homologues Norvégiens.

Cette thèse pose les fondements d'une approche des variétés du capitalisme universitaire (VCU) qui permettrait d'analyser de manière plus systématique l'influence des structures politico-économiques sur les avantages comparatifs développés par les SES anglo-saxons, européens et nordiques dans la lutte mondiale inhérente au capitalisme universitaire.

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I believe education is the cornerstone of human well-being. After completing undergraduate studies in psychology – with a specialization in educational psychology – and Master’s studies in public and international affairs – with a specialization in educational policies – I chose to indulge myself and study what I have always been passionate about. It was difficult, however, to get into the Ph.D. program in higher education at OISE, and I want to begin by thanking those who endorsed, supported and defended my application: Professor Glen A. Jones, Professor Creso Sá, Professor Ruth Hayhoe, Professor Tricia Seifert, Sezen Atacan-Mert, Grace-Karram Stephenson, Karen Dinsdale and the former department chair, Professor Blair Mascall. Thanks to you, and with the support of Vanier Canada Graduate Scholarships and the W. Garfield Weston Foundation, I have been able to undertake this Ph.D. journey with the ultimate goal of contributing to excellent and accessible education systems that will allow young scholars from all over the world to develop their potential and build a bright future in which they believe.

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List of Abbreviations

ARS – Academic research systems
CAP – Changing academic profession
CERN - European Organization for Nuclear Research
CME – Coordinated market economy
DNRF – Danish National Research Foundation
EC – European Commission
ECR – Early-career researchers
ECT – European credit transfer (system)
ERC – European Research Council
EU – European Union
GDP – Gross domestic product
GUF – General university funding
HERD – Higher education expenses in research and development
HES – Higher education systems
ICT – Information and communication technology
LME – Liberal market economy
MANOVA – Multivariate analysis of variance
MLG – Multi-level governance
MoHER – Ministry of Higher Education Research
MOOC – Massive open online course
NCM – Nordic Council (of Ministers)
NOKUT - Norwegian Agency for Quality Assurance in Education
Norden – Nordic region of cooperation
NPM – New public management
NTNU - Norwegian University of Science and Technology
OECD – Organization of Economic Cooperation and Development
PSR – Public-sector research
R&D – Research and development
RCN – Research Council of Norway
SJTU - Shanghai Jiao Tong University (Ranking)

SME – Small-medium enterprise

SNAHE – Swedish National Authority for Higher Education

SRC – Swedish Research Council

STEM – Science, technology, engineering and mathematics (may include health sciences)

TEKES – Finnish Funding Agency for Innovation

THES – Times Higher Education Supplement (Ranking)

UAS – University of applied sciences

UIC – University-industry collaboration

UNESCO – United Nations Educational, Scientific and Cultural Organization

VoAC – Varieties of academic capitalism

VoC – Varieties of capitalism

WCU – World-class universities

Chapter 1

Introduction

Higher education is at the core of many of the social changes being driven by today's global knowledge society. Governments all over the world are attempting to make their universities lead or at least contribute to the shift to a knowledge economy. The American, Australian and British examples easily come to the mind of policy-makers who are busy reforming their higher education systems (HES). This thesis sheds a new light on the issue of academic research production. On a *per capita* basis, HES in Nordic countries achieve comparatively high results in terms publications, citations, patents and positions in world university rankings. These HES have often been studied with regard to their access policies, but their contribution to knowledge production should also be of interest to anyone in search of alternatives to assumptions currently dominating the global discourse. Relying on a complex mixed-method design, the purpose of this thesis is to explain how Nordic HES, while distinct from the systems usually cited as examples, have achieved high levels of excellence.

1 The position of knowledge

“Knowledge” can be defined as the corpus of information accumulated by humankind (Webster's New World Dictionary and Thesaurus, 1996). Although science as a means of generating knowledge has been crucial to many governments over the past five centuries, the current position of knowledge today is unprecedented (Pestre, 2003). Nowotny, Scott and Gibbons (2003) have asserted that societies passed from a knowledge regime called “Mode 1,” in which modern science was a distinct and endogenously evolving institution, to “Mode 2,” in which research becomes problem-solving, interdisciplinary and conducted in collaboration with private partners, and where governments use steering mechanisms to impose their priorities, make scientists accountable and commercialize results. Pestre (2003) also noted multiple transformations in the role of knowledge, although he argued that close collaboration between scientists and public authorities is by no means a recent development. In the economic realm, knowledge is now more than an input transformed by firms: it is a desired output. Knowledge-

based economies are also characterized by a powerful financial sector, virtual firms, legal battles for intellectual property and the collectivization of risks parallel to a privatization of research and development (R&D). Societies also mutate: new groups (educated and networked) gain influence, social challenges require leading-edge expertise, and autonomy, creativity and networking are believed to be the new pillars of success.

To both respond to and support these transformations, the global discourse seems to value scientist-entrepreneurs, collaborations between private and public actors, the reassertion of universities' economic and social relevance and, broadly, a liberal economy in which knowledge creation and transmission is maximized. However, Pestre (2003) observed that "different arrangements and regimes co-exist, and there is no obvious hegemony (or evidence of superiority) of one mode of production (of knowledge) over another, and the questions remain largely of a political nature" (p.255).

1.1 The knowledge economy

The knowledge economy is not a single discourse, but several discourses linked by a common basic assumption: the importance of knowledge (Dale, 2005). Economic mechanisms produce and consume science, intellectual property debates become central, and the sciences that produce the most wealth are most highly regarded (Bonneuil & Joly, 2003). For Moulner-Boutang (2007), the world has moved into a new form of capitalism that he calls "cognitive." Its resources are innovation and collective intelligence, and its capacity to function operates by capturing the positive externalities from intellectual work. The goods produced are quite complex and require a new investment in intellectual capital (education and training) as well as bringing together the work of geographically distant individuals through new technologies. The organization of work is also transformed, becoming more flexible and horizontal, with innovation becoming possible only through "connected brains."

Some have argued that the knowledge economy contains an inherent contradiction in that knowledge is abundant and capitalism tries to force scarcity. But Newfield (2010) observed that in the "cognitariat," a new hierarchy and unequal division of labor takes place. There is an appropriation of knowledge by firms, the privatization of socially created goods and the use of knowledge instead of natural resources or labor to generate profits. In this new configuration, Type C workers (e.g., with a degree in the field of services) possess commodity skills and are

interchangeable (Ibid). Type B (e.g., with post-graduate degrees in leading-edge fields) possess “leveraged skills” that offer an added value to the firm that hires them—though many employees with the same skills exist elsewhere in other firms. Finally, Type A people possess “proprietary skills,” which are defined by Stewart (1998) as talents specific to a company and around which the whole organization is based.

1.2 The knowledge society

Besides the transformation of the economic process and the organization of work, a corollary process is taking place in society as a whole that is granting renewed importance to knowledge. The social changes constituting this corollary process can be broadly grouped around the term “knowledge society.” Used for the first time by Drucker in 1969, the term was less used than the terms “information age” or “learning societies” in the 1990s, but since the UNESCO’s (2005) report *Towards Knowledge Societies*, it seems to have become a commonly used term. The concept, as presented by UNESCO, encompasses social, political and ethical dimensions, fosters diversity and nurtures creativity, suggests the emergence of a new digital age and corresponds to an upheaval in the patterns of the production, spread and application of knowledge.

Societies face new challenges that cannot be solved without drawing upon ever-increasing leading-edge expertise. Our understanding of climate change issues, renewable energy production and the extraction of difficult-to-access traditional resources are all dependent on the advancement of science. The same goes for the risk management of nuclear power, the issue of growing food insecurity, the defense against cyber-attacks, the ethical issues surrounding the fields of genetics, nanotechnologies and bio-technologies, and the support of a virtual and dematerialized financial economy. In the context of these complex issues, knowledge has acquired a new social importance. It is the “resource” needed by authorities and citizens to improve their living conditions, or even simply survive. Luckily, with the availability of information and communication technologies (ICTs), knowledge is disseminated more easily.

Having become crucial for governmental authorities, the terms “science diplomacy” and “knowledge diplomacy” are increasingly used to describe the use of science in the establishment of relationships between sovereign states (Royal Society, 2010). The Royal Society in London distinguished four ways in which science is integrated into international relations. First, “science in diplomacy” refers to the necessity for governments to have a scientific understanding of

international issues in order to make correct decisions. Inversely, authorities can also facilitate science cooperation between national and foreign research institutions (“diplomacy for science”), which they in turn can take advantage of to improve their international relations with partners (“science for diplomacy”). But if science and knowledge have in this way acquired a new position in society, what can be said of institutions such as universities that produce such knowledge?

In sum, the knowledge economy and the knowledge society are inter-related notions. The former refers to the prominence of knowledge in the economic mechanisms of production, distribution and consumption. The latter is broader and encompasses transformations in the social, political and ethical realms because of the prominence of knowledge.

2 Higher education systems in the knowledge society and economy

Within the dual contexts of the knowledge economy and the knowledge society, universities have acquired a crucial position as the main depositories of knowledge, creators of knowledge and producers of highly-skilled workers.

2.1 The economic contribution of higher education

In an economy revolving primarily around the production and dissemination of knowledge, higher education has become a sector capable of stimulating economic growth and making a profit in its own right. With the ratification of the General Agreement on Tariffs and Trades , it is said that a \$50-billion-dollar market was opened up (Marginson, 2011). Taking advantage of the liberalization process that has characterized the past several decades, some universities (mostly in English-speaking countries) have started to compete internationally and to generate revenues through the recruitment of international students, the construction of branch campuses, the creation of online courses and the selling of educational packages to institutions in developing regions (Altbach, 2005). Universities also produce spin-offs, implement technology transfer offices, and produce more and more proprietary research on behalf of private firms (Kogan, 2005).

2.2 The global academic order

Beyond their economic contributions, universities help shape the societies in which they are embedded. In addition to the massification of higher education and the increasing proportion of university graduates in the population (Teixeira, 2009), the Royal Society (2011) noted the establishment of science as a global enterprise led by universities. There are over 7 million researchers around the world who produce 1.58 million publications each year in 25,000 scientific journals, and who draw on a global spending in R&D that increased by 45% between 2002 and 2011 (reaching US\$1000 billion). Science is increasingly global: over 35% of the articles published in international journals are the result of international collaborations, compared to 25% in the mid-1990s (Ibid). The landscape has also changed with China now having more publications than Japan or Europe.

With globalization and the current widening, deepening and accelerating geo-spatial processes of interdependence, convergence and integration (Marginson, 2011; Assayag, 2005), an “academic world order” (Hazelkorn, 2013) is taking shape at the global level. This new global hierarchy appears partly structured by a quantitative measure of performance in research.

In order to compare Chinese universities with other universities performing well in the natural and medical sciences, in 2003 the Shanghai Jiao Tong University (SJTU) created a ranking of the top 500 universities based on their research outputs (Liu, 2009). The indicators include the number of highly cited researchers, staff who won Nobel Prizes and Fields Medals, papers published in Nature or Science, papers indexed in Science Citation and Social Science Citation indexes, and the number of alumni who have won Nobel Prizes and Fields Medals (SJTU, 2012a). Another ranking system was created in 2004 by the Times Higher Education Supplement (THES) based on reputation, student-teacher ratios, publications and internationalization. The indicators for this ranking system include the number of citations in Thomson Reuters’ Web of Science, results from a reputation survey, staff-to-student ratios, doctoral degrees awarded, institutional incomes, the international outlook and research income (THES, 2013b). In total, Hazelkorn (2013) has identified eleven schemes for the global ranking of universities.

Fulfilling the functions of quality assurance mechanisms, accountability measures, knowledge diplomacy and “knowledge market regulators,” world university rankings operate as private instruments of governance (Marginson, 2006) in the sense that these ranking systems induce

profound changes in the governance of national higher education systems. Graduate students look at rankings to choose their alma mater (Hazelkorn, 2009), university administrators to identify their weaknesses (Altbach, 2004), governments to allocate funding (Mok & Chan, 2008) and increase their reputation (Olds, 2009), and, like rating agencies, rankings give value to some institutional outputs and organize the ways in which globalization is expressed (King, 2009). By focusing on specific indicators, rankings also contribute to a transnational convergence, i.e., the dynamic process by which institutions adopt similar objectives and instruments (Hassenteufel, 2008). Marginson and van der Wende (2009) report that horizontal differences (based on institutions' missions) are gradually replaced by vertical differences based on rank and prestige.

2.3 World-class universities

A world-class university (WCU) is generally defined as an institution in the top-20, -50 or -100 of a specific ranking system (Usher & Savino, 2009). Considering that the first ranks are almost always granted to the same institutions, regardless of the ranking system, Usher and Savino (2009) believe that there are underlying factors that determine what makes a “world-class university” (WCU).

It is worth noting that various scholars (e.g., Gingras, 2014; Münch, 2014) strongly criticize university rankings for using unreliable indicators, arbitrarily assigning values, relying on biased databases, rewarding overinvestments in fields with decreasing marginal utility, and rewarding past achievements at the cost of present performance. One has to be careful when using university rankings since they are believed to have detrimental impacts on HES. Rankings encourage isomorphism and undermine institutional diversity; they focus disproportionately on research, leaving aside other core academic missions such as expanding enrolment, training professionals or promoting critical thinking; they also put at disadvantage developing and emerging countries that, despite billion-dollar investments, can hardly increase their position; and their focus on past achievements reinforce the existing tendencies of “brain drain” and “knowledge gap” (Hazelkorn, 2013; Knight, 2009; Münch, 2014).

It must be stressed, however, that rankings are more than instruments of governance and the WCU is more than an ideological discourse. Rankings can also serve as tools to help researchers understand the geopolitical importance of knowledge and the multiple reforms in the field of higher education. I recognize the arbitrary nature of certain indicators and reject any normative

statements based upon them. The diversity of higher education institutions' missions and organization cannot be adequately addressed by a ranking that claims to be holistic. However, the emphasis rankings put on research indicators allows researchers interested in academic research production (especially in the fields of the natural and health sciences) to understand how a plurality of university models can achieve comparable results. The reader will note below that I have attempted to counter the inherent bias of rankings by adding other quantitative measures such as publications, citations and patents.

Using rankings as research tools, various scholars have attempted to define the new WCU configuration. For Morhman, Ma and Baker (2008), the Emerging Global Model (EGM) includes a global mission, an intensive focus on research production, participation in academic networks, diversified funding sources and worldwide recruitment strategies. Marginson (2006) has observed that the United States (US) and the United Kingdom (UK) have the greatest number of top-100 research universities in the SJTU, and concluded that the current global hierarchy is structured by two factors: the distribution of research capacity, and the global advantage of English and Anglo-American cultures. For his part, Salmi (2009) listed the characteristics of WCUs as follows: concentration of talent (graduate students representing more than 50% of the student population), abundant resources (high tuition fees and concentration of funding) and a competitive and autonomous form of institutional governance. Moreover, WCUs tend to be managed by experts, to attract the best international students, to have faculty publish mainly in English, to count the highest proportion of foreign researchers, to benefit from a long history of great achievements, and to be embedded in selective systems of higher education.

Using a quantitative approach, Aghion, Dewatripont, Hoxby, Mas-Colell, and Sapir (2009) surveyed 196 European universities and correlated universities' governance with their performance in the SJTU. Results indicated that performance is positively correlated with greater per-student revenues, budget autonomy, capacity to select students and control hiring, competitive grants and patents. The study also mentioned that US private universities perform better in the rankings, and identified a negative correlation between performance and the share of university budget coming from block grants (for both American and European universities).

Instead of simply counting the number of universities in the top-100 per country (like Salmi and Marginson had done), Aghion (2008; 2010) innovated by developing regional indexes that would

take into account both universities' rank and countries' population (as a proxy for countries' capacity to support their universities). The rationale would be that, for a country, having one university ranked in the top-20 is more impressive than having one university ranked in the top-100, and that having one university in the top-20 when the country has 5 million inhabitants is more impressive than if the country has 300 million inhabitants. The index was calculated by taking the number of universities in the top-100, multiplying that number by the reversed rank of the universities (rank 73rd equals 37 points) and dividing the total number by the population. The regional index was made to be a comparison between a given country and the United States (which has an index arbitrarily fixed at 100). All countries are thus compared to the US. This methodology increased the relative presence of European countries, which had few WCUs but also smaller populations sizes. In his recommendations to the French Minister of Higher Education, Aghion (2010) promoted a governance model based on the Anglo-Saxon tradition in which graduate schools operate autonomously, funding is concentrated in the best institutions, and executive, administrative and academic functions are divided among the Board (including external members from industries), the President and the Senate.

In Table 1, I have attempted to synthesize the descriptions made by the scholars mentioned above and present a coherent WCU configuration. Most of the authors focus on the institutional characteristics that make a university "world-class" and few explicitly describe how a HES may contribute to the emergence or support of WCUs. If one tried to synthesize these systemic factors, the resulting grouping could include beliefs and culture (e.g. Anglo-American culture), stratification, academic work, governance arrangements (e.g. institutional autonomy), research funding, partnerships between academics and national and international actors.

And yet universities are embedded in a HES that structures how they are funded, governed and perceived. For instance, if charging tuition fees is an important factor (Salmi, 2009), it means that the system allows institutions to charge fees and may even decide how much they can charge. Marginson's (2006) description is partly concerned with system characteristics (e.g., research capacity and Anglo-American culture) and Aghion's (2008, 2010) method of calculation of regional indexes can be used to define what systemic factors are related to the number (and the rank) of WCUs in one HES.

Table 1

The underlying factors supporting world-class universities

Authors	Institutional Factors	Systemic Factors
<i>Aghion (2008, 2010) & Aghion et al. (2009)</i>	Bigger budget per student Private institutions Larger institutions Cumulative reputation (age) Comprehensive institutions Separation and balance between executive and academic legitimacies External members of University Boards Distinction between graduate schools and colleges A bigger proportion of graduate students <i>Ad hoc</i> committees	Autonomy (power delegation) <ul style="list-style-type: none"> - Budget autonomy - Capacity to select students - Capacity to determine salaries and to recruit professors - Capacity to create programs and degrees Competitive environment <ul style="list-style-type: none"> - More private funding - Competitive research grants and competition for basic research funding Proximity to the technology frontier Horizontal and vertical diversity Excellence-based initiatives
<i>Marginson (2006, 2007)</i>	English-language institutions International collaborations Private institutions Bigger budgets Competition for doctoral students (places are scarce and subsidized)	Anglo-American culture Culture of competition Important public and private funding Supra-national funding Decentralization and coordination Segmentation and stratification
<i>Morhman, Ma & Baker (2008)</i>	Global mission Research intensive and multidisciplinary From independent researchers to team-oriented Diversified sources of funding Worldwide recruitment strategies Increasing complexity of organization Global collaborations	New relationships between universities, governments and corporations to produce knowledge
<i>Salmi (2009)</i>	Concentration of talent <ul style="list-style-type: none"> - Highly qualified faculty - Some world-class faculties - Select the highly sought graduates - Recruit many PhD international students and international researchers Abundant resources <ul style="list-style-type: none"> - Large endowments revenues (budget security) - Successful faculty competing for government research grants Appropriate governance <ul style="list-style-type: none"> - Private institutions - Strong strategic vision - Culture of constant reflection 	Abundant resources <ul style="list-style-type: none"> - Competitive research grants - Capacity to charge tuition fees Favorable governance <ul style="list-style-type: none"> - Unrestrained scientific inquiry - Competition between universities - Independence from the State - Institutional autonomy (select students; hire, fire and promote staff). - Integrated system of teaching, research and technology-oriented institutions that feed into a few centers of excellence Strategy to select the best institutions, encourage mergers or create new institutions.

Except for Morhman et al. (2008), scholars seem to be implicitly suggesting that the Anglo-Saxon model of higher education is the best performing. Anglo-Saxon countries (Australia, Canada, the United Kingdom and United States) count the highest number of WCUs. In fact, of the 20 top-ranked universities in the SJTU, 17 are American and 2 are British. Authors seem to consider that this phenomenon is a consequence of greater institutional autonomy, a higher percentage of private institutions, a culture of competition, international students and faculty, and the use of English. These conclusions are based on mainstream observations and measures of central tendencies. In contrast, the objective of this thesis is to understand what systemic factors allow “marginal” HES (in statistical terms) to perform as well as HES in Anglo-Saxon countries, at least on a *per capita* basis.

2.3.1 A plurality of models in a global convergence

For the authors cited above, there seems to be convergence towards an Anglo-Saxon model (including Australia, Canada, New Zealand, the United Kingdom and the United States). Although Benner (2011) acknowledged that many countries adopt a simplified emulation of the American model of governance, there remain at least two other models that he named “Continental European” and “Nordic.” The Anglo-Saxon research governance model concentrates funding in a few universities and a few areas, connects universities to risk capital markets and private actors in order to foster economic growth, is biased towards profitable areas and built upon a long entrepreneurial tradition in which professors are encouraged to become entrepreneurs. The Continental European governance model is less flexible, increasingly based on clusters and excellence initiatives, and concentrates research funding in research institutes instead of universities. The Nordic HES, for their part, are embedded in regulated economies where investment is controlled, research funding is based on block grants to all universities and State-initiated mergers concentrate resources. Unlike the Anglo-Saxon model where a group of universities is considered to be excellent in all fields, the Nordic model is characterized by a horizontal segmentation in which each university is deemed excellent in its field of expertise.

All this suggests that the realm of higher education is more diverse than what some observers have concluded. But if there is diversity in the inputs and the structures, is there also a difference in the outputs? In a knowledge society where universities are asked to increase their production of academic research, is there one system better than others? Again, looking at the number of WCUs,

publications, citations and patents, the Anglo-Saxon HES appear to dominate. Moreover, a top-20 university is considered too expensive for small countries (Sheil, 2009). But when these contributions are considered on a *per capita* basis, some smaller countries seem to achieve comparatively high results. For instance, Finland produces 25% more scientific articles than what would be expected on the basis of its population (Välilmaa, 2005), Swedish researchers account for 1.5% of nanotechnology scientific publications and Sweden ranks 13th worldwide in terms of citations (Jacobson & Perez Vico, 2010). Overall, Denmark and Sweden are in the world top-5 in terms of field-weighted citation impact (Elsevier, 2013).

Table 2 divides 16 OECD countries into three groups: Continental European, Anglo-Saxon and Nordic. The names of these categories originate from Benner's (2011) typology of macro-governance models of academic research. The 16 countries are compared with regards to various indicators related to knowledge production. First, using Aghion's method (2008, 2010) of calculating regional indexes, Table 2 shows that, in the SJTU, two Nordic countries obtained higher indexes than the U.S. In fact, in the SJTU (2012a) top-100, there are three Swedish institutions - Karolinska Institute (rank 43rd), Uppsala University (73rd) and the University of Stockholm (81th) - two Danish institutions - the University of Copenhagen (44th) and Aarhus University (86th) - while Norway has the University of Oslo (67th) and Finland the University of Helsinki (73rd).

THES regional indexes show a different picture. While three Nordic countries obtained zero in these indexes, the Anglo-Saxon cluster once again appears the most successful with Australia and the United Kingdom obtaining respectively 115 and 120. The Continental European cluster, for its part, includes two countries with indexes above 100: The Netherlands (125) and Switzerland (234). This difference can be explained by the different indicators used by the two rankings. Both THES and SJTU consider research as the most important factor, but the SJTU bases 90% of its score on research outputs. The performance of Nordic countries in these ranking systems, and especially that of Denmark and Sweden, therefore suggests that these HES have many famous researchers, publications and citations, but have lower research incomes (THES, 2013a) compared with other countries included in this analysis.

Table 2

Academic research production in 16 OECD countries

Countries	Continental European							Anglo-Saxon					Nordic			
	AUT	FRA	DEU	NLD	ITA	CHE	BEL	CAN	USA	AUS	NZL	UK	DNK	FIN	NOR	SWE
Pop (M)	8.4	63.4	81.8	16.8	60.8	8.0	11.0	35.0	316	22.9	4.5	63.2	5.6	5.4	5.0	9.6
#top-100 SJTU	0	3	4	2	0	4	1	4	53	5	0	10	2	1	1	3
SJTU Index	0	23	15	44	0	206	10	51	100	44	0	85	126	50	66	109
# top-100 THES	0	4	4	7	0	3	2	5	48	6	0	10	0	0	0	2
THES Index	0	20	15	125	0	234	52	88	100	115	0	120	0	0	0	94
U21 Rank	11	16	15	7	29	3	13	4	1	8	14	10	5	6	11	2
Citation (K) ¹	18	62	95	41	55	34	21	54	342	43	7	106	17	11	11	23
Citation <i>per capita</i> ¹ (1/1,000)	1.75	0.98	1.17	2.47	0.90	4.22	1.83	1.55	1.08	1.88	1.58	1.67	3.01	1.98	2.16	2.38
Citations ¹ per paper	0.74	0.60	0.67	0.85	0.64	0.94	0.75	0.64	0.64	0.64	0.58	0.70	0.85	0.68	0.67	0.73
Citation impact ⁴	1.21	1.14	1.16	1.44	1.10	1.54	1.36	1.25	1.36	1.22	1.21	1.28	1.48	1.21	1.28	1.32
Publication (1,000) ²	19	102	142	47	81	34	26	83	542	66	12	152	19	15	16	30
Publication per 1,000 inhabitants ²	2.29	1.61	1.74	2.80	1.33	4.29	2.38	2.38	1.72	2.89	2.74	2.40	3.33	2.85	3.09	3.11
Patent per 10,000 ³	0.49	0.39	0.70	0.55	0.12	0.10	0.34	0.17	0.42	0.13	0.10	0.26	0.50	0.62	0.24	0.94

1 Source: SCImago Journal & Country Rank (2013) for the year 2012

2 Source: ISI Web of Knowledge (2013) for the year 2011

3 Source: OECD (2012) for the year 2009.

4 Source: InCites (2016) for the years 1991-2012.

The THES is based, among other things, on data from a reputation survey sent to academics (to evaluate universities' research) and employers (to evaluate the quality of graduates). Data related to reputation accounts for 30% of the ranking. Because Nordic countries are small and possess less common languages than other countries, academics and employers may be less inclined to classify their universities as "world-class," thus affecting their ranking in the THES. Marginson (2007) reported that the response rates for THES surveys were about 1% and that they favored British and Australian universities. Moreover, the SJTU is known to be based on reliable indicators accessible to the public (Liu & Chen, 2005; Usher & Savino, 2009).

While the SJTU and THES rank institutions and force researchers to use proxy methods to transform these institution-based results into system-based numbers, the U21 ranks national HES *per se* (MIAESR & Universitas 21, 2013). The ranking looks at 22 attributes, including government expenditures in tertiary education and R&D, the regulatory framework, the gender

balance of students and academic staff, web usage, the number of international students and research collaborations, research output (publications, citations, WCUs) and impact (SCImago impact factor), the presence of world-class universities, participation rates in higher education and the qualifications of the workforce (Ibid). The ranking uses already existing data related to both inputs and outputs, but fails to make any connection between these two types of indicators (Cheng, 2012). The results presented in Table 2 show that four Anglo-Saxon, three Nordic and two Continental European HES make the U21 top 10 (the other country being Singapore).

The analysis of global rankings is supplemented by data related to research production. According to the Thomson Reuters' ISI Web of Knowledge (2013), even if Nordic countries have a smaller total number of publications than Anglo-Saxon countries and some Continental European countries (i.e., France, Germany, Italy and the Netherlands), the number of publications *per capita* reveals that Nordic countries have a greater output than any other country but Switzerland (and Australia, which has a greater output than Finland). Similarly, the SCImago Journal & Country Rank (2013) reveals that articles published by researchers in Nordic countries are cited more often than articles published in other countries (with the exception of the Netherlands and Switzerland).

Thomson Reuters' ISI Web of Knowledge (2013) has indexed 184,252 documents (4.05% of the world) by scholars from the Nordic region, and it reveals that 72.19% of these documents have been cited, that the average citation per document is 3.52, and that the citation impact relative to the world is 1.42. The InCites (2016) database also reveals that over a 20-year period, Denmark achieves the second highest citation impact (1.48) among the 16 OECD countries, while Sweden comes fifth (1.32), Norway comes sixth (1.28) and Finland holds the thirteenth position (1.21). Finally, the OECD (2012) *Factbook* shows that, *per capita*, Sweden produced the highest and Finland the third-highest number of patents.

At this point of the thesis, four clarifications are needed. First, one could wonder what is meant by "research production" since the initial discussion related to world university rankings and Table 2 presents a variety of metrics. Numbers of patents and publications *per capita* are measures of quantity, while rankings and citations per paper can be considered as measures of quality (or at least visibility). It is possible that factors influencing research quality differ from factors influencing the research output, but it is worth noting that, on a *per capita* basis, Nordic countries produce more research and that this research is cited more often than the OECD average. A focus

on “production” implies that this study is more interested in the quantity of research produced, than on its dissemination.

Second, one could argue that *per capita* measures shift the focus from research performance or excellence to research productivity (i.e. dividing the output by the cost). In this case, *per capita* measures are used to provide a nuanced perspective on quality and quantity. Studies relying on raw numbers tend to overemphasize the contribution of large countries. But whether we look at the concentration of top performers or the overall performance of a system, *per capita* measures allow to include a greater diversity of countries.

The third clarification relates to the fields and areas where Nordic countries appear particularly good in terms of research. As mentioned above, rankings and bibliometric databases give a lot of importance to papers published in English and in the natural and health sciences. In fact, according to a study by Albarrán, Perianes-Rodríguez and Ruiz-Castillo (2013) based on a 4.4-million-articles dataset, Denmark has fewer articles in physics not cited at all than the United States or Switzerland, Finland has among the largest proportion of fairly cited articles, and Norway and Sweden have around 8% of their articles with remarkable and outstanding number of citations. Regarding citation distribution in chemistry, Denmark and Sweden are 4th and 5th in the world, while Finland is 18th and Norway 20th. In clinical medicine, Denmark and Finland are 2nd and 3rd while Norway and Sweden are 8th and 9th. In biology, articles written by the Nordic appear less cited, with Denmark, Sweden, Finland and Norway being at the 9th and 10th, 11th and 17th rank. In engineering, Denmark comes at the second rank, followed by Sweden (4th), Finland (6th) and Norway (8th). So articles written by Nordic scholars have the most citations in the fields of physics, chemistry, medicine and engineering. But Albarrán et al. (2013) also noted that country citation distributions are similar across fields and that country citation distributions appear to have a strong scale factor component.

Data are more difficult to find for the social sciences and humanities. According to Cruz (2016), h-indexes based on 2 million research pieces in economics indicate that Sweden, Denmark, Norway and Finland come at the 10th, 15th, 20th and 21st position. In a study on the Swedish production of highly cited papers, Karlsson and Persson (2012) showed that Finland and Sweden had high activity indexes in the social sciences, while Denmark had the highest indexes for chemistry and agriculture.

Fourth, it is worth mentioning that there are noticeable differences between Nordic countries. For instance, Denmark and Sweden have citations impact rates almost as important as the United States, but Finland and Norway have much smaller citation impact rates, although they remain above world average (Karlsson & Persson, 2012). A longitudinal analysis reveals that Sweden has shown the third weakest development of the mean citation statistic and the fifth weakest with respect to the development of the proportion highly cited publications in the last 20 years (Ibid). On the contrary, there was an increase in Danish mean citation rates, mostly due to a large increase in the top 0.1% of the most cited papers. Despite variations, these multiple indicators suggest that Nordic countries produce a comparatively high level of research, and that this research achieves a noticeable level of visibility.

3 Research objectives and organization of thesis

In the global knowledge economy and society, higher education seems to have acquired a vital role. Higher education institutions train a skilled workforce, produce the innovations needed for economic growth, educate the population and produce knowledge in order to face the complex challenges of today's society. Some universities (like WCUs), embedded in specific systems of higher education, are known to contribute massively to academic knowledge, whether in terms of publications, citations or patents. The Anglo-Saxon HES, characterized by autonomous institutions, a competitive culture, private investments, segmentation and competitive funding, are often taken as models because they account for most of the top-100 universities in both THES and SJTU and because they produce most of the scientific articles.

On a per-capita basis, however, Nordic HES achieve comparatively high results in terms of WCUs, publications, citations and patents. Nordic countries are known for their policies facilitating access to higher education and this feature of access will be taken into account in further chapters, but the focus will remain on academic research production as a key activity responding to the demands of the knowledge economy and the needs of the knowledge society. *The objective of this thesis is to explain how the Nordic HES achieve a comparatively high level of academic research production and to identify the systemic factors contributing to this production.*

To meet this objective, I will use Holmes' (1981) problem approach to comparative education. In this approach, "problems" refer to abstract constructs that can be formulated when an

asynchronous change happens in a society: in other words, something changes and something else does not. The approach is hypothetical-deductive and it includes five steps: intellectualizing a problem, formulating hypotheses based on a theory of social change, identifying the context in which the problem will be studied, predicting the outcomes of the hypotheses in the specific context, and comparing the logical predictions with observable events (or outcomes). The ultimate goal is to generate sociological laws so that, under specified conditions, an outcome can be predicted.

This thesis is divided into five parts, each including two to four chapters that closely follow Holmes' five steps. This introductory chapter has sought to intellectualize the problem of "academic research production." Part I, composed of chapters 2 and 3, presents the background for this study. Chapter 2 presents the study's theoretical frameworks (academic capitalism, the varieties of capitalism approach, the welfare regimes typology and neo-institutionalism) used to formulate hypotheses on why Nordic HES achieve comparatively high results in terms of academic research production. Chapter 3 describes the contextual contingencies in which the problem will be studied. First, the Nordic welfare regime is a well-established ideal type that might have a strong influence on the way research production and higher education are conceived. Nordic HES would then represent a subset of the Nordic welfare regime ideal type. Superimposing the context on the problem, Chapter 4 lists the systemic factors potentially explaining academic research productivity in the Nordic HES. Each factor becomes an hypothesis to be further tested.

Part II, composed of chapters 5, 6 and 7, presents the methodology. In Chapter 5, the problem approach and the post-positivist stance on which this approach relies are explained in more detail. As stated in Chapter 6, in order to assess the importance of systemic factors on research production in four countries, the study relies on the aggregated perspectives of multiple system actors. These perspectives were gathered through a survey and a series of semi-structured interviews. Following a convergent parallel mixed-method design, the quantitative and qualitative data are analyzed independently and merged during the interpretation phase. Only that which appeared significant in both datasets was considered robust. Chapter 7 lists the analyses necessary to test the hypotheses. A factorial analysis served to test the survey's internal consistency. Average Likert scores, comparisons of means, multiple comparisons based on a one-way repeated-measure ANOVA (and pairwise post-hoc *t* tests), and saturation in interviews

were used to assess each factor's perceived importance for the research production process. Interviews also enabled an understanding of why each factor was important (or not). A multivariate analysis of variance allowed for the analysis of differences between countries.

Part III includes four chapters related to the qualitative findings, organized according to six systemic factors derived from the quantitative and qualitative analyses. Chapter 8 focuses on the systemic factor of "beliefs." Chapter 9 analyzes "academic structure." Chapter 10 includes the factors of "governance" and "public-sector research funding," while Chapter 11 includes the factors of "networking with non-academic actors" and "internationalization."

Part IV includes two chapters related to the quantitative results. Chapter 12 assesses and evaluates psychometric qualities of the survey created for the purpose of this study. The use of an exploratory factor analysis also made it possible to examine how indicators would group into factors. Chapter 13 presents the results of the survey and assesses the perceived impact of systemic factors on academic research production in the four Nordic HES.

Part V presents the discussion of the thesis' findings. In Chapter 14, quantitative results and qualitative findings are merged in order to draw points of convergence regarding the positive impact of certain systemic factors. Since the Nordic HES do not necessarily form an homogenous set, Chapter 15 analyzes differences between Denmark, Finland, Norway and Sweden. Chapter 16 takes the discussion to a more abstract level by combining the lenses of sociology and political-economy in an attempt to understand a possible Nordic "comparative advantage." This chapter concludes by suggesting that a "varieties of academic capitalism approach" (VoAC) could allow for a closer look at the interactions between academic research production and the political-economic structure of the countries whose HES are under consideration.

Part 1
Background

Chapter 2

Theoretical Frameworks

As stated in the previous chapter, the purpose of this thesis is to explain how the Nordic HES achieve a comparatively high level of academic research production and to identify the systemic factors contributing to this production. The present chapter introduces four theoretical frameworks (and their broad disciplinary origin) used to frame the problem, the context and the dynamic nature of higher education systems. These core frameworks are: academic capitalism, the varieties of capitalism approach, the welfare regimes typology and neo-institutionalism.

The version of “academic capitalism” used here is slightly different than the version initially articulated by Slaughter and Rhoades (2004) while investigating how HES are integrated with the new economy. Academic capitalism was for them a methodological tool for explaining both structural and behavioral changes in higher education. This tool included neoliberal policies and governance regimes (including funding streams and interstitial organizations), increasing links between HES and the market (Cantwell & Kauppinen, 2014), and the market and market-like behaviors in higher education.

For Kauppinen and Kaidesoja (2014), the academic capitalist regime is radically different from the previous public good regime in which basic research was conceived in Merton’s (1973) terms: communalism, universality, disinterestedness and organized skepticism. In the academic capitalist regime, the distinction between basic and applied research is increasingly blurred due to commercialization, knowledge privatization and profit-making. Academic research in this context also finds itself transformed by the new rules regarding intellectual property facilitating the conversion of cultural capital (e.g., scientific discoveries) into economic capital (e.g., patents).

This initial conception of “academic capitalism” has a number of shortcomings, however, which make it less than ideal as a framework for the present study. Firstly, it appears to apply mostly to Anglo-Saxon countries (and only to a limited extent at that, since the involvement of academia in commercial endeavours remains fairly limited).

For Välimaa (2014), it is obvious that technology, global networks and the expansion of knowledge in every sphere of society has transformed HES. The locus of knowledge would move from local to global networks, and academic-only knowledge production would be gradually replaced by shared production of knowledge (including with business partners). Välimaa argued that it is an exaggeration to claim that the commercialization of higher education happens in all developed countries to the same extent as in the United States. For example, in Finland, universities charge no tuition fees to their students and the rhetoric of the “public good” which informs perceptions of the nation’s HES strongly resists the basic assumptions of academic capitalism. Even in the United States, academic capitalism explains only a few of the multiple transformations taking place. Geiger and Sá (2009) argue that the productivity of technology transfer offices has been poor, and that commercialization has remained difficult in many disciplines. Although there are more business-oriented evaluators on research councils than before, Geiger and Sá consider that the academic Mertonian norms remain strong.

In my opinion, the biggest issue remains that a focus on material capital accumulation omits a distinct yet intersecting logic transforming academia. As stated by Kauppinen and Kaidesoja (2014), the term “capital” does not have to refer solely to economic and intellectual capital in the previous senses used, but also to social, cultural and symbolic capital. As it was suggested in the Introduction (Chapter 1), the combined phenomena of a knowledge society, globalization and international rankings may have helped foster a new “academic world order” (Hazelkorn, 2013) in which countries, institutions and individuals use academic research to compete for recognition and prestige more than for material gains.

In response to this, Münch (2014) has developed a second version of academic capitalism in which symbolic power results from the accumulation of scientific capital as a specific form of cultural capital acknowledged by rankings and other bibliometrics. By extending the concept of capital to include social, economic, cultural and symbolic forms, Münch’s (2014) theory of academic capitalism examines the struggle of universities for power in the academic field. Münch identifies strategies of adjustment to this global race for prestige along more traditional academic norms.

Considering the nature of the Nordic HES and this paper's research objective, I have decided to frame the core problem of this study in a terminology developed by Münch and based on Bourdieu's sociology of science.

Following Holmes' (1981) problem approach to comparative education, the problem needs to be studied in its proper context. Academic capitalism offers a framework that explains the different responses by HES to a number of general trends including higher education expansion, rankings and the knowledge society (Bleiklie & Kogan, 2007). The global struggle for excellence may in turn provide justifications for reforms, but the *way* in which strategies are developed and reforms take place are strongly influenced by existing institutionalized systemic features (Ibid).

Because different environments explain different policy designs (Bleiklie, 2006), I use theories from political economy, especially the welfare regimes typology (Esping-Andersen, 1990, 1999) and the varieties of capitalism approach (Halls & Skoskice, 2004; Hall & Thelen, 2009) to analyze and predict national responses to the global academic race for capital.

1 Sociology of science

Sociology views science as a social activity whose social conditions, structures, processes and outcomes can be studied (Ben-David & Sullivan, 1975). This kind of study is conducted by examining the political, historical, cultural and economic factors shaping the scientific field. Bourdieu (1975, 1986, 1988, 1993, 2004), for instance, proposes a compelling framework in which his concepts of capital, power, habitus and field highlight the key components of the process of (academic) research production. This section begins by describing Bourdieu's key concepts and then elaborates on Münch's (2014) theory of academic capitalism.

1.1 The academic field for Pierre Bourdieu

For Bourdieu (1986), capital represents the accumulated labor that enables actors to appropriate social energy and ensure the production of a particular category of goods, with the potential of converting it into material or immaterial profit. In addition to its subjective form in which it consists of the basis of power for certain actors, capital in its objective form is a manifestation of the underlying but immanent regularities of the social world, thus determining the realm of

possible actions for actors (Ibid). It determines the conditions under which individuals or institutions employ strategies to maintain or enhance their position in the social order (Swartz, 1997).

In addition to the traditional concept of “material capital,” Bourdieu (1986) identified three types of capital: cultural, social and symbolic. Cultural capital can exist in three forms: in the embodied state (internalized schemes of appreciation, e.g., culture or science), objectified state (objects requiring specialized cultural abilities) and institutionalized state (e.g., educational qualifications). For Bourdieu and his followers, of the four types of capital, cultural capital contributes the most to the stratification process in advanced societies where higher education is massified and status allocated based on professions and knowledge (Swartz, 1997). Cultural capital is particularly important for this study because it encompasses scientific knowledge, discoveries and publications (Bourdieu, 1975).

If scientific authority stems from recognition as a form of symbolic capital that structures the scientific field, scientific capital is a sub-type of cultural capital that allows actors to make socially recognized achievements and claims. According to Bourdieu (2004):

“Scientific capital is a set of properties which are the product of acts of knowledge and recognition performed by agents engaged in the scientific field and therefore endowed with the specific categories of perception that enable them to make the pertinent distinctions, in accordance with the principle of pertinence that is constitutive of the nomos of the field” (p. 55).

Considering the purpose of this study, I will not examine the whole scientific field, but rather focus specifically on the systemic factors contributing to the accumulation of scientific capital by HES in Nordic countries. Scientific capital would thus be understood as the accumulated labor by academic actors to produce science in its objectified state for material and immaterial profits. Objectified scientific capital would then include articles published in peer-reviewed journals, books published by a recognized publisher, papers presented to scientific conferences, patents and other means of dissemination recognized by the scientific community.

Besides cultural capital, other types of capital are also interesting for this study since they can be converted into one another. Social capital encompasses the resources linked to a more or less institutionalized durable network (Bourdieu, 2004). The volume of social capital that actors possess therefore depends on the size of the network and the number of connections they can

mobilize. Social capital allows actors to benefit from the economic, cultural and symbolic capital accumulated by others. As for symbolic capital, it represents the power that a dominant group has in the form of credit. It is associated with recognition, deference and obedience and is considered legitimate in that it appears to lack vested interest (Swartz, 1997). It can be conceived as a capital of trust stemming from social esteem. Symbolic capital is particularly relevant in the global quest for rankings and citations, which are observable proxies for credit in the academic field. Analyzing symbolic systems may thus help us to understand social differentiation, codes used in a given culture and instruments of knowledge (Ibid).

Bourdieu also developed a framework within which to approach the scientific and academic fields. The scientific field has the monopoly of scientific competence in the sense that actors have the legitimacy to speak depending on the position they occupy in the instituted hierarchies (Bourdieu, 1975). In this field, symbolic power is derived from one's contributions to scientific discoveries and the authority granted by peer recognition. The field teaches us that, as scientific knowledge and resources increase, the capital needed to appropriate such knowledge and resources, as well as the cost of entering the competition, also increase. In other words, as knowledge increases, areas of research become narrower and it takes more time, energy and equipment to make new path-breaking discoveries and thereby gain recognition.

Bourdieu also developed the idea of a "logic of distinction" that was later further explored by Münch (see Section 1.2 below). Since the scientific field is based to a large extent on visibility and recognition, dominant actors use their cultural, social and symbolic capital to minimize loss of distinctive values. For example, a researcher can use a set of resources to have his or her name as first author, or a university can use its resources to recruit prize-winning scholars. In the scientific field, dominant groups use conservative strategies like a kind of valorization (e.g., academic prizes and scientific journals) to maintain the homogeneity of the field and the correlative decline in revolutionary discoveries.

The academic field interacts closely with the scientific field, providing credentials to scientists and a significant portion of the scientific capital. In his book *Homo Academicus*, Bourdieu (1988) describes the academic field as being partly autonomous in that it is mostly concerned with the endogenous demand for the production and reproduction of knowledge, and partly heteronomous in that it is influenced by broader external social reproduction schemes. Within the

field, academic power consists in membership in prestigious committees, tenure, leadership positions and grants. It is linked to scientific capital, but also greatly influenced by other forms of capital. For instance, to accumulate and preserve social capital, professors need to spend time in committees and undertake various tasks, leaving less time for the accumulation of scientific capital. Moreover, institutions may rely on rankings (i.e., symbolic capital) to legitimately request special treatment from political authorities. Although these concerns will be explored below, it is worth remembering that the focus of this thesis is on the accumulation of *scientific capital* (i.e. quantity of research produced) rather than on the symbolic benefits (such as citations, impact or academic prizes) resulting from it.

As Marginson (2006) reports, the autonomous pole in the academic field allows universities to develop their culture and sets of values. At the same time, universities control all university-specific capital that can then be converted by actors into cultural, economic, social or symbolic capital. This allows universities to maintain their position in society. According to Marginson, social-democratic regimes value the public benefits of university research more than liberal regimes. “Public” does not in this case mean that academic research is accessible to the common discourse (especially since excellence is often measured in terms of exclusivity), but rather that the pursuit of knowledge is funded by the public purse, not subject to market logics, and benefits the overall society (Calhoun, 2006).

1.2 The struggle for excellence of Richard Münch

Münch (2014) re-examined the academic field in the wake of the global quest for prestige fostered by globalization, rankings and the knowledge society. This author looks back longingly on times when the academic field had still been based on the trusteeship of the scientific community and characterized by the expectation that those who receive “the gift of the PhD” have a duty to reciprocate by contributing to knowledge; times when failure was accepted, where there was no calculation of price on research and no ranking. Münch adopts a strongly critical stance regarding the seizure of the academic field by economic thought in the symbolic sense, pointing to the new (and in his view problematic) national and global realities brought on by this seizure. On a national scale, universities have become independent actors accountable to public authority, management has taken over from collegiality, and professors’ knowledge has become a raw material to be exploited by other universities and researchers. On a global scale,

universities struggle for positions in rankings which grant them additional economic, social, cultural and symbolic capital. Such rankings are based on research output. Münch adds that if HES are more or less stratified when education is concerned, they become extremely stratified when only research output in high impact journals is considered. States encourage universities to adopt the logic of capital accumulation by reinforcing a hierarchy where the most visible institutions, and not the most efficient, receive most support. States contribute to their flagship universities' symbolic capital by concentrating research funds into few centers and outbidding competition (see Gao, 2015).

Before entering a more detailed explanation of Münch's (2014) framework, I must acknowledge that I do not fully agree with his overly critical tone and the general claims he makes about the transformations of higher education. Relying exclusively on examples from the United States and Germany, Münch believes that academic communities have been robbed of their power. But one could also say that, with the growing importance of knowledge, their role has instead become more crucial. Although I agree that concentrating resources into few research centers risks undermining competition on a national scale, we should keep in mind that there remains strong competition between many centers on a global scale. Also, Münch attempts to demonstrate that there is no correlation between the accumulation of scientific capital and the symbolic capital gained by institutions. But one could argue that he makes questionable choices regarding his proxy variables. For instance, cultural capital was only measured by the age of the institution. One could have looked at other indicators such as libraries, professors' qualifications or doctoral graduation rates. Economic capital was only measured by the proportion of scientific staff in STEM fields. This focus on STEM-fields was however not supported by any rationale. Economic capital could have also included research funding, patents and endowments. Finally, symbolic capital was only measured by faculty members who sit on research council committees. University rankings, membership in prestigious networks or simply citations would have been more robust proxies.

Although I disagree with some of its conclusions, I still consider that Münch's *Academic Capitalism: Universities in the Global Struggle for Excellence* provides a structured, robust and compelling theoretical framework for analyzing the strategies used by HES to enhance or maintain their position in the academic field. Below I explain Münch's concepts of academic

subfields, social mechanisms constructing/reproducing excellence, institutional logics and hierarchical model.

Basing his argument on Bourdieu's field theory, Münch found that there was a tension in the academic field between an autonomous pole marked by competition in the pursuit of science and recognition by the scientific community, and a heteronomous pole marked by competition for funds and influential positions. Where the former autonomous pole dominates, institutional positions are determined according to an institution's accumulation of scientific capital. In contrast, where the latter heteronomous pole dominates, positions are based on social and economic capital. Beyond these two poles of tension, the academic field also counts three interdependent subfields. The subfield of academic research seeks truth and recognition, and possesses scientific capital. The subfield of evaluation seeks prestige, grants symbolic capital to the subfield of academic research through accreditations and ranking, and reduces the complexity of the academic field. Lastly, the subfield of resource allocation consists of funding organizations, seeks wealth, grants economic capital, and receives symbolic capital from the evaluation subfield and scientific capital from the academic research subfield.

Münch described social mechanisms at work constructing and reproducing status hierarchies in the academic field. One example of such a mechanism is institutional size, which increases a center's or an institution's scientific capital accumulation and contributes to its visibility. Another example is evaluation, which creates differences and reduces the complexity of criteria to a rank or a mark, thus allowing individuals, institutions and HES to stand out and accumulate symbolic capital. Inspired by Merton's (1968, 1995) sociology of science, Münch identified four mechanisms contributing to the reproduction of hierarchies. The Matthew Effect (Merton, 1968) states that the probability of gaining a greater reputation increases with each previous gain in reputation until a point of saturation has been reached. Similarly, the Thomas Theorem (Merton, 1995) states that current research achievements are assessed in light of past research assessments. According to the Potlatch Effect, departments (or institutions) with more capital can invite guest researchers to pursue their research in-house and later serve as vehicles for the promotion of their host institution upon their return. Finally, the Closing Effect stipulates that prestigious institutions protect their status by cooperating solely with prestigious scholars and institutions.

Münch's study goes on to identify different logics of accumulation and distinction in the academic field. The resource allocation subfield invests in scientific undertakings both in line with anticipated material revenues (e.g., patents or commercialization) and symbolic revenues (e.g., publications in high-impact journals or rankings). Investments are based on what is known at the time and sometimes risk impeding the scientific process (which as we know often involves developments and breakthroughs that are impossible to predict). But in the global academic capitalist race, membership in prestigious global networks, positions in world-class universities and publications in high-impact journals have greater value for actors than the accumulation of scientific capital *per se*. Logics of distinction mean restricting visible knowledge to increase its value.

Finally, Münch developed a cogent model in which he described how the macro-, meso- and micro-levels of HES may be structured in the global academic capitalist race. At the macro-level, social, economic and cultural capital can be distributed based either on an unequal and homogenous cartel-like structure or on an equal and pluralistic structure. An oligopolistic appropriation of research funds (such as granting a premium to prestigious institutions) can create a gap between funding and the actual accumulation of scientific capital, while a pluralistic mode of appropriation (e.g. through basic funding or smaller competitive grants) will encourage congruence between funding and research production.

At the meso-level, the level of social closure influences the rigidity of the hierarchy and the amount of symbolic capital granted to certain institutions and researchers. A concentrated allocation of funds will encourage a rhetoric of excellence and create clusters, irrespective of the uncertainty of the research production process at the micro-level. The construction of excellence can undermine research production in that it can lead to an overinvestment of resources in the production of a certain kind of good (e.g., popular research theme), neglecting the production of other goods, decreasing the marginal utility of investments and routinizing research.

At the micro-level, there is an inherent asymmetry of information in the peer-review process. Because the results of research can hardly be known in advance, systems based solely on referees' appreciation of applications will merely reproduce existing symbolic stratification. Institutions may use their symbolic power in a situation of uncertainty to gain further economic,

social and cultural capital. Success through peer-review screening leads to a signaling effect where other actors give more credit to granted institutions and individuals.

In the end, Münch calls for a political-economic analysis of this new global academic power struggle. His work identifies global logics of capital accumulation such as investments in research projects motivated by expected material and symbolic revenues, as well as logics of distinction that restrict visible knowledge to create exclusiveness and status. Although playing out on a global scale, these different logics are mediated by the traditions and national contexts of HES.

2 Political economy

The problem approach being introduced here requires that the researcher take into consideration the context in which the phenomenon under study is taking place. How this context is to be described of course depends on the research question being asked, but Holmes (1981) does suggest a set of ideal types with which to express and interpret contextual statements.

Applied to the concerns of the present thesis, the question then becomes how do countries following different paths (i.e., associated to different ideal types) succeed in the common global power struggle of “academic capitalism”? Like Slaughter and Rhoades (2004) before him, Münch (2014) calls for a political-economic analysis in order to understand the multiple adaptations or resistance strategies being employed by HES in response to the phenomenon of academic capitalism. Political economy is a valuable discipline for studying cross-national variations. Caporaso and Levine (1992) define it as the study of the inter-relationships between the structure of power and economic processes. Comparative political economy is more precisely interested in processes shaping citizen welfare or the comparative advantage of organizations and outputs (Hall & Skokice, 2004). For instance, from a political-economic lens, welfare regime typologies were developed as ideal-typical configurations that conceptualize the durable historical choices of specific societies and the factors conditioning their adjustment paths (Esping-Andersen, 1990, 1999). The varieties of capitalism approach (VoC), for its part, frames the ways in which political-economic structures provide organizations with comparative advantages for engaging in specific types of activities (Hall & Skokice, 2004).

Regarding the importance of political economy for higher education, Cantwell and Kauppinen (2014) make the following claim:

Nearly all aspects of higher education (e.g. student recruitment and learning, governance, organizational administration, public policy, and the academic profession) are embedded in the political economy with links to the market, non-profit and nongovernmental organizations, and the state. (p.3)

Multiple studies have indeed demonstrated a relationship between societies' political-economic structure and academic activities. Pechar and Andres (2011) conducted a correspondence analysis based on Esping-Andersen's (1990) typology and found that regimes had different national approaches for the funding and expansion of HES. Writing about academic research, Benner (2011) argued that Anglo-Saxon governance models are different from Continental European and Nordic models. Bégin-Caouette, Askvik and Bian (2016) conducted a non-parametric correspondence analysis and demonstrated that Esping-Andersen's (1990, 1999) welfare regime typology could partially explain the correspondence between OECD countries and academic research system indicators. Further details about these studies will be provided in the next chapter, but at this point, they are cited merely to emphasize the multiple interconnections between political-economic structures and HES.

The categorizations presented below should not to be accepted as empirical truths. Rather, they are ideal types. Weber (1924/1968) defines ideal types as analytical tools, logical "utopias" and abstract constructs resulting from a synthesis of multiple characteristics. Ideal types are often understood as "pure" ideas and exaggerations of real phenomena. In education, ideal types imply a particular philosophy that can be summarized in terms of the nature of human beings, society and knowledge.

2.1 Varieties of capitalism approach

The varieties of capitalism (VoC) approach is interested in analyzing the factors that condition the adjustment paths of a particular political economy in the face of macro-economic challenges (Hall & Skoskice, 2004). The focus is on the process rather than the outputs. The framework presupposes that all political economies can achieve the same performance in the long-run, while the factors supporting such performance might significantly differ from one case to another. Hall and Skoskice used the concept of "comparative advantage" to understand how the institutional

structures of a particular political economy provides businesses (or HES) with advantages for engaging in a specific type of activity (such as academic research production). Because of their comparative advantage, certain organizations can produce certain goods more efficiently than others.

As Hall and Skoskice (2004) put it: “The varieties of capitalism approach to the political economy is actor-centered, which is to say we see the political economy as a terrain populated by multiple actors, each of whom seeks to advance his interests in a rational way, in strategic interaction with others” (p.6). It is worth noting that the VoC approach acknowledges the role of societal beliefs and culture, since actors are seen to choose an adjustment path according to a set of informal rules passed on through common values or shared understanding.

The VoC approach groups developed countries into two types: liberal market economies (LMEs) and coordinated market economies (CMEs). LMEs achieve coordination through hierarchies, competitive arrangements and market relationships. There is a private market for investments in human resources, as well as a market that controls wage inflation (Hall & Skoskice, 2004). Institutions respond to price signals and make strategic decisions without much consultation with other actors.

CMEs, for their part, achieve coordination through non-market mechanisms such as extensive relational contracting and network monitoring. CMEs encourage strategies based on differentiation rather than intense competition. The institutions in place are encouraged to engage in consensus-based collective discussions where it is more difficult for an organization to “take over” another, but where change is also slower and incremental. Although states always take part in these discussions, they cannot dictate policies unilaterally because issues tend to be complicated and they need to rely on the information of multiple actors.

In some CMEs, non-state groups might have such a structural influence on political parties, policy-making or on a sector of activity that they can prevent excessive state interventions. On those occasions, states might create “buffer organizations” which grant a voice to the relevant organizations. A number of institutions promote inter-organizational networks, consequently assuring the breadth of common knowledge and the maintenance of a “non-market equilibrium.” In terms of policy-making, information feeds through networks and potent technocrats, bargaining

is achieved through formal corporatist meetings, and decisions are made through consensus (Campbell & Pederson, 2010).

VoC describes the sets of factors maximizing institutions' capacity to adjust to macro-economic challenges. Hall and Thelen (2009) questioned whether this framework was stable over time. They argued that the persistence of institutions depended not only on their aggregate welfare effect, but also on the benefits they provide specifically to the social and political coalitions supporting them. In both types of economy, some institutions support market coordination while others support strategic coordination. Hall and Thelen thus argued that the stability of institutions depends on the availability of meta-institutions for deliberation and rule-making. Meta-institutions refer to institutions organizing other institutions, such as the public sector, the form of democracy (deliberative, participative or delegated) or the electoral system. These meta-institutions aggregate the multiple local knowledges and allow for the improvement of institutions. Change agents can succeed, but they have to work around institutional features that are "locked in." They can add new elements and alter the overall trajectory of a nation, but they must do so by working with the existing strongest institutions.

The VoC is also a powerful approach for explaining variations between HES. Drawing on the VoC approach, Kim (2013) demonstrated that CMEs invest more in R&D during recessions than LMEs, consolidating a knowledge-intensive economy. Moreover, Olson and Slaughter (2014) have observed ways that VoC can apply to academic capitalism. LMEs are characterized by an open higher education system that allows individuals and firms to continually redefine the skills that are needed. The state reduces its intervention in the education system and restricts its role to ensuring the protection of private property rights, free markets, and free trade in order to promote radical innovation. In CMEs, collaboration is prized over competition. Academic capitalism entails a more scripted transition, coordinated by the State. In some CMEs, the rhetoric of excellence is manifested in the form of channeled competition wherein some institutions are selected by public authorities to receive greater support.

The VoC approach could also explain national responses to academic capitalism. After comparing Germany and the US, Olson and Slaughter (2014) even concluded that "The neoliberal variety of academic capitalism has been successful in creating and sustaining world-class universities by rewarding the successful research universities in world-class rankings" (p.20). First, as I mentioned

in the Introduction, there are multiple and competing definitions of WCUs and academic excellence. And if even if we solely focus on indicators such as the number of indexed publications or citations rates, data suggest that different political economies can achieve similar results although they follow different paths. Nordic HES also take part in the global academic capitalist race. But taking the example of Finland, Kauppinen and Kaidesoja (2014) think the transnational trend of academic capitalism is mediated by the particularities of this Nordic country. Like Benner (2011), Bleiklie (2006), Hall and Skoskice (2004), Kauppinen and Kaidesoja (2014) and Münch (2014), I believe a political economy's institutions may mediate responses to global phenomena and that it is worth identifying what systemic factors contribute to scientific capital accumulation in the specific context of Nordic CMEs governed by social-democratic regimes.

2.2 Welfare regimes typology

While the VoC is interested in analyzing the factors that condition the adjustment paths of a particular political economy, the welfare regimes typology analyzes how in different societies states, families and businesses coordinate the production of welfare. Esping-Andersen (1999) defines welfare regimes as specific configurations involving the state, the market and households, through which welfare is produced. The typology of welfare regimes used by Esping-Andersen is derived from classical political economy and the study of mature welfare states since the 1970s and the 1980s. Three concepts are central to Esping-Andersen's analysis: de-commodification (protection of welfare benefits from market forces), stratification (inequality between social groups) and welfare mix (the involvement of states, households and markets in providing welfare).

It is particularly useful in this case because it provides more nuanced categories than the VoC. Instead of a two-poles typology (CMEs and LMEs), Esping-Andersen identifies three types of welfare regimes. Liberal regimes are found mostly in Anglo-Saxon countries (e.g., Australia, Canada, New Zealand, the UK and the US). These regimes are biased towards market-like behaviors, competition, needs-based social assistance, the restriction of social guarantees to "bad risk" and a residual view of state intervention. This regime type emerged from 19th-century English political economy. It is strongly supported by a notion of "less eligibility" and "self-help" as well as by a faith in markets. Liberal regimes maintain a low level of de-commodification whereby the market takes care of good risks (benefits) and the state absorbs

bad risks. This means that in liberal regimes the accumulation of scientific capital is fostered by the private sector so long as it can be easily converted into economic capital, but is taken over by the public sector in the cases of more basic or fundamental research.

Conservative or corporatist regimes (e.g., Austria, Belgium, France, Germany, Italy, the Netherlands and Switzerland) are supported by a strong corporatist-statist legacy and provide social benefits to their citizens (such as social policies) while preserving class and status differentials. Citizens would thus receive help based on their job occupation and family status. Conservative regimes first emerged in Continental Europe in the mid-19th century when liberalism played a marginal role and socialists were excluded from the political arena. Their social policies were originally inspired by monarchical Statism, traditional corporatism and Catholic social teaching (Esping-Andersen, 1999). In addition to Bismarck and von Taffe who greatly shaped the corporatist ideal in Protestant countries, the Catholic Church influenced Mediterranean countries' regimes by maintaining states' reliance on families to provide child and elderly care, a strategy which Esping-Andersen (1999) refers to as "familialism." Familialism is less dominant in France and Belgium. All countries characterized by a conservative regime feature a privileged treatment of the public civil service as well as marginal social rights associated to class and work effort.

The third regime identified by Esping-Andersen, the social-democratic welfare regime, is, according to Esping-Andersen, only found in Nordic European countries (e.g., Denmark, Finland, Iceland, Norway and Sweden). This regime is characterized by comprehensive social policies, entitlement programs and universal access to quality services. Countries that identify with the social-democratic category have implemented comprehensive social policies to reduce individual risks and have ensured universal access to quality programs in order to reduce the influence of the market, on the one hand, and the traditional family, on the other. The ideal motivating this regime includes a focus on positive equalizing actions, freedom of choice for citizens, and market-regulation through consensus between the state, unions and employers.

In the context of a growing "post-industrial" knowledge society, social-democratic welfare states pool and redistribute social risks. A social risk is the probability that people will experience a loss of welfare during the course of their life (e.g., job loss or pension fund collapse). Esping-Andersen (1999) observed that the different regimes adopt different strategies to respond to the

transformation of social risk. The service economy of social-democratic regimes, for instance, is biased towards “public” welfare state jobs, while liberal regimes favor tax-subsidized private provisions. Conservative regimes generally allow service earnings to follow general wage trends. Yang (2014) adds that conservative regimes seem to break down here into two sub-types, with some conforming to their existing model and others producing a genuine regime-shift.

It is worth recalling once again that Esping-Andersen’s (1999) welfare regimes are used here as ideal types. An ideal type is not an exact reflection of the regimes it describes but an abstract construct that exemplifies (or even exaggerates) certain characteristics to facilitate analysis. Despite objections by critics, it is safe to say that Esping-Andersen’s (1990, 1999) approach to comparative political economy serves on the one hand as a helpful interpretative guide for understanding the national contexts of HES, but on the other hand says little about the actual strategies used by organizations in order to compete globally. To address this latter element, the varieties of capitalism (or VoC) approach provides an insightful complement.

In sum, the problem under study (i.e. scientific capital accumulation) is understood through the framework of academic capitalism (Münch, 2014). Re-examining Bourdieu’s (1975, 1986, 1988, 1993, 2004) notions of academic subfields, social mechanisms constructing excellence and institutional logics, Münch considers academic capitalism as a global pressure to which countries respond differently. Like Cantwell and Kauppinen (2014) and Slaughter and Rhoades (2004), Münch called for an analysis of the paths followed by political economies. The context is here described with the help of the VoC, which focuses on institutional structures providing organizations with comparative advantage (Hall & Skoskice, 2004), and the welfare regimes typology, which provides more nuanced categories than the VoC and singles out Nordic welfare regimes as a specific type (Esping-Andersen, 1990).

3 Neo-institutionalism

The role of institutions is central to Hall and Thelen’s (2009) approach to comparative political economy, as indicated by the following quotation:

We have portrayed the political economy as an institutional ecology in which the strategies of the actors are simultaneously conditioned by multiple institutions, and the

process of institutional change is one of mutual adjustment, inflected by distributive concerns, with incremental impacts on the strategies of firms and other actors (p.27).

For Hall and Thelen, institutions (as sets of regularized practices) condition organizations' adaptation strategies, but are also subject to the influences of transnational political-economic trends. Slaughter (2014) also considered that HES consist of a set of institutions, and that one needs to be familiar with neo-institutional theories in order to accurately understand policy networks, new forms of governance and connections between different organizational fields.

Looking at studies in higher education, I have also come to understand how powerful neo-institutional theories can be in explaining both the influence of the systems and institutional behaviors. Indeed, many of the studies used for this thesis are based on that framework (e.g., Benner & Sandstrom, 2000; Chou, 2012; Kaplazidou Schmidt, Graversen & Langberg, 2003; Perez Vico & Jacobson, 2012; Potì & Reale, 2007).

Institutional theories appeared in the early work of political scientists, economists and sociologists. In 1867, Bagehot published *Comparative Government: The English Constitution* in which he attempted to understand political institutions and their relations to culture and society. Against neo-classical economists, Menger (1883/1981), Veblen (1909) and Commons (1924) developed an institutional theory based on exogenous determination of preferences, behavioral realism and diachronic analysis. Finally, sociologists, such as Spencer (1906), Cooley (1902/1956), Durkheim (1893/1949) and Weber (1924/1968), contributed to institutionalism by advancing, respectively, the views that society is a system achieved by institutional subsystems, institutions are developed and preserved through interaction among individuals, symbolic systems are pivotal in understanding institutions, and organizations are shaped by political and legal frameworks, rules and general beliefs.

After the Second World War, the institutional approach lost part of its interest in the face of new phenomena such as social movements and new approaches such as phenomenology. However, in the 1970s, a renewed interest in institutions and their spatial and temporal contexts emerged with the formulation of neo-institutionalism (Gazibo & Jenson, 2004). Theories and concepts such as path-dependency, layering, powering, institutionalization and rational choice have adopted a state-centered approach to show how different institutions (including symbols, rules and patterns of

interactions) in different countries structure social processes and guide choices made by various actors.

Most neo-institutional studies focused on organizational fields, which represent a collection of organizations that compete or cooperate within a given area of institutional life (DiMaggio & Powell, 1983; Scott & Davis, 2007). Studying the Nordic HES as organizational fields, this thesis is mainly interested in the organization of the environment, including the effects of societal rules and field-specific norms and beliefs. Fields vary in terms of degree of structuration, i.e., the relational and cultural coherence (DiMaggio & Powell, 1983). Changes in fields can be precipitated by exogenous processes (technology, political shifts, economic crises, etc.) or endogenous processes, such as a mismatch between macro-models and micro-realities.

In order to understand how Nordic HES are shaped and contribute to the accumulation of scientific capital, the thesis will be based on Scott's (2008) neo-institutional theoretical framework. Scott defined institutions as "comprised of regulative, normative and cultural-cognitive elements that, together with associated activities and resources, provide stability and meaning to social life" (p.48). This study pays special attention to the regulative, normative and cultural-cognitive elements that shape Nordic HES. As shown in Table 3, regulative elements include rule-setting, monitoring and sanctioning. These tasks are most of the time accomplished by the State as a rule maker, referee and enforcer. In higher education, these elements refer to university acts, development contracts, evaluation agencies and funding mechanisms. Normative elements include values (conceptions of what is desired), norms (legitimate means to pursue values) and roles (prescriptions, privileges and procedures attached to a specific position). In the realm of higher education, such elements would be linked to the academic profession, degrees, differentiation between sectors and international cooperation. Cultural-cognitive elements refer to the mental templates used by individuals to generate meaning and interpret social reality. In higher education, this category relates to beliefs and values regarding access, quality, efficiency, collegiality, academic freedom and others.

Regulative, normative and cultural-cognitive elements can be understood as broad categories of forces that shape and transform HES. However, in order for these forces to operate, some carriers need to be put in place. Scott defined carriers as the mechanisms that transport ideas through time and space. As demonstrated by Table 4, symbolic systems (rules, values, norms, laws, schemas)

guide behavior; relational systems (patterns of interactions coded into organizational structures) carry institutions; routines (patterns of actions reflecting actors' tacit knowledge) influence habits; and artifacts (material objects produced by human activity) become part of the structure of organizations. The current study uses a survey and interviews to understand relational systems (i.e., governance, funding and segmentation) as well as to examine the symbolic systems (i.e., policies and values) and routines (of the academic profession and doctoral students). It is worth noting that Scott et al. (2007) defined governance structures as "all those arrangements by which field-level power and authority are exercised involving, variously, formal and informal systems, public and private auspices, regulative and normative mechanisms" (p.173).

Table 3

Institutional pillars

Institutional pillars	Regulative	Normative	Cultural-Cognitive
Basis of compliance	Expedience	Social obligation	Taken-for-granted Shared understanding
Basis of order	Regulative rules	Binding expectations	Constitutive schema
Mechanisms	Coercive	Normative	Mimetic
Logic	Instrumentality	Appropriateness	Orthodoxy
Indicators	Rules Laws Sanctions	Certification Accreditation	Common beliefs Shared logic of action Isomorphism
Affect	Fear/Innocence	Shame/Honor	Certainty/Confusion
Basis of legitimacy	Legally sanctioned	Morally governed	Comprehensible Recognizable Culturally supported

Source: Scott (2008)

Systems being an immaterial construct, any attempt to characterize them requires that attention be paid to the interpretation and actions of individuals who are somehow agents in these systems. Agency was defined by Olivier (1991) as the capacity to innovate, act strategically and contribute to change. Scott (2008) identified seven types of agents: The Nation-State, professions, associations, other elites, marginal players, social movements and rank-and-file participants. Considering this thesis' focus on macro-phenomena and systemic factors, it considers the State as the actor that provides the legal framework and influences the selection of the governance regimes.

Table 4

Institutional pillars and carriers

Carriers	Regulative	Normative	Cultural-Cognitive
Symbolic systems	Rules Laws	Values, Expectations	Categories Typification Schema
Relational systems	Governance systems Power systems	Regimes Authority systems	Structural isomorphism/ equivalence Identities
Routines	Protocols Standards operating procedures	Jobs Roles Obedience to duty	Scripts
Artifacts	Objects complying with mandate specification	Objects meeting conventions, standards	Objects possessing symbolic values

Source: Scott (2008)

Professions are also important because research fellows and professors have their own standards (normative) and ethos (cultural-cognitive) that may shape the production of research. Finally, neo-institutionalism points at phenomena such as institutionalization (i.e., the process and arrangements that have attained a certain set or property) and legitimacy (i.e., perception that the actions of an entity are desirable and appropriate within a set of norms). Institutionalization is influenced by social networks (who share normative frameworks and monitor changes), environments (which feature support for change and maintenance) and actors (who use power to create institutions and may use rewarding and sanctioning if regulation is institutionalized). The legitimacy principle states that organizations that succeed in becoming isomorphic with their environment gain legitimacy and the resources to survive (Meyer & Rowan, 1977).

Neo-institutionalism is therefore a powerful tool for understanding the forces, mechanisms, actors and processes that shape HES. Kaplan (2006) promoted neo-institutionalism because it highlights the institutional arrangements that explain variations cross-nationally, the relation between normative views and cognitive frameworks, and the influence of political and economic forces on an institution's exposure to competition, its ability to insulate themselves and its capacity to attract quality inputs.

4 Research questions

The objective of this thesis is to explain how the Nordic HES achieve a comparatively high level of academic research production and to identify the systemic factors contributing to this production. The current chapter presented four core frameworks to conceptualize the problem of academic research production: academic capitalism, the VoC approach, the welfare regimes typology and neo-institutionalism.

Based on Bourdieu's (1975, 1986, 1988, 1993, 2004) sociology of science, Münch (2014) developed a theory of academic capitalism in which symbolic power in the academic field results from the accumulation of scientific capital. Münch depicted a clear tension between an autonomous pole marked by competition in the pursuit of science and recognition by the scientific community, and a heteronomous pole marked by competition for funds and influential positions. He also identified social mechanisms constructing and reproducing hierarchies in the academic field, and he distinguished between oligopolistic and pluralistic structures in the global academic capitalist race. In light of this theoretical frameworks, the term "academic research production" is replaced by "scientific capital accumulation."

Münch also calls for a political-economic analysis of this new global power struggle. The VoC approach appears particularly relevant in analyzing the factors that condition countries' adjustments paths in the face of global challenges (Hall & Skoskice, 2004). A key concept is "comparative advantage" and refers to the institutional structures of a particular political economy providing organizations (such as HES) with advantages for engaging in a specific type of activity. The current study is interested in better understanding Nordic HES' comparative advantage in academic research production. The VoC however does not consider that Nordic countries might differ from Continental European countries. I therefore also relied on Esping-Andersen's (1990, 1999) welfare regimes typology and considered the Nordic HES as distinct. Finally, since HES are immaterial constructs, this study uses a neo-institutional framework to depict the internal forces, mechanisms, actors and processes that shape Nordic HES.

Inspired by these frameworks, I could build more theoretically-grounded research questions. Considering that this study is based on system actors' perspectives regarding the role of systemic factors on scientific capital accumulation, these research questions are framed as follows:

(RQ1) What are the systemic factors perceived to have a positive impact on scientific capital accumulation in Nordic HES?

(RQ2) How do system actors explain the impact of systemic factors on scientific capital accumulation in Nordic HES?

(RQ3) How does the perceived impact of systemic factors on scientific capital accumulation vary between Denmark, Finland, Norway and Sweden?

Chapter 3 The Context

This thesis follows Holmes' problem approach to comparative education. According to this approach, any prediction based upon a hypothesized relationship between a factor and an outcome is context-dependent. Context refers to the specific setting in which the study takes place. The "problem" of scientific capital accumulation thus needs to be understood from within the specific Nordic context, a context that I describe through the lens of political economy. The present section describes three levels of contextual contingencies: The Nordic welfare regimes, Nordic HES and Nordic academic research systems. Based upon these contingencies, the next chapter will present six hypotheses that potentially explain scientific capital accumulation in Nordic HES.

1 Nordic welfare regimes: A robust ideal type

Holmes (1981) suggests the use of ideal types and the expression of contextual statements in terms of natural environment, patterns of mental states (deeply held beliefs), normative patterns (values and norms as they are found in a Constitution or legal documents) and institutional patterns (the changing arrangements in society's structure). In this study, the specific patterns defining the ideal type of Nordic welfare regimes are considered to influence the way the four HES that fall within the purview of this regime type perceive academic research and achieve productivity in this domain.

1.1 Natural environment

In the year 5 AD, Emperor Augustus sent his fleet to Jutland. For the general of the fleet, Ptolemy, what lay beyond the Jutland was an unexplored island referred to as "Scantinia," which a misreading later turned into "Scandinavia" (Derry, 1979). *Scandza* was a word used by the Goths to designate their homeland. In old Germanic, it means "island," and in Old Norse it could mean "danger" or refer to the mythological creature Skadi (VikÅr, 2004). While "Scandinavian" is used by most scholars today to refer to the whole region of Northern Europe, the Nordic people use the

term “Scandinavisk” to refer specifically to the countries of Norway, Sweden and Denmark, which share mutually intelligible languages. “Nordic” (or *Norden*, “from the North” in Old Scandinavian), in contrast, refers to Scandinavia and all culturally-related areas (Ibid). The term was extensively used during the development of the Pan-Nordic ideology (starting in the mid-twentieth century), and it is now institutionalized by the Nordic council (founded in 1952) .

The designation “Nordic countries” therefore includes Denmark, Finland, Norway and Sweden, as well as Iceland and associated territories (Faroe Islands, Greenland, Svalbard and Aland Islands). They form a distinctive region surrounded by seas (Baltic, Barents, North and Norwegian) and close to both Russia and Continental Europe (Derry, 1979). Facing difficult temperatures, long dark nights during the winter and a difficult agriculture, the Nordic people, with the exception of Finns, inhabit the same territory inhabited by their direct ancestors long before the Greeks and Romans. Close to the seas, the Vikings were feared by many coastal abbeys facing the attacks of these Nordic warriors.

Half of the length of Sweden consists of the “Norrland,” a very cold area where the only industries are mining (silver, copper, gold, iron, zinc and uranium) and timber. Approximately 12% of the country’s surface is bare mountains or fells. Finland represents the border between East and West, between Russia on the one hand and the Scandinavian countries of Northern Europe on the other, and is the second northernmost country in Europe, which partly accounts for its very difficult climate. It possesses massive sources of renewable water (60,000 lakes) and mining resources but very little arable land. Norway is essentially one long coast and is only separated from Sweden to the East by the Scandes mountain-ridge (Ibid). It is richly endowed with petroleum, natural gas, hydropower and minerals. Denmark is closer to the European continent and to Germany than the other four countries. It has a warmer climate and a greater population density. The natural landscape in each these countries influenced science, as is attested by the Swedes having developed metal industries, Norwegians hydro-electric resources, Danes having specialized in advanced engineering and Finns creating ice-breakers.

It is said that late industrialization, small capital cities and easily accessible open-air recreational areas have all been conducive to healthy behavior patterns (lower health costs) and working rigor (Ibid) in Nordic countries. According to Pratt (2008), communities were too small to sustain a conservative upper class, which lay the ground for equal social conditions, autonomy and local

self-government. Solidarity and cohesion were also reinforced by the homogeneity of the population. Due to poverty and difficult climate conditions, however, emigration from Finland, Norway and Sweden was endemic in the early twentieth century. Again according to Pratt, emigration (and low immigration) may have eased tensions in a context of struggle over scarce resources. It also reinforced the population's homogeneity, consensus and an emphasis on collective interests. In Swedish and Norwegian, the term *likhet* means both equality and sameness (Ibid). The most obvious reminiscence of this ancestral link between environment and equality is in Norway where it is stated that forests are common property, where all have rights and responsibilities. In Norway, "freedom to roam" is a general public right which allows anyone to access public and privately owned lands for recreation and exercise.

1.2 Patterns of mental states

To define an ideal type, Holmes (1981) suggests paying attention to religious and civilizational roots. Like most of Europe, Nordic countries have been greatly influenced by Christendom. In 1016, Cnut the Great, king of England and Denmark, was the first Viking leader to be admitted in the civilized Christian community. This community imposed its religion on Norway and Sweden and "the Church proved to be a great organizing and unifying force in medieval" times (Derry, 1979, p.37). Two hundred years later, facing economic decline, volcanic eruptions, earthquakes and the Black Death, Denmark, Norway and Sweden united under the Treaty of Kalmar (Ibid). This era corresponds to the downfall of the Catholic prelates, considerable economic growth and the rising power of the nobility.

The Reformation came to Scandinavia in the 1530s, after which it became the heartland of Lutheranism. Lutheran protagonists gained support from the population and from King Christian III. This era witnessed the transfer of ecclesiastical wealth to the Crown, the elaboration of new services performed in common dialects, and the publication of the Bible in the vernacular language. Lutheranism had a tremendous influence on Nordic societies. It provided the moral basis of societies, combined the ideologies of actual political parties and contributed to the importance of local powers since administration was based on local parishes (Välilmaa, 2001). During the Reformation, the social role of the State was transformed and acquired the mission of serving all citizens (Välilmaa, 2005).

It should be pointed out that while ministers were Lutheran, local pastors were more inclined to pietism. Through the Quakers' contact with Norway, the Good Templars' connections with Denmark and Sweden, and the Finnish Friends of Temperance, pietism spread alongside the cooperative movement and restrictions on alcohol consumption and the removal of Latin from the requirements for university entrance in Norway (Derry, 1979). Inspired by their German counterparts, Norwegian Pietists argued vernacular languages were indispensable for enabling Bible reading, as well as for allowing the imagination of collective nationhood. During the same time (1896-1900), Sweden established a broad pathway from public elementary school through intermediate schools, gymnasiums and the universities. The percentage of young people matriculating from universities doubled during this period.

1.2.1 Protestant work ethic

Christiansen and Markkola (2006) established a relationship between, on the one side, a Lutheran work ethic and the idea of the priesthood of all believers and, on the other side, full employment and social security for all citizens. The starting point of Weberian sociology is the analysis of major religions as shaping societies' institutional dynamic. For instance, according to Eisenstadt (1990), the Reformation redefined the relations between men and the sacred by abolishing institutional mediation, facilitating autonomy in individual entrepreneurship and more differentiated economic organizations. Max Weber (1930/2001) argued that Protestantism in Northern Europe influenced the development of capitalism. Lutheranism, Calvinism, Pietism and Baptism all proposed that an individual was religiously compelled to follow a secular vocation with as much zeal as possible, develop their own enterprise and accumulate capital for further investment (contrary to the Catholic bias against usury). This would have contributed to the emergence of unplanned and uncoordinated markets.

Zuckerman (2008), however, raises an important point: Nordic countries count among the most secular countries in the world, Sweden being the most secular. For Zuckerman, it would therefore be incorrect to affirm any relationship between religiosity and the Nordic welfare regimes since it is, on the contrary, secularity which is the most strongly correlated with high levels of societal health, well-being and moral order. Lejon and Agnafors (2011), for their part, respond by agreeing that Nordic countries do not have the most devout populations, but that Nordic secularity would in fact be a "Lutheran secularity." Nordic culture and history are intimately connected with religion

and the Lutheran ethos is still manifest in multiple societal norms and political institutions, despite their supposed secularity. For instance, Lejon and Agnafors drew a relational line from the biblical ideal of all men created equal, through Luther's doctrine of priesthood of all believers, to the Nordic emphasis on social welfare, equality and literacy.

Hübinger (2005) believed that it is not religiosity that influences the Nordic welfare regimes but rather a "cultural Protestantism," which he would define as the historical constellation of multiple elements such as religious virtuosos, the need for local pastoral care, and efficient social action. Arruñad (2009) conducted a large-scale quantitative comparative study between OECD countries, and although he could not demonstrate a Protestant work ethic, his analysis showed that there was in Protestant countries an "alternative social ethic," perceptible in mutual social control, institutional performance, homogeneity of values and impersonal trade. More precisely, he found that on average Catholics volunteered less, placed less trust in and support to political and legal institutions, were more tolerant of tax fraud, and gave more importance to family ties than Protestants. For Holm (2008), there exists an overlap between cultural Protestantism and the contemporary political discourse in Nordic countries revolving around the concepts of rights, sociality, communication and interaction.

1.2.2 Nordic philosophy

Nordic countries not only share a religious heritage, but they also share a common philosophical outlook that influences the deep structure of their welfare regimes. Politics in Nordic countries is often qualified as "pragmatic" in that they deal with existing problems in specific situations based on a rational and logical approach. But this approach does not necessarily mean that pragmatism (as a philosophy of action originating in the US) is widespread in the Nordic region (Philström, 2010). In simple terms, pragmatism claims that a proposition is true if it works well. Although pragmatism flourished in Nordic universities between the two world wars with the study of Darwin, Dewey, James and Schiller, it did not achieve the level of approval of other philosophical traditions, such as logical empiricism, positivism and, more recently, ecophilosophy (Ibid).

Philosophical positivism states that positive knowledge is based on natural phenomena, derived from sensory experience, and interpreted through reason and logic. In the Nordic countries, positivism was promoted by the Finnish philosopher and sociologist Edvard Westermarck (1862–1939) – who favored empirical rather than normative sciences – and Harald Høffding (1843-1931),

who adopted a strong anti-clerical stance and developed ties with left-wing liberalist organizations in Denmark (Heidegren, 2010). It is worth mentioning the strong connection between the so-called Uppsala philosophy and the Vienna Circle. Committed to the ideals of the Enlightenment, the Vienna Circle (1924-1936) was a group of scholars that developed logical empiricism as a philosophy, claiming that knowledge only comes from experience and philosophy serves to clarify problems and assertions through “logical analysis.” Like the Vienna Circle, the Uppsala Philosophy critiqued metaphysics for being built on statements that cannot be reduced to experience. Yet the Uppsala Philosophy was more nuanced in accepting that some statements may come from an internal experience which cannot be reduced to empiricism. More recently, Nordic ecophilosophy – like critical realism – continued to reject constructionism, but also admitted the fallibility of knowledge and human agency, the need for interdisciplinarity, and a non-dualism between humanity and nature (Bhaskar, 2012).

One might wonder how this positivist inclination relates to Nordic welfare regimes. For Asdal and Gradmann (2014), Nordic countries are prone to relying on science and experts to develop policies and interventions. For instance, there is a strong tradition of scientists’ intervention in the public health sector. “Natural” breastfeeding is now part of everyday culture because it is known to help the infant’s development, and Nordic countries have among the highest vaccination rates when compared internationally. Nordic states also created uniform and publicly accessible databases so that their social scientists can formulate accurate recommendations. Nordic law also tends to look at crime as a form of sickness which, through expert diagnosis and carefully planned policy, can be cured. This is why, since 1945, treatment has become a key element of all penal policies in Sweden.

1.2.3 Peace, cooperation and progressive thinking

Beyond Lutheranism and deep philosophical roots, three other patterns of mental states can be identified: peace, cooperation and progressiveness. Although the Nordic countries participated in the Napoleonic wars, the wars against Russia and both World Wars, the Nordic mental state includes a propensity towards Nordic cooperation and a neutrality in many international conflicts (Derry, 1979). Denmark, Norway and Sweden remained neutral throughout the First World War (Ibid) and, although Denmark and Norway were invaded by Germany during the Second World War, Sweden remained neutral, providing material supplies to the Nazis while offering refuge to

Jews who had escaped from Denmark. Interestingly, during the Cold War, Finland signed a treaty of mutual assistance with the USSR, while Denmark and Norway joined NATO and Sweden remained neutral.

In 1873, Denmark, Sweden and Norway formed a monetary union. But formal Nordic cooperation actually started in 1886 with the first Nordic Workers Congress, a body through which progressive policy ideas were disseminated. In 1907, members of the Danish, Swedish and Norwegian parliaments founded the Nordic Inter-Parliamentary Association (Petersen, 2006). Although Norway was hesitant (it had just dissolved the union with Sweden), all the Nordic Labour Movements united in 1932 and helped the Social Democratic parties to establish themselves in all four countries. Cooperation further increased in 1945 when in the wake of WW2 Sweden was the only country with functional infrastructures that could help its neighbours. After WW2, the ties between the Nordic countries intensified with the creation of a Scandinavian Airlines System and the Nordic Council. The Council includes all political parties and members are placed in alphabetical order (to discourage party affinities), and its function is to provide recommendations to the Ministries of each member country. A study showed that, in 10 years, half of the 269 recommendations have resulted in positive action. For instance, schools now encourage Nordic language studies and universities recognize each other's examinations and credits. The Nordic labour market even obtained its own profile within the International Labour Organization (ILO) classification. Christiansen and Markkola (2006) observe that, unlike most international cooperation agreements, the Nordic cooperation is not limited to elites and enjoys popular support and participation. In all departments, there are public servants dedicated to Nordic affairs.

Nordic progressive thinking and propensity to support local populations emerged in the 19th century. In Sweden, local parishes became responsible for public health in 1843. Finland was the first country to establish universal suffrage. Denmark, an enlightened autocracy, implemented free and compulsory primary education in 1814, followed by Sweden (1844), Norway (1860) and Finland (1865). Education became regarded as a key to a progressive and democratic society. Dissolving the old trade guilds, Denmark intellectuals recognized the “intelligence of the peasantry” and advanced the idea that schools should be in charge of developing the minds of the people through singing, lectures, physical exercise and folk-lore, in order to create a “rural civilization” that would be educated enough to force the Government to serve its people (Musial, 2000). The folk high schools offered residential courses for five winters (when the land was not

ploughed) so that the “rustic people” could be emancipated. Already in the first half of the 19th century, peasants formed 15% of the secondary school population in Sweden (Derry, 1979). The work of NFS Gruntvig on Danish folk high schools is especially noteworthy (Lawson, 1989).

This open and democratic approach to education and science contributed to the production of brilliant scholars in Nordic countries, even at a time when these countries were too poor to subsidize the publication of revolutionizing papers following the Napoleonic wars. Alfred Nobel was a Swedish inventor who wanted to make science (discoveries) and technology (applications) interact for the betterment of societies. Aarhenius was the first Swedish recipient of the prize in 1903 and he became the director of the Nobel Institute for Physical Chemistry (Ibid). Today, Finnish biochemists, Norwegian oceanographers, Danish atomic researchers and especially Swedish physicists and medical researchers are internationally recognized.

1.3 Normative patterns

To identify normative patterns, Holmes (1981) suggests reading constitutional documents and major laws. All Nordic constitutional documents establish the powers of the parliaments, limit the powers of the monarchy (present in all countries but Finland) and state the fundamental rights of the citizen. The current section discusses the role of national constitutions but the reader should bear in mind that the welfare states took origin in an era of weak legal arrangements, dynamic local administration, local taxation and independent farmers (Christiansen & Markkola, 2006).

1.3.1 Constitutional documents

A careful analysis of the four constitutional documents reveals six cross-cutting themes (see The Constitutional Act of Denmark, Finland Constitution, the Constitution of the Kingdom of Norway, the Swedish Instrument of Government). The first theme is tied to the role which Lutheranism has played, and continues to play, in the history of Nordic countries. As was mentioned above, Nordic countries have been greatly influenced by Lutheran Protestantism. It therefore comes as no surprise that, with the exception of Sweden (where the Constitution only refers to “the Church of Sweden”), the constitutions of Denmark, Finland and Norway, and the Swedish Act of Succession, make the Evangelical Lutheran Church the State-official Church. In Denmark and Norway, the King or the Queen must also be a member of this Church. That said, freedom of religion is protected for all citizens. The second theme involves the role of the monarchy, with all Nordic countries, except

the Republic of Finland, having Kings or Queens as their Head of State. Yet as with other constitutional democracies, royal power has become mostly symbolic and ceremonial. Interestingly, if there is no Princess or Prince entitled to the succession of the Norwegian King; the King may propose his successor to the Parliament, which has the right to make the choice if the King's proposal is rejected. The third theme regards the countries' relationship to international organizations. Nordic countries are part of Europe and their Constitutions indicate that Members of the Parliament, with a qualified majority, may transfer some of their responsibilities to international organizations, such as the European Parliament.

The fourth theme is reflected in the fact that constitutional documents in the four countries explicitly codify citizens' civil and social rights. In all countries, the right to property and to free and equal trade is inviolable. Finland also includes the inviolability of human dignity, equality of sexes, and the promotion of justice in society. Denmark, Finland and Norway also indicate that public authorities should make every effort to create conditions enabling every able-bodied citizen to enjoy a secure livelihood. This disposition seems to correspond to the political-economic concept of "productivism" according to which economic growth and human work are mutually reinforcing (Esping-Andersen, 1999). The fifth theme regards education. All constitutional documents refer explicitly to education. In Denmark, the Constitution states that all children of school age shall be entitled to free instruction in an elementary school. In Finland, everyone has the right to free basic education and public authorities shall guarantee equal opportunity to receive educational services in accordance with students' ability and special needs. Finland also protects the freedom of science, the arts and higher education, as well as the self-governing nature of universities. In Norway, the Constitution states that public institutions are responsible for the provision of higher education, and that freedom of research is protected.

The sixth and final theme involves, as was stated previously, a deep concern for nature and the environment. This concern is associated with the Nordic ideal type, and it is accordingly codified in the Finnish and Norwegian constitutions, which state that nature and its biodiversity are the responsibility of every citizen, that every person has a right to a natural and healthy environment, and that everyone should have the possibility to influence decisions regarding their surrounding environment.

1.3.2 Experimental universalism

There has for some time existed a delicate balance between “experimental universalism” in the cities and the careful administration of local parishes. Even today, progressiveness in Nordic countries rests upon local communities, strong loyalty and the dissemination of a “utopian realism.” For Haave (2006), scholars should talk about “public ownership” instead of “state-ownership” because, in Nordic countries, sub-national authorities play a decisive role in shaping policy. During the Great Depression of the 1930s, the Swedish Social Democratic Party came to power and initiated the reforms that would lead to what is today called the “Nordic Welfare Model.” The long-term objective was to create a *Folkhemmet* (People’s Home) by fighting unemployment, establishing a publicly-funded insurance system based on transfer, providing free education, health care and social security to all citizen and developing a centralized wage negotiation process between unions and employers (Brundenius, Göransson, & Ågren, 2011).

In terms of education, Danes have a long tradition of progressive thinking in their organization of the education system. This progressive attitude towards education manifested itself through free primary and secondary education, the establishment of folk high schools, child-centered pedagogies, a tolerant discipline, curriculum experiments, arts and crafts, learning by doing and simplicity of living (Musial, 2000).

But the relationship between education and public governance goes beyond a well-educated population. In 1939, Simon ((in) Musial, 2000) was amazed to see that Swedish professors in the social sciences were not only listened to by the Parliament, but were often members of it. In 1939, five of the eight professors of law at the University of Uppsala were members of Parliament. As Musial writes, rationality and social engineering were used as the basis of a modernization process in which the government would rule according to the social sciences. And this relationship between science and policy-making extends to the public service sector, which has institutionalized scientific expertise and its processes. For example, Nordic countries are known to give more voice to doctors and health researchers in health policy-making than to political parties (Haave, 2006). For Haave, the Nordic social-democracy is based on this idea of providing the best services to the entire population and, in the case of health policies, it means to “give all citizens access to what is perceived as the best that medicine had to offer” (Haave, 2006, p. 230). To do so, social

developments are based upon social learning, strategic decisions and an important cooperation among institutions.

It should be noted that the Nordic social legislation is different from the German Bismarckian dependency. Unlike Bismarck who, in a context of restricted democratic participation, initiated a social welfare based on corporatism that granted benefits based on workers' occupation and omitted the regulation of women's and child labor, the initial Nordic welfare system gave more attention to citizenship (women acquired equal rights quite early). Individuals (regardless of their working condition) were the prime recipients of social security while the State acted as a co-provider of universal benefits (Christiansen & Markkola, 2006). The Social Democratic parties that took power in the 1930s tried to transform the "class parties" into "people's parties," including all groups (except landowners) in their comprehensive social reforms. They built alliances and merged their vision of an ideal society with a tradition of social integration through State mediation. Between the 1950s and 1980s, political parties agreed to integrate all social policies together (children, handicapped, health, education, research, etc.) and all parties but the communists agreed that economic growth was a pre-condition of welfare.

1.4 Institutional patterns

Institutional patterns include the formalized arrangements, organizational structures, rules and practices influencing education systems (Holmes, 1981). In the present case, it is relevant to describe in more details the contemporary Nordic political context and Nordic welfare structures.

1.4.1 Contemporary Nordic politics

Arter (2008) qualified Sweden as a "harmonious democracy." Nordic forms of democracy are characterized by the involvement of many experts prior to the legislative process, an open process where all parties are consulted and conflicts dealt with within national parliaments. It should also be emphasized that the Nordic political process is highly rationalist, problem-focused, and consensus-based. Except for Finland where the executive branch dominates the process, it is said that parliaments and especially their standing committees are very influential in policy-making. Expert public servants and local municipalities also have a strong voice within these committees.

1.4.2 Nordic welfare policies

Nordic institutional patterns have been described with acuity by Esping-Andersen (1990, 1999) and integrated under their “social democratic” welfare regime category. As Esping-Andersen write, “this regime is virtually synonymous with the Nordic countries” (Esping-Andersen, 1999, p.78). As was explained in the previous chapter, Esping-Andersen’s (1990) studied welfare regimes by describing social expenditures, income transfers, and commitment towards de-commodification (a service rendered as a right) and social stratification (social benefits tailored to the status). Esping-Andersen argued that in social democratic countries, social benefits are graded according to income and embedded in a universal system that does not take into consideration the market or social classes.

According to Lundberg (2006), the Nordic welfare model emerged as a “third way” between socialism and capitalism. The goal was to provide young people with support in their free choice of education and occupation. The Nordic model was based on a “large actor approach” in which the State invests in the technological process and maintains high demand to remain competitive in the global economy. The Nordic Labour Movement called for a coalition of Nordic countries to promote democracy, justice and solidarity as an alternative to the global right-wing discourse. According to the approach encouraged by the coalition, higher profits and lower wages are tolerated as long as profits can be invested in measures that promote employment. Moreover, investments in education and research were seen as contributing to the rehabilitation of people and continuing the full employment objectives (Ibid). Indeed, well educated people in a flexible labour market is the social-democratic pillar in a global competition.

In anticipation of a post-war trade depression, Nordic governments took responsibility for the economy. Norway proposed a budget based on the principle that public and private sectors can serve common purposes (Derry, 1979). Denmark developed a corporatist system of interaction (the flexicurity model) in which the state, unions and employers jointly negotiated the organization of the job market (Gregersen & Rasmussen, 2011). Trade unions cooperated to establish comprehensive social policies mixed with competitive markets so that their members would remain employed (Kautto, Heikkilä, Hvinden, Marklund, & Ploug 1999).

1.5 The Nordic ideal type: A contested discourse

The ideal type described above is well accepted by most social scientists. However, some studies in the 2000s have questioned the relevance and applicability of the construct. The critics are supported by two underlying arguments: the name of the model is incorrect and the actual basis of the model has changed.

Sometimes Nordic countries are called “social-democratic welfare regimes” because, in most of these countries, the Social Democratic parties arrived during the Great Depression and enjoyed the *problemformuleringsprivilegiet*, or the privilege of defining the problems and proposing a model to solve them (Musial, 2000). Most Nordic countries did not tolerate the dualism between the State and the market and tried to improve the conditions of the middle-class through a form of liberal socialism (Christiansen & Markkola, 2006). In Finland, however, it is the Agrarian Party that played an important role in developing the welfare state (Haave, 2006). Other political economists used the term “labourist” to also include Austria and the Netherlands in this category of progressive countries.

The Nordic countries use “Nordic” to refer to themselves, but they also advocate the use of “Scandinavian” by other countries when referring to them. For Musial (2000), the “Scandinavian model” emerged as a discursive figure in the 1970s. Believing in a structured modernization, Scandinavia became a frame of reference praised for its economic success, its progressiveness, its moral superiority and its capacity to collaborate. As Musial (2000) says: “The process of Nordic autostereotyping was based on including relatively less known Finland and Iceland in the category of the already known Scandinavian countries, [thus] a new image of the region in the North of Europe was promoted” (p.19). But in the Anglo-American literature, Denmark and Sweden are still perceived as the leading countries while Norway and Finland appear as poor copies, and Iceland is barely mentioned.

This stereotypical frame became in some cases the basis of a virtuous circle. Although Denmark produced many important scientists for its relative size in the early 20th century, very few remain in the consciousness of the general public. Nonetheless, Denmark used its relative prestige to attract a \$100,000 grant from the Rockefeller Foundation in 1924 to develop Copenhagen into an international centre for the natural sciences (Derry, 1979). Between 1920 and 1940, the Rockefeller Foundation also established contacts with Swedish professors in the social sciences

and granted the Stockholm School of Social and Municipal Work \$75,000 for five years, because the country was seen as a laboratory for the United States' progressive policies. Therefore, one could wonder if the Scandinavian or Nordic model is really different from other European models, or if it is only its surrounding discourse that differs.

Still today, the Nordic model is a concept used by those who wish to defend the welfare state (Kettunen, 2006). In the 1930s, when it was an autonomous part of the League of Nations, the International Labor Organization (ILO) proposed the convention on the 40-hour week (ratified by Norway, Sweden and Finland in 1935) and it praised the Nordic work policies. The convention presupposed the collaboration and participation of employers and unions in elaborating social and economic policies. In that process, employers would gain moral legitimacy and workers gained economic legitimacy. With globalization, the Nordic countries used the term "Nordic" to define the local preconditions necessary to compete in the global economy. The national virtuous circle between solidarity and efficiency was questioned by the encounter with transnational capital. Consequently, the discourse of a "new welfare society" implied that firms would be able to create competitiveness "based on commitment, knowledge and innovativeness, i.e. on social capital and human capital" (Kettunen, 2006, p. 64).

However, Kautto (2001) asserts that the Nordic model is defined in greater part by the nature and origins of its welfare system than by its outcomes. In the 1980s, income taxation was among the highest in the history of Nordic countries and revenues from social contributions were much lower. Since the 1990s, social contributions have increased and social protection as a share of the GDP in the United Kingdom and Portugal has reached the level of Finland and Norway. Moreover, all Nordic countries except Denmark have seen a decrease in employers' responsibilities in social protection financing, bringing them closer to other European states. Asian scholars criticize the whole difference between welfare regimes as being biased towards the Western reality (in Christiansen & Markkola, 2006). Feminists say the categorization lacks an analytical indicator (i.e., gender), and certain historians think that while the Nordic welfare regimes as conceived by scholars were developed between 1950s and 1980s (the "Golden Age"), only Sweden now remains in line with the initial model. Indeed, since the 1980s, conservative parties have taken office and deregulated financial markets. With the exception of Norway, Nordic countries have all joined the European Union. Individuals agree with social-democracy, but they disagree with higher taxes and they accept some kind of privatization and a move towards workfare.

And contrary to the prevailing opinion that welfare emerged as a matter of linear and rational progress, Andersen et al. (1999) showed that, in the Norway of the 1980s, the public discourse emphasized the costs and incentive effects of social security and taxation. Denmark experienced a “welfare backlash” in 1973 when an anti-tax Progress Party gained 28 seats in Parliament and the support for comprehensive social security declined. Finland has seen great variations in public support for the welfare state. Sweden, closer to the ideal type, showed fluctuation in the political debate about the welfare state. The authors observe that it is the public health system that is the “queen” of the welfare state in all four nations, followed by old age pensions and then childcare. The less popular programs are social insurance and unemployment allowances.

Other authors have wondered if the Nordic countries still formed a distinct bloc. Regarding social benefits, Hvinden, Heikkilä and Kankare (2001) assert that, even if there is an Europeanization process, a shift from non-means-tested social benefits to means-tested benefits, and a reduction in the length of benefits, the Nordic countries maintain the highest average level of standardised spending on active employment measures, the lowest unemployment rates in Europe and the most generous income maintenance programs. In terms of social inequalities, Nordic countries face the same challenges as Continental European countries (immigration, change in family patterns and change in welfare provisions), but, they have succeeded in maintaining the lowest income inequality levels, and this is partly a consequence of their high employment levels and universal good quality childcare systems. Indeed, the Gini coefficient shows no sign that Nordic countries have become more "European" (Fritzell, 2001). In 2014, Denmark had a Gini coefficient of 27.7, Finland 25.6, Sweden 25.4 and Norway 23.5 (European Commission, 2016) . The relative size of cash benefits is assumed to be a factor contributing to the low level of gross income inequality.

2 Academia in the Nordic countries

The first section of this chapter clarified the contextual contingencies in which this study takes place. It clarified the ideal type which is used to describe the Nordic region. It is worth remembering at this point, however, that this study is primarily interested in the inter-relations between *academia* and the Nordic political economic structure. Before formulating hypotheses that potentially explain the level of scientific capital accumulation in Nordic higher education

systems, it is worth examining the structure of these systems in more detail, since these structures are considered inherent components of the ideal type of Nordic welfare regimes.

2.1 Nordic higher education systems

If the ideal type of Nordic welfare regimes seems robust, it should follow that this ideal type influences how HES in such regimes are designed and managed. Using the welfare regimes typology developed by Esping-Andersen (1990), Pechar and Andres (2011) confirmed that HES behave according to the welfare regimes in which they are embedded. Their correspondence analysis, however, showed significant overlap. Nordic HES (labelled “social democratic” by Pechar and Andres) avoid the trade-off between equality of condition and equality of opportunity by expanding access while also providing social benefits for citizens who cannot “get in.” Consequently, their HES are characterized by entry rates comparable to those in liberal systems, the result of a form of “social engineering” that orients a high proportion of the population towards upper secondary vocational studies. In social-democratic countries, vocational training is institutionalized and developed in cooperation with industry.

An extensive report from Ahola, Hedmo, Thomsen, and Vabø (2014) studied funding, participation, research, internationalization and governance, and “Conclude[d] that the Nordic model of higher education has to be understood as an ideal type: in practice, we find various national models reflecting a different set of policies and rules in every country; each of the Nordic countries has its own economic and social models” (p.9). This ideal type is characterized by egalitarian traditions in terms of accessibility (higher education being both an instrument of development and a social right) mixed with elitist values that regulate the scientific quality of research.

Maassen (2014) identified features common to the various Nordic HES, including similar political, cultural and social patterns, a combination of economic growth and high levels of social protection, massive public investments in the knowledge sector, success in terms of both research output and access, a significant presence in world university rankings, and public trust. Maassen (2014) claimed that there is a “Nordic exceptionalism” in terms of the normative filters affecting how policy problems and solutions are framed.

2.2 Nordic academic research systems

The Nordic governance model, is characterized by its HES being embedded in regulated economies where investment is controlled (Benner, 2011). Unions, the state and markets work together, and social protection is comprehensive and universal. Research funding is based on block grants accorded to all universities, with a small proportion of competitive funding. Recently, funding to research institutes has declined while competitive grants have increased. State-initiated mergers have been widely employed and inter-disciplinary research has become more common (Ibid).

In some respects, the Nordic countries borrow characteristics from the Anglo-Saxon model, such as a strong position for universities, a high profile of growing research areas and ties between universities and technology firms. The Nordic model also includes strong public support for research, connections with small to medium enterprises, and a balance between concentrating funds into fewer institutions and making major investments to support research excellence at local/peripheral universities. Unlike the Anglo-Saxon model in which a group of universities is perceived to be excellent in all fields, the horizontal segmentation in Nordic HES suggests that each university is excellent in its field of expertise.

The framework developed by Benner is fundamental and resembles the original typology developed by Esping-Andersen (1990, 1999) and tested on HES by Pechar and Andres (2011). Bégin-Caouette et al. (2016) also examined the extent to which these various frameworks can explain a correspondence between 16 OECD countries and their academic research systems. For the latter authors, academic research system (ARS) refers to the interdependent macro-level conditions, structures and processes contributing to the production of knowledge by higher education institutions. A non-parametric correspondence analysis built upon 12 ARS indicators revealed three dimensions explaining 67.4% of the variance. The first and most important dimension distinguished Nordic from Anglo-Saxon countries, while Continental European countries were spread among all quadrants.

The first dimension was tentatively interpreted as “academic centrality,” and included indicators related to higher education funding support, doctoral education, international co-authorship and industry-science co-publications. Compared to ARS in Anglo-Saxon countries, ARS in Nordic countries showed higher doctoral graduation rates, larger higher education research and

development expenditures (HERD) relative to the GDP, and a greater importance of general university funds (GUF) as a percentage of non-military government budget appropriation for research and development. Along with Austria, Germany, the Netherlands and Switzerland, Nordic countries were characterized by the authors as being “academically central” in that ARS were leading the research production process in these societies, while academics benefited from the autonomy offered by an unfettered lump-sum grant from the government.

Bégin-Caouette et al. associate the GUF with the political-economic concept of the “socialization of risks” observed in social-democratic regimes (Yang, 2014), since the GUF allows a diversity of projects to flourish equally despite their risky nature. The large proportion of doctoral students in Nordic ARS is also associated by the authors with the concept of “productivism” (Esping-Andersen, 1999), that is, the view that welfare states must maximize the productive potential of citizens by guaranteeing work and resources for all people who have the motivation and capacity. Regarding the “welfare mix” (Esping-Andersen, 1999), ARS in Anglo-Saxon countries respond more to surrounding market forces, they avoid “bad risks” by funding research through competitive funding and provide needs-based or merit-based funding for doctoral students.

Regarding the two other dimensions observed by Bégin-Caouette et al., ARS were also differentiated through their research workforce, although these differences could hardly be explained by the welfare regime typology. ARS could also be differentiated according to their “responsiveness to market forces,” a third dimension which nuances the first dimension and further highlights the similarity of ARS in Anglo-Saxon countries. With regard to these dimensions, the Nordic ARS appeared both “central” and “responsive to market forces” in that, in addition to GUF, they benefited from research project funding and from strong connections with the private sector. As predicted by Benner (2011), both Nordic and Anglo-Saxon countries were seen to foster collaborations with the private sector. Bégin-Caouette et al. acknowledge this apparent contradiction with the social-democratic element of public ownership (Esping-Andersen, 1999), but explained that in the context of a consensus-based decision-making process, buffer organizations and academic traditions may still protect their “central” character.

3 Summary

This chapter has provided a description of the ideal type used to frame the contextual contingencies in which this study took place. Nordic welfare regimes are characterized by small capital cities, a concern for nature and the environment, a Lutheran cultural heritage that fosters the ideal of equality and local governance, strong positivist beliefs in the sciences, and a concern for peace, international cooperation and universal social benefits. Nordic countries are also, with the exception of Finland, constitutional monarchies. As consensus-based democracies, parliaments, their standing committees and invited experts have a great deal of influence on policies. The Nordic region also demonstrates the lowest levels of income inequality in the OECD, and this is partly a consequence of their high employment rates and world-class childcare systems.

Influenced as they are by the political-economic structure in which they are embedded, Nordic HES have expanded access while providing good conditions for citizens who cannot “get in.” Nordic HES are also characterized by egalitarian traditions, high levels of research production, public trust and massive public investments. Finally, Nordic ARS are considered both “academically central” and “responsive to market forces.” The detailed depiction of the context of Nordic HES provided above thus allows for a more robust study of the problem of scientific capital accumulation, and paves the way to the formulation of more precise hypotheses.

Chapter 4

The Hypotheses

This study follows Holmes' (1981) problem approach to comparative education, which is a hypothetical-deductive approach in which hypotheses are formulated by setting them within a very specific context, such as the ideal type of Nordic welfare regimes, as part of a theoretically sound problem such as the accumulation of scientific capital. According to Holmes' approach, "problems" are abstract constructs that can be formulated when an asynchronous change happens in a society, in other words, something changes while something else does not. Often, changes happen at the institutional level while deeper mental states and normative patterns are less likely to change. In the case of the present thesis, the "problem" arises from the emergence of a global knowledge society, academic capitalism and the dominance of international metrics to evaluate research. Yet this problem also has to be understood from within the Nordic context: a context shaped and informed by Lutheranism, positivism, social-democracy and cooperation.

According to the data provided in Chapter 1 and the description of Nordic HES provided in Chapter 3, it seems that Nordic HES succeed in accumulating high levels of scientific capital while preserving a commitment to accessibility, equality and the public good. Holmes' problem approach is deductive and requires researchers to formulate specific hypotheses solving the tension between the problem and the context. Hypotheses are efforts to "solve the problem" and, as such, the six hypotheses listed in this chapter represent a possible explanation of Nordic HES' research performance in a coordinated and social-democratic context.

Although the overarching approach is deductive, the process of formulating hypotheses is partly inductive. The present study, for instance, began with an extensive review of more than 200 documents, which yielded a list of 39 widely acknowledged explanations for Nordic HES' level of academic research production. Some explanations refer to the specific character of the Nordic welfare regimes, but many are similar to the explanations presented in Chapter 1 and mirror the broader literature about academic research production (e.g. Aghion et al., 2009; Esterman, Nokkola & Steinell, 2011; Hazelkorn, 2012; King, 2011; Marginson, 2006; Salmi, 2009). The reader might thus find that some explanations, such as competitive funding, the proportion of time spent by professors on research activities, the proportion of doctoral students and

international research collaborations, are not unique to Nordic HES. It should however be emphasized that each explanation was supported by the literature about Nordic countries, as well as are understood through the lens of the Nordic welfare regimes ideal type.

These explanations became “empirical indicators” that were in turn grouped into six broader systemic factors, which become the hypotheses to be tested. The hypotheses are framed based on an adaptation and integration of Clark’s (1983) framework (which focuses on beliefs, academic work, authority and coordination) and Benner’s (2011) analytical dimensions of research personnel, research funding, networking with private enterprises and internationalization. Although the model being used is based on robust conceptual frameworks, this grouping into factors will be verified through an exploratory factor analysis (see Chapter 12).

1 Beliefs

Beliefs represent the cultural-cognitive structure that holds systems together. They can also contribute to some actors’ symbolic power insofar as they are perceived as trustworthy and legitimate (Swartz, 1997). The primary manifestation of beliefs is in the form of academic traditions (Clark, 1983). As mentioned in chapter 3, Nordic universities have always been used by political authorities. Nordic medieval universities had to train the Lutheran Clergy and civil servants, while modern universities are expected to contribute to national identities, solidarity and citizenship (Beerens, 2004; Välimaa, 2001). While universities were initially cultural institutions, in the 19th century they began to develop an important research component in order to support industrialization (Välimaa, 2012). Following the principles of the Reformation, higher education is generally assumed to serve the public good, and this is why higher institutions are publicly owned and receive most of their funding from the state (Kalpazidou Schmidt, 2007). That said, local interests and the voices of local authorities are given more attention in Nordic countries than in, for instance, Continental European systems (Maassen et al. 2008).

Another tradition in Nordic countries is tied to the university ideal. During the Middle Ages, many students from the Kingdom of Sweden went to study in France. With the Reformation, German universities replaced French ones as the destinations of choice. (Välimaa, 2001). Up to the 1960s, universities continued to be influenced by German ideals of education, such as a strong

government protection and the Humboldtian integration of research and teaching, academic freedom and collegiality (Askling, 2012). Today, Nordic universities continue to follow a Nordic adaptation of the Humboldtian ideals of academic freedom with professors as the principal ‘unit’ of the academic organization, while also promoting freedom of access, free tuition and diversified funding (Ahola, 2007; Välimaa, 2005).

A second manifestation of beliefs is the set of values held by a given population. The cultural function and objective of higher education in Nordic countries is to socialize ordinary people in order to make them into members of civil society (Välimaa, 2001). Today, values include accessible higher education, equality of opportunity and early academic specialization (Maassen, Vabø & Stensaker, 2008). Accessibility is so important that, for example, Finland's constitution guarantees tuition-free education for all students (Aareva, Dobson & Elander, 2012). As Välimaa (2005) wrote: “Nordic responses to globalization in higher education are rooted in the strong welfare societies and the tradition of equal and free education for their citizens” (p.29). That said, the Nordic egalitarian principle stands alongside a concern to provide the “best education” to all students. In Sweden, a center-right government took office in the early 1990s which raised the question of the economic and social relevance of university research (Brundenius et al., 2011). Despite such questions, the high social prestige of universities and science remain important in Nordic countries. In Finland, 70% of the population express confidence in higher education institutions (Välimaa, 2005). Similarly, the Danish welfare state sees the hard sciences as important for competing at the global level, while the soft sciences are important for furthering the country’s specific social organization (Gregersen & Rasmussen, 2011). The first hypothesis proposed by this study can therefore be formulated as follows:

H1: Beliefs contribute to the accumulation of scientific capital in Nordic HES.

This hypothesis will be tested against seven indicators:

- 1.1. The Humboldtian ideal of academic freedom
- 1.2. The central role of professors in the academic organization
- 1.3. The assumption that higher education serves the public good
- 1.4. The relative importance of local (municipal) authorities
- 1.5. The concern for providing the “best education” to all students

- 1.6. The public's perception that STEM fields are important in a global competition
- 1.7. The public's perception that social sciences further the country's welfare system

2 Academic structure

As stated by Clark (1983), “In the beginning, there is work, for if we reduce a knowledge-bearing system to its primordial elements we find first a division of labor, a structure of organized effort within which many people individually and collectively take different actions” (p. 28). The second factor considered in the present section concerns the very structure to which Clark alludes in the above statement, in this case in the form of the division of work between academic institutions and academic positions.

In the Nordic countries under study, most higher education institutions are public and free of charge (Välilmaa, 2005). Also, while there is no ostensible hierarchy or perceived difference of status (vertical differentiation) between institutions (Fägerling & Stömquist, 2004), sectoral differentiation plays an important role (Hazelkorn, 2013). Indeed, these countries seek to establish “world-class higher education systems” by strengthening horizontal specialization, a strategy which has the aim of supporting excellence in all sectors. Horizontal specialization has four implications for the academic structure: (a) it increases the presence of the non-university sector, (b) it encourages institutions in each sector to specialize in specific disciplines, (c) it promotes a close correlation between research and teaching, and (d) it treats doctoral students as junior researchers. I will now discuss these implications in order.

While Denmark and Finland are characterized by a typical binary system, Norway and Sweden have integrated systems for qualifications (Ahola et al., 2014). The Danish HES was significantly reformed in the early 2000s. It now counts eight university colleges (*professionshøjskølen*) which provide medium-cycle education (professional bachelor programs). Present-day university colleges emerge from a long tradition of seminaries, the oldest having been founded in 1780. Denmark also counts eight universities, eleven artistic higher education institutions, nine business academies and four schools of maritime education and training. Finland has one of the most accessible higher education systems, with 70% of the age cohort enrolled in higher education (almost half in polytechnics), though only 40%-50% begin their higher education immediately

after their Matriculation Examination (OECD, 2012; Rinne, 2004; Välimaa, 2005). Finland counts 26 polytechnics (sometimes called universities of applied sciences, or *ammattikorkeakoulu*). These institutions have the mission of training a professional workforce, carrying out applied research and supporting regional development (Aarrevaara & Pekkola, 2010). That said, faculty members in polytechnics spend only 14% of their time doing research, while university faculty spend 46% of their time doing research (Ibid).

In addition to its eight universities and eight specialized university institutions (including its business schools), Norway counts twenty-two university colleges (some of which offer PhD programs), two national colleges of arts and several publicly-subsidized private institutions (OECD, 2012). In 1962, Sweden broadened the path to gymnasium and gave the same official status to non-university training as university education (Derry, 1979). Today, Sweden counts more than seventeen university colleges (*högskola*) as well as several university-affiliated institutions (*filiabler*) established in rural areas and providing basic higher education (Skoie, 2000).

Most HES around the world present a binary division between higher education sectors. What is interesting in Nordic countries is that all institutions within the university sector are considered both “research universities” and “national teaching institutions,” offering programs ranging from the diploma to the PhD level of education (Aarrevaara & Pekkola, 2010), although most of these are restricted to the institution’s specific field of expertise. Some of these institutions respond to ministries other than the Ministry for Higher Education and Research, while working within a broader governmental framework that ensures coherence between programs as well as the mobility of students across institutions. Similarly, all Finnish universities are expected to award comparable and mutually recognized degrees (Aarrevaara et al., 2009). In Norway, the four universities and the six institutions that specialize in specific fields and the regional colleges are unified within a single sector coordinated by the Network Norway Council (Skoie, 2000). In these different ways, Nordic countries seem to show a combination of segmentation and “permeability,” in the sense that students can often move from one institution to another.

The third implication concerns segmentation within the academic profession. In his sociology of science, Bourdieu (1975) insisted that there are many classes of trajectories leading to or away from academic research, each with different associated capital and symbolic profit. For instance, Sweden puts a lot of resources into R&D, but the use of time expenditure suggests that full

professors spend relatively little time doing research, research being performed by research teams (Brundenius et al., 2011). Researchers from the international project entitled the Changing Academic Profession (CAP) observed that during a standard teaching period in Finland, full-time faculty members spent 38% of their time doing research, 41% teaching and 21% carrying out other duties (Aarrevaara & Pekkola, 2010). In Norway, the proportions are 39%, 36% and 25%, respectively. Interestingly, in both Norway and Finland, senior academics spent less time doing research (30% and 26%) than their junior counterparts (58% and 43%). Välimaa (2005) also observed an increase in temporary contract-researchers in Nordic countries. For instance, in Finland, the number of academic teaching staff fell from 7,800 to 7,300 people over ten years while the number of staff funded by external sources (namely, researchers, assistants and administrative staff) had increased by twofold. In Sweden, Riis (2012) gave the example of Uppsala University, where the number of professors doubled between 1999 and 2010, but the number of chair professors (mostly dedicated to research) only increased by 17% during the same period.

The final implication is that doctoral students are said to contribute in an important way to scientific capital accumulation. The number of doctoral degrees conferred by Nordic universities increased by 32% between 2002 and 2011 (Myklebust, 2013). From 2000 to 2011, graduation rates at the doctoral level (i.e. the estimated percentage of an age cohort that will complete a doctoral degree) increased from 1.1% to 2.2% in Denmark, from 1.9% to 2.5% in Finland, from 1.0% to 1.9% in Norway, and from 2.5% to 2.8% in Sweden (OECD, 2013a). In 1993, the Danish reform of doctoral education aimed at (and succeeded in) doubling doctoral graduation rates. The reform introduced research schools with standardized doctoral studies and required students to work 840 hours for the university (Jensen, 2007). Funding for doctoral students was provided through basic allocation to the Danish universities under contract from the government, as well as from public research funding via research councils (Ibid).

Thanks to its 1995 policy reform, Finland introduced nation-wide doctoral schools (now university-based) and increased doctoral graduation rates by 350% (Ahola et al., 2014; SNAHE, 2006), mostly in the fields of biomedicine and agriculture (Öquist and Benner, 2012). For Ahola et al. (2014), the increased interest in higher education relates to the national innovation strategy and the Finnish Government's strong commitment to meet international standards on the level of R&D investment. Finland remains however, in that doctoral students who are not enrolled in a

doctoral school need to find research contracts inside the university, apply for project funding from the Academy of Finland or a private foundation, or work outside academia. All students, however, receive aid in the form of study grants, housing supplements and government-guaranteed study loans (SNAHE, 2006).

Norway similarly implemented doctoral schools and doubled its number of students in 20 years (Olsen, 2014). It also implemented a unique “personal professorship” program for qualified individuals, which has had the result that there are now more professors in Norway than PhD students. These professors hold the title of “research scholars” and form a third of all academics in the country (Kyvik, 2015).

In Sweden, doctoral education is regulated by law. Sweden has imposed a four-year limit for the completion of the doctoral thesis, though students (who are considered formally employed) can take five years if they devote 20% of their time to departmental tasks, including research, teaching or administrative tasks (SNAHE, 2006). Swedish universities can establish their own doctoral schools, but these must be evaluated by the Swedish National Authority for Higher Education (SNAHE).

Most PhD students in Nordic countries specialize in medical, health and natural sciences (51% of all doctoral students in Norway). Moreover, most of them are enrolled in old comprehensive multi-faculty institutions that conduct more research. In Norway, the University of Oslo, the University of Bergen and the Norwegian University of Science and Technology (NTNU) awarded 85% of its doctoral degrees between 1817 and 2013 (Olsen, 2014). In Denmark, the University of Copenhagen awards one-third of the total number of PhD degrees in the country (OECD, 2005), and 60% of Aarhus University students are at the post-graduate level. The second hypothesis could thus be formulated as follows:

H2: Academic structure contributes to the accumulation of scientific capital in Nordic HES.

This hypothesis will be tested against seven indicators:

- 2.1. The importance of non-university higher education institutions
- 2.2. Field specialization within the university sector
- 2.3. Hierarchy between research-intensive, comprehensive and teaching universities

- 2.4. Faculty members' proportion of time spent on research activities
- 2.5. Proportion of temporary contract-researchers
- 2.6. Establishment of research/doctoral schools
- 2.7. Proportion of doctoral students in universities

3 Governance

In most Nordic countries, universities are publicly-owned or publicly-monitored, and the parliaments have an important influence on funding, number of students and research activities (through, for instance, the Standing Committee on Research in Denmark). The strength of Nordic governments is especially perceptible in the recent state-initiated mergers of universities. The Finnish government decided in 2007 to merge its institutions of technology, economy and design into a future “world class” innovative institution, the Aalto University (Aareva et al., 2009). Denmark, which employed a gentler and more bottom-up approach, nonetheless decreased the number of universities. The University of Odense and a small business school were merged into the University of Southern Denmark in 1998, while smaller education institutions were brought together to form the Danish University of Education in 2000 (Gregersen & Rasmussen, 2011; Raaheim & Karjalainen, 2012). In November 2006, the Danish parliament enacted a reform of the higher education sector, which aimed at merging 12 universities and 13 governmental research institutions into 8 universities and 4 research institutes (Degn & Sørensen, 2014).

In terms of major research influence, Nordic states remain the planning and coordinating authorities, as demonstrated by policies on research and innovation. In 1979, Sweden elaborated its first research policy with the objectives of a long-term planning and coordination of public investments in R&D. Perez Vico and Jacobson (2012), however, report more recently that Sweden lacks a renewed and coordinated policy effort and is not yet a policy actor capable of promoting innovation in emerging fields. In 2001, the Swedish state funded 47% of all the R&D, and this number does not include national research councils, central government agencies or research foundations (Brundenius et al., 2011). In 2004, the government launched its “Innovative Sweden” strategy and appointed an ad hoc Innovation Policy Council that would encourage business investment in R&D, research clusters and commercialization of results. The key sectors affected by these initiatives were metallurgy, forestry, pharmaceuticals, biotechnology, IT and aerospace. In

Sweden, the *Higher Education Act* (HEA) defines rules about courses, boards, instructors' duties, student influence, recruitment and equality of opportunity. The *Higher Education Ordinance* (HEO), for its part, regulates staff appointments, entrance qualifications, course selection, syllabi and grades (Bauer *et al.*, 1999). The Swedish government ensures centralized management through nine agencies responsible for admissions, research, student support and appeals. Correspondingly, based on various indicators, Swedish universities would have less autonomy than their Danish, Finnish and Norwegian counterparts, even though they can hire, promote and fix salaries (Esterman *et al.*, 2011).

The role of Nordic governments was transformed following the influence of New Public Management (NPM) and the introduction of quality reforms in the 1990s that increased institutional autonomy in exchange for a new management by results that is argued to promote a world-class status for universities (Fägerling & Strömqvist, 2004; Välimaa, 2005). Finland's University Act of 2009 separated universities from the state budget, making them independent legal organizations that can own their properties, receive donations and make capital investments. The university board must include at least 40% of external members appointed by the university collegium (formed by elected students, professors and staff) that also approves the annual budget submitted by the board (Välimaa, 2012). Through this act, the rector gained power at the expense of the collegial bodies, while professors and staff lost the status of civil servants (tenure-track being implemented in 2010).

In Denmark, universities are state institutions that are granted a certain degree of autonomy as well as a collegial decision-making system (Gregersen & Rasmussen, 2011). Since the 2003 *University Act*, senate and faculty boards have been replaced with advisory academic councils that make recommendations to university boards composed of a majority of external members that are responsible for appointing the rector. Universities no longer fall under the purview of the state administration, but they remain publicly funded and regulated by mechanisms established by the government. For instance, no Danish university can start a new bachelor or master program without the permission of the state, and the ministry appoints teams of external examiners to inspect internal governance mechanisms and innovation (Ibid).

Esterman, Nokkola and Steinel (2011) studied 26 European countries, developed scorecards for four types of autonomy (organizational, financial, staffing and academic) and distributed

questionnaires to institutions. Each restriction was assigned a deduction value depending on the importance of the restriction. The results of the study described Finnish universities as having important organizational, staffing and academic autonomy, while mandatory three-year development contracts ensure that they remain aligned with the state's objectives (Esterman *et al.*, 2011).

Such questions of efficiency, freedom and quality assurance seem to all come together under the new theme of "management by results." It is possible that collaborations between institutions and their government - in which the government provides 90% of university budget (OECD, 2012) but imposes quality assurance mechanisms and development contracts - may be an alternative to privatization reforms. National evaluation agencies act as semi-independent organizations that provide a judgment on quality (Välimaa, 2005). The Finnish Higher Education Evaluation Council organizes audits and assesses the internal quality assurance systems. Within a four-year cycle, the SNAHE (2012) assesses programs, including doctoral programs that receive allocation based on diploma and research costs plus 10% depending on publication, citations and external funding. The Council also evaluates institutions, after which the government grants a premium to universities that have obtained a level of "very high quality."

Most Nordic governments negotiate development contracts with their institutions (Kvil, 2004). In Denmark, development contracts between the government and educational institutions have existed since the 1985 reform. Such contracts run for a period of four years and specify goals regarding external resources, research publications, national, regional and international cooperation, number of graduates, PhD production, and administrative efficiency (Gregersen & Rasmussen, 2011). In Finland, the mandatory three-year contracts made between the higher education institutions and the ministry have increasingly been used as a way for the ministry to compel HEIs to specify their goals and to demand specific results (Ahola *et al.*, 2014). Välimaa (2005) observes, however, that this steering of higher education should be understood within the Nordic social context of trust. The third hypothesis can thus be formulated as follows:

H3: Governance contributes to the accumulation of scientific capital in Nordic HES.

This hypothesis will be tested against seven indicators:

- 3.1. University autonomy
- 3.2. Quality assurance mechanisms
- 3.3. The parliament and its standing committees
- 3.4. A lower level of institutional bureaucracy
- 3.5. National innovation and research policies
- 3.6. Development contracts and performance agreements
- 3.7. The national government as planning and coordinating higher education

4 Public-sector research (PSR) funding

Closely related to governance issues are the concentration, type and administration of public-sector research (PSR) funding (as a form of material capital). These aspects of PSR funding are assumed to have an impact on research. Kalpazidou Schmidt (2012) identified the common features of research funding in Nordic countries: the use of formula-based basic funding (which occurs less in Sweden), increased use of competitive funding for projects, a general decrease in basic funding, the use of development contracts in Denmark, Finland and Sweden, and a trend towards greater transparency in fund allocation.

The first factor associated with Denmark's and Sweden's success is the fact that research is mostly conducted by universities. In Sweden, 52% of the R&D is conducted in universities, with 80% of the share of PSR funding being allocated to them (Henrekson & Rosenberg, 2001). In their mapping of the academic innovation system in Sweden, Brundenius et al. (2011) observed that there are few research institutes and that 52% of total person-years dedicated to R&D take place in the five biggest universities (Lund, Uppsala, Gothenburg and Stockholm). In Denmark, the share of PSR funding allocated to universities is 64% (Brundenius et al., 2011; OECD, 2005). Finland is the exception here, for even if the number of researchers were to grow by 50%, PSR funding would remain comparatively weak, allocated on a day-to-day basis, and less concentrated in universities (Aarova et al. 2009; Kalpazidou Schmidt, 2007).

The *type* of PSR funding can be distinguished according to its source and its mode of governance. In terms of source, in Sweden, of the 21.7 billion SEK that universities and colleges received for R&D, 17 billion come from the public sector, 2 from the private non-profit sector, 1.3 from abroad

(including the EU) and 1,1 from the business sector (Brundenius et al., 2011). Similarly, in Denmark, of the 8,4 billion DKK received by the higher education sector, 7 billion come from the government, 0.7 from private non-profit organizations, 0.5 from foreign sources and 0.2 from the business sector (Gregersen & Rasmussen, 2011). In Finland, data about PSR are more difficult to find, but overall university funding is received, in order of importance, from direct grants (64.5%), research organizations (11%), and private and European sources (10.4%) (Aareva et al., 2009).

PSR funding can also be classified into four streams based on the mode of governance: basic, competitive, excellence and strategic funding. Nordic countries have established a balance between funding types (or governance models) where almost half of the funding is provided by block grants, an important share coming from competitive/response-mode mechanisms and a smaller proportion through excellence and strategic mechanisms. Basic funding refers to direct allocations from governments to institutions. Larger block grants allow institutions to maintain their research infrastructures, to encourage curiosity-driven research, to fund revolutionary ideas no matter where they happen, and to reduce the paperwork for researchers (assuming that institutions themselves do not require detailed reporting), thus increasing their time for research (Sörlin, 2007).

Whether negotiated based on a formula or decided according to historical trends, basic funding has become increasingly dependent on performance-based measures (Auranen & Nieminen, 2010). In 2013, basic funding was broken down into several categories, with 29% allocated toward education, 31% distributed to direct research funding, 33% awarded based on competitive research funding, and 7% identified as miscellaneous. The share of basic funding has steadily decreased from 64% in 2003 to 56% in 2010. In Finland, basic funding for universities consists of a lump sum, and has decreased from 84% to 65% of the overall university budget since 2000 (Virtanen, Silander & Pietilä, 2014). In Norway, in accordance with the *Norwegian Quality Reform*, 60% of the funding is allocated as basic funding, 25% of which is based on education outcomes and 15% on research performance (Frølich et al., 2010). Performance-based research funding is based on completed PhD degrees (30%), external EU research funds (20%), research council grants (20%) and the level of scientific publications (30%). In Sweden, block grants cover 50% of PSR costs, 66% in the case of the humanities, but only 33% in the case of technical sciences (Brundenius et al., 2011). These grants are based on the number of students and their accomplishments, research costs and publications (Eliasson, 2009; Frølich et al., 2010).

Ahola et al. (2014) note a shift towards more competitive funding. Response-mode funding covers 25% of total PSR in Sweden, while mission-oriented agencies (associated with strategic funding) account for 30% (Benner & Sandström, 2000). In Norway, 70% of the research projects are funded by sub-councils using a response-mode and peer review mechanisms. (Potì & Reale, 2007). Following a bottom-up approach, the Academy of Finland (2014a) allocates 310 million euros in research funding. National data (Ibid) also show that only one in five proposals is funded. The largest share of the research funding allocated by the Academy goes to the Research Council for Natural Sciences and Engineering (Finland Ministry of Education and Culture, 2013). Approximately half of the applications received by the Academy were for personal grants, 36% for non-thematic projects and programs and 14% for thematic (or strategic) programs (Ibid).

Bloch and Sørensen (2015) have identified a recent trend towards greater concentration of funding in fewer academic units, suggesting that excellence funding may be of increasing importance in many universities. For instance, in 2001, 65% of all project grants from the Danish Council of Independent Research were for a sum of money below 1 million DKK, while in 2009, the share of small grants for less than 1 million DKK had dropped to 16%. The same pattern was observed in Norway where the size of grants from the Norwegian Research Council increased from 3.0 million NOK to 5.6 million within five years.

Excellence funding is part of a broader international move towards “research excellence initiatives.” The excellence funding stream is characterized by a systemic re-structuring of the research landscape through long-term and large-scale grants to research groups of exceptional quality (Asknes et al., 2012). Excellence funding has been shown to improve critical mass, economies of scale, agglomeration effects, interactions, research visibility, path-breaking discoveries, and research utility. The emergence of excellence funding can be seen in Denmark’s National Research Foundation, which “focuses on supremely talented individuals and providing them with sufficient funds, a long-term horizon and autonomy” (DNRF, 2013, p. 4). In Norway, Centers of Excellence are part of a scheme of 350 million Norwegian crowns (20% of the budget funded by the Research Council). In the summer of 2016, the scheme was funding 21 centers doing long-term high-quality research mostly in the field of natural and medical sciences.

The strategic funding stream encourages institutions and individuals to conduct research in priority areas designated by governments (Benner & Sörlin, 2007). Potì and Reale (2007) reported a

growth of governmental funding for research, but also a transformation of sub-councils into mission-oriented organizations that follow priorities determined by the government. The early 2000s saw the founding of the Swedish Foundation for Strategic Research, which announced a call for tenders titled *Individual Grant for the Advancement of Research Leader* (INGVAR). INGVAR is one of the largest foundations in Sweden and has an annual expenditure of more than 100 million euro (Melin & Danell, 2006). In addition to providing basic and excellence funding, the Academy of Finland is also involved in strategic funding. Its Strategic Research Council, which consists of a chair and eight members and is appointed by the Finnish Government, formulates themes in accordance with the government's decisions. The annual funding budget has been set at around 57 million euros, or around 3% of the Finnish Government's R&D expenditure (Finland Ministry of Education and Culture, 2013).

The final aspect of PSR funding concerns its administration, and, in this case, the presence of research councils. In the 1990s, the Norwegian government forced the merger of three research councils into a single organization in order to promote interactions between basic and applied research, and also to make the system efficient in view of pursuing international cooperation (Benner & Sandström, 2000). The council adopted a governance structure based on role differentiation, support for basic research and the establishment of centers of excellence (Benner, 2011).

It is of note that biotechnology became a key priority for all research councils mentioned above and it is Denmark and Sweden that appear the most successful in that field. Denmark benefits from a more recent system that has been easier to modify in order to integrate emerging fields. As for Finland, its Academy not only provides competitive, strategic, excellence and even basic funding (through the doctoral school instrument), but also acts as a science policy advisor whose proposals regarding changes that address structural problems carry significant weight (Finland Ministry of Education and Culture, 2013).

In sum, Benner and Sandström (2000) suggest that diversified funding mechanisms and a certain coherence lead to better research outputs. The fourth hypothesis can thus be formulated as follows:

H4: PSR funding contributes to the accumulation of scientific capital in Nordic HES.

This hypothesis will be tested against seven indicators:

- 4.1. Concentrating research funding into universities (rather than into governmental institutes or private enterprises)
- 4.2. The prominence of public over private funding
- 4.3. The role of research councils
- 4.4. Basic funding given to higher education institutions
- 4.5. Competitive funding given to researchers for specific projects
- 4.6. Strategic funding given by mission-oriented agencies
- 4.7. Excellence-based initiatives where the “best” research groups receive more funding.

5 Networking with private actors

Clark (1983) defines market-based coordination as “unregulated exchanges [that] link persons and parts together” (p.162) and include consumer, labor and institutional markets. For Singh (2012), responsive HES have the capacity to meet the needs of the knowledge economy, deliver research as well as highly trained people and address national needs. Since the 1980s, Nordic governments have begun pressuring universities to get involved in real-world problems, especially in Sweden where universities are perceived as part of the technological change process (Sörlin, 2014).

The fifth factor to be discussed in this section relates to the networks (as a form of social capital) established between universities and private actors. Potì and Reale (2007) defined research networks as “instruments in which highly qualified representatives of the scientific community, sometimes together with highly qualified representatives of the technology community, are free to build their own research agenda, within some broadly defined boundaries” (p.424).

Well-known in many Anglo-Saxon countries, the concept of a “Third Mission” was formally introduced in Nordic countries in the late 1990s, requiring that academic institutions interact with the surrounding society and economy (Brundenius, Göransson & Ågren, 2011). If networks are believed to be conducive to research production (Perez Vico & Jacobson, 2012), Pinheiro (2012) observed that universities’ level of engagement in their “Third Mission” is partly determined by path-dependency, resource-dependency and systemic incentives. The introduction of this “Third Mission” has been accepted by smaller and newer institutions, whereas older comprehensive universities perceived it as a potential obstacle to researchers coming with curiosity-based ideas

without knowing if they will prove useful and who will have to complete more paperwork (Brundenius, Göransson & Ågren, 2011). Moreover, Gregersen and Rasmussen (2011) observe that small and medium scale enterprises invest little in R&D, have few direct interactions with universities and that the most research-intensive industries tend to be established outside the Nordic region.

Among the Nordic countries, Sweden is a pioneer in developing innovation systems. The Swedish Agency for Innovation Systems (Vinnova) launched a program encouraging Swedish regions to compete and propose the best clustering alliance (Brundenius et al., 2011). Moreover, the national business promotion agency (NUTEK) ensures that all regional agencies incorporate clusters in their policies and, together with Vinnova and ISA (Invest in Sweden Agency), it created the Dahmén Institute to link researchers and practitioners. As a result of these innovation initiatives, academics have taken on a proactive role in nanotechnologies and 75% of the Swedish nanotechnology firms are former university spin-offs (Perez Vico & Jacobson, 2012). In Finland, national policies also encourage cooperation between universities and private enterprise and, since the 1990s, the share of funding from private sources has grown sixfold (Välimaa, 2005). The University of Oulu, in Northern Finland, is an example of a university that succeeded in building close ties with external actors by carrying out applied research in “relevant” fields (e.g., technology, science and medicine), counting on an office for innovation, and using a “matrix model” that fosters multidisciplinary research with the involvement of external parties (Pinheiro, 2012).

Norway also counts on networks (e.g., VRI and ARENA) and centers of expertise to ensure that specialized knowledge produced in one sector and in one location can be disseminated in an ongoing endogenous process of growth (Herstad et al., 2010). And university executive structures play an important role in raising regional engagement. For example, the rector of the University of Tromsø (in Northern Norway) used the government’s High North Strategy to establish networks and consolidate its position in marine biotechnology. Denmark has put in place diverse initiatives to encourage universities to collaborate with industries from the perspective of knowledge accumulation and “absorptive capacity” (i.e., ability to recognize, assimilate and transform information into a product; Cohen & Levinthal, 1990). For instance, the Danish Agency of Science, Technology and Innovation’s innovation policy promotes the training of “industrial PhDs” who work part-time in a firm and study part-time, thus promoting knowledge circulation

(Herstad et al., 2010). Most Danish science parks are also connected to a university, especially in the sectors of agriculture, pharmaceuticals, energy and health. Finally, all Danish universities have established technology transfer offices, patent offices, network centers, incubators and knowledge ambassadors (Gregersen & Rasmussen, 2011). The fifth hypothesis can thus be formulated as follows:

H5: Networking with non-academic actors contributes to scientific capital accumulation in Nordic HES.

This hypothesis will be tested against five indicators:

- 5.1. The formal introduction of a “Third Mission” for universities
- 5.2. Governments’ incentives for universities to collaborate with private actors
- 5.3. Innovation clusters (i.e., specific businesses, public organizations and universities joining forces to do research in a particular field)
- 5.4. External members on university boards
- 5.5. The involvement of private businesses in research funding

6 Internationalization

According to the Royal Society (2011), international collaborations in research have a positive impact on the quality of the research and the efficiency of the research process. As a form of social capital, these collaborations increase citation impact and access to new markets, and broaden researchers’ research horizons. For Denmark, Finland, Norway and Sweden, an international outlook takes the form of Pan-Nordic cooperation, a Europeanization process and the internationalization of research production.

Nordic cooperation is a clear asset insofar as it compensates for smaller populations, increases research capacity and provides an alternative to the global discourse of neo-liberalism by defending a “public good” ideal for higher education, reinforced by universal access, public funding and free tuition (Maassen et al., 2008). Cooperation begins with the Nordic Council of Ministers. The Nordic Council of Ministers was founded in 1971 and consists of several councils, including the Nordic Council of Ministers for Education and Research (MR-U). This last council

counts nine members: Faroese, Danish, Icelandic, Swedish, Alandic, Finnish, Greenlandic and Norwegian. It has two committees: Culture, Education and Training, and Business and Industry. Its role is to foster synergy and support the leading position of the Nordic region in terms of knowledge production. There is also a committee of senior officials for education and research (EK-U) in which civil servants from the different national ministries prepare and implement decisions made by the Nordic Council.

Institutions and instruments for Nordic collaboration also include NordForsk (for R&D), the Nordic Area for Education, NORDPLUS (for student mobility) and the Nordic Academy for Advanced Studies. NordForsk receives annually 117 million Norwegian crowns as basic funding, as well as other funding for specific assignments by the Nordic Council of Ministers (Norden, 2014b). In 2003, the Nordic research councils, the Nordic Council of Ministers and NordForsk created and funded the program for Nordic Centers of Excellence. There are now three components for this program funding a total of fifteen centers that conduct research on themes like security technologies, social security, climate change, education, welfare policies, health and nutrition and the Nordic welfare state. It also supports Nordic doctoral courses and visits of Nordic professors. Moreover, most universities count one central administrator responsible for “Nordic issues” (Maassen et al., 2008). Recently, twelve Danish and Swedish universities as well as four regional and bi-national networks have formed a consortium, Oresund University, to improve research production and PhD education (OECD, 2005).

Unlike Denmark, Finland and Sweden, Norway is not an EU member, but like them it is part of the European Research Area (Gornitzka & Langfeldt, 2008). European integration occurs in three ways: funding, policy shift and policy learning. With the Framework Programs, the Structural Funds, the Marie-Curie Actions (to facilitate the mobility of researchers) and the European Research Council, Nordic universities now have access to more diversified funding sources. The Framework Programs passed from representing 12% to 34% of the Norway Research Council’s budget in 10 years (Ibid). Regarding policy shifts, Chou (2012) has shown how the Europeanization process implies change in legislation. In addition to the harmonization of degrees and the suggestion to countries to establish quality assurance mechanisms (Välilmaa, 2005), the European Commission has adopted a Charter for Researchers (specifying the role, responsibilities and entitlements of researchers), a Code of Conduct for the Recruitment of Researchers and a “scientific visa package” (to admit researchers from third-country nationals). With respect to

policy learning, Tamtik (2013) suggests that the Open Method of Coordination (OMC) has allowed country representatives to network, gain insights from other countries' experience, and to contribute to both a vertical and horizontal diffusion of policy ideas.

With regard to the third facet of internationalization as it appears in the countries under study, the internationalization of research production, Nordic countries generally seem to be proactive actors in global science networks. This is reflected in part in their increasing knowledge production and publications in English (King, 2011). Half of the articles produced in Sweden in 2003 were the result of collaborations that, in total, encompassed 116 countries (OECD, 2009). Denmark and Sweden also count more publications with international co-authorships in percentage of total publications than other European countries, apart from Austria, Belgium and Switzerland (OECD, 2013).

Nordic countries also appear particularly strong regarding internationalization "at home." In Denmark, the number of admitted international students increased by 18% between 2010 and 2012 (Ibid). In Sweden, international students represent 37% of all doctoral students (SNAHE, 2012), and, according to the OECD (2013), the proportion is 23% in Denmark. Danish immigration laws also give special recognition to post-graduates from the top-20 in major world university rankings (Hazelkorn, 2013). In Norway, 26% of the doctoral students at the University of Oslo (2012) are international. By contrast, in Finland, neither the government nor the universities have found a strategy to increase the inflow of international students. This is especially so at the graduate level (Aareva et al., 2009). Nonetheless, between 2010 and 2013, the number of foreign degree students in Finland grew from 16,000 to 20,000. In light of all this, the sixth hypothesis is formulated as follows:

H6: Internationalization contributes to the accumulation of scientific capital in Nordic HES.

This hypothesis will be tested against six indicators:

- 6.1. Research collaborations with researchers in other countries
- 6.2. The proportion of international students
- 6.3. The recruitment of foreign scholars
- 6.4. Nordic policies and funding

6.5. European policies and funding

6.6. Partnerships with institutions outside the Nordic and European regions.

7 Summary of the hypotheses

The various Nordic HES do share characteristics and, as such, they represent a coherent subset of the Nordic welfare ideal type. Holmes' (1981) problem approach proposes to intellectualize a problem by imagining how it would take place in a specific context. The problem under study is the capacity of Nordic HES to accumulate scientific capital, while respecting their tradition of equality and equality.

So far, an extensive literature about research production in Nordic HES has led to the formulation of the six factors, which have in turn been translated into hypotheses. Each hypothesis is formulated as potentially solving the tension between the global pressure of academic capitalism and the coordinated and social-democratic nature of Nordic HES. Using a post-positivist paradigm (Popper, 2005), the problem approach then suggests that the researcher should take the hypotheses and attempt to disprove them by observing what happens in the empirical world. To do so, this study has used the 39 indicators (between 5 and 7 per hypothesis) listed above.

As stated in Chapter 2, the main research question of this study is framed as follows: (RQ1) What are the systemic factors perceived as having a positive impact on scientific capital accumulation in Nordic HES? This research question has been broken down into the six hypotheses:

H1: Beliefs contribute to the accumulation of scientific capital in Nordic HES

H2: Academic structure contributes to the accumulation of scientific capital in Nordic HES

H3: Governance contributes to scientific capital accumulation in Nordic HES

H4: PSR funding contributes to scientific capital accumulation in Nordic HES

H5: Networking contributes to scientific capital accumulation in Nordic HES

H6: Internationalization contributes to the accumulation of scientific capital in Nordic HES

Comprising six hypotheses, thirty-nine indicators and four theoretical frameworks, this thesis presents a complex challenge. Table 5 attempts to present an integrated and coherent model; it also identifies the theoretical elements used to understand how each factor might influence scientific capital accumulation in the Nordic context.

For example, the first hypothesis states that beliefs contribute to the accumulation of scientific capital in the Nordic HES. According to neo-institutional theories, beliefs are supported by a cultural-cognitive pillar, i.e. the mental templates used by individuals to interpret a social reality. Beliefs are also “carried” through time and space by symbolic systems, including norms, political statements and schemas. Beliefs could explain performance in the global academic capitalist race in that they would foster the accumulation of symbolic capital, in the form of a high social prestige. Relying on the VoC approach and the welfare regimes typology, I also tried to define what political-economic elements would shape this factor in the specific context of the Nordic welfare regimes. The importance of local (municipal) authorities is connected to the traditional strength of local parishes in Nordic countries; the reliance on social sciences to inform social policy making is supported by a philosophical tradition of positivism; and access to higher education is supported by the principles of universalism and productivism. All the terms and concepts used in Table 5 were explained in the two previous chapters.

One could question the appropriateness of hypotheses’ label. The names given to hypotheses are broad and appear, at least on the surface, difficult to refute. Moreover, their broad character might fail to highlight what is distinct about Nordic HES. This issue will be discussed more at length in the next chapter but it is worth recalling that hypotheses were generated inductively by grouping together the 39 explanations initially found in the literature about research production in the Nordic countries. Hypotheses’ labels are derived from Clark’s (1983) and Benner’s (2011) frameworks, which have been used to compare multiple countries from different regions. The grouping of indicators is also, in some ways, similar to the tentative grouping of systemic factors presented as contributing to academic research production in Chapter 1. Labels are general and reflect the terminology used in the field of higher education across countries, but the indicators they include are more specific and, for some of them, stemming directly from the literature about Nordic HES. It was not possible to summarize five to seven indicators into one sentence, but it is implied that what will be tested is not the perceived impact of, for instance, “beliefs” as much as the perceived impact of beliefs as understood, framed and operationalized in Nordic HES.

In sum, the objective of this study is to assess the perceived importance of the empirical indicators in order to identify the systemic factors contributing to the accumulation of scientific capital in Nordic HES. The three research questions ask 1) what are the systemic factors perceived as contributing to scientific capital accumulation? 2) how do system actors explain the impact of systemic factors? and 3) how do the perceived impacts vary between Denmark, Finland, Norway and Sweden? The following chapters will present the approach, the mixed-method design and the multiple analyses used to test the hypotheses and assess the perceived importance of systemic factors in the four countries.

Table 5

Hypotheses and indicators under the light of three theoretical frameworks

Hypotheses	Indicators	Academic capitalism	VoC and Nordic welfare regimes	Neo-institutionalism
Beliefs contribute to scientific capital accumulation in Nordic HES	Academic freedom Collegiality Higher education serves the public good Local (municipal) authorities Providing the “best education” to all students STEM fields allow global competition Social sciences inform welfare	Public good regimes Symbolic capital	Universalism Freedom of choice Protestant work ethics Positivism Local autonomy	Pillar: cultural-cognitive Carrier: symbolic systems
Academic structure contributes to scientific capital accumulation in Nordic HES	Non-university higher education institutions Hierarchy between universities Field specialization Professors’ time spent on research activities Proportion of temporary contract-researchers Establishment of research/doctoral schools Proportion of doctoral students	Logic of distinction Construction of excellence Cultural capital Symbolic capital	Differentiation Productivism Equal opportunities Academically central	Pillar: regulative and normative Carrier: relational systems and routines
Governance contributes to scientific capital accumulation in Nordic HES	University autonomy Quality assurance Parliaments and standing committees A lower level of institutional bureaucracy National innovation and research policies The national government as a planning and coordinating agency Development contracts and performance agreements	Subfield of evaluation Cartel-like/Pluralist structure New public management	Consensual decisions Relational contracting Meta-institutions Evidence-based policies	Pillar: regulative Carrier: symbolic and relational systems
PSR funding contributes to scientific capital accumulation in Nordic HES	Concentrating funding into universities Public funding The role of research councils Basic funding Competitive funding Strategic funding Excellence-based initiatives	Subfield of resource allocation Potlatch Effect Thomas Theorem Material capital	De-commodification Socialization of risk Welfare mix	Pillar: regulative Carrier: relational systems
Networking contributes to scientific capital accumulation in Nordic HES	“Third Mission” for universities Governments’ incentives to collaborate with private actors Innovation clusters External members on university boards Private research funding	Interstitial organizations Social capital Material capital	Scripted transition “Large actor” approach Responsive to market forces	Pillar: normative Carrier: relational systems and routines
Internationalization contributes to scientific capital accumulation in Nordic HES	International research collaborations The proportion of international students The recruitment of foreign scholars Nordic policies and funding European policies and funding Partnerships with institutions outside the Nordic and European regions	Closing Effect Material capital Social capital Cultural capital Symbolic capital	Solidarity and cohesion Homogeneity International cooperation <i>Norden</i>	Pillar: normative and cultural-cognitive Carrier: symbolic and relational systems

Part 2
Methodology

Chapter 5 The Approach

This thesis attempts to assess in a robust and confirmative manner the impact of pre-defined systemic factors on scientific capital accumulation in four Nordic HES. The language used to formulate this objective reflects the paradigm, approach and epistemology supporting the investigation. More precisely, the thesis follows Holmes' problem(-solving) approach. It is thus informed by a post-positivist stance and relies on Popper's (2005) falsification epistemology. This chapter describes and explains how these foundations are intertwined.

1 Post-positivism

Positivism is a broad metaphysical stance which presupposes numerous postulates, including the existence of an objective truth, the independence of the researcher from the researched object, the strength of experiments, the use of methods from the natural sciences, and the possibility of inducing general (or even universal) laws explaining causality across contexts (e.g. Bereday, 1964; Noah & Eckstein, 1969). Positivism emerged in comparative education with Jullien's *Plan for Comparative Education*, published in 1817, and then became more prominent in the 1960s and 1970s with the advancement of technology and statistical methods.

Post-positivism (or post-empiricism) is both an epistemological position and an ontological position in that it informs our understanding of the empirical world and guides its study (Fox, 2008). It accepts human experience as a valid source of data, considers "truth" to be context-specific and believes values guide the social world. As a post-positivist, I therefore believe in the pursuit of knowledge, although I acknowledge the importance of context and recognize that our capacity to apprehend the empirical world is approximative and tentative.

For Fox (2008), Max Weber is among the first to promote a post-positivist approach with his hermeneutic technique and his understanding that social realities need to be understood in their "totality" and from the subject's perspective. Fox asserts that social researchers need to study a phenomenon by relying on the meaning and interpretations of the subjects involved.

Understanding rather than establishing causality would then appear as the primary goal. As such, Fox positions post-positivism closer to interpretivists' approaches and phenomenological studies by requiring that researchers have a degree of empathy with the actors and focus more on their construction of field (i.e. symbolic interactionism). Fox also strongly emphasizes the importance of self-reflection and the integration of researchers' own interpretive work and sense-making into the analysis.

Consequently, Fox considers Karl Popper to be a positivist because the latter argues that theories should be tested against data with the intention of their falsification and eventual replacement with improved theories, and because Popper rejected non-observable and non-testable sources of knowledge (what he called "psychologisms"). I disagree with Fox, however, and contend alongside Robson (2002) that Popper is one of the most prominent fathers of post-positivism (or at least of its realist branch).

Popper (2005) made a sharp distinction between the process of developing a theory, an explanation or a hypothesis, and the process of testing it through systematic methods. All scientific statements should be "conclusively decidable" in that they should be verifiable or falsifiable. That said, Popper was not a positivist: he rejected the uncritical naturalistic view according to which dogma could be inferred from the observation of a single or a series of repeated events. Since it is practically impossible to survey all occurrences in all places at all times, Popper rejected induction as a method for formulating universal statements:

It should be noticed that a positive decision can only temporarily support the theory, for subsequent negative decisions may always overthrow it. So long as theory withstands detailed and severe tests and is not superseded by another theory in the course of scientific progress, we may say that it has "proved its mettle" or that it is "corroborated" by past experience. (p. 10)

Popper believed scientific theories were abstract and hypothetical and could thus only be tested indirectly through their implications. He developed the process of falsification in consideration of the fact that a theory was scientific insofar as it was falsifiable. General causal laws could not be deduced but predictions could be made and considered tentatively true so long as researchers were genuinely incapable of finding a negative occurrence. A more detailed description of the falsification process will be presented at the end of this chapter.

Although scientific tools are value-laden, theory-driven and context-specific, I consider that there is some objective reality to the social world and that tentative laws can be approximated through the rigorous use of multiple data analysis, tests and theoretical frameworks. In this context, participants' perspectives are not ethereal social constructions but reflect (in an admittedly approximative fashion) the empirical phenomenon under study. As it will be explained in further detail in the next chapter, this thesis studies systemic factors as empirical phenomena and attempts to assess their impact through the perspectives of participants involved in the Nordic HES. In this sense, the thesis re-affirms three assumptions of positivism: ontological realism (a philosophical thesis asserting we can determine what exists by seeing which entities are endorsed by our best scientific theory of the world; Quine, 1948), the desirability of an "objective truth," and the utility of the scientific method.

2 Problem approach to comparative education

Comparative education is a social science divided by the opposition between idiographic and nomothetic approaches to knowledge. While nomothetic approaches (from the Greek "*nomos*" meaning "law") attempt to derive general laws that explain objective phenomena across contexts, idiographic approaches (from the Greek "*idio*" meaning "own" or "private") attempt to specify and understand the unique character of subjective phenomena.

Kandel (1955) developed an idiographic frame of comparative education which he named "a problem approach." This approach consisted in identifying a problem (an educational issue) and observing two to four countries separately in order to note how the problem is addressed in each. National systems of education thus become "laboratories" of sorts. This idiographic "problem approach" is characterized by an emphasis on contextual information which sheds light on the specific issue, the subjective nature of language and knowledge across cultures (e.g., to what extent would the term "academic research" be understood consistently across countries), and the recognition of the importance of "spiritual forces" (including values) moving the system without people being aware of them.

Inspired by the methods of the natural sciences, Bereday (1964) later proposed a nomothetic version of the problem approach to comparative education. The objective of his hypothetical-

inductive method was to examine the persistence and variability of an educational phenomenon in a relevant set of educational systems. The process included four steps: enumerating systems' characteristics relevant to the theme; interpreting the data within each system's relevant context; juxtaposing the data sets to establish similarities and differences and formulate hypotheses; and highlighting educational characteristics previously described in order to prove the hypotheses. Although he acknowledged the specificity of each context, Bereday believed it was possible after a number of years to have studied enough cases to achieve what he called a total analysis: "the total comprehension of the interdependence of all aspects of education and society around it" (p. 26). In this way, Bereday's nomothetic problem approach attempted to discover "universal" laws explaining educational phenomena across contexts.

In agreement with Popper's (2005) post-positivist argument, Holmes (1981, 1988) attempted to solve the disputes between nomothetic and idiographic approaches by developing a pragmatic and hypothetical-deductive problem(-solving) approach to comparative education. As a *post-positivist*, Holmes acknowledged the interpretivist arguments that people and systems are moved by values and that any relationship between two phenomena is context-dependent. At the same time, he also adhered to the positivist assumptions that the research process itself should be value-neutral and that tentative laws can be deduced in a specific context given that a proper scientific method is used.

According to Holmes' approach, "problems" are abstract constructs that can be formulated when an asynchronous change happens in a society, in other words, something changes while something else does not. Often, changes happen at the institutional level while deeper mental states and normative patterns are less likely to change. In the case of the present thesis, the "problem" arises from the emergence of a global knowledge society, academic capitalism and the dominance of international metrics to evaluate research. Yet this "problem" also has to be understood from within the Nordic context: a context shaped and informed by Lutheranism, positivism, social-democracy and cooperation. The present study therefore offers not only one of many studies on academic capitalism around the world but a specific inquiry into how the "problem" of academic capitalism interplays with the ideal type of Nordic welfare regimes. Multiple theoretical frameworks are thus combined to explore in more depth the multiple interactions between the "problem" and the context.

2.1 Pragmatism

Pragmatism is a philosophical tradition that originates in the United States at the end of the 18th and the beginning of the 19th centuries. Peirce's (1992) canonical statement on pragmatism is as follows: "Consider what effects, which might conceivably have practical bearings, we conceive the object of our conception to have. Then, our conception of those effects is the whole of our conception of the object." (p. 132) For James (1907/1975), this method could settle metaphysical disputes between the empiricists and the rationalists in such fields as morality, religion and philosophy. In education, Dewey (1933) regarded hypotheses as the primary instrument in science and proposed that theoretical and practical judgments were closely related.

As noted by Papong (2013), Holmes' problem approach clearly follows a form of Deweyan pragmatism. Dewey (1933) urged his contemporaries to concentrate on the "problems of humanity" rather than to remain immobile in sterile debates on appearance and reality, theory and practice, fact and value. In his book *How We Think*, Dewey sees inquiry as beginning with a problem, an "objectively" indeterminate situation that we wish to transform into a determinate and coherent situation. The problem then needs to be intellectualized and framed into a question that exemplifies the relations between the various elements of the context. The third step involves formulating hypotheses using theories as instruments. The hypotheses are to be judged by how well they achieve the intended purpose. The fourth step – reasoning – implies making predictions based on the hypothesis. The final step consists of experimental verification.

Holmes' (1981) problem approach shares many features with Dewey's dynamic and pragmatic inquiry process. A first point in common can be found in Holmes' five steps, as presented in the Introduction (Chapter 1):

1. Intellectualize a problem
2. Formulate hypotheses based on a theory of social change or an ideal-type
3. Identify contextual contingencies (e.g., normative statements, institutional patterns, patterns of mental state and the physical environment) in which the problem will be studied
4. Predict the outcomes of the hypotheses in the specific context
5. Compare the logical predictions with observable events

A second feature in common between Holmes' and Dewey's methods is that both put a strong emphasis on the importance of clarifying the question and intellectualizing the problem. Unlike other comparativist approaches that infer elements of the problem based on random observations

in the field, the problem approach requires extensive knowledge of both the problem and context in order to formulate hypotheses and deduce predictions prior to attempting any field work. For both authors, a question well asked is half-answered. A final instance of commonality between Holmes and Dewey is that they both look ahead: both try to solve problems by thinking of solutions and making predictions, in contrast to the historicists whose backward-looking gazes explained phenomena by means of evolution, and to the positivists who searched for causal relationships in what happened prior to the present moment. The distinction is subtle, but nonetheless deserves mention: Holmes believes in prediction rather than in causality.

2.2 Hypothetical-deductive reasoning

The problem approach is also hypothetical-deductive. Holmes (1988) rejects descriptive studies that are not based on a clear problem or on a well-defined ideal-typical model. He also rejects inductive testing which lacks the necessary analysis to operationalize the variables and an interest in the “living spirit” of an educational system. For Holmes (1988), large-scale quantitative studies like the one conducted by Noah and Eckstein (1969) are not entirely convincing because of the limited amount of data such studies include. Important variables may be the hardest to apprehend and the distinction between dependent and independent variables might be blurrier than commonly expected. Causal analysis may also present a level of circularity. It would therefore be preferable to make predictions and test them by means of the scientific method. The problem approach thus relies on successful predictions rather than the discovery of antecedent causes (Papong, 2014).

Unlike Bereday's random observations (1964), Holmes' (1981, 1988) problem approach focuses on specific hypotheses generated by a theory of social change (e.g., academic capitalism). Based on shared and deeply-held sentiments of a population regarding the nature of humans, society and knowledge, these ideal-types lead to specific hypotheses that can then be contrasted with what is observed in a specific system, which in turn allows for a better understanding of that system. Within this deductive frame, Holmes provides a clear roadmap for collecting and classifying data about a particular educational context. Statistics, observations, interviews and documents should be put in mutually-exclusive categories such as administration, finance, structure and organization, curriculum, and teacher education. The present study prefers to use terms related to higher education and uses the six systemic factors described in the previous

section as its main categories: beliefs, academic structure, governance, research funding, networking with non-academic actors and internationalization.

3 Falsificationist epistemology

The pillar of Holmes' problem approach is Popper's (2005) falsification epistemology. For Popper, a theory can only be called "empirical" or "falsifiable" if all possible basic statements deduced from it fall unambiguously into the following two non-empty subclasses: true or false. Since the verification of "natural" or "sociological" laws "can only be carried out by empirically ascertaining every single event to which the law might apply, and by finding that every such event actually conforms to the law," it is clearly an impossible task (Popper, 2005:42). Popper and Holmes thus prefer to insist on the non-existence prescription of theories in order to assess their empirical value. Theories do not only assert that some things exist, but by doing so they deny that other things might exist. And it is because they prohibit the occurrence of certain events that theories and hypotheses are falsifiable. In other words, a hypothesis is falsifiable when it is possible to prove it to be false. As Popper explains:

I shall not require of a scientific system that it shall be capable of being singled out, once and for all, in a positive sense; but I shall require that its logical form shall be such that it can be singled out, by means of empirical tests, in a negative sense: it must be possible for an empirical scientific system to be refuted by experience. (p. 18)

In this thesis, the six factors become six hypotheses to be falsified. According to Popper, empirical statements must be synthetic (or non-contradictory), be perceptible through experience (or non-metaphysical) and distinguished from other statements. This is the reason why strictly existential statements are not falsifiable.

One could wonder if the very general labeling of hypotheses could make them difficult to refute. As mentioned in the previous chapters, hypotheses' labels are general and it would be problematic if my intention was to prove them. I however consider that their broad character makes them easier to falsify since they encompass a greater spectrum of elements, and it becomes harder to be incapable of genuinely finding one disproving element.

Similarly, in Holmes' (1981) problem approach, no theory or hypothesis can be derived from single positive statements, but all can be contradicted by singular negative statements. The purpose of this thesis is thus not to prove the importance of systemic factors on scientific capital accumulation, but rather to use the thirty-nine empirical indicators to test the hypotheses critically in such a way that what survives the testing can be seen as tentatively true (or not yet falsified) in the specific context of the Nordic HES. What Holmes calls "sociological laws" do not involve the establishment of causality but allow for predictions to be tested against a defined context. The context of Nordic HES was previously described thoroughly so that researchers in similar contexts can attempt to replicate the observations.

The final point concerns the coherence of post-positivism, the problem approach, the falsification process and the data and analyses described in the two next chapters. The falsification process increases the threshold for considering statements as empirically valid. In light of this, one might question how a post-positivist study can rely on actors' perspectives to falsify predictions about the importance of immaterial systemic factors. This will be further explained in the next few pages but for now let me say that perspectives are here taken as proxies for the relative impact of systemic factors. Participants' perspectives are not understood according to a social-constructivist paradigm where individuals construct their realities through interactions. Rather, these perspectives are understood in a critical realist way that considers them as mental constructs built upon an informed observation of the empirical world. It is thus through the eyes of system actors within the four Nordic HES that I have tested the importance of systemic factors.

Although positivism is the paradigm most often associated with quantitative methods, I consider post-positivism to be the most relevant paradigm for both quantitative and qualitative methods. As Popper prescribed, statistical procedures can never be used to prove or disprove the alternative hypothesis (H_1) but only to test the null hypothesis (H_0), and moreover only to reject it in the case of a significant result. The significance threshold represents the probability of the event occurring by chance in a normal situation considered by researchers as acceptable. This study relies on both quantitative and qualitative methods in order to triangulate data. It rejects H_0 – or considers a factor to be not yet falsified – when convergence is observed between participants, countries and data sets.

4 Summary and statement of positionality

The current chapter has explained the philosophical and epistemological foundations upon which I developed a methodology to identify systemic factors contributing to scientific capital accumulation in Nordic HES. I conclude this chapter by summarizing some of the highlights so the reader can better understand my philosophical and methodological stances with respect to the research problem under study. One could call my approach as “value explicit” in that I wish to make clear the values I am bringing to the study, rather than pretending to be neutral.

First, I appreciate Dewey’s pragmatism and, like him, like to begin an inquiry with the identification of a situation that I wish transform. While the “knowledge society” of the 1970s involved broadening access to higher education, I am worried that recent reforms put equality of opportunity at risk in the name of research excellence (see Bégin-Caouette & Jones, 2014; Bellei et al., 2014; Rheingans & Hollands, 2013). Noting that recent reforms were prompted by the American, Australian and British examples, I decided to look at other HES achieving high levels of research production while protecting a broad access to higher education. I thus need to acknowledge my pragmatic desire to improve a situation by identifying systemic factors contributing to scientific capital accumulation in Nordic HES.

Second, after having explored different paradigms in comparative education, I became aware of my philosophical affinities with post-positivism. Inspired by my studies in psychology (anchored in a nomothetic epistemology), I believe in researchers’ capacity to distance themselves from the researched object, in the strength of experiments and in the relevance of methods from the natural sciences. In fact, I doubt there could be any science if there is no objective reality. I am however aware of the importance of values (and other immaterial phenomena) and of the context-specific nature of knowledge. As a post-positivist, I accept human experience as a valid source of data but recognize that our capacity to apprehend the empirical world is approximative and tentative. Although I try to be as rigorous as possible, the methodology I am proposing does not allow me to apply my findings to any country outside the Nordic region. My findings are shaped by the Nordic context, its own values and history.

Third, unlike other comparativist approaches that infer elements of the problem based on random observations in the field, Holmes’ (1981, 1988) problem approach requires extensive knowledge of both the problem and context in order to formulate hypotheses and deduce predictions prior to

attempting any field work. The body of literature regarding academic research production in Nordic HES is fairly comprehensive, and I did not think I would make any contribution to knowledge by collecting random data and inductively constructing hypotheses. I preferred to draw hypotheses from the literature and confine myself to only work with these.

Popper (2005) makes a statement that I think is essential to all scientific investigations: a theory can only be called “empirical” or “falsifiable” if all possible basic statements fall unambiguously into the following two non-empty subclasses: true or false. It is impossible to prove a hypothesis through confirming observations because one can never survey all the occurrences of a phenomenon. But, one can consider a theory to be not yet falsified if, through experimental testing, no disconfirming elements can be found. It therefore seems reasonable and scientifically sound though more difficult to try to disprove my hypotheses (the systemic factors I identified), and when I fail to disprove them, to consider my conclusions as tentatively true.

Fourth, I decided to rely on system actors’ perspectives to falsify predictions about the importance of immaterial systemic factors as a proxy of the empirical reality. The next chapter (Chapter 6) will provide more details on this approach, but this methodology allowed me to cover in a holistic way a broader spectrum of factors (including the role of beliefs and values) in a limited number of countries. Since the falsification process increases the threshold for considering statements as empirically valid, I developed a mixed-method design where I solely focus on points of convergence between participants, countries and data sets. In sum, I will reject H_0 – or consider a factor to be not yet falsified – when triangulation between interviews and surveys allow it.

Chapter 6 The Data

Holmes' (1981) problem approach to comparative education poses a challenge in that it requires researchers to adopt deductive (nomothetic) analyses using deductive reasoning, approach contexts holistically and find a way to grasp idiographic phenomena (e.g. beliefs and values). To meet these challenges, I developed a method consisting in both a vertical scheme identifying the system levels involved in academic research production (i.e. data collection sites) and a mixed design focusing on convergences between parallel qualitative and quantitative data sets.

1 Apprehending higher education systems

This study aims at discussing the importance of systemic factors on scientific capital accumulation in Nordic HES. Following Clark (1983) and DiMaggio and Powell (1983), HES can be defined as the aggregation of organizations that constitute a recognized area of institutional life and are structured by the social function of controlling and contributing to the advancement and dissemination of knowledge and technique. Systems being mostly immaterial, comparative studies attempting to apprehend this component of social life often rely on individual, institutional or national proxies.

1.1 Individual and institutional proxies

To conduct meaningful statistical analysis, one tends to rely on large samples. Studies comparing individual researchers in different countries (e.g. Aarrevaara & Pekkola, 2010; Bentley, 2015; Cummings, 2012) can effectively explain researchers' publishing productivity with demographic factors and workforce characteristics. When they reveal national variations in research production, these studies suggest potential explanations but they seldom confirm any correlation between systemic factors and the research output. Various studies have also attempted to connect the performance of research groups (or centers) to systemic factors, such as the size and length of PSR funding (e.g. Ballou et al., 2002; Bloch et al., 2011; Fukuzawa, 2013; Wadman, 2010), or collaboration with industries (Gulbrandsen & Smeby, 2005). Findings are convincing, but since

cross-country comparisons are rarer with this type of study, the generalization of the results to the overall system remains unclear.

Focusing on institutional proxies, some researchers have used world university rankings to establish relations between university characteristics across several countries and their performance in research (e.g. Aghion et al., 2009; Salmi, 2009). These studies are robust when it comes to distinguishing factors that contribute to universities' performance across multiple contexts, yet extending their conclusions to the overall functioning of systems is problematic because it fails to distinguish institutional from systemic factors and it often omits outliers. For instance, it is argued that, since universities with a larger share of their budget coming from competitive sources have a greater research output, competitive funding would lead to ranking performance. The relationship could however be hypothesized in a reverse way by suggesting that flagship universities (old, comprehensive and research-intensive) rely on cultural, symbolic and social capital to attract external funding (see Münch, 2014). Thus the amount of competitive funding could be the consequence of status rather than its cause. Moreover, when all institutions across several countries are taken into account, systems with few institutions will not be able to affect the relationship even though these systems could generate impressive results for their size.

1.2 National proxies

National proxies include documents, statistics or actors' perspectives. First, it is common in the field of comparative higher education to find national case-studies juxtaposed to allow the reader to identify transnational trends and understand contextual specificities (e.g. Locke, Cummings & Fisher, 2011; Mårtensson, Roxå & Stensaker, 2014; Sörlin, 2002; Välimaa, 2012). These in-depth studies provide the groundwork for cross-cutting comparisons and the hypotheses they generate can then be further tested empirically.

Second, studies based on the analysis of national policies, strategies or statements (e.g. Degn, 2014; Kalpazidou-Schmidt, 2012) can inform researchers about the values and ideas permeating the system, and formal mechanisms established by the legitimate authorities. Yet policies and strategies tend to reflect intentions more than practice (Brunsson, 2003).

Third, nationally aggregated statistics or bibliometric data are extensively used to compare countries' performance and identify causes. Using Web of Science bibliometric patterns, Öquist

and Benner (2015) for example revealed that Denmark, the Netherlands and Switzerland had a greater top-10 publication index and that it could be linked to the level of basic funding, coordination between funding streams and concentration into fewer areas. Performance differences appear undeniable, but their explanation then must rely on careful observation of national differences.

National statistics being collected at regular intervals, it is also possible to connect the evolution of specific systemic trends (R&D allocations, R&D personnel, PhD students, direction of research and international collaborations) with the national research output (e.g. Academy of Finland, 2009; RCN, 2011). A causal link is however harder to establish since reforms tend to include multiple components and the actual impact of these components might take more or less time to be observable. Auranen (2014) therefore had to process multi-level regressions on longitudinal individual, institutional, national and international statistics to argue that competitive funding or state steering could lead to short-term improvement but had little impact in the long-run.

Considering that very few countries fit the Nordic welfare regimes' ideal type, it is not possible to conduct large-scale quantitative studies based on country indicators. Studies relying on actors' perspectives regarding various systemic factors may combine a holistic view of the system with the possible identification of single components as more or less relevant to the analysis. Vitola (2014) has interviewed policy-makers in the Nordic countries to characterize interaction between different government levels, but also to assess the importance of coordination mechanisms. Based on interviews with institutional leaders, Degn (2013) has illustrated the resilience of academic frames and values in higher education management, while Elken, Stensaker and Hovdhaugen (2014) reported how Danish leaders made a connection between their success and policy instruments developed in the early 2000s. Interviews with academic staff members allowed Maassen et al. (2008) to conclude that Nordic cooperation could compensate for country size, but nowhere did it form the core focus of institutional strategies for internationalization

What is common among these studies is that they identify a specific systemic factor (e.g. beliefs, governance or internationalization), target a group of actors influenced (or influencing) this factor and rely on their first-hand knowledge to draw conclusions. The next step would be to add

the perception of various groups to obtain a broader description of the system and to detect interactions between systemic factors.

1.3 Vertical scheme and multi-level governance

In order to assess the importance of systemic factors on research production in a limited number of cases or countries, this study relies on the aggregated perspectives of multiple actors located within different levels and strata of the Nordic higher education systems. The data collection method was inspired by the multi-level governance (MLG) framework. Developed by Marks (1992, 1996) to understand decision-making processes in the European Union, the MLG framework is an actor-centered framework that emphasizes how different levels are “traveled” by the various institutional and non-institutional actors populating the policy network (Piattoni, 2009). For Sabel and Zeitlin (2007), MLG refers to a panoply of systems of coordination among entities that are formally independent from one another but functionally interdependent.

Although he did not use the term “multi-level governance”, Clark (1983) was among the first to disaggregate the structure of a HES into specific levels of authority. At the time, it included departments, faculties, multi-campus administrations, local governments and national governments. Studying internationalization in the Canadian context, Jones and Oleksiyenko (2011) have developed a global higher education matrix that compared the local, national and international emphasis expressed by the following levels of authority: federal government, provincial government, institution and faculty.

In a comparative approach, Bleiklie and Kogan (2006) have applied the MLG framework to develop their theory of policy regimes. They chose three countries (United Kingdom, Norway and Sweden) and proceeded to conduct *a structured and focused comparison of cases* (expression developed by George, 1979). Although they rejected the testing of pre-structured hypotheses, they horizontally compared countries and vertically compared micro-, meso- and macro-levels of institutional change to identify causal regularities (Skocpol, 1980). This synoptic model recognized the existence of a formal hierarchy of organizations, yet it emphasized the multilevel character of HES while retaining an analytical openness towards the multiple social forces that interact with the decision-making process (Becher & Kogan, 1992). In their policy regime theory, actors include institutions, interest groups, elites, and central political or administrative authorities (Bleiklie, 2006).

Table 6

Vertical scheme of organizations targeted because of their perspective on academic research

Levels	Strata	Perspective	Interviews conducted	Questionnaires distributed (completed)
International	Nordic Council of Ministers (NCM)	NCM has a regional perspective and fosters Nordic cooperation in the field of research.	1	-
	NordForsk	NordForsk funds collaborative research projects.	2	-
National	Ministry of Higher Education and Research (MoHER)	MoHER coordinates HES and formulates policies.	4	197
	Evaluation agency	Agencies implement quality assurance mechanisms for education and research.	4	0
	Research council	Research councils grant funding and consecration.	4	113
	Innovation network	Innovation networks foster interaction between academic and non-academic actors.	4	18
	Association of higher education institutions	Associations defend the role of institutions, interact with public authorities and foster cooperation.	4	30
	Academic staff union	Unions defend their members' rights and can explain factors constraining and supporting them.	4	120
	Institutional	University board member	Boards can provide an institutional perspective.	3
Senior university administrator		Administrators can explain how external factors shape their institution's productivity.	4	-
Faculty member		Faculty members can describe what factors support their involvement in research projects.	9	2,968
Contract-researcher / Postdoc		Contract-researchers and Postdocs can describe their role in research production.	4	-
Doctoral student / Student union		Doctoral students and student unions can describe their role in research production.	5	-
Non-(traditional) university institution		Non-(traditional) university institutions can explain differentiation within the system and their role in research production.	4	-
Total				56

The present study also relies on a structured and focused comparison of countries, namely Denmark, Finland, Norway and Sweden. As showed in Table 6, the comparison is structured vertically and consists of three levels of authority and fourteen strata to be investigated in each country; each stratum has a first-hand perspective on academic research production. For each stratum I indicated the number of interviews I conducted as well as the number of survey instruments disseminated; the response rate for each level was known (see Table 8 below) but not for each stratum. In total, 456 questionnaires were completed, representing a response rate of 13%.

The target population includes actors within Nordic HES. Table 6 above lists the 14 strata targeted by this study and the rationale for their inclusion. The sampling frame is based on a vertical design in which each constituent of an overall process provides its perspective on the process.

1.3.1 Sampling design

The potential participants in this study are sampled on the basis of the following inclusion criteria: they are individuals who speak English and are potentially exposed to different experiences with regard to research production in Nordic higher education systems and will be speaking in their professional capacity.

The imaginary population would include all the actors involved directly or indirectly in the process of academic research production in the four Nordic HES. In agreement with the MLG framework, the sampling design was nested, meaning that I made a purposeful selection of organizations representing each stratum (non-probabilistic purposeful sampling), but all potential respondents within these institutions were contacted (probabilistic census-based sampling). I identified fourteen strata that were comparable across countries. I then asked to interview one representative from these organizations, and asked that the survey link be sent to all who would be on the sampling frame.

In my design, the national level provides a general view of the dynamics within the system. Ministries responsible for higher education and research provide an essential perspective since they have access to national data, are in regular contact with various institutions, develop and implement research policies and represent the formal authority within HES. Semi-independent

from governments, evaluation agencies include organizations that conduct quality assurance audits and assess the education (and sometimes the research) of higher education institutions. Research councils represent another core institution since they provide research funding (economic capital), and also grant legitimacy to certain methods, theories or paradigms (symbolic power).

In this study, innovation networks refer to organizations either dependent or independent of the state that connect academic institutions or researchers to individual businesses or innovation clusters. Associations of higher education institutions have a clear institution-focused perspective, but they can provide an essential perspective on the role of higher education institutions in research production, on their interaction with public authorities and on the environment that constrains or supports their action. Similarly, academic staff unions can explain the role of different categories of personnel in the research process and provide a general view of academic work in the country. In terms of sampling, for some strata, there was only one relevant organization and I asked that all the employees meeting the inclusion criteria be invited to participate in the survey. In other instances, there were more than one relevant organization and, in those cases, I chose one organization to contact.

In addition to these six national strata, six institutional strata have been identified. In an ideal scenario, all higher education institutions within each country would have been studied. Considering resources, time and space, this was impossible to accomplish, but the study nonetheless required the ‘bottom-up’ perspective of institutions regarding the overall system dynamic. And it is worth noting that the objective of this study is not to describe the aggregation of higher education institutions, but rather to explain how HES – which extends beyond the collection of institutions – foster research production. In agreement with the rationale behind this study, it was thus decided to target one “world-class university” (i.e. in the SJTU top-100) per country, since these institutions have the biggest research output and contribute significantly to their country’s position in the global struggle for scientific and symbolic capital.

University boards have formal authority over the institution and interestingly also represent the interaction between external demands and internal functions of universities. Senior administrators responsible for research can explain how systemic factors influence research in different disciplines and how institutions navigate their environment to accomplish their mission

of research production. Faculty members, doctoral students and other researchers are essential to this study because they represent the only actors who are actually conducting research. Although they might be mostly aware of their immediate environment and less of the broad systemic factors, their specific experiences can provide meaning to broader analyses (Bleiklie & Kogan, 2006). The institutional level also includes a non-(traditional) university higher education institution, such as a university college or a polytechnic (university of applied sciences). These institutions are both increasingly involved in academic research production and they have a particular perspective on how HES are differentiated. Finally, considering the focus of this study on Nordic HES, it appeared relevant to include observations relative to the whole ideal type and to discuss the importance of Nordic cooperation.

Within the institutional level, targeting only one university and one non-university institution induces sampling error. For the universities, the rationale is to choose the university that obtains the highest rank on the SJTU because these universities seem to achieve a greater research output and may indicate what systemic factor in their country contributes to their performance. The focus of this study is the research produced in the universities, yet one non-university institution is included in order to explain the role of these institutions in the higher education system. I therefore selected institutions based on purposeful and non-probabilistic criteria, but then created a sampling frame of all full professors within these specific institutions. Since, in that case the sampling criterion was full professorship, then we can consider sampling at the individual level to be census-based on that single sampling criterion.

So the survey was not disseminated to all the employees of the selected organizations, but only to employees that may provide an informed perspective on academic research production in their country. Consequently, the risk of under-coverage is important yet it is consequent to the purpose of this study. There is also a risk of duplication since some faculty members sit on research councils, university association committees and university boards. To minimize duplication, the email asked participants not to respond to the survey if they had already done so previously.

It could be argued that actors within each stratum are not representative of the whole strata, yet it does not undermine this study's overall objective because I am not attempting to study individual strata but to use their perspectives to apprehend the system. Moreover, as explained below, interviews will be supplemented by survey responses or data in order to limit individual bias.

One could still question what credit can be granted to actors' perspectives. Following a post-positivist approach, it is assumed in this research that perspectives are based on an interpretation of the empirical reality and, since the targeted actors have first-hand knowledge of research production, their perspective will reflect that knowledge.

For Becker, Geer and Hughes (2003), perspectives are a coordinated set of ideas and actions used by individuals facing a challenge. Studying college students' experience, the authors consider that interviewing students enables one to understand the environment in which they act. Moreover, while most students are less involved in student organizations, those who are develop a complicated and detailed perspective. In the same way, the present research is based on the perspectives of actors who are not merely observers but who are directly involved in the system dynamic.

To conclude, how does this combination of a non-probabilistic purposeful sampling strategy at the level of organizations and a census-based probabilistic sampling strategy at an individual influence the choice of analyses? In terms of qualitative analyses, it has little impact since validity is more based on the criteria used to select participants than the number of participants interviewed (Patton, 2002). Section 4.3 below will describe in more details the guidelines I followed to improve the validity of this study. It is however more problematic for quantitative analyses. The size of the sample is sufficient to conduct multivariate analyses, but one could question the validity of my findings considering the purposeful nature of the sampling strategy. It should however be remembered that organizations were selected because they corresponded to strata and levels of authority and were known to be involved in the process of academic research production. Then, within each organization, all the employees meeting the inclusion criteria were contacted, thus giving to each individual a known nonzero chance of being surveyed (Groves et al., 2009).

1.3.2 Ethical considerations

Between June 2014 and March 2015, I sent an email (Appendix 1) to the head of the organizations listed in Table 6 in order to request administrative consent for both disseminating the survey to a specific group of employee and interviewing a key informant. The email included the Administrative Consent Form (Appendix 5). Granted I receive administrative consent, I asked if I could send an invitation email to the group of employees selected (finding their email

address on the website) or if this person (or his or her assistant) could forward an invitation email (Appendix 4) that contained a hyperlink leading to the online version of the survey. Since the email and the first page of the survey addressed the necessary ethical considerations for an informed consent, it was assumed that participants who clicked on the hyperlink and on the “next” button were consenting to participate in the survey.

It should be noted that, in the case of higher education institutions, senior administrators were asked if an additional approval was requested by the institution’s Research Ethics Board. In Sweden, the ethical approvals obtained in Canada were sufficient. In Finland, this approval took the form of an administrative consent from the Head of Discipline of the Department supervising this study. In Denmark, the Danish Protection Agency requires researchers to obtain an ethical approval if their study concerns use of data revealing racial or ethnic origin, political opinions, religious beliefs, trade union membership or health and sex life. Since the survey asked only questions regarding the importance of various systemic factors, an approval was not required. In Norway, I followed the process and obtained an approval from the Norwegian Data Protection Authority in October 2014.

After having received these approvals, an invitation email was sent to potential participants. The message described the purpose of the research, the number of participants and the reasons why they had been approached. It explained that participation was voluntary, that there was no compensation and that risk was minimal. It also explained what was expected from participants (fill out a survey that takes around 10 minutes), how the data would be handled (i.e., only the researcher has access to data; the survey is hosted on an American website; responses are confidential and no nominal information is asked) and how data would be used for various publications.

2 Mixed method design

Every data-gathering class - interviews, questionnaires, observation, performance records, and physical evidence - is potentially biased and has specific to it certain validity threats. Ideally, we should like to converge data from several different data classes, as well as converge with multiple variants from within a single class. (Webb, 1996, p. 35)

For Creswell and Plano Clark (2007), mixed methods research “focuses on collecting, analyzing and mixing both quantitative and qualitative data in a single study or a series of studies” (p.5). For Johnson, Onwuegbuzie and Turner (2007), researchers can mix methods, methodologies, research types, or the whole process. In this case, methods (data and analyses) are mixed. By examining published research, Greene, Caracelli, and Graham (1989) inductively identified the following five broad purposes or rationales of mixed methodological studies: (a) triangulation (i.e., seeking convergence and corroboration of results from different methods studying the same phenomenon), (b) complementarity (i.e., seeking elaboration, enhancement, illustration, clarification of the results from one method with results from the other method), (c) development (i.e., using the results from one method to help inform the other method), (d) initiation (i.e., discovering paradoxes and contradictions that lead to a reframing of the research question), and (e) expansion (i.e., seeking to expand the breadth and range of inquiry by using different methods for different inquiry components). In this case, the main rationale is triangulation, i.e., using multiple methods to study a single phenomenon (Denzin, 2001). The objective is to compensate for each method’s inherent limitations and expand the generalization of findings. Moreover, as explained by Tashakorri and Teddle (2003), mixed methods enable researchers to ask simultaneously confirmatory and exploratory questions. For this project, qualitative data will be collected through interviews and quantitative data through a survey.

Table 7

Description of the mixed method design

Features	Decisions
Rationale	Offset methods’ weaknesses Ensure completeness and generalizability of the findings Explore both structures (quantitative) and processes (qualitative) Increase the credibility of the process Confirm and discover
Design	Convergent parallel design: results are merged after separate analyses
Timing	Mostly concurrent with one sequential component
Priority	Equal
Point of interface	Interpretation
Level of interaction	Interactive
Data collection	Purposeful
Analytical strategies	Reduction Integration: present coherent whole

Source: Creswell & Plano Clark (2011).

As showed in Table 7, this study follows a convergent parallel design (Creswell & Plano Clark, 2011) where the two sets of data are analyzed independently and merged (point of interface) during the interpretation phase. This allows one to compare, contrast and ultimately identify the level of convergence between two data sets considered of equal importance and priority. It has to be mentioned that, in this deductive study, rejection of the null hypothesis relies exclusively on convergence (between participants, between data sets and between countries). The analytical strategy is thus to reduce a plethora of factors, indicators, strata and data to what appears both quantitatively and qualitatively significant.

2.1 Data collection process

Drawing on the vertical scheme previously explained, the data collection process can be characterized as purposeful since each stratum is targeted in a non-probabilistic way to account for the different components of the academic research process (maximal variation) and ensure the compatibility of the data sets across countries (homogeneity) (Coyne, 1997).

Between June 2014 and March 2015, administrative consent forms were sent to organizations listed in Table 5 to obtain the administrative approval to disseminate an anonymous online survey to a group of employees (pre-defined at the time of the consent form) who had knowledge about academic research production, and to conduct an interview with a senior representative of the organization. Three exceptions, however, have to be mentioned. First, while interviews were conducted with international actors, no questionnaire has been disseminated at this level because the objective of the survey was to assess participants' perspectives regarding the impact of the indicators in their specific country.

Second, data was collected concurrently for the most part, but one-quarter of the interview protocol (see below) was based on preliminary survey results. For instance, when it was possible, the representative of one organization was asked to comment on the importance of the three most important factors and three least important factors as identified by participants within the same organization or the same type of organization. This sequential component enabled understanding of how various factors could influence research production in a specific context.

Third, as will be further explained below, despite an intention to survey and interview every stratum in a similar way, denied administrative consents, non-responses and the inconsistency

between some strata across countries has resulted in slightly different samples for the two data sets (i.e. interviews and survey responses). This is mostly visible at the institutional level where interviews were conducted with representatives of six strata and the survey only disseminated to full-professors because it is the most homogenous group across countries.

3 Interviews

Both qualitative and quantitative data collection processes were conducted simultaneously, and equal priority was given to both data sets. I begin by describing the qualitative data collection to follow the order of the chapters describing findings and results.

3.1 Selection of participants

The head of the organization within each targeted stratum (Table 6) was contacted by email between June 2014 and March 2015 to obtain the administrative consent for disseminating the survey and conducting an interview with a representative of the organization (see Appendix 2). In some cases, the person contacted was a senior administrator who, instead of granting administrative consent, accepted to be interviewed and thus signed a participant consent form. This situation occurred mostly with presidents, directors or chairpersons who could speak on behalf of the whole institution. The sampling method was therefore purposeful in the sense that specific organizations were chosen for their capacity to answer specific questions.

In a majority of cases the people who were interviewed were different from those who completed the questionnaire. It should be noted, however, that in some cases the survey offered the possibility for participants to indicate their contact information if they wished to be contacted for interviews. This last part appeared once the participant had completed the survey and pressed the "Send" button, and so preserved his or her anonymity by preventing the researcher from being able to connect responses with participants' information. This accelerated the data collection process and was mostly used to recruit professors. In total, three interviewees (5%) were contacted through this means.

Granted I had obtained administrative consent, I contacted by email (Appendix 3) the people listed in Table 9 in order to invite them to participate in an interview. The message described the

purpose of the research and the number of participants. The email also included the Interviewee Consent Form (Appendix 6), which contained all the information regarding the interview's recording, the protection and destruction of the data, the participants' ability to modify whatever they saw fit in the summary that would be sent to them, as well as their right to withdraw from the study at any time. If participants wrote back to the researcher and agreed to be interviewed, then a meeting would be fixed at their convenience.

In the email, I invited participants to print, sign, scan and email back to me the consent form. If this was not possible and we agreed to a face-to-face meeting, participants also had the option to sign a hard copy that I would bring with me to the interview. In either case, I would review the form orally with participants prior to the interview and answer any questions they might have prior to starting.

Interviews were conducted in September and November 2014 in Finland, in October 2014 in Norway, in January and February 2015 in Sweden and in February and March 2015 in Denmark. If participants agreed, the interview was recorded in order to be correctly transcribed and summarized by the researcher. The transcript was sent by email to the interviewee for him or her to review and approve. Of the 56 interviewees who received their transcript, 25 returned it with minor revisions. This process respected participants' right to remove or rephrase any sentence and increased the validity of the research process by ensuring that what had been understood by the interviewer was accurate. The audio files were then deleted to ensure that interviews remain confidential and participants not formally identified.

All participants met the two following criteria: being knowledgeable about academic research and fluent in English. At the international and system levels, participants had to hold leadership positions and be capable of expressing positions on behalf of their organization. Within these universities, participants included senior administrators, external board members, contract-researchers, doctoral students and full-professors. At least two professors were contacted. Each was a highly published scholar (as indicated on the university's website) either in the field of natural or medical sciences. Again, this creates a bias that is coherent with the type of research taken into account in the global competition for knowledge production. It was also important, however, to take into account the perspective from other disciplines that work within a different environment. Therefore, in each country, two participants (doctoral students, contract-

researchers, faculty union representatives or members of a research council) were selected from the social sciences or the humanities.

Table 8

Interview participants per country

Strata	Participant	Country				n
<i>International</i>						
Nordic cooperation organizations	Position	Senior advisor				3
	Contacted	4				
	Interviewed	3				
		Denmark	Finland	Norway	Sweden	
<i>National</i>						
MoHER	Position	Senior official	Senior advisor	Senior advisor	Senior official	4
	Contacted	2	2	3	1	
	Interviewed	1	1	1	1	
Evaluation agencies	Position	Senior official	Senior advisor	Senior official	Senior official	4
	Contacted	2	1	2	1	
	Interviewed	1	1	1	1	
Research councils	Position	Senior official	Former senior official	Senior administrator	Chair	4
	Contacted	4	2	2	3	
	Interviewed	1	1	1	1	
Innovation networks	Position	Director	Senior advisor	Senior official	Former senior official	4
	Contacted	1	3	1	4	
	Interviewed	1	0	1	2	
University association	Position	Senior official	Senior official	Senior official	Senior official	4
	Contacted	2	1	2	1	
	Interviewed	1	1	1	1	
Faculty union	Position	Representative	Representative	Representative	Representative	4
	Contacted	8	3	4	5	
	Interviewed	1	1	1	1	
<i>Institutional</i>						
University board	Position	External member	External member	External member	External member	3
	Contacted	2	1	2	2	
	Interviewed	1	1	0	1	
University management	Position	Senior administrator	Senior administrator	Senior administrator	Senior administrator	4
	Contacted	2	1	2	1	
	Interviewed	1	1	1	1	
Professors	Area	Health sciences; natural sciences	9			
	Contacted	6	7	10	8	
	Interviewed	2	3	2	2	
Contract-researchers ^a	Area	Social sciences	Social sciences	Natural sciences	Social sciences	4
	Contacted	5	1	3	8	
	Interviewed	1	1	1	1	
Doctoral students ^b	Area	Social sciences	Social sciences	Social sciences	Natural sciences	5
	Contacted	2	2	3	2	
	Interviewed	1	2	1	1	
Non-university institution	Position	Senior administrator	Senior administrator	Faculty member	Senior administrator	4
	Contacted	1	2	1	3	
	Interviewed	1	1	1	1	
Total		13	14	12	14	56

^aIn Denmark, the contract-researcher was a postdoc.

^bIn Finland, an interview was also conducted with a student union representative, while in Sweden, the doctoral student was also member of the student union.

As is shown in Table 10, interviews were conducted with 56 actors of the Nordic HES, including 22 women. With the exception of an innovation network in Finland and a board member in Norway, at least one interview was conducted per stratum. To obtain 56 approvals, 143 people had to be contacted by email. Of those who were not interviewed, 15 refused the interview because they had changed jobs, felt they did not know enough about the subject, or did not have the time. Ten other people responded after the researcher had left the country and the remainder neither answered the first message nor the reminder sent three weeks later. It should be noted that, following the logic of the vertical scheme, when one strata could not be reached, “near-strata” were identified and asked questions that would normally have been asked to the representative of the missing stratum. For instance, it was impossible to conduct an interview with a representative of a Finnish innovation network, and so additional questions regarding the role of innovation policies and networking between academic and non-academic actors were asked to the external board member.

3.2 Interview protocol

The qualitative data-collection took the form of one-hour semi-structured interviews. Richards and Morse (2007) define this method as open-ended questions developed in advance and asked in a logical order according to an understanding of the relevant theories. The interview focused on specific themes to explore and hypotheses to test (Kvale, 2001). The order of the questions was the same for all the participants, but the framing of the questions varied according to the stratum and survey results. A general frame of the interview protocol can be found in Appendix 8.

Interviews were divided into four parts: background, general perspective, stratum’s perspective and comments about survey findings. First, participants were asked to describe their organization, its link with other organizations and its role in the academic research process, as well as to explain their role in the organization. Second, I asked participants to comment on the level of research production in their country, explain the performance and reflect back on the changes that occurred in the system and the challenges undermining academic research production.

Third, each stratum is connected to one or many factors. For instance, innovation networks can elaborate on the importance of networking between academic and non-academic actors while

faculty unions can comment on the importance of the academic structure. Finally, if preliminary survey results were available, the participant was asked to comment on systemic factors that were identified in the survey results as having a strong positive or strong negative impact on research production and that were related to the stratum. For example, the representative of a research council (national level) may be asked to comment on the attributed importance of “research councils” or on another factor identified by national actors as important. The participants also had the opportunity to bring up new elements that were not part of the interview. Special attention was paid to links participants made between different factors. As it will be explained below (see Section 4.3.2), twenty-five (45%) of the participants responded to the email and twenty-two (39%) proposed modifications to the transcript.

3.3 Validity

Reliability and validity are rooted in a positivist paradigm and need to be defined and assessed differently in a qualitative inquiry (Golafshani, 2003). This study follows Maxwell’s (2001) guidelines to conducting valid qualitative research. For Maxwell, researchers cannot step outside of their own perception of reality, but they can use fallible means to generate evidence about the relationship between an object and its representation. I will use four “fallible means” to enhance four of the author’s validity types: descriptive, interpretive, theoretical and ecological.

3.3.1 Expert review of the interview protocol (theoretical validity and dependability)

Theoretical validity (or construct validity) refers to an account’s function as an explanation of the phenomenon. The first step to enhance the theoretical validity was to design the interview protocol based on the six systemic factors designed after an extensive literature review. I asked a professor from the University of Toronto who specialized in higher education as well one Finnish professor who was also an expert on higher education issues to review the interview protocol and ensure that it was built in a way that encouraged consistency in the interviews.

This process also contributed to this study’s dependability. Lincoln and Guba (1985) use the term “dependability” to evaluate if the findings are consistent and could be repeated. To respect this criterion, a researcher should ask another researcher to examine the process and the product of the research, and he or she should account for the ever-changing context within which

research occurs. In this case, both the design of the interview protocol and the preliminary interpretation of findings (see below) were reviewed by experts.

3.3.2 Member checking and investigator triangulation (descriptive and interpretive validities)

To ensure the descriptive validity of the study, I attempted to accurately report what interviewees said by using a numeric recorder, transcribing the interview, sending the transcript to interviewees for approval and making modifications when they suggested it. The inclusion of citations that have thus been pre-approved enhances the validity of the descriptions I make. Reported meaning given by participants to specific items was more challenging since neither the interviewees nor myself have English as a first language. Sending the transcript to interviewees and corroborating statements with secondary sources will however mitigate this challenge. It should also be mentioned that two doctoral students (from Canada and Sweden) working in the field of higher education were asked to co-code a sample of anonymized transcripts in order to triangulate the investigation. Although the inter-coder reliability was not calculated *per se*, this process enhanced the accurateness of the categorization process.

Interpretive validity represents the degree to which the researcher accurately reports meanings given by participants. Sending the transcript to participants was used as a way to solicit feedback and further understand participants' representations of the subject discussed. Twenty-five (45%) of the participants responded to the email and twenty-two (39%) proposed modifications to the transcript. With the exception of three cases (5%), all the modifications suggested were minor. One of these three participants made several revisions and ultimately indicated that the transcript could be used for general understanding, but could never be cited.

3.3.3 Peer verification of preliminary findings (theoretical validity)

Mathison (1988) states that triangulation (through peer review) is an effective way to control bias and ensure that a specific occurrence leads to a generally accepted interpretation. The data collection process occurred sequentially in Finland, Norway, Sweden and Denmark. In each country, I was offered the possibility of presenting preliminary findings (e.g., frequencies and quotes) to a group of professors, researchers and graduate students in the field of higher education or science policy. Presentations lasted around 30 minutes, followed by a thirty-minute

period for questions. Table 11 presents a summary of these meetings. The last column provides examples of comments I received from the participants who attended seminars.

Table 9

Peer verification seminars

Country	Date	Group	Attendees	Example of comments
Finland	12-09-2014	Higher Education Governance and Management Unit (University of Helsinki)	5	Finland has more competitive funding; Finland is less internationalized; Results differ by disciplines.
Sweden	02-06-2015	History of science, technology and environment (KTH)	5	Be careful with the “good environment rhetoric”; University professors might be afraid that block grants give too much funding to colleges; Explore the importance of education on academic research production.
Sweden	02-09-2015	Research Unit for Studies in Educational Policy and Educational Philosophy (Uppsala University)	15	Responses to survey depend on the time of dissemination; Sweden appears to lag because SSH studies are more often published in Swedish; Sweden has different funding instruments for different fields.
Norway	04-17-2015	Expert cultures and institutional dynamics: Studies in higher education and work (University of Oslo)	20	Number of PhD students is influenced by funding; Professors in Norway can have joint appointment outside the university; Include the overall funding level; EU research collaborations are decreasing in Norway; Nordic countries are externally-oriented and this influences internationalization.
Denmark	05-19-2015	Danish Center for Studies on Research and Research Policy (Aarhus University)	20	Support the claim that there is a Nordic ideal type; Divide some indicators further; Include a timeline perspective; Explain how the factors I find differ from factors in Anglo-Saxon HES.

3.3.4 Multi-level framework (ecological validity)

Ecological validity means that one can extend the results to other groups or institutions within the setting (internal generalizability) or outside the setting (external generalizability). Following a MLG framework and a vertical scheme of data collection, internal generalizability in this study refers to the *systemic representativeness* of the sample. Each interviewee is not necessarily representative of his or her own stratum, but the aggregation of each actor’s perspectives about the overall academic research production process might offset *locus biases* (induced by one person’s location within the system). Ultimately, the coherence between diverse actors’ perspectives promotes a more accurate understanding of the empirical reality.

External generalizability could be attempted considering that the sample includes almost all the countries within the Nordic HES ideal type, but I prefer to use transferability (Bruhn Jensen,

2002) in the sense that this study attempts to accurately describe contextual contingencies so findings could be transferred to the “nearest context”, i.e., a context that would share similar contingencies. MLG and the vertical scheme I used also contribute to the transferability of findings since it includes three representatives of Nordic organizations who have first-hand knowledge of academic research production in the Nordic countries (Iceland) and regions (Greenland, Faroe Islands and Åland) that were not investigated.

3.3.5 Expert interview regarding general observations (theoretical validity and transferability)

I was welcomed as a guest researcher in the four countries I visited and I took this opportunity to conduct one expert interview per country. Four one-hour expert interviews were conducted with professors in the fields of higher education or science policy. The experts commented on my method, suggested potential interviewees and provided constructive criticism on the preliminary interpretation of findings. Sharing findings with professors who have extensive knowledge about research production in the Nordic region and who were not directly involved in this project helped me to develop theoretical explanations that both fit the data and connect to the state of knowledge about the phenomenon. Meeting experts who know the Nordic region also helped me to better distinguish what is country-specific from what is common, thus increasing this study’s transferability.

4 Survey

To avoid relying on a single participant’s perspectives, to draw broad tendencies and to increase the credibility of the hypothesis-testing process, I designed a survey based on the 39 indicators listed in Chapter 4. Unfortunately, it is not possible to link the 39 indicators to any measurable output (i.e. research production) because the output does not vary by participant, but rather by country. The four countries have nonetheless been chosen for this study because of their respective research output (a latent dependent variable).

4.1 Survey construction

Passmore, Dobbie, Parchman, & Tysinger (2004) summarized the development of a survey in an eight-step process: state the problem, plan the project, state the research question, review the literature, develop questionnaire items, construct the questionnaire, pilot test the draft questionnaire and administer the questionnaire. I first elaborated the survey items according to the 6 factors and the 39 indicators drawn from the literature on academic research production in the Nordic HES. Items are statements composed of stems and response formats that elicit a specific response from similar participants. In this case, each indicator becomes a short stem (statement) to which participants respond, such as “Universities' autonomy from the government.” The questionnaire relies on Likert-type scales and asks participants to indicate to what extent each of the 39 indicators has a positive, negative or negligible influence on the level of research production in their country (interval measure). The scale is then divided into five points: strong negative influence, weak negative influence, no influence, weak positive influence and strong positive influence. For each item, participants were able to check an “I don’t know” box. At the bottom of the questionnaire, participants also had the possibility to comment on factors that would have been omitted in the survey. The 39 items became the 39 rows of one table that can be completed in 15 minutes. The complete survey can be found in Appendix 8.

Regarding the 'utility' of the questionnaire, it should be noted that it can only be used to measure the perceived influence of six factors and 39 indicators identified as appropriate in the context of academic research production in Nordic HES. Considering this very specific use, the statistical requirements regarding the questionnaire's psychometric qualities are lower, although it should remain valid, reliable and usable.

Although a formal pre-test phase was not conducted, various mechanisms were used to enhance the validity of the survey before its first large-scale dissemination. First, once a draft was elaborated, it was distributed to ten graduate students who specialized in higher education and/or comparative and international education. This focus group had the objective of assessing the cognitive and usability standards of the questionnaire; i.e., to attest to what extent respondents understand and can answer the questions and how easy it is to complete the task (Groves et al., 2009). During 30 minutes, participants attempted to complete the questionnaire and discussed the formulation of the general question, stems and response format. Participants suggested more than

20 changes mostly related to the terms used (e.g., Humboldtian, central role, differentiation, premiums, block grants, Third Mission). The draft notably over-estimated the knowledge of the participants and most of the items have been reformulated accordingly. They also suggested to add "not sure" as a possible answer, to allow a space for participants to be critical of their system and to add some data proving their country is in fact doing well in terms of research production.

Two faculty members were then contacted in order to conduct a cognitive interview in which I collected verbal information about the survey responses that I used to assess the quality of the responses and determine the value of the questions (Beatty & Willis, 2007). During each one-hour interview, I acted as a data collector and used the techniques of concurrent think-aloud, paraphrasing and emerging probes to better understand how participants understood the questions, how the questions could be reformulated and assess the overall quality of the questionnaire. The questionnaire was then reshaped and many stems were changed. The focus group and the cognitive interviews have helped to re-design the questionnaire so that it meets the usability standards (Dillman, Smyth & Christian, 2009).

A third phase consisted in strengthening the survey's criterion/expert validity by a systematic expert review (Groves et al., 2009). I sent the survey to four professors in the field of higher education working in Denmark, Finland, Norway and Sweden. These experts evaluated the terminology and the relevance of the questions in the Nordic context. The survey was then put online using SurveyMonkey®. The website is located in the United States and this was clearly indicated in the invitation to participants as well as in the administrative consent form in order to avoid any ethical issue. As will be explained below, the survey was completely anonymous and did not ask any nominal or demographic questions. Ten graduate students were then asked to complete the survey in its online form to report any issue regarding the answering process.

Finally, pilot-testing an instrument is a major study in itself and is not possible in the specific context of this study because the survey was designed for a very specific population (i.e. actors within Nordic HES) and it could be misleading to do a large-scale pilot-test with another population that faces different issues and probably considers other factors. Therefore, both the reliability and the construct validity of the survey are assessed in the first part of the results section (Chapter 12).

4.1.1 Process

The first page of the survey informed participants that they always had the right to close their browser and leave the questionnaire unfinished. However, both the invitation email and the first page of the survey notified participants that once the questionnaire is completed (i.e., participants clicked on the "Send" button), it is impossible to withdraw from the study since responses are anonymous and the researcher will not be able to match responses with participants. Participants always had the option of skipping questions or choosing the "I don't know" response.

The first round of survey dissemination occurred in Finland in September 2014, in Norway in October 2014, in Sweden in December 2014 and in Denmark in January 2015. A reminder was sent to all institutional participants (due to the difficulty of obtaining administrative approval at the national level) in March 2015. Since the survey was anonymous it was not possible to identify who had already completed the questionnaire, so the reminder message was sent to the whole email list, indicating that participants who had already responded should to click on the link.

4.1.2 Participant responses

Eight different hyperlinks leading to the same survey were created to distinguish between national and institutional actors from the four countries. Table 8 presents the number of email invitations sent to participants from the different strata, but only the aggregated response rates at the national level. At the institutional level, once I obtained an ethical approval, I gathered the email address of all full professors within the case institution in each country. At the national level, if senior representatives are accustomed to be interviewed, the dissemination of a survey was a much more unusual procedure. A zero therefore means the administrative consent to disseminate the survey was denied. It should be highlighted that no survey could be disseminated to employees working for evaluation agencies because these organization administrators explained that their role was to evaluate education programs rather than research.

Table 10

Participants to the survey per country

Country	Denmark			Finland			Norway			Sweden			Total
Participants	Invited	Responded	Completed	Invited	Responded	Completed	Invited	Responded	Completed	Invited	Responded	Completed	Invited
<i>National</i>													
MoHER	22	16 (22%)	15 (21%)	65	31 (18%)	28 (17%)	100	19 (14%)	18 (13%)	10	15 (15%)	14 (14%)	197
Evaluation agency	0			0			0						
Research council	34			8			14			57			113
Innovation network	2			0			8			8			18
University association	0			4			16			10			30
Faculty union	14			91			0			15			120
<i>Institutional</i>													
University (professors)	586	121 (21%)	92 (16%)	634	97 (15%)	85 (13%)	936	158 (17%)	120 (13%)	812	108 (13%)	84 (10%)	2,968
Total (n)	658	137 (21%)	107 (16%)	791	128 (16%)	113 (14%)	1,074	177 (16%)	138 (13%)	912	123 (13%)	98 (11%)	3,435

The number of participants I could contact was also constrained by the decision of senior administrators. In some cases, it was argued that only a limited number of employees (e.g., senior advisors) had the knowledge to answer the survey and, in other cases, only heads of units were sent the invitation email by their superior. This has led to under-coverage, but this study has nonetheless been able to reach actors who tend to be less represented in surveys.

Table 11

Total number of participants at the national and institutional level

<i>Participants</i>	Total		
	Invited	Responded	Completed
National	478	81 (17%)	75 (16%)
Institutional	2,968	484 (16%)	381 (13%)
Total (n)	3,435	565 (16%)	456 (13%)

Participation rates vary between 11% and 22%. As it is showed in Table 9, 3,435 surveys have been disseminated in total, 565 (16%) participants responded to the survey and 456 (13%) completed it; the other 109 participants withdrew before the end of the survey. Since they had only responded to 0-70% of the questions, they were removed from the database. Response rates are roughly the same for national and institutional actors, but a slightly higher percentage of national actors completed the questionnaire than institutional actors.

Such response rates might be considered unsatisfactory, but it should be noted that online surveys with no concrete rewards tend to receive fewer answers (Nulty, 2008). The acceptability of response rates should instead be considered based on the total population. In this case, the objective was to collect 400 responses in order to process the adequate analyses. According to Dillman et al. (2009), if the sample size includes 346 participants (on a population of 3,435), I could count on a confidence interval of 5% and a confidence level of 95%. Moreover, I would need between 200 and 400 cases (with no missing data) to reach a satisfactory effect size (i.e. strength of the association between variables), meet the requirements of factor analyses (50 participants per factor) and standard multiple regressions (10 participants per indicator; VanVoorhis & Morgan, 2001).

With 456 completed questionnaires, I have met these criteria. However, as it will be explained in Chapter 7, questionnaires with more than 5% of missing responses were removed from multivariate analyses, thus downsizing the sample to 324 participants, which is slightly below the threshold set by Dillman et al. (2009) for conducting analyses with a confidence level of 95%. This sampling error calculation is correct if the objective is to develop inferential statistics from a target population without sub-group comparisons. It will thus work for two of the three statistical procedures (factor analysis and GLM repeated-measures procedure), but not for the MANOVA where I will compare the relative influence of factors compared to others by country. Subgrouping require larger samples. With a sample of 324 participants and four groups to compare (so an average of 81 participants per group), I would obtain a confidence interval of 10.37 for a confidence level of 95%.

Given the overall non-probabilistic approach, one could consider the sampling error to be immaterial and calculating confidence intervals as inappropriate. However, as explained above (Section 3.1), although the sampling design is purposeful in that I selected organizations, one has to remember that, within each organization, I followed a census-based (probabilistic) sampling strategy in inviting all actors meeting inclusion criteria to fill out the survey. At the same time, the most relevant organizations within this population were surveyed and my hope is to draw some conclusions system actors' perspectives in general. It is why I decided to calculate the confidence intervals.

However, it is worth restating that this thesis follows a post-positivist approach which, although is paradoxically based on inferential statistics, does not aim at making inferences about an unknown overall population (e.g. all the system actors in Nordic HES). The problem approach is deductive so, instead of making inductive claims about a population based on the responses of a representative sample, I used statistical procedures to falsify hypotheses by contrasting them with the responses of a purposefully selected sample. Hypotheses that cannot be disconfirmed by this analysis could then be further tested on a representative sample of the overall population of all system actors in the four Nordic HES. In conclusion, I attempt to reject my hypotheses based on the responses of a carefully selected sample of system actors who are directly involved in the academic research production process; I do not attempt to make any generalized statement concerning how the overall population perceives the systemic factors I have identified.

Chapter 7 The Analysis

The main research objective of this thesis is to identify systemic factors contributing to scientific capital accumulation in Nordic HES. Following a deductive approach, I initially identified thirty-nine possible explanations for the high level of scientific capital accumulation. These thirty-nine indicators were merged into six systemic factors, which became hypotheses to be tested empirically through the perspectives of system actors.

Inspired by the methodology employed by Wong (2009) in her thesis on anesthetist residency training programs in Thailand and Canada, this thesis uses mixed methods to compare, contrast and observe convergence between data sets. In following Holmes' (1981) problem approach and Popper's (2005) epistemology, convergence serves as the principal tool for rejecting the null hypothesis (i.e., that a factor has no impact). Below I reiterate the three core research questions (RQ) and briefly specify the type of analysis that will be used to answer each question. Each analysis will then be further detailed later in the chapter.

(RQ1) What are the systemic factors perceived as having a positive impact on scientific capital accumulation in Nordic HES?

To answer this question, I relied on a deductive and theoretically-driven thematic analysis. Factors were treated as global themes and indicators as organizing themes (Braun & Clarke, 2006). The criterion of saturation at the stage of data analysis (Guest, Bunce & Johnson, 2006) served to assess the perceived importance of systemic factors.

Although the six systemic factors identified in Chapter 4 emerged from a comprehensive literature review, the internal consistency of the survey (which was based on the thirty-nine indicators and six factors) could not be tested before its first large-scale dissemination. The first step was conduct a factor analysis. In addition to assessing the instrument's reliability, the factor analysis grouped indicators into a new set of factors to be tested (Tabachnick & Fidell, 2006).

I then compared factors' and indicators' Likert scores as a first indication of the perceived impact of systemic factors on scientific capital accumulation. Since it is difficult to make any

conclusive statements based on average scores, I had to identify a statistical procedure allowing me to identify significant differences between factors' perceived importance. As will be explained in Section 2.4, I conducted a GLM one-way repeated-measures ANOVA (where each factor represents a level of the IV and survey scores represent the DV), followed by post-hoc pairwise *t* tests comparing each factor's mean survey score to one another.

(RQ2) How do system actors explain the impact of the systemic factors on scientific capital accumulation in Nordic HES?

I relied on the thematic analysis processed on the 56 interview transcripts. Interviewees were asked to elaborate on why they thought a specific factor or indicator had a positive, negative or negligible impact on academic research production in their country. Codes regarding these explanations were generated inductively and then connected to the corresponding organizing themes.

(RQ3) How does the perceived impact of the seven systemic factors on scientific capital accumulation vary between Denmark, Finland, Norway and Sweden?

First, interview scripts included questions regarding differences between their country and other Nordic countries. Second, to examine any significant difference between participants in Denmark, Finland, Norway and Sweden regarding their perspectives on factors' impact, I conducted a multivariate analysis of variance (MANOVA) on survey data. Countries represented categorical independent variables (IV) and the average factor scores represented the pseudo-continuous dependent variable (DV).

Table 12 represents the different steps undertaken in this mixed-method design. As specified in the preceding chapter, equal priority was given to quantitative and qualitative data. Moreover, qualitative and quantitative data collection was conducted simultaneously. However, since qualitative analyses are based upon the factor structure identified initially in Chapter 4 and the quantitative section begins with a factor analysis reconfiguring that structure, it appeared simpler to begin with presenting qualitative analyses, thus the current order of sections.

Table 12

The mixed-methods analytical process

Phases	Qualitative	Quantitative
Preparing	Transcribe the interview, send it for approval and import it to QNvivo®. Import expert interviews, peer verification notes and survey comments.	Review, make uniform and merge the eight databases (i.e., 2 levels in 4 countries) in IMB SPSS 20®.
Exploring	Read materials and associate extracts with the six pre-defined factors and the 39 indicators.	Delete incomplete cases; measure skewness and kurtosis; identify missing data.
Analyzing	Deductive thematic analysis.	Factor analysis; average scores; frequencies; one-way ANOVA; correlation matrix; MANOVA.
Interpreting	Merging results and reduction of data sets based on convergence	
Validating	Member checking; triangulation; expert interviews; peer verification; reporting disconfirming evidence.	Cronbach's Alpha; confidence level; statistical significance; effect size.

Source: Creswell & Plano Clark (2011).

1 Qualitative analysis

The qualitative analysis process relied on thematic analyses, and was shaped by the problem approach (hypothetical-deductive) and the multi-level governance framework (vertical scheme).

1.1 Thematic analysis

A thematic analysis examines patterns across data sets according to specific research questions (Braun & Clarke, 2006). While the content analysis relies on participants' narration and focuses on patterns of words used, frequency, relationship and the structure of discourses, the thematic analysis involves the search for and identification of common threads across a large data set. It is a pragmatic tool that is more interested in the expression of latent content than in the manifest content of the text (Vaismoradi, 2013). Coherent with a post-positivist paradigm, thematic analysis follows a "realist epistemology" based on interviewees' reported experiences, meanings and reality of participants, where a unidirectional relationship is assumed between meaning on the one hand, and experience and language on the other.

Traditionally, the coding consists of six phases: familiarization with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the analysis (Braun & Clarke, 2006; Vaismoradi, 2013). It also often involves drawing a thematic map explaining relationships between themes. For Braun and Clarke, (2006), "a theme captures something important about the data in relation to the research question, and represents some

level of patterned response or meaning within the data set” (p.10). Hierarchically, basic themes are the lowest-order occurrences in the text, organizing themes summarize basic themes into abstract concepts, and global themes encapsulate and transcend the abstract organizing themes (Attride-Stirling, 2012). Organizing themes should group the main ideas proposed by basic themes, and support the assumptions underlying global themes.

For this study, thematic analyses were deductive and theoretically-driven in the sense that themes were identified from *a priori* hypotheses and codes were generated to answer specific questions. In this context, the six factors (i.e., beliefs, academic structure, governance, PSR funding, networking with non-academic actors and internationalization) became global themes, while the 39 indicators became organizing themes. For Corbin and Strauss (2008), organizing themes should be sufficiently abstract to encompass other themes, appear frequently in the data, be consistent and logical with the data and the theory, and grow in explanatory power.

Within each of these organizing themes, codes were generated inductively to identify what appears interesting and meaningful. Codes were then merged into basic themes that helped understanding the essence of each organizing theme or indicator. This inductive process resulted in the identification of new indicators (e.g., national research collaborations, career path between PhD and professorship, postdoctoral researchers, research information systems, and social prestige of researchers) and the sub-division of the factor “academic structure” into two factors: institutional differentiation and academic work. The coding process occurred in QSR Nvivo.

To analyze interviews, I developed four broad categories of nodes and each interview extract had to be coded at least once for each of the following categories: factors, impact, relationships, theories, and case nodes. “Factors” included all the global, organizing and basic themes identified above. The “impact” category allowed the characterization of how an actor portrays a specific indicator. It included the same categories as the survey (strong negative impact, weak negative impact, negligible impact, weak positive impact and strong positive impact), as well as additional organizing themes such as “would be needed to improve research,” “differs by discipline,” “differs between institutions,” “differs by country,” “level of research production” and “other issues.” To characterize the impact of indicators and factors, I used Corbin and Strauss’ (2008) flip-flop technique where I looked for various meanings of a word. For instance,

if a participant described internationalization as unimportant, I tried to understand what “unimportant” would mean in the case of this interview.

The third category was labeled “relationships” and included the interview extracts in which actors made a connection between two indicators or two factors. For instance, the proportion of time professors can dedicate to their research was perceived by different actors to be influenced by the relative importance of competitive funding in a country. Then, a category of nodes was developed to facilitate “theoretical coding.” It included the relevant concepts of neo-institutionalism, welfare regimes, multi-level governance and academic capitalism. Finally, case nodes were essential in this coding process since they related to the basic categorization of interviewees according to their country, level of authority, strata (or organization) and gender. This allowed, for instance, the comparison of the perspectives of international, national and institutional actors while looking for coherence.

In addition to the 56 interviews, the data corpus includes survey, open-ended questions, expert interviews and peer verification notes. The analytical process was roughly the same for these additional sources. Basic themes were identified in the transcripts of expert interviews and notes taken during presentations’ question period. Responses to the survey open-ended questions, however, served different objectives: to identify additional indicators and factors, and to qualitatively assess the survey. If the first part was partly inductive, since new themes emerged from the data, and partly deductive, since these new themes were subsumed to existing factors, the second part was entirely inductive. Comments on the survey itself are presented in Appendix 9.

1.2 Saturation of data

To assess the importance of indicators and ultimately of factors, I relied on the criteria of saturation. Saturation was initially developed in studies using grounded theory (e.g. Glaser and Strauss, 1967) and was conceived as the moment where the researcher became empirically confident that a category was saturated. In those studies, saturation was used as a signal to cease data collection (Morse, 1995). However, this study uses a deductive approach and works with a priori hypotheses. By following an MLG framework (vertical scheme), the sample is purposeful, theoretical and stratified (Robinson, 2014). As was explained Chapter 6, the sample had to

include at least one actor from each stratum and data collection could not be concluded until then.

I therefore used the criterion of theoretical saturation as developed by Ando, Cousins and Young (2014). Saturation was attempted at the stage of data analysis when new information produced little or no change to the codebook (Guest, Bunce & Johnson, 2006). As the sample size was fixed, the iterative process leading to saturation had to rely only on multiple reading and analysis of transcripts. Like Halberstadt et al. (2016), I identified evidence in each transcript relevant to research questions, grouped evidence thematically according to the six factors and thirty-nine indicators, connected themes across transcripts, and repeated this iterative process until saturation was achieved (i.e. few or no refinements with additional evidence). Qualitative studies are generally not considered as suitable to test hypotheses (Patton, 2002), but the problem approach implies hypothesis-testing (Holmes, 1981). Hesse-Biber and Dupuis (2000) proposed a reiterative process where hypotheses (either generated by data or by pre-existing literature) can be tested by new observations of the data, additional coding and the verification of codes. The process is continued until the researcher reaches a point where no additional coding of the data contravenes the refined hypotheses.

Saturation was not needed to describe each actor's background or the functioning of strata, but it was used as a standard (yet fallible) means of rejecting the null hypothesis about a specific indicator and potentially a factor. An indicator was indeed assessed as tentatively not disprovable in one country if saturation occurred in analyzing interviews in that country. Then, I proceeded to multiple rounds of analysis and coding and, after five rounds, I reached for some indicators a level of thematic prevalence (Guest et al., 2006) in the sense that no new meaningful codes (considering the research question) were further developed and that the codebook was relatively stable. It is worth noting that Guest et al. suggested that, if the primary focus is on global themes (e.g., factors), saturation is likely to occur earlier in the process than if the focus is on basic themes.

As explained in the previous chapter, interviews were divided into four parts: background, general observations, stratum perspectives and comments about preliminary survey findings. While the background and stratum perspectives were specific to the individual interviewee, the

general observations and comments on survey findings were consistent across interviews within each country and allowed to reach saturation more quickly in the case of some indicators.

If saturation could emerge in different categories of nodes (i.e., factors, impact, relationships and theories), the deductive process focused on saturation occurring for interview extracts at the intersection of indicators and “positive impact.” The intent was to consider that the importance of specific indicators can be disproved, except if interviews saliently attest its importance. Salience, prevalence and saturation did not only rely on frequencies of occurrence but on my capacity as a researcher to understand the importance of an indicator and elaborate a comprehensive explanation of its importance. Saturated indicators were then grouped by their factor and, in the case of a meaningful number of saturated indicators, a factor could be considered as equally saturated. Saturated indicators and factors were compared and contrasted to the significant quantitative results, and convergence prevented me from disproving their importance.

As Silverman (1985) noted, “The aim is not to count for counting’s sake, but in order to establish a thoughtful dialogue with qualitatively-derived insights about the setting and actors’ version of the situation at hand” (p. 148).

2 Quantitative analyses

In order to distinguish national and institutional actors from the four countries, eight identical surveys were created in SurveyMonkey®. Using SPSS 20®, databases were made uniform and merged into one where two additional variables were created: country and level.

2.1 Incomplete questionnaires and missing data

From a total of 3,435 participants potentially contacted, 565 clicked on the hyperlink to answer the survey. Of those 565, 80 withdrew from the survey without having completed it (100% missing data) and another 29 participants quit the survey after responding to between 35% and 70% of the 40 questions. Incomplete cases had to be deleted to ensure the robustness of factor analyses, multiple comparisons and multivariate analysis of variance.

In addition to the Likert scale, the survey offered to participants the option to check an “I don’t know” box. This box was added for ethical reasons since participants could not skip a question, as well as for the sake of exhaustiveness since participants could be unaware or have no opinion about the importance of one specific item. The resulting issue, however, was the question of how to treat these responses. SurveyMonkey® automatically codes them into zeros. However, on a Likert scale where 1 signifies that the item has a strong negative impact, and 5 that it has a strong positive impact, a score of zero would mean a “very strong negative impact” and would skew the average toward the negative end. I could not give the average score (3) because it would imply the factor has negligible impact. The “I don’t know” responses were thus coded into missing data. Table 13 indicates the number of cases that were removed. Moreover, in Chapter 12, Table 21 indicates how many of the 456 participants indicated “I don’t know” to each item. For instance, there were only two missing data for the item “international research collaborations” but seventy-one missing data for the item “hierarchy between universities”.

For correlation matrices, factor analyses and the one-way repeated-measures ANOVA, I followed the usual procedure (see Cleophas & Zwinderman, 2012) of deleting all cases for which more than 5% of the questions would remain unanswered. This means that all participants who answered “I don’t know” to more than two of the 39 items were not included. Due to technical glitch, the item “hierarchy between research-intensive, comprehensive and primarily undergraduate institutions” did not appear on the survey sent to Norwegian national-level participants. Those 18 cases were therefore also excluded from both the factor analysis and the repeated measure design.

For participants with fewer than 5% missing data, responses were analyzed in SPSS using the pairwise method. A listwise deletion would have reduced the number of participants to 210, which would have greatly undermined the sample’s statistical power. The missing data did not influence the calculation for the average scores since, unlike listwise deletion that removes cases with missing values on any of the variables, pairwise deletion only removes the specific missing values from the analysis and computes the average for each variable based on the available data points. In other words, the procedure can still use cases when analyzing other variables with non-missing values (Meyers et al., 2013).

Table 13

Incomplete questionnaires and missing data

Country	Level	Participants	Drop-offs	>5%	Acceptable cases
Denmark	Institutional	121	29	27	65
	National	16	1	6	9
Finland	Institutional	97	12	26	59
	National	31	3	6	22
Norway	Institutional	158	38	35	85
	National	19	1	18	0
Sweden	Institutional	108	24	11	73
	National	15	1	3	11
Total		565	109	132	324

It should be noted that data imputations (such as mean substitution based on the grand mean and the country mean) were attempted but provided roughly the same results as the pairwise method (Ibid). I therefore continued with the latter. Since in the survey each variable corresponded to a unique construct, it was inappropriate to conduct more advanced missing value analyses. At least before the confirmation of a factor analysis, one could, for instance, hardly justify using a participant's perspective on "the number of international students" to predict a response for the item "policies and funding from European organizations." In the end, the final sample includes 324 participants in total, of which 74 come from Denmark, 81 come from Finland, 85 come from Norway and 84 come from Sweden.

2.2 Factor analysis

The survey was designed for the purpose of this study and although various procedures were used to enhance its validity (e.g., focus group, cognitive interview and expert review), the first large-scale dissemination happened at the time of the data collection. The first step will therefore be to verify the reliability (i.e., accuracy of the instrument) through a measure of internal consistency such as Cronbach's alpha. The Cronbach's alpha for each factor and the whole survey can be computed by SPSS through a factor analysis.

For Tabachnick and Fidell (2006), a factor analysis "seeks to describe and summarize data by grouping together variables that are correlated; variables are not carefully and specifically chosen to reveal underlying processes" (p. 609). Factor analyses can either be exploratory or confirmatory. Exploratory factor analyses are often used in theory development because they help understand the underlying process that could have produced correlations among variables.

Prior to the statistical analysis, exploratory analyses were done in order to verify the conditions of use of the factor analysis. Chapter 12 will present the results of these exploratory analyses in more detail, but it is worth noting that although variable transformations were considered, raw data were retained. It will also explain that items related to non-university higher education institutions, to the proportion of time dedicated to research by professors, and to a lower level of institutional bureaucracy were withdrawn from the study because both qualitative and quantitative findings revealed their inadequacy.

In brief, an exploratory factor analysis was conducted on the 36 items with orthogonal rotation (varimax). A rotation is an arithmetic procedure in which factors are rotated to achieve simple structure and to increase factor loadings (Abdi, 2013). An orthogonal rotation was preferred because of the apparent independence (and low correlations) between factors (Meyers et al., 2013). In fact, none of the correlations between factors exceeded the Tabachnick and Fidell's (2006) threshold of $r = 0.32$. The varimax rotation simplifies the correlation within each factor and the subsequent interpretation since each original variable is associated with few factors and each factor represents few variables (Abdi, 2003). Given the fact that some variables were not normally distributed, the unweighted least squares factor extraction method was preferred.

A test of internal consistency reliability (Cronbach's alpha) allowed to better understand factors based on the items included. The alphas vary between $a = 0$ and $a = 1.00$ where a higher score indicates a higher internal consistency. The minimum needed to conclude to a good instrument is an alpha at $a = 0.70$ (Kline, 2000).

The factor analysis was also used to observe the construct validity of the survey, that is, the relationship between the observed variables and their underlying latent constructs (Surh & Shay, 2009). The factors were inductively constructed based on a literature review on academic research production in the Nordic HES. However, based on the resemblance of respondents' response profiles, it could be that items factored differently might lead to new factors taking shape. The following quantitative analyses were then based on this new configuration.

At this point, however, it is relevant to present the limits of this factor analysis. According to Tabachnick and Fidell (2006), a sample of over 300 participants is acceptable but a sample over 500 would have been better. The authors also suggest that missing data plague a factor analysis,

though our data are not really “missing” since participants responded “I don’t know.” Finally, poorly distributed variables undermined the quality of the factor analysis.

2.3 Average scores and multiple comparisons in the form of a one-way GLM repeated-measures ANOVA

The first step to represent actors’ perspectives about systemic factors will be to measure the average score (between 1 and 5) for each item and then for each factor. It is also relevant to observe the percentage of respondents that considered each item as having a strong negative, weak negative, weak positive, strong positive or negligible impact on academic research production, as well as the percentage of respondents who indicated “I don’t know.”

That said, it appears difficult to make any conclusive statement based on average scores. The core objective of this research is to identify the *common* systemic factors positively influencing academic research production *across* the four countries. I therefore needed a method allowing to compare factors’ mean scores and examine if one factor has a mean significantly higher than the other factors. An option would be to simply rely on pairwise *t* tests to examine any significant differences in each pair of factors. This option would however inflate Type-I error rates (Field, 2013). In the process of conducting multiple significance tests, we are misperceiving the probability of making false claims. Tukey (1953) named this issue the familywise error rate. The methodological design thus has to control for Type-I errors.

I relied on a one-way (within-participant) repeated-measures ANOVA, followed by post-hoc *t* tests for each pair of factors. As Field (2013) explained, “One-way repeated-measures ANOVA compares several means when those means have come from the same entities (p. 565). Repeated measures are typically used when the same entities participate in all conditions of an experiment and provide data at multiple time points (Ibid). However, in this design, instead of comparing participants’ response at different time points, I compared the survey scores they gave to different factors. The multiple time points were thus replaced by the factors. Instead examining change in mean scores over multiple conditions, I examined differences in mean scores under a specific number of factors. One could consider each factor as a specific condition.

In this specific design, the IV was named “factors” and, following the factor analysis, included seven levels. The DV consisted in participants’ responses to the items belonging to the seven

factors. In the data editor, each row represents data from one participant, while each column represents one factor. ANOVA stands for analysis of variance. In a within-participant repeated-measures design, Field (2013) explained that “we are looking at the variation in an individual’s scores and then adding these variances for all people in the study” (p. 552). Factors’ perceived impact then becomes noticeable in the within-participant variance. Some of that within-participant variance comes from the “experimental conditions”, but some of it also comes from random elements. By comparing the size of these two variances (or dividing the mean squares for the experimental effect by the error mean squares), the F-ratio allowed me to examine if there is an overall difference between factors’ mean score. The F-ratio however does not say which factor is significantly more important than the others.

Finding a significant F-ratio indicates that at least one condition (or factor) is significantly different from at least one other condition (or factor). When researchers have strong theoretical reasons to expect a specific pattern of differences between conditions (or factors), they can proceed to planned comparisons. In this case, I do know which factor might be significantly different from the others, so I conducted post-hoc *t* tests for each pair of factors (Field, 2013). It means that I compared factor 1 to factor 2; then factor 1 to factor 3; and then factor 1 to factor 4 and so on. As it will be explained in Chapter 13, the Huynh-Feldt estimate was used as a correction for inflated Type-I error. Pairwise comparisons helped identified which systemic factors obtained significantly higher and lower mean scores.

2.4 Multivariate analysis of variance (MANOVA)

The last research question involved the variation in the importance of systemic factors between Denmark, Finland, Norway and Sweden. To observe any significant difference in terms of the perception of the importance of each factor among the four groups, a multivariate analysis of variance (MANOVA) was processed. Derived from the ANOVA, the “MANOVA has the power to detect whether groups differ along a combination of dimensions” (Field, 2013: 625). It first compares the ratio of systematic variance (explained by group) to unsystematic variance (called “error”) and the result is similar to the F-ratio presented above.

In this analysis, countries will represent the categorical independent variable (IV) and the scores for each factor will become pseudo-continuous dependent variables (DV). The goal of this analysis will be to look for an effect of an IV on several DVs at the same time. If the MANOVA

is significant, I will proceed to follow-up analyses of between-subject (or between-country) effects in order to identify between which countries there is a significant difference in factors' average score.

3 Convergent merging

As explained in Chapter 5 and Chapter 6, this study follows Popper's (2005) falsification process. In following this process, I attempt to disprove the six factors (hypotheses) and I can disprove them unless I achieve both significant quantitative results and saturation in qualitative findings. For Whittemore, Chase and Mandle (2001), congruence between the research question, method, data collection and findings contribute to the robustness and persuasiveness of a study. In this study, I use a parallel mixed-method design in which convergent merging occurs at the stage of interpretation (Creswell & Plano Clark, 2011).

A convergent parallel design requires the comparison of results and the observation of the extent to which they converge. It provides a more complete understanding and corroborates findings. Part III presents qualitative findings from the thematic analysis of interviews, survey comments, expert interviews and peer verification notes. In addition to a focus on indicator and factor saturation, this in-depth analysis enables a better understanding of how and why factors influence research production, as well as how and why countries differ from one another.

In Part IV, I first assess the psychometric quality of the survey by merging the results from the factor analysis, and by conducting an inductive analysis of the comments received to the open-ended question in the survey as well as to suggestions received during expert interviews and peer verification presentations. I then present a quantitative assessment of the importance of systemic factors. Average scores, frequencies, comparisons of means, correlation matrix and MANOVA allow me to draw broad tendencies and observe which indicators and factor appear as more important.

It is therefore only in Part V's Discussion that data are merged, compared and contrasted. Table 30 (in Chapter 13) presents indicators (grouped by factor) that appear quantitatively significant and qualitatively saturated. In this study, convergence leads to the rejection of the null hypothesis

for these indicators and factors, and the first part of the Discussion focuses on these tentatively undisproven factors. The following chapter then relies on MANOVA results and country-specific saturation to answer the second sub-research questions regarding country differences and country-specific factors. Finally, the last part explores how these findings may lay the foundations for a new systematic approach to compare interactions between political economies and HES' responses to academic capitalism.

4 Limitations

The methodological considerations presented above open new horizons for the investigation of academic research policies. The methodology enables to confirm hypotheses in a small number of systems while acknowledging contextual complexities. But researchers whose gaze is fixed on the horizon run the risk of stepping into pitfalls. I came across a number of pitfalls, four of which are presented as limitations below.

4.1 Language considerations

The hypotheses are derived from theories emerging mostly from English and some French sources. Although I used the work of many Nordic scholars who published in English, this research does not include documents written in any of the four Nordic languages. Moreover, the interviews were conducted in English, despite this not being the mother-tongue of either the researcher or the interviewees. The questionnaire was also written in English, which could have led to multiple interpretations of terms by participants whose proficiency in English was of varying degrees.

4.2 Connecting nomothetic and idiographic epistemologies

Rejecting the dichotomy between interpretivists and positivists, Holmes (1981) developed a problem approach to comparative education that requires researchers to explain an objective/nomothetic phenomenon while understanding and accurately portraying its contingent, unique and inherent subjective/idiographic character. This “third-way” presented by Holmes in comparative education opens multiple horizons but is also problematic in the sense that the two epistemologies are not easily connected. For instance, this study attempted to understand,

through the perception of individual actors (idiographic epistemology), how systemic factors had an influence on the level of scientific capital accumulation as represented by bibliometric measures (nomothetic epistemology).

The survey asked participants to assess the impact of various indicators (items) on the level of academic research production in their country, but it did not ask participants to characterize the overall level of research production. This configuration was theoretically sound insofar as the level of research production was the starting point of the study and was treated as already known by virtue of the bibliometric measures. The survey was not designed to measure what participants thought about the level of research production, but rather to measure the perceived impact by participants of systemic factors on the level of research production, regardless of what participants thought the level of production was.

In the end, it was possible to identify factors perceived as having a significantly greater impact. And despite positivists' and interpretivists' potential objections, the study treated participants' perspectives as reliable representations of "objective reality" (Becker et al., 2003), and considered that convergence between saturated themes and statistically significant survey results provided sufficient robustness in acceding to valid perspectives.

4.3 Validity concerns

The study followed Maxwell's (2001) guidelines for conducting valid qualitative research. The present study relied on five "fallible means" to enhance validity: expert review of the interview protocol and the survey, member checking, peer verification of preliminary findings, expert interviews and a multi-level framework.

It was argued, however, that the sample was not representative, especially at the international and institutional level. At the international level, representatives from European organizations were contacted but none accepted to be interviewed, thus reducing the "international scale" to a "Nordic scale." At the institutional level, only one institution per country was selected. Although the objective was not to describe the aggregation of higher education institutions, but rather to explain how HES – which extends beyond the collection of institutions – foster research production, choosing only universities and targeting WCUs (i.e., in the SJTU top-100) per country introduced an obvious bias. The rationale was to focus on institutions that had the

greatest research output and that contributed the most to their country's position in the global struggle for scientific and symbolic capital production (Münch, 2014). Only full-professors (not associates, assistants or lecturers) were surveyed and only professors in the natural and health sciences were interviewed. This is a major limitation, since as it was noted in Chapter 4, the time professors spend doing research vary among full-professors in the Nordic countries.

A natural bypass in this case would be to interview different academic professions working in different disciplines and institutions, and to include more than one representative of a non-traditional university (e.g., polytechnics, university colleges and new universities) and of national-level organizations when applicable.

Another caveat of this study regards the 39 indicators used to test hypotheses. Since many of them mirror the broader literature about academic research production and are not unique to the Nordic context, one could question their appropriateness to the context of this study. Indicators were supported by the literature about Nordic HES, but interviewees and survey participants (in the comment section) commented that some indicators had little relevance in their country.

Indicators do not easily lend themselves to measurement, which raises important questions for the survey design. For example, how well are the actual indicators used able to measure the concept or factor that it intends to measure? Moreover, how can we be sure participants in different settings understood items in a similar way? In his study on innovation, Bloch (2011) admitted that various sectors in Nordic societies had different interpretation of concepts such as innovation.

Several “faillable means” were attempted to improve indicators' validity. First, there was a focus group, two cognitive interviews and four expert reviews to strengthen items' conceptualization. Second, survey participants could include comments at the end of the questionnaire, and these comments – along with the factor analysis – led to the removal of three indicators. Third, interviews were conducted with system actors at all level where the survey was disseminated. Interviewees could explain how they understood and perceived the indicators, and only what converged with the survey was further considered in the discussion. The falsification epistemology requires to solely rely on statements accessible through experience (Popper, 2005) and an improved version of the survey could frame indicators in a more concrete way. And

despite efforts, stems' meaning might have been understood differently in the four countries so comparisons between cases should be treated with caution.

4.4 Circularity in deductive approach

The fourth pitfall relates to circular design and data, and appears inherent to the hypothetical-deductive approach. First, the study used rankings as a starting-point and contributed to the legitimating of an inequitable competition. For instance, bibliometric practices create a halo effect whereby researchers who publish in English and who are found in these databases are more likely to get cited (Hazelkorn, 2013). Moreover, by not looking at the economic or social impacts of research, an important part of the innovation process was excluded. It also presented Nordic HES as producing a lot of scientific capital, but only on a *per capita* basis. In the global competition for knowledge production, however, one might wonder if the size of the population should be taken into account. The study also focused on systemic factors and therefore assumed implicitly that systems shape individual behaviors. This issue could be solved if participants were given the opportunity to bring up new elements during the data collection process. But because the research objective was to test hypotheses, even if new themes saturated the interviews (such as the importance of mergers), they were not included in the survey and convergence was therefore impossible.

Despite efforts to be rigorous, little could be done to prevent a rhetoric of the “good research environment.” Participants were inclined to respond positively, no matter the content of the question (de Vaus, 2001). Similarly, the context of the interview (i.e., a foreigner asking questions about the Nordic countries) could have raised the issue of social desirability (Krosnick, 1999). Finally, while criticizing the existing literature for its methodological flaws, the study relied on the same literature to formulate hypotheses and hoped that the system actors would confirm or refute these hypotheses. Now, some might argue that these actors had a limited understanding of the systemic factors at play and had to rely on the same literature.

5 Summary

In this study, I use a parallel mixed-method design in which convergent merging occurs at the stage of interpretation (Creswell & Plano Clark, 2011). The qualitative analysis consisted in a deductive and theoretical-driven thematic analysis performed on the transcripts from 56 interviews. The six factors (i.e., beliefs, academic structure, governance, PSR funding, networking with non-academic actors and internationalization) became global themes, while the 39 indicators became organizing themes. The quantitative analyses were performed on a sample including 324 participants in total, of which 74 come from Denmark, 81 come from Finland, 85 come from Norway and 84 come from Sweden. In addition to survey scores and frequencies, analyses included an exploratory factor analysis with orthogonal rotation performed on 36 of the 39 items; multiple comparisons based on a one-way repeated-measures ANOVA (followed by post-hoc *t* tests) to examine significant difference between factors' average score; and a MANOVA to examine differences in participants' perception of the importance of factors among the four countries.

Part 3
Qualitative Findings

Chapter 8 Beliefs

The present chapter presents qualitative findings regarding the systemic factor referred to as “beliefs.” Beliefs are the cultural-cognitive framework shaping HES, and may be divided into two broad categories: societal beliefs and academic traditions. Societal beliefs represent the exogenous aspects of beliefs and include values, ideals and the perceived role of higher education in a society. Academic traditions represent the endogenous aspects of beliefs and include the basic ideals, routines and norms that structure higher education organizations and the work done by the agents working within them.

Table 14

Saturated themes associated with societal beliefs and academic traditions

	Denmark	Finland	Norway	Sweden
Societal beliefs	Positive impact Higher education contributes to society Egalitarian values			
	Status of higher education			Status of higher education
Academic traditions	Positive impact			
	Academic freedom			
				Collegiality

1 Societal beliefs

A mix of deductive and inductive thematic analyses resulted in the following basic and organizing themes: (1) trust between citizens, State and institutions, (2) changing academic traditions, (3) higher education contributes to society, (4) egalitarian values, (5) status of higher education, research and science, and (7) the importance of education.

Among these themes, I reached saturation for the following: egalitarian values, higher education contributes to the public good and the status of higher education. Saturation was not reached

regarding the status of higher education in Norway. This does not mean that higher education has a lower status in Norway, but rather that it is not impossible at this point to reject the potential influence of this theme on scientific capital accumulation in that country.

1.1 Higher education contributes to the public good

When asked about a possible societal belief that higher education should contribute to the public good, all interviewees agreed that higher education had been fundamental in the development of their society. Participants explained that, since Nordic countries are small in size and population, and have few natural resources (except for Norway), it makes sense within a rational modernization process to shift from a resource-intensive to a knowledge-intensive economy. A representative from a Nordic organization said that “People are very curious about research results. Maybe it has something to do with the fact that we are a small country with few natural resources. We have to trust education and research because we have no other instruments.” As a Danish professor explained, “I think we are somehow trained to look at niches. We grow up knowing that we are a small nation and that we cannot compete in those areas that a lot of human-power, etc. We have to go in areas where people have a major impact.”

1.1.1 Higher education contributes through research

In all four Nordic countries, participants reported that there is a social perception that higher education contributes to the development of knowledge-intensive industries. In Norway, the research activities of institutes and universities compensate for a smaller number of research-intensive companies. A Norwegian national-level representative explains, “There is a challenge because of the economic structure and the business structure in Norway. We have very few really big companies that can act as motors for private sector research.” In Denmark, there are SMEs doing research, but, as a national-level representative reports, “We do not have many large businesses, and that could give the impression that universities’ activities are beneficial for the society.” In Finland, an academic staff union representative stated that “the whole development of research is linked to the economic development of the country.”

Interestingly, this perceived utility of higher education seems to translate into high social status (symbolic capital), trust (or legitimacy) and funding (material capital). Regarding this connection between utility and funding, a Finnish professor in the health sciences recalls the following:

When the Soviet Union broke down at the beginning of the 1990s, Finland's economy was affected a lot because exportations decreased. Despite these difficulties, the government of Finland did not diminish the amount of money for research even if other programs were cut down. It was important for our scientists, **but also** for Nokia Company that was rising with the introduction of the cell phone. That meant the creation of many scientific foundations (that gave grants), which had Nokia shares; their stock increased with the positive situation of Nokia. Then many of us [scientists] explained to the politicians that investments in research led to important returns for the country. The industries are dependent on technological innovation and higher education.

A Swedish government representative explained that its country was an important producer of research because of the level of resources dedicated to R&D in comparison to the GDP. This representative explained the level of support to R&D as follows:

First, partly because, on the political level, all the way back from the 1950s and 1960s, research has been seen as important, both as such and as contributing to Swedish industries. Sweden has relied a lot on large exportation companies that have been, to a relatively large extent, research-based. It is recognized that research plays an important role... But primarily because research is recognized as important for Sweden and Sweden's future.

In Denmark, a government representative explained that the precondition for continuing to invest massively in research is the social status of higher education as a contributor to Danish society:

There is a high degree of trust in the society at large towards researchers and regarding the allocation of research resources. That is a precondition for us to be able to maintain a percentage of our GDP to research.

This connection between the perceived utility of research and financial support is also visible in the perspectives of institutional actors. A Danish professor of biochemistry explained that his capacity to conduct large experiments increased when his field attracted the interest of society at large. As he reported, "the big money comes from strategic targets," and despite a possible division between basic and applied research, he felt that "it is also good to target goals for society" and that he had "a wonderful position to develop [his] ideas in a society, and [has] the freedom to do it."

The thematic analysis reveals convergence between actors' perspectives from different levels and countries. In the interest of transparency and descriptive validity, it is nonetheless important to consider the following dissenting opinions. First, a Swedish representative working for an innovation network observed a "tendency for researchers to isolate themselves and solely focus

on producing academic publications, with no desire or incentive scheme to engage with society.” This perspective was contradicted, however, by national and institutional actors who noted that, particularly in the bio-medical fields, there are multiple and deep connections between higher education researchers, public authorities and private enterprises. In Norway, the dissenting opinion was formulated by a national-level representative who stated that the institute sector is perceived as a greater contributor to “useful research” than the university sector:

The institute sector was established because of the need for applied research. It is discussed at the moment that the sector might be too big. But there are historical reasons for this sector to be big. It was developed in 1960s-1970s because we needed research on marine sector, transport, petroleum, etc. It was an applied wave and there was a view that universities could not cope with this kind of research. Some other Nordic countries envy Norway because they do not have this “large machine” moving quicker than universities and respond to national needs in more adequate ways than universities.

Even in Norway, where the institute sector is strong, universities are perceived as central in that they provide evidence to policy-makers and even participate actively in the policy-making process. The senior official of a university association explains the role of the social sciences as follows:

For instance, in social sciences, we have a very good tradition of involving researchers in developing social reforms. Social sciences are frequently used by ministries, e.g., work on how to deal with child-care and family policies, how works the welfare state, employment policies, etc. A lot of research resources are used to support policies, and these results seldom appear in journals because it constitutes applied social sciences. Of course, we have a society that is working relatively well and these kinds of dialogue, participation, consensus policies in a broad sense are ways... even radical parties are socialized into the model as soon as they get in the government. They even developed it. It has to do with consensus and knowledge-based policies. You cannot get away with rhetoric if the facts tell you something else... Historically universities have been quite applied and instrumental in constructing the state and the nation, which in modern vocabulary is ‘involvement with society’. And then it developed as a more classical university, but still with a heavy societal engagement.

The role of academic research would therefore expand beyond its economic contribution. Denmark is also described by a participant as having a tradition of accumulating data about multiple phenomena to support both research and policy. For instance, Denmark has the longest-standing registration of twins.

Despite the two dissenting voices presented above, there remains a notable convergence between actors’ perspectives regarding the societal belief that higher education contributes

to the development of their society through the research it produces and the education it provides.

1.1.2 Higher education contributes through education

Beyond its capacity to produce research, the higher education sector was described as useful to society because of the quality education it provides to students. As one Swedish university board member stated, “I think there is a societal belief that education is important. This is one ingredient in the recipe that makes this country so wealthy.” One Finnish union representative explained that beyond the measurable impacts of academic research, higher education also improves the well-being of a society through less measurable activities:

Research can benefit to society in many ways, through technical innovations that can be easily measured... But universities also produce critical thinking people who then might be more involved in the democratic society. We know from the economics of education that higher education might be connected to responsible consumption for example.

A Finnish professor explained that the perceived utility of higher education leads to an increase in the number of funded positions:

In Finland, our statement has been for many years that the whole economy and well-being are based on the higher education of the whole population... I think also that the fact that we are training so many PhDs, so many M.Sc. in comparison with the size of the population, I think it represents a key factor of how this country developed.

Higher education would therefore seem to contribute both to the development of a democratic society and the emergence of knowledge-intensive industries. In Denmark, there was strong convergence between actors’ perspectives regarding the perceived role of PhDs as contributing to the economy of their country. While the director of an innovation network talked about a “global race for more PhDs” that would increase employees’ qualifications and increase the amount of research produced, a Danish senior university administrator recalled that, since the mid-1990s, it is mostly the natural sciences that argued that PhD education was necessary to promote the development of an advanced nation like Denmark. The suggestion was taken up by the Danish university association, which lobbied the government and succeeded in doubling the number of PhDs in Denmark. A senior official in this association said:

Both private and public institutions needed researchers; so more money had to be used to educate more researchers. It was a big move: instead of graduating 1,000 PhDs per year,

Denmark should graduate 2,000 PhDs per year; and we are now there. The suggestion was taken up. The idea is that the Government would provide more money and then, in the development contracts, institutions would promise to produce more PhDs. 90% of the money was supposed to be directed to PhDs in the STEM fields.

As explained above, participants are aware their country has a small population and providing education to a greater proportion of the population is described as one of the many ways that higher education can contribute to the development of their society. A Finnish doctoral student in the social sciences said that, in Finland,

We need equal access so we can use all the potential of a small country as we are able to get the best students in a small population. It does not matter if you are on the left or right side of the political landscape... One of the basic thing people in which people believe is access, no matter your family background. If a student is poor but has good grades, then he or she should have access to higher education.

Interestingly, access has increased while respecting Nordic countries' egalitarian values, namely equality of opportunity and equality of conditions. For Danish, Finnish, Norwegian and Swedish interviewees, their country is not elitist. Although access to some university programs is greatly restricted, there is a general perception that higher education and graduate education are accessible to all those who have enough talent. A Finnish government official said:

Everyone has the opportunity to apply to a university education. But it's hard for even those who have the motivation, as the access rate is about 10% to 20% depending of the field. However, everyone can apply to a university... If you imagine the case of individuals who have the opportunity to study without financial constraints because they receive governmental financial support, they are given the opportunity to realize their potential and will end up in a research or academic career and, if they possess energy and motivation, they will produce good research and publish. They will be successful.

Higher education is said to contribute to Nordic societies because the quality of the education provided maximizes the potential of the small population. A senior advisor to a Finnish quality assurance agency explained that the quality of doctoral education is connected to the quality found at other levels, "you need high quality bachelor and master education to provide good basis for doctoral education."

Interestingly, the quality of higher education was conceived as a combination of teaching and research, or to provide "research-based education." A senior advisor to a Nordic cooperation organization said that "We have to work hard to combine high quality teaching and high quality research... You cannot develop high-quality research without high-quality teaching."

Institutional-level actors seemed to share this perspective that combining research and education can encourage students to pursue research activity and, in the end, contribute to academic research production. One Danish university board member, for instance, explains why mixing education and research is important for his country:

The reason is that the best way to educate top-notch young people is to make sure that they work and are educated in close proximity to some of the top-notch researchers. The fascination of doing research is contagious if you work with or close to a top-notch researcher. This is how we should motivate young people to do research.

In Sweden, three participants noted a separation between research and teaching and advocated for more investments in education. An advisor for an innovation network said that “in this country, research is considered to be the number 1, 2, 3, 4... activity. Education comes at number 57.” A former senior administrator however suggested that there is progress in this regard:

We should benefit from our strong research to improve education programs, specifically in engineering fields; and in every field, because it's always a sustainable value when people are well-educated. So I had quite a battle with the Minister of Education and the Parliament and, finally, I came through.

In short, there is strong convergence between participants’ perspectives regarding the presence of a societal belief that higher education should contribute to the public good. This belief implies that academic research can support industry-related innovation and promote evidence-based policy-making, and that higher education can maximize the potential of citizens. Interestingly, the perceived utility could contribute to the level of academic research production because it would provide funding and status to researchers. It is worth noting that a belief regarding equitable access to higher education also supports academia’s social status since it is perceived that those who are working in academia have earned their place on the merit of their talent and efforts, and that by pursuing these studies they contribute to the country as a whole.

1.2 Status of higher education

Another converging theme in interviews is the status of higher education in Nordic societies. Interviewees reported that their respective societies tended to consider higher education as pivotal for development. According to the former director of a granting agency in Finland:

Citizens trust and praise researchers a lot and that is a tradition in Finland that, in the beginning of the nation, education and knowledge creation was on the priority list. There is a general idea that university education and science are important activities in the country and are worth of investing... One reason for that is the regional networks of universities and the “open access for all” to enter the scientific society. It is not a secret area or a place where people do very strange things.

In Norway, a senior official of a university association made the same connection between the “openness” of higher education, its accessibility and its social status, saying that “The universities were, on the one hand, very elitist because a great part of the population did not have a secondary education. But at the same time, universities worked on problems that were accessible and understandable to people.” This contribution of universities to solving understandable problems may have enhanced their prestige. In Sweden, one representative of an academic staff union explained that an indication of the status of research in Sweden was that the fact that it hosts the Nobel Prize ceremonies:

Winning the Nobel Prize is something important almost everywhere, and you can see that the Nobel Prize is often use in the Swedish political debate on how research and higher education is important. My kids in school go to school in nice outfits when it is the day the Nobel Prize is celebrated. It is not a holiday, but it is an important day.

This endorsement of research by society also seems to grant prestige to those working in academia and conducting research. A Finnish doctoral student stated that according to a recent survey, “young people thought that research was attractive for future positions and that they could think of having a career in research.” A student union representative in Finland said the following:

For people, education is still quite valued. The position of researcher is still valued. People know it is not an easy task and that you have to struggle for finance, but there is a general perception that if you are good enough, you will get funding. So you still get the status and it gives motivation; it looks like a nice place to be even if it is hard.

This perspective was shared by other Danish and Swedish actors. In Sweden, a PhD student said that “it is very prestigious to have a PhD title and to contribute to the health care. We work with the whole society basically.” A senior government official in Denmark said that researchers have a lot of credibility and are well appreciated by the general public.

Researchers have a high degree of credibility in the public area in Denmark. We are undertaking surveys from time to time where we ask the public about their perceptions of

research, such as “How can great investments in research be a solution for society problems?” It always comes out very favourable.

High social status also seems to be associated to a sense of responsibility towards the society that provided the individual with an opportunity to succeed. A Danish professor in the natural sciences, for instance, spoke about the responsibility he feels towards society. “We are not forced to contribute to society,” he said. “It is more a moral thing; we have to do it because we have the ability to contribute to the development of the society.”

It is worth noting that higher social status does not necessarily translate into a higher salary. For instance, an international-level actor explained that “you get very good salary if you go directly to industry,” whereas, despite the difficulties of acquiring external funding, “people recognize that having a research career can give some freedom.” In Nordic countries, it seems important to provide equal opportunity to all citizens with regards to higher education, but also to preserve the living conditions of those who cannot or choose to not enter the higher education stream. In this context, university researchers might not receive the highest salaries, but they are aware of having chosen their career freely. They know their position has legitimacy and their work has symbolic power. One Danish professor summarized this thought as follows:

We are one of the most socialist countries in the world, so nobody in physics is in it for money. Not in Denmark. There was an investigation some years ago showing that a lawyer and a carpenter at the age of 62 years old have earned the same amount of money. It shows the equality. You can choose quite freely your education and it does not really affect how much money you will have.

Similarly, a doctoral student felt that, generally speaking, there is prestige associated to her studies and a high degree of trust in most areas of the Norwegian society. In fact, during a peer verification seminar in Norway in 2015, one participant pointed out that although it was prestigious to possess a PhD in the social sciences, Norwegians with a lower level of education could easily get well-paid positions in the fields of natural and health sciences, where the job market held more sway than academia.

A professor in the health sciences in Norway explained that the social status of higher education may be slightly lower in his country. “The tradition for research and the prestige of research is not as high in Norway as it is in Sweden for example, due to Norway becoming an industrial country quite recently.” On a similar note, a faculty member in a Norwegian university college

was of the opinion that academic research might not have the same status in Norway as in other Nordic countries:

Norway is the richest of the Scandinavian countries so that makes us a little ‘lazy.’ Young people are less encouraged to enter into research. They want to enter higher education, but then, if you take medicine as an example, students will prefer to do clinical practice rather than medical research.

On the grounds of these two dissenting perspectives, it was impossible to achieve saturation in Norway regarding the status of higher education research. In Denmark, Finland and Sweden, convergence was observed between national- and institutional-level actors regarding the high credibility, legitimacy and status granted to academics.

1.3 Egalitarian values

The organizing theme of “equality” was latent in many of the quotations presented above, especially those related to access to higher education. Welfare regimes tend to establish a balance between equality of opportunity and equality of condition.

1.3.1 Equality of opportunity

There is convergence between actors’ perspectives regarding the importance of ensuring equality of opportunity for those who want to access or develop a career in academia. As a Finnish national-level actor put it, “The original idea in our education system was the principle of equality. I think the public opinion accepts this and we have to offer equal opportunity to higher education.” There seems to be this social belief that each individual is a “potential” who has the right to be developed, and that this development will bring benefits to society.

In more concrete terms, this means that an individual should have a place in higher education, the drawback being that it is harder to get into certain selective programs, comprehensive institutions or institutions located in the capital. That said, as a Danish national-level actor explained regarding the situation in their country, “if a candidate is applying to multiple programs in Denmark, it is almost impossible to be denied access.” The wide accessibility is made possible thanks to an important network of new universities and university colleges (or polytechnics) established in all four Nordic countries. Most comments about these networked institutions can be found in the section on institutional differentiation (Chapter 9), but it is worth

noting here that they seem to contribute to equality of opportunity in Nordic countries.

According to a Swedish university board member, university colleges are often “more open, not so old fashioned, closer to the community and to the private sector. [They have] freed up a talent pool that could have never have gone to university.”

In Nordic countries, by contrast, it is often possible to start one’s studies in a field in one type of institution and later, provided adequate experience or grades, to move to another type of institution. On this point, a senior official in a Norwegian quality assurance agency made the following remark:

There are established roads by which you can qualify for higher education points more quickly, e.g. crash courses. It is called the Y-Route. There is a route higher and you do not have to start from the very bottom. It depends in what is your diploma. In Norway, it was important to have this openness with little tracking. The secondary education reform put all the secondary education in one system, while before there were different institutions leading to different careers. There are more transit possibilities. It is the Scandinavian social-democratic way of thinking that everyone should have the chance to access higher education.

For a senior official in an innovation network in Sweden, it was important that all citizens who have the capacity should have access to quality higher education and to the opportunity to contribute to research and the development of their country.

This system is open for everyone as long as you are capable and as long as you have an interest in becoming a researcher. There are opportunities, which are not exclusive in anyway. It is a positive thing even if perhaps we have too many researchers on our country now. It is an egalitarian system where everybody has the opportunity to make something of himself and we have a lot of good institutions in what they do, so it is positive.

1.3.2 Equality of conditions

In addition to equality of opportunity, Nordic countries appear to provide good living conditions to all their citizens. As the Danish professor explained above, by the end of their career a carpenter and a professor will have earned a similar amount of money. A national-level actor in Sweden pointed to the strong role of the State in ensuring that every citizen can live adequately: “There is this deep trust in Sweden in the fairness of the state or the *fair parent*: the state would be fair and just; it would not allow the poor to starve.”

This equality of condition also appears to be present in academia. In both Denmark and Norway, staff union representatives stated that “basically, we have the same conditions in all universities

and wages are almost the same.” This applies even to individuals who are not members of the union.

This does not do away, however, with the tension that exists between the issue of equality of condition and the meritocracy inherent in academia. As one consultant for a Nordic cooperation organization put it:

We could do better and, like every Nordic country, we wish to have a balance between typical Scandinavian quality measures, welfare measures or fairness measures (everybody should be treated more or less the same), and, on the other hand, meritocratic measures (giving funds to those who are the best and allow the best students to be admitted). There is always a balance in the Nordic countries.

At the national-level, a Swedish union representative echoed this statement when commenting that “on the one hand, there is an ideal elitism and meritocracy (Darwinist in a way) that prevails in academia, but on the other hand, there is the value of basic job security and being able to foresee the nearest future for yourself.” Academia tends to praise the projects that have the greatest impact and to provide grants to researchers who present the most robust and innovative projects. This meritocratic attitude is balanced against the societal concern with providing equal working conditions to all.

Three institutional-level actors suggested that equality of condition might however undermine scientific capital accumulation. For one university administrator, the “egalitarian slant in universities is a vast money burner,” while a board member stated that the “egalitarian approach does not really work for tough research.” A Norwegian professor also found inefficient that professors received similar treatment regardless of their achievements:

There is no incentive to do research. All the resources are divided equal so [another professor doing less research] is paid as much as I am. If I had a big lab and an important budget to manage, my job would be very different from hers and yet I would still be paid the same.

The thematic analysis therefore suggests convergence regarding equality of opportunity, but a potential divergence regarding equality of conditions.

2 Academic traditions

The thematic analysis for its part reveals strong convergence on the one hand between the perspectives of actors in three of the four countries regarding the importance of academic freedom, while on the other hand divergence regarding collegiality in decision-making.

2.1 Academic freedom

Academic freedom was perceived by actors as an academic tradition that increases professors' motivation and dedication and truly respects the scientific process, seeing as it is impossible to predict discoveries or breakthroughs. For one Finnish professor, academic freedom "is an essential thing because you cannot plan very high-level research nor discoveries." Similarly, a Danish professor explained that

When you are free to make your own choices concerning the area, theme and methodology, when this is an open thing, you become more dedicated to it. I think that it is a very important thing in this case and an aspect that makes you get as dedicated and involved in acquiring new knowledge. You develop your own skills and you get a reputation from your colleges and other people, and that is what is important for most people.

A Finnish national-level actor agreed that academic freedom is important for research production because "it is part of the path to make mistake and false hypotheses." At the institutional level, a professor noted that his university "has tended to give individual researchers and group leaders much freedom of choice. This has allowed researchers who are passionate and have means to lift themselves fairly high." This professor went on to say that "in the atmosphere of freedom, researchers are happier and energetic."

In order to support academic freedom, one approach involves providing relatively equal basic conditions to professors so they can undertake their research projects. A Swedish union representative argued that high levels of basic funding to universities support both equality of conditions and academic freedom. A senior official of a research council in Finland explained that regardless of the funding stream, "it is essential that researchers be able to do what they are most interested in, and that there are opportunities to concentrate on research, no matter in which area they are." And although his work depended entirely on competitive grants, a contract researcher in Norway said that what he liked about his work was "that we have freedom;

freedom to seek. We recover money for a project and we can develop another. It makes less external stress and is paid properly.”

Two components can interfere with academic freedom. The first is institutional autonomy, as will be seen in the section on governance (Chapter 10), which is perceived as a positive factor although it can also result in the university making decisions that orient research production. For instance, a senior university administrator in Denmark explained that although he was not in a position to tell researchers what to study, he could use incentives to guide departments towards areas of strategic interest to the deanship or rectorship.

The second component that can potentially interfere with academic freedom is the involvement of society in academic research decisions. A senior faculty member in a Norwegian university college described the complex balance that prevails between the interests of society and academic freedom:

The first paragraph of that law says that researchers enjoy freedom in terms of choosing theories and methodologies. But they have to accept being governed by the overall priorities and areas of research set by the government and their employer. As a researcher, you are free in the sense that you can use the methods you want but within parameters defined by the government and the institution.

It was described above how academic research in Nordic countries is perceived as useful for society. It was also noted that for some participants this perceived usefulness called for an increased interaction between researchers and society. As one university board member explained,

One of the beauties with the university is its self-governing capability and its peer-system, etc. That really drives excellence in many ways. However, it can be extremely introverted and extremely resistant to any interference from the outside, and quite isolated

A national-level actor in Denmark explained that with the previous Government “the message to universities was to “go home” and better explain to society what they do, and help the Government to explain why it should fund research.” A government-level representative said that he thought it was important to include citizens as a check on potential drifts in academic research:

Find mechanisms to include citizens in the research in order to make sure that investments made in bio-technology, products coming out, are in line with the preferences of citizens.

We all know the tragic example of GMOs and nanotechnology where enormous investments were made, not wasted, but hampered by the fact that there was no inclusion of the concerns of the civil society.

The potential control effected by society on academic research appears in this case to be taking place in a context of trust between citizens, institutions and the government. A senior government official in Norway remarked that “to a large extent, there is trust.” An innovation cluster representative in Denmark also explained that clusters’ evaluation is a “trust-based” process. As in Denmark and Finland, quality assurance in Norway consists of a national organization which monitors the internal quality assurance systems of institutions and, as stated by the representative of the Norwegian quality assurance agency, “it is a system rather based on trust.” A representative of the Finnish quality assurance agency recalled that

Our external evaluation (conducted in 2010) stated that, in Finland, there is an unusually high level of trust between institutions and evaluation organizations. We hear this also from experts in our evaluation teams. They are amazed by how well things are here and how communications are open and supportive between us and the institutions, us and the Ministry, and the Ministry and institutions.

An excessive focus on utility of higher education could undermine academic freedom, yet Nordic societies are described as trust-based. This trust might act as a buffer protecting academic freedom, one of the core themes identified as important for academic research in Denmark, Finland, Norway and Sweden. As stated previously, an absence of saturation in Sweden does not mean that there is less academic freedom in that country, but only that I do not have sufficient data to make a claim in its regard.

2.2 Collegiality

It is interesting to note the interaction between equality of conditions, on the one hand, and concern for a collegial decision-making process, on the other. As will be explained in the Funding section below, professors that were interviewed remarked that it is difficult for them to conduct research projects when they do not receive competitive grants. If their engagement in research is thus restricted, there is always the possibility of taking on more teaching responsibilities or getting involved in administration. When asked about professors’ influence on the decision-making process in Denmark, a professor in the natural sciences said “I think co-influencing is time consuming, but people should be given the right to co-influence. Not everybody wants to do it, but at least, they should have the chance to do it.” The faculty union representative explained that

professors can hold important roles in negotiating new positions or promoting new fields of research. Moreover, this representative explains that:

If you want to get involved and have influence on the development of new teaching programs or research programs, then you get involved and have to use a lot of time for administration. But if you don't want to, you could sit in your "ivory tower" and make your research.

This participant suggested that professors could choose to what extent they are involved in research, teaching and administrative work. For a Finnish professor in the natural sciences, it made sense that professors willing and capable to take care of administration should be allowed to do so in order that other professors whose focus lies in research or teaching are freed from administrative responsibilities. This professor said:

So, one person is doing it for a larger group. I know how to do it, I do it very quickly, I do it efficiently and it is almost like a factory. When I send an email asking for certain details from 10 people, I get the responses and process them efficiently. But, when I have a problem (because I'm not an administrative person), I should have a secretary who knows the technical part and all kind of agreements and rules which should be followed.

In all four countries, professors nonetheless felt that they had less impact on the decision-making process since the governance reforms that were introduced in the 2000s. A Finnish professor remarked that one of the big changes introduced since then was that there are no longer professor assemblies where professors gather to decide on professorships, appointments or strategy. The process is now more hierarchical. If a professor wants to have an impact on decisions, "It is a very hierarchical process. I can go to my department head... Then he brings this up [to] the dean of the faculty. Then the dean brings that to the rector. This is the chain of command."

In the eyes of various participants at the institutional-level, there is little collegiality in the decision-making process. At the national-level, however, perspectives are more varied. For instance, a Swedish national-level actor noted that there remains a strong sense of collegiality in his country and that this collegiality can undermine the development of research:

It would therefore require that the academic community accepts that the Vice-Chancellor negotiates a contract with the Government. It has to be a balance. I cannot think of a university without a strong collegial influence because you need the acceptance from the people in the university. But there are disadvantages with the collegial system. One is that it does not represent the whole academic community...Also, research in university becomes so complicated that you need different types of competence. The positive side is that if it works right, it creates acceptance since everyone feels involved. But the major problem is

that it is not good at making priorities; saying that this particular activity is more important and should get more money.

3 Summary

The current chapter attempted to approach beliefs in a coherent manner by firstly demonstrating that four themes were saturated in all four countries. These themes were the “positive impact” of societal beliefs and academic traditions, the belief that “higher education contributes to society” and the importance of “egalitarian values.” Secondly, saturation occurred regarding “academic freedom.” In Sweden, the “status of higher education” and “collegiality” also reached saturation.

The current chapter also suggested there were multiple inter-connections between the two cultural-cognitive frameworks of societal beliefs and academic traditions. The perceived utility of higher education was linked to its public funding. Equality of opportunity and funding contributed to an equitable access to higher education, while access and status in turn generated demand for higher education. Both perceived utility and equality of opportunity tended to contribute to the social status and trust conferred on higher education. Equality and trust supported academic freedom, while utility had the potential of undermining the tradition of collegiality.

Chapter 9

Academic structure

The objective of this thesis is to identify systemic factors that contribute to scientific capital accumulation in four Nordic HES. The last chapter focused entirely on beliefs. The present chapter is dedicated to academic structure. Academic structure refers to the rules, categories, protocols and procedures contributing to the division of academic labor between different institutions as well as between individuals within those institutions. The second hypothesis (H2) suggests that a differentiated and segmented academic structure (in terms of institutional types and work positions) is conducive to a comparatively high level of scientific capital accumulation. However, the global theme of “academic structure” can hardly do justice to the complexity of Nordic HES. Following the interviewees’ nuanced comments, I decided to sub-divide “academic structure” into two second-order global themes: “institutional differentiation” and “academic work.”

1 Institutional differentiation

Institutional differentiation here refers to the cognitive, normative and regulative systems supporting the multi-dimensional diversity within Nordic HES. Interviewees were asked about the different types of higher education institutions existing in their country and the coordination mechanisms that distinguish them. Nuanced and even contradictory statements were offered by interviewees regarding a possible hierarchy between institutions, the specialization of higher education institutions and the role of both new universities and other higher education institutions. Although it was not included in the original interview protocol, several interviewees commented about the impact of mergers between universities themselves and with public research institutes. The organizing themes that achieved saturation are presented in Table 15.

Table 15

Saturated themes associated to institutional differentiation

Organizing themes	Denmark	Finland	Norway	Sweden
Horizontal specialization	Positive impact			
	Specialization by approach/mission	Specialization by area	Comprehensive old universities Specialization by type of research	Comprehensive old universities
Vertical hierarchy	Size			
	Equality Research	Resources	Equality Location	Positive impact Inequality
Non-university sector / New universities		Contribute to research	Academic drift	
				Contribute to research
Mergers		Positive impact		

1.1 Horizontal specialization

This category includes interviewees' perspectives regarding higher education institutions of a similar status specializing into distinct missions, education programs or areas. Specialization was acknowledged by actors in the four countries, though specialization can take different forms. In Finland, the University of Helsinki covers all fields but technology, while other universities have developed strengths in different areas that are recognized by system actors. As one government representative explained:

People know that Jyväskylä has been very active in teacher education, has a lot of different teacher education lines and has good reputation. University of Turku has a long tradition in history, language and cultural studies. Tampere has a good reputation in social science. It is a picture of the university sector. But is it true? It is not always true, but the picture also says that universities are "even."

There would also be a division within disciplines themselves. A Finnish academic used the example of political sciences to explain research subject specialization: "Turku does 'public choice', Tampere does more 'sociologically-oriented political sciences' and Helsinki does 'power research'."

In Norway, actors' perspectives converged regarding a division of labor in the type of research performed by higher education institutions. An interviewee at the institutional level noted that his

country follows the OECD distinction between basic and applied research: “Universities traditionally have had PhD programs and the responsibility of doing basic research.” But Norwegian technical universities are also greatly involved in research, though their focus is evidently on applied research. A national-level actor said that “The technical universities do a lot and produce also academically and patent because their academic tradition is close to related industry.” A university administrator also made a clear distinction between technical and comprehensive universities:

For a very long time, the technological studies and expertise in Norway were mostly concentrated in Trondheim, where was located in NTH (now NTNU), and they had kept up much of the technology transfer relations with industries. The universities themselves, particularly the University of Oslo, had fewer connections

In Denmark, interviewees emphasized how the five universities in the country have chosen slightly different mandates, or different approaches to a same mission. Although the University of Copenhagen and Aarhus University have more students and are more recognized globally, other institutions have focused their strengths not in terms of areas covered but in terms of self-given mandates. The representative of a networking agency described the Danish system as follows:

I think the picture now is more mixed. And I know by a fact that Aalborg and Roskilde have very good ratings in getting their students hired in the private sector. And the University of Southern Denmark had a lot of initiatives in engaging local and regional business leaders to get their students employed.

Hazelkorn (2013) suggested that horizontal differentiation promotes excellence in all sectors, leading to “world-class systems.” Convergence in actors’ perspectives support this hypothesis of a positive impact of horizontal specialization on academic research production. Among the main reasons for specialization are the economic benefits of a division of labor. As the representative of a Finnish university association asserted, “We do not have to be the best in doing everything, but we have to be the best in doing something.” An administrator suggested that Finnish institutions could become “excellent” and “internationally attractive” if they could “specialize, divide the work and concentrate knowledge into one field and one place.” As she then said:

At the sector level, at the country level, how will people know what the profile of the Finnish education and research sectors? What are we good at and how can we communicate this to the world? First, we should know what are our strengths in order to concentrate the resources and to find reasonable divisions of labor.

Norway counts eight universities, eight specialized institutions, and twenty-six university colleges and a couple of art colleges. A government official explained the role of specialized institutes as follows:

If you want to study music, you would probably apply to the Academy of Music. If you want to study technology, NTNU is a natural choice, although there also are others. For economy, the University College of Economy in Bergen is a number one.

The University of Oslo is known as the most research-intensive institution in the country and a representative from a quality assurance agency wondered why it had not yet specialized. His words were, “Why should University of Oslo have such a broad base while it could focus on postgraduate education and research, and other universities offer these undergraduate programs?”

Sweden is distinctive in that it counts more specialized institutions that are perceived to contribute to research production. As will be explained in the next section, Sweden represents a mix of horizontal specialization and vertical hierarchy, making its system highly segmented despite a general framework regulating all higher education institutions. The representative of a Swedish university association described the law as follows:

If you are a university, you have a general right to award PhD degree in any area you like. The university colleges have to apply in a specific area and prove that they are good in that area. I don't think that the new universities nor the old universities could really award PhDs in any area. In Lund University, there is no space engineering programs. In principle, if we were dumb enough, we could have such a program, but there is no capacity for that. At the same time, in the review, it was proven that if you do not fulfill the requirements you can lose the right to award a PhD in certain areas, and even the old universities can lose this right for a specific program. Everyone has to develop and keep-up the quality. For instance, the Karolinska Institute which is very well known, a few years back, lost its right to award nursing degree. That was a big thing in Sweden. They took more than a year to get their right back. They had to get a whole new set of staff because they said that the lecturers and the teachers did not live up to the standards.

The Swedish HES involves a quality assurance agency (the SNAHE) that operates under a legal framework covering all higher education institutions equally, while also encouraging them to specialize and allowing a form of vertical hierarchy to take place. According to a representative of that agency, each institution should be encouraged to play its specific role both in terms of areas of expertise and mission:

We have to have a system where each higher education institution plays a role. Karolinska Institute should be a research-intensive university, which can play that role very well in the world and, of course have some education. But the emphasis should be on international competitive research. Uppsala and Lund are the big comprehensive universities, but they still play on a very high level and they should continue doing that. And we have the business schools which play their role. But university colleges should brand themselves by emphasizing the higher education they provide, even in special areas where they can attract very good teachers and be extremely good at attracting students

A number of actors also praised the academic and research work of specialized institutions such as the Karolinska Institute (specialized in medical sciences), Chalmers University of Technology, KTH Royal Institute of Technology, Stockholm School of Economics or the Swedish University of Agricultural Sciences. The representative of a funding organization wished “that universities and university colleges we fund become more specialized than they are today.” In slight contrast, a university board member remarked that “specialization works if you do it well; if you don’t, you just become completely uninteresting, especially if are in a narrow field and do badly.” She then added that, “If you are specialized you have to learn how to create those interactions with others,” in order that scientific breakthroughs happen increasingly between established fields.

It should be added that horizontal specialization was considered by interviewees to have a stronger positive impact on new universities than on old comprehensive universities. For a Swedish government representative, many new universities choose to focus on narrow areas and he said, “I think it is a much better way” because “in some narrow areas, they can even become better than big universities.” As for Norway, a government representative explained that the quality of the system could be improved by having each institution focusing in a research area. The example she gave was the reputation of the University College of Economy in Bergen.

In contrast, old comprehensive universities were perceived by interviewees as resistant to specialization. As the representative of a Swedish funding organization reported, “We have comprehensive universities in Sweden, several of them have no specialization because there is so many staff applying for their own research funding and they work on their own.” For this participant, larger institutions were harder to move strategically towards specific areas since the multiple disciplines were flourishing based on professors’ interests. The representative of a university association in Norway recalled that previous governments had “tried to profile the University of Oslo as a research-based university” but that it was “very hard to develop policies

that [made] universities like the University of Oslo profile in only few fields because it was a “catch-all’ university.”

These “flagship universities” are characterized by researchers (e.g., Douglas, 2016; Maassen, Gornitzka and Fumasoli, 2015) as old, comprehensive, research-intensive, publicly-funded and located in urban areas. A Finnish professor in the health sciences said that “old universities have almost all programs.” His Swedish counterpart noted that “Uppasala and Lundy, they do everything. They have all the disciplines and topics you can ask for.” The representative of a Finnish student association said it was not the “Finnish way” to put schools in order, but also conceded “Helsinki has a special status because its scope is broad and it is located in the capital.”

A university administrator explained that flagship universities such as the University of Helsinki were leading in “almost all disciplines” because of the relationship between age, prestige and research production:

If you look at the world ranking of universities, there is a direct correlation between being an old university and be higher in the ranking. So the fact that [the University of Helsinki is] 375 years old gives a lot of benefits in terms of tradition. It was already the most prestigious when the other universities were created. It takes a long time to take away the best minds from the University of Helsinki. So it has been attracting the best mind in Helsinki in terms of professors, staff and now students. [It has] the biggest population in the surrounding area and if someone decides to go elsewhere than in the closest university, the second choice is the University of Helsinki.

Old and comprehensive universities seem to represent an altogether distinct type of institution, and in this way to contribute to horizontal differentiation. But as a Swedish board member remarked, being older and comprehensive are not sufficient to ensure success. Universities need to use breadth to their advantage. As she explained,

If you are broad, like Uppsala and Lund, you have to learn to use that. Just being broad doesn’t mean that you are good in using this broad scale. Then you have to find ways even in broad universities to get the different faculties, to meet each other, to get interactions, the spaces for the frictions to be created. Just being broad is not the solution if you cannot turn it into an advantage

One final note about flagship universities is that although they include most disciplines, some interviewees from Finland and Norway pointed out that they rarely have faculties of technology.

1.2 Vertical hierarchy

The previous section suggested that Nordic HES consist of institutions that share equal status while being considered “world-class” in their specific subject area, pedagogical approach or type of research. In light of this, the question of “equality” brought participants to depict a complex academic structure where status and quality are influenced by multiple features, including size, resources, location and a focus on research.

I achieved saturation regarding the organizing theme of “equality” only in interviews with Danish and Norwegian participants. In both these countries, system actors asserted that degrees from all universities have the same value and that students tend to choose the closest university to them. A Danish postdoctoral researcher (henceforth referred to as simply “postdoc”) explained equality in her country as follows:

Students are extremely geographically-bound and, in most cases, they just choose the university that is the nearest to them. People find it very long if they have to travel one hour in Denmark, so they don’t do so normally. If you have your degree, it’s generally considered that you are able to do the work afterwards that your education has you qualified.

The same portrait was drawn in Norway, where, according to one university association, “it is formally correct to say that all the universities have the same value.” According to a doctoral student in Norway, “the quality of PhDs in the four oldest universities could be seen as relatively similar.” In an expert interview, a scholar explained that “the regional impact of higher education was very important for Norwegian politicians.” Using her experience as an example, a Norwegian doctoral student said that “Norway is geographically very stretched and long... I chose my university because there was an open position and I was living close by.” A national-level representative agreed that “people from Bergen would go to the University of Bergen and people from Oslo would go to the University of Oslo.”

There appears to be a disparity, however, between the apparent equality of institutions when viewed from within their national framework, and the apparent inequality of these same institutions with regards to global reputation and rankings. A faculty member in a university college said that Norway does not have a ranking list, but that international rankings have given Norwegian institutions the appearance of being vertically differentiated:

We have this monolithic system. There is one law applied to universities and university colleges... We don't have a Norwegian ranking list and we are not so good that we are included in the international ranking lists. But Oslo, Bergen and NTNU appear in these lists.

A Norwegian doctoral student recalled a telling story about the University of Oslo which brought to light this disparity between national and international statuses:

I think it was about ten or fifteen years ago, the University of Oslo wanted to call itself "the best university in Norway." This created tensions and what they ended up saying is "we are one of the best universities in Europe." And that is ok to say, but you cannot say that you are the best in the country.

Granting special status to the Norwegian flagship university was nonetheless questioned by a number of actors. One faculty union representative admitted that the University of Oslo was the oldest in the country and recognized its superiority with regard to rankings, but also stated that it remains very similar to others institutions in Norway:

But universities are very similar. The University of Oslo is still recognized as the best one in the rankings, so it is in a special scale. But still we are very equal. And people move back and forth from universities to university colleges; researchers here can apply to get a postdoc in a university college and then come back to teach here... I think some would say that, still, the University of Oslo is in a special league. It still calls itself the oldest and the best. But it might be only the oldest...

The heart of this discrepancy might be found in the education-research nexus. Even though Nordic countries ensure, partly by way of their quality assurance agencies, that their citizens get a high-quality education regardless of their socio-economic origins, research remains the prerogative of an elite group. On this point, a representative of a Swedish funding organization said that "There is a vertical hierarchy, made visible in all kinds of rankings; as academics we are in a meritocratic system and we need verticality." This representative added, however, that the hierarchy applies only to the research side of academia and does not apply to undergraduate programs. The Danish postdoc who said that all universities in her country provide an education of equal quality (section 1.2, above) later noted that "Copenhagen is perceived as the best university in Denmark, no question about that, because the picture of what is best is based on research quality and publications." An external board member also remarked that in Denmark "we have a number of high quality universities producing good research, like the University of Aarhus, University of Copenhagen and the Danmarks Tekniske Universitet." A national-level

actor also noted that Aarhus University and the University of Copenhagen have more publications, but also that hierarchy “is a more mixed picture.”

In Finland, research production was also a theme that presented a certain level of differentiation, though interviewees expressed it in terms of a vertical allocation of funds, and linked that funding to institution size. According to an institutional-level representative:

If you put together the University of Helsinki and Aalto University, it represents 80% of the doctoral and research training. So we do have a quantity and, statistically, if you have more quantity, you have more quality. If you look at how much funding we get from the Academy of Finland or how many Academy Professors we have, there are areas where we could do better than we do. But the answer is that we are big enough to have a critical mass to be at the top.

Having more students allows universities to receive more block funding from the State and to build doctoral programs, thus encouraging research production. A professor in the health sciences noted a causal link between the size of the Finnish flagship university and its capacity to maintain its position:

The University of Helsinki produces 25% of the PhDs and gets 20% of the money given by the State. One can say that it would be enough for Finland to have 4-5 universities, with Helsinki being the most important since more people live in its area, the best students go to the best university, so it accelerates the status differential. That is at the university level, but of course there are excellent research groups in different universities. But in the long run, it is still hard because, when this person retires, the groups dissolve. While in Helsinki, there are so many people that are reasonably good that there is some continuation.

The relation between size and quality was also perceived as critical in Denmark, Norway and Sweden. An institutional-level actor argued that the difference between Norwegian institutions lied in their size: “The difference would be that research groups are bigger in Oslo and Bergen, while in the other universities, there could be only one PhD student in the field. So it is a different environment.” More programs, more students and more funding also mean more academic staff and, according to a faculty union representative in Sweden, a more stimulating research environment:

It is quite different to be part of a research environment where you have a lot of colleagues to talk to, a lot of international guests and you can teach in your specialty. In smaller institutions, there might be only two people responsible for your subject within multi-disciplinary departments. It means you need to manage in a more isolated research

environment. You might miss the critical mass of having people doing similar things. People who did their PhD in Uppsala or Stockholm, fear of being the only political scientists in a small institution.

As will be discussed below, system actors also mentioned “size” when the question of mergers was raised.

As shown in Table 15 above, vertical hierarchy was considered to have a positive impact on academic research production in the Swedish HES. The hierarchy was acknowledged and depicted similarly by most Swedish interviewees. The following quote from a government official was representative and telling:

We need a vertical division and we have it, very strongly... We have to start with, Uppsala and Lund. Then we have Stockholm and Gothenburg, which are slightly behind Uppsala and Lund, but still very good. Then we have a number of specialized institutions, for example, Chalmers, KTH and KI. Then on a lower level, we count Umea and the Agriculture University. Already among these you can see three levels. The step from them to the next level – i.e., new universities and some university colleges – is a large step. And then there is another large step towards the smallest university colleges.

According to a university board member, “Sweden has a vertical concentration in place” with Karolinska, Chalmers, KTH, Uppsala and Lund being at the top. Although equality might be promoted nationally, this interviewee said that “If you look from the outside, I think it would be a more interesting perspective” because “then you will get a very clear hierarchy.” The hierarchy is also perceptible in terms of funding since, as an international-level actor said, “Uppsala may have ten to twenty times the size of block funding compared to new universities.” It is also reflected in governance arrangements, where “the Minister’s secretary doesn’t meet all the university leaders; he chooses the biggest ones like Uppsala, Lund, Karolinska while other universities meet a more junior person.”

1.3 Non-university sector / New universities

Nordic HES are marked by the presence of a “non-university” sector that is said to have contributed significantly to the expansion of higher education (Pechar & Andres, 2011) and, to a lesser extent, to academic research production (Aarrevaara & Pekkola, 2010). In many interviews, the question about non-university higher education institutions led to a discussion about those university colleges which became universities. These were named by participants

“new universities.” Two inter-related organizing themes appear under this topic: “research contribution” and “academic drift.”

University colleges and polytechnics were created in order to expand access to higher education. As one board member in Sweden said, “they put less emphasis on research and more on education.” A national-level representative said that university colleges were important for Sweden because they were “more open, not so old fashioned, closer to the community and to the private sector” and that they served to “free up a talent pool that could have never gone at the oldest institutions.” A senior faculty member in a Norwegian university college described the university colleges’ contribution to education as follows:

University colleges started out as “district colleges” meant to be open to young people in their region in order to prevent rural exodus... We are much more down to earth and we emphasize this closeness with the working-life... Our students can get jobs at the bachelor degrees because we have a very good system of internships. That is our strength compared to universities. You have a lower proportion of academic staff with PhD, we produce less research, but our students often come after having been in a university, and they prefer the college because professors are more available and studies are more practical.

In the late 1990s and early 2000s, some “non-university institutions” demanded to be recognized for the research they did or might do. In Norway, there was convergence in actors’ perspectives regarding the research contribution of university colleges to research production. The faculty member cited above had a positive perception of the research produced in university colleges. “I am not doing basic research,” he said. “I am doing applied research and working with institutions that come here and teach or offer placement for students.”

For a government representative, the research conducted in university colleges might not be highly prestigious nor cited, but it filled a gap in the research produced by universities:

University colleges do more research than before, but they do not produce most or the highly ranked research; yet they do receive less funding for research. They could potentially develop. They are developing research in new and more practical research fields such as nursing, teacher education or health care. We think this development is positive and we hope their publications will become more visible. In general, I think that this unified system is a positive achievement in that professors now all have higher qualifications and can increasingly base their teaching on research.

A representative of the Norwegian research council said that “the newcomers is a positive development” and that “it might be an advantage for the total system.”

In Sweden, university colleges that were highly productive in terms of research became “new universities” and there was convergence in actors’ perspectives regarding these institutions’ research contributions. The representative of a funding organization allocating grants for applied research projects mentioned that a Swedish report had shown new universities in Sweden producing more research than new universities in other countries:

Our old universities don’t perform as well, and the newer or less experienced universities perform better than the newer in the other countries. It is an interesting fact... And this is why we focus on them... There is no qualitative difference when they conduct research in comparison to old universities, if they are given the opportunity to do so. Of course, a lot goes into that. They need senior researchers in place, they have to be good in what they do, they need strategic direction and a strategic focus and all these things have to be in place. When they are given the instruments and the tools, they do a very good job... I think the system that we have is pretty good, but we can produce research even in the smaller and new universities. I think that is a strength in our system. I think you see pretty big problems in our older institutions. That is a fact that they are very research-intensive and the undergraduate education of lower quality. If you look at the lessons to be learnt from the new universities is that you can combine research and education. I think that’s a lesson to be learnt by our old universities who are lagging behind internationally.

The senior official in a quality assurance agency also considered that new universities contributed to research “but to a fairly low extent” when they transitioned. She then gave multiple examples showing how new universities contributed to research in very specific areas:

If you go back and look at Linköping University, they became a university forty years ago and today their technical faculty is probably comparable to Chalmers and KTH. They don’t have exactly the same international reputation yet, but if you look at what funding they take home from the different funding agencies, I would say they compete on exactly the same levels. Umeå University became a university around the same time of Linköping. And in terms of some of the areas in medicine or some of the areas in natural sciences, they are even better than Uppsala and Lund. So one has to realize that it sort of takes more than ten years to get to a level where you really can compete, because you really have to recruit the best people and raise a new generation of doctoral students so they become professors.

It should however be pointed out that participants considered that the research conducted in “non-university institutions” and “new universities” was qualitatively different from the research conducted in traditional or older universities. According to a senior administrator in a Finnish

polytechnic – or university of applied sciences (UAS) – the research they do was considered “development” and was published for practical purposes:

Of course we need academic research, we need top research, but the difficulty is to translate the results of academic research into practice. This is where our contribution should be; more on development and innovation rather than basic research... UAS publish. Many are associate professors in universities or selective researchers. We have classified publications and scientific journals and, of course, most of the publications from the UAS are not in the “scientific class,” but more articles in “specialized professional journals,” handbooks or others forms of more practical than theoretical publications. There is a clear difference between the kinds of publication in the different types of institutions.

In Denmark, the quality reform mission of university colleges was to include research besides their teaching and service mandates. A senior administrator said that, with this new mandate and with roughly the same budget, university colleges had to become strategic and develop research that was complementary to the research produced in universities:

University colleges became recognized as research institutions in 2013... My feeling is that [university colleges] are much more responsible and they must make the decisions so it actually forces them closer to real-life problems, in dialogue with external actors such as cities and hospitals. We don't do basic research at all... We are not trying to compete with universities. First, they get around four billion crowns for research while we get around 100 million, so it would be stupid to do a cheap copy of the top-100 in the world for research, it wouldn't make sense in this society. We had to define our task as complementary and be much more focused. We know that 90% of the world's research is a total waste, we don't know which 10% could be very important. For instance, we have a project on how to store heat in the underground, it's a very good project. We went to the city administration asked to place research center in Horsens, so it would help us and the city. We have also engineers in practicum placements out there, and the company says “we'd like to do an innovation project about this and this and this,” and we want to be an innovation partner in that. The company then asks “can we use some students?” and we say, “sure, it is not a problem,” and sometimes it turns into research.

Hence the type of research undertaken in university colleges is different from that in older or traditional universities, conducted in narrow fields where institutions with an applied focus have succeeded since their inception. In Norway and Sweden, these fields are often the only ones where they can award PhDs. A national-level actor in Norway explained that, in order to succeed under their new research mandate, university colleges and new universities had to concentrate the scarce resources they have into very narrow fields where they can hope to have an impact:

Instead of doing everything in a broad university, they have to try to profile more as a research-based university... The policies are to develop the most specialized and the

smaller universities into having at least a few fields in which they can compete internationally.

A senior government official, while acknowledging the research work conducted by new universities in the service sector, also emphasized the lower level of citations for articles authored by professors in new universities:

If you take Karlstad, which is not doing very good as a new university, it is the best institution when it comes to research in the service industry, such as hotels and restaurants. So it is the best in that narrow area. And there are other examples as well... One of the problem with Swedish research is that too much is not up to the standards. In old universities, there was a percentage of work not cited (20-35%). But in smaller institutions, the percentage was 75% of work not cited at all.

The second theme to be explored in this section is “academic drift,” which is defined as the tendency of organizations to copy roles and missions of their most prestigious counterparts (Berdahl, 1985). This organizing theme achieved saturation in both Norway and Sweden where participants considered that “non-university institutions” and “new universities” were moving increasingly closer to a more traditional university status. A senior official of a university association in Sweden noted that the number of higher education institutions awarding PhDs in some areas had increased significantly:

We have 37 members and I think there is still one or two that cannot award PhD. In 2010 was introduced in Sweden the possibility for an institution to apply to award PhD degrees in certain areas. Before, you had to prove to have sufficient research in a much wider area, natural sciences, humanities, etc. and then you could get the right to award a PhD in one such area. It is an important thing because that means many institutions were able to apply and went through some critical reviews in order to be given the right to award PhD. It was very important for their operation to have this possibility to build research strengths in some areas and diversify (institutions choose an area in which they are good and they can promote).

In Norway, a faculty member at a university college explained that his institution was moving towards becoming a university and he questioned the assumed positive impact of such a move. He felt that aspects of the college’s vocational mission would be brushed aside in favour of resource-demanding graduate programs:

I think that, at the creation of colleges, the intention was to have the same kind of division; colleges doing development and not research. But with the quality reform, they created this dynamism whereby colleges can strive to become universities if they achieve certain standards. There were criteria for institutional accreditation that set certain

standards... This institution is one of the 26 university colleges in Norway. It will apply for full university status in 2016-2017. We already have six doctoral programs, so we fulfill the requirements... But it does not mean we will get more money. On the contrary, it will be a zero-sum game. We will be fighting for the same money. When you start a PhD program, you also assume the main responsibility for basic research in that field, including building up libraries... A lot of people in this institution are opposed to this move. Academic staff with no PhDs who teach at the bachelor level feel that their work is subsidizing the PhD programs. Then, when we will be a university, we will have to spend even more money to do basic research, build up libraries. Some more applied programs might disappear.

The representative of a quality assurance agency similarly considered that colleges were conducting more “so-called research development work” than before, and that “some of them have being very successful, especially in the professional fields.” This interviewee was also skeptical regarding the necessity of such research work for students or for colleges themselves: “many of their master and doctoral programs have few students, and these programs take a lot of resources but produce few candidates. Are these programs needed by society”? Taking a step back, it seems that system actors appreciate the research work of new universities. But the formal transition from a “non-university” to a “new university” status also appears more problematic in the eyes of system actors who fear that it might fragment and scatter forces within systems. A university professor perceived, for example, that “research funding in Norway is too fragmented between many units, it does not seem logical to add more units to the system.” As for a consultant for Nordic cooperation organizations, he also wondered if “every small town (deep in the forest for instance) should have their own college and their own research.”

1.4 Mergers

The four Nordic countries under study experimented with mergers between higher education institutions or between higher education institutions and public research institutes. Because the topic of “mergers” was omitted in the initial design and considering the deductive nature of this research, it could hardly be tested. That said, quite a few interviewees mentioned this theme.

Although Denmark is the country that went the furthest in merging universities, university colleges and public research institutes, convergence regarding the positive impact of mergers only occurred in Finland and Norway. An international-level actor suggested that Finland’s international status was suffering from having resources scattered in too many smaller institutions:

I am pretty informed about the standing of Finnish system. They are really concerned. They realized that the system is quite scattered. They have 14 universities, 24 universities of applied sciences. It is just too many and the resources are little bit too thinly spread. They have one university in Finland which is in the top 100 by international standards when it comes to the ranking. I think that if we could concentrate research funds into fewer units, it would be better. There is too much emphasis on same the idea than in Finland that each town should have their own college and the major towns should have their university. I am not sure that it is possible in a country with 9 million inhabitants.

A senior official in a Finnish university association wondered “how many research-intensive universities can Finland support”? She then took the examples of Denmark and the Netherlands to argue that, considering the cost of research, it would be cost-efficient to consolidate the sector by merging institutions so each university would receive more basic funding. It was also pointed out by a senior government advisor that Finland was in the process of merging institutions together and with public research institutes:

Once you get better units and bigger organizations, you get better opportunities for people to study there and build internal strengths and capacities... The policy has been that, in Finland, there is a large-scale very profound reform of the research sector which includes mergers of small research organisations with universities, fusions between some research organisations to make larger networks and centers of competence... Now we have the reform of the whole government research institute sector. There will be bigger institutes and some fusions with the universities, and especially, there will be an emphasis on closer and stronger collaborations between the government research organisations and the universities. This type of cooperation is important in a small nation because there are limited resources.

In both Finland and Norway, the size of the population and the amount of resources available served as strong rationales to argue for a restructuring of the higher education and research sector. A senior official in a Norwegian university association noted that there is a process of “merging smaller institutions into bigger ones in order to be able to compete internationally for resources and people.” The senior administrator of a research council also acknowledged that “There is now a tendency towards merging,” but also that “In Norway, it could happen but more gradually.” In Norway, the institute sector appeared so powerful that “some policymakers are afraid that, if institutes merge and become too integrated, they could lose their advantage.” The advantage considered here, as it will be explained in further chapters, regards the capacity of research institutes to quickly adapt their focus to the needs of society, to produce applied research and to dedicate all their efforts to research production.

Danish actors, however, appeared more concerned about mergers and were still waiting to see the benefits of such a strategy. The research produced by public institutes is now grouped with university research, which has mathematically boosted universities' output. Other benefits, however, remain to be demonstrated. As the representative of a Danish funding organization said, "Universities were merged in 2013 and I am not even sure we saw the impact of this yet." An expert interviewed in Denmark explained that mergers happened voluntarily but under serious pressures from the Government. Institutions were encouraged to find partners with whom they would like to merge, or else they were to be forced. It was difficult in some cases to build synergies between different work procedures, aims and positions. The problem of synergy was well illustrated by the following quote from a Danish professor in the health sciences:

The details of mergers were not planned ahead. I have sympathy for the overall concept. But, now, the University spread to other areas. And with the mergers, the University has branches as far as 50km away. It brought some chaos both geographically and culturally. Then the merging was envisioned as building housing and everything. But we suffer from the remaining geographic distance. Moving people closer fosters interaction. It would be a much better model, rather than merging without moving units closer. So we have people from more applied research, but they are far away. And they don't think the way we do.

Another issue is linked to egalitarian values. A senior official in a university association explained that Denmark could superficially create a world-leading university by bringing all its most promising scholars under one roof, but that this would exclude the country's other regions, institutions and populations. In her words:

Few years ago, the Government wanted to have one Danish university in the world top-10. Everyone agreed that it would be very easy to do. We would simply have to put all the money into the University of Copenhagen and move all researchers to the University of Copenhagen. Then we would make the ranking list because they look at the number of researchers who won the Nobel Prize, etc. We would have one very good university and 9 not so good. But that is not what we want in Denmark. We want to have good universities all over the country.

In sum, institutional differentiation is a factor that raises a lot of interest from system actors. The landscape, however, appears nuanced and ever-changing to the point that it is difficult to completely reject the null hypothesis. It does not seem possible to confirm that research production in Nordic countries is important because (a) each institution can specialize in a field of research, (b) the most prestigious are able to compete internationally, (c) new institutions that

were originally focused on education now contribute to research, and/or (d) because Nordic countries improve synergy, critical mass or prestige through mergers.

2 Academic work

In the Nordic countries under study, higher education contributes to society through research and education. It educates an important number of PhDs that are needed for academia and industry. The increase in enrolment rates may have “massified” or “mainstreamed” PhD studies, in turn leading to increased standardization. But what is interesting is that, in spite of such “massification” and “mainstreaming,” the working conditions of PhD students remain very good, with the exception of Finland which appears to be a unique case that can be treated separately. While working conditions are appreciated by PhD students during their studies, the situation becomes more complicated afterwards. Themes that achieved saturation are presented in Table 16.

Table 16

Saturated themes associated with academic work

	Denmark	Finland	Norway	Sweden
Doctoral students	Positive impact Expansion Standardization			
	Status		Status	
	Doctoral schools			
Postdocs	Positive impact			
Other research staff	Deferred bottleneck Temporarity			

As explained in Chapter 8, system actors’ perspectives converged regarding the importance of higher education for the development of Nordic societies. A Finnish doctoral student said that:

In Finland, our statement has been for many years that the whole economy and well-being are based on the higher education of the whole population... I think also that the fact that we are training so many PhDs, so many M.Sc. in comparison with the size of the population, I think it represents a key factor of how this country developed.

For a Danish government official, “the tradition and the focus in Denmark has been on human resources, PhD initiatives and the relatively high number of scientific staff in the universities. In Norway, the senior administrator of a granting organization said that “the number of doctoral

degrees has increased a lot in the last few years and it is an important part of the total picture.” Increasing the number of early-career researchers (ECR) thus seemed to be associated with an increase in research production.

2.1 Doctoral students

Interviews regarding the role of ECR began with actors’ perspectives on doctoral education. Three themes emerged and achieved saturation: the expansion, standardization, status and contribution of doctoral education. As explained in the preceding chapter, participants’ perspectives converged regarding the contribution of higher education to Nordic society, partly by means of the graduate education that it provides to an important proportion of the age-cohort.

Professors tend to be perceived as the core leaders of research projects, but they themselves admitted relying on a growing number of PhD students. At the institutional level in Finland, there was convergence in actors’ perceptions of doctoral students as “taking a big proportion of research in universities.” A professor noted that “professors who are leading research groups can do research only to a limited degree” and that “too much of the actual research is done by PhD students and postdocs.” In Norway, a professor in the health sciences said that “PhD candidates and postdocs are I think contributing the most to the scientific production.”

At the institutional level in Finland, there is a general impression that doctoral students account for “a big proportion of the Finnish research in the universities,” and that since their salary is slightly lower (unlike in other Nordic countries), “I think it is good in general for the universities because their salary level is lower, so it is cheap labor.”

2.1.1 Expansion

The theme of “research contribution” was associated and partly explained by the expansion of doctoral education. As a Danish professor explained, “We are a small nation and we cannot compete in those areas that need massive investments or a lot of man-power. We have to go in areas where people have a major impact.”

For a Danish university association representative, “The idea was that the Government would provide more money and then, in the development contracts, institutions would promise to produce more PhDs.” Similarly, in Finland, a government official also mentioned that

“generating more PhDs” was a way for Finland to increase academic research production. A Finnish professor explained that the perceived utility of higher education led to the increase in the number of funded places. Although they recognized that doctoral students contributed to research, some system actors suggested that there are too many doctoral graduates. According to a national-level representative, “It is a reality that our annual doctoral production is too high (around 1,600 per year). There was a huge increase since 1995 when the doctoral programs funded by the Academy of Finland were established.”

2.1.2 Standardization

As doctoral education expanded, the status of doctoral students and what is expected from them has become more standardized. Pressure on students in the natural and health sciences to write theses in the form of articles rather than monographs has extended to the social sciences and humanities. In Denmark, a student said that “Today, it is more common to have article-based theses... Now, nine PhD students out of ten is writing a thesis by articles.” A doctoral student in Norway noted that this new “standard” increased students’ research output:

If you look at the PhDs, almost everyone is guided to do an article-based thesis – you have a choice to do a monograph but it is recommended to write articles. Of course it is good, you already have articles when you complete your PhD. So there is pressure to get out articles.

In addition to this normative change, doctoral students face regulative transformations in the form of mandatory working hours. They are encouraged to contribute either directly to the research output or indirectly by alleviating professors’ teaching load so that they can potentially dedicate more time to their research. As this quote from a Danish doctoral student suggests, the PhD has become closer in kind to a regulated academic program than a personal journey:

When you apply, you have three years of funding and then there are some standard demands in general. You have to work 840 hours for your institution and, depending on where you are, it is either teaching or research... You have to do 840 hours of work: you have to do 30 ECTS, you have to present at least one international conference with your own paper, and go abroad.

A professor in the health sciences recalled the following: “In my days, the master students could be very involved [in research projects]. But PhD students are becoming more like students... they have to finish on time and it is difficult to meet all expectations.” This professor felt that

standardization and control on students might undermine one of the strengths of the Nordic HES, namely, “autonomous and independent young people.” In Denmark, the formal standardization also takes the form of financial rewards to doctoral students who finish their degree in three years.

2.1.3 Status

Even though doctoral education is increasingly becoming as regulated as other academic programs, doctoral students still enjoy the status of being university employees on short-term positions. That status may enhance students’ contributions by granting them freedom in the form of stability and material security. As one Norwegian student explained, the status of a PhD student provides a certain amount of leeway and independence:

It is different from the US where there are considered as “students” who follow their supervisors and are very dependent on the supervisor. In Norway, from day one, you are more independent. You are employed by the university; you are expected to produce articles either related to your PhD or something else. You have a bit more autonomy. There is now a tendency in Norway to talk more about “PhD Students.” But when I started, my position in Norwegian was like “scholarship holder.”

For one Danish doctoral student, being a university employee also provided the proper framework to develop as a researcher: “I think that having three years to do research allows you to pursue your research interests and it gives you time to actually do your research... if I had to seek external funding all the time, I don’t think that it would be possible to focus.” One Danish university administrator acknowledged the research contribution of doctoral students but explained that the salary they receive cost a lot to the faculty:

Remember that these people spent 3 years here, maybe they are doing good research here and their output can be useful and increase the institution’s output (and maybe it creates more possibility for the division of labour), but PhD training in Denmark is very expensive... Here you get a proper salary. Since you are M.Sc or M.A., your salary has to fit into the regular run-of-the-mill centrally bargained wage; so you are at a similar level than junior civil servants. We have 300 PhD students per year and they cost 500 000 crowns per year. These are estimates of the direct cost. And there are added costs. Typically, a PhD project costs around 2 million crowns. 700 thousand a year, we have 300 of those, so we talk about 200 million crowns poured into/by this faculty.

Working conditions include benefits beyond wages. Doctoral students also receive insurance, parental leaves and paid sick leaves. This representative of a Swedish student union said the following about the issues currently being addressed in her organization:

We have always one or two specific questions that we bring up every year. Last year, it was about the use of stipends from the government to pay the first year of the PhD studies. It was basically a good thing for the departments and the university because they did not have to pay for the first year. Since January 2015, it is no longer allowed to admit PhD students with a stipend, they have to get their salary when they start their studies. Right now, we work on the prolongation issue. For instance, if you are on a parental leave do you get prolongation? Do you get extra time because you have been away and you need to read into the field again because you have been away for 6 or 12 months? If you are sick, usually you don't call in sick; you stay at home if you can. If you are at home for two months, should you report it in order to get extra two months? If you have different position of trust and you need to get prolongation, you have to ask HR... In the sciences and technology areas, if you are home for months for a parental leave, you can get an extra month or at least you can apply for it. It is not that you have to take this extra month, but if there are some issues because you were at home and you had to start up everything, it is your right to get one or two extra months. So now we are working together about getting a prolongation for research.

2.1.4 Doctoral/Research schools

In the four countries under study, doctoral or research schools were created at a time when it was perceived that PhD education would further the development of societies. As an international-level actor recalled:

In the late 1990s and few years in 2000s, there was heavy investments in PhD education. We launched a modernized version of PhD training in what was called *research schools*. That was a reaction to a perceived problem. We (including society) needed more people with PhD.

According to a Finnish professor, doctoral schools marked “the beginning of systematic PhD training.” There also appear to be tensions between equality and meritocracy, as one Danish university board member noted:

So, our university has developed a supporting system to support the brightest students. I mean, we need all 25%, but in many cases, students have other skills which can be useful in non-academic jobs. However, all of them are not necessarily good for basic research. So, it is about doing high quality massive education and at the same time, picks out the very talented students and gives them extra opportunities to learn more and to do more in order to do strong basic research.

In Norway, since 2008, the Research Council of Norway finances (with grants from the Ministry of Education and Research) a system of fifteen national research schools that consist of formal networks of universities, university colleges and institutes. The issue is that these networks go against the general perception that “everyone is equal in Norway” in that doctoral schools now create two types of doctoral students. One doctoral student who studied in a graduate school explained how this “inequality” was resolved by her university:

There was an evaluation of educational research in Norway, which concluded that research was too fragmented. I started my PhD when the graduate school for education was launched and, at the time, more or less everyone who applied was accepted. There was then a discussion about quality criteria to evaluate applicants. There was a strange balance between “should this be an elitist school taking the crème of the top?” and “should this be everyone’s in?” It started a bit unclear but became more restricted over time. But if you have PhDs who are part of the school and those who are not, how do you deal with it? The university had therefore to put additional funding so those students who would not be part of the graduate schools would get similar opportunities to go abroad for example.

In Denmark, students may be funded by professors’ external projects or the doctoral school. A Danish doctoral student noted that “it is increasingly the case that PhD students are funded by the external funding obtained by a professor. But I think most Ph.D. students are still funded by doctoral schools.”

The Finnish and Norwegian cases are particular, however, in that doctoral schools are multi-university. In areas considered priorities, the Government funded doctoral programs across various institutions where the most renowned professors could supervise students attending other universities. For two national-level actors, these schools contributed to the quality and the growth of PhD education in Finland.

In the 1990s, university rectors expressed the concern that they did not have enough educated researchers. Then a special program was created: the doctoral schools. That has been a very big change for almost 20 years. It was a very good system guaranteeing that, in the most important scientific fields, students would obtain sufficient funding and good supervision for the whole period of doctoral studies (i.e., 4 years). Those were common for several universities in certain fields of science. It meant that the best professors in Finland were supervising the best students, no matter the university attended by the student. These doctoral schools were nominated according to the quality of their research ideas and professors. It was an essential program. The doctoral student grants essentially supported the best researchers’ groups in Finland. It had a cumulative effect so that good units and professors could get extra money for their doctoral education.

Since 2010, institutions are now autonomous entities and the Government has decided to give back the doctoral schools to individual institutions. For the large universities and the well-established scientific fields, this may turn out to be beneficial as it might increase multidisciplinary and coherence. A senior advisor to a quality assurance agency explained that “big universities such as the University of Helsinki wanted to have one doctoral school per faculty and all doctoral programs under these schools,” and she noted that if universities “really invest in the umbrella doctoral schools and link their programs with these schools, it might be beneficial.” A doctoral student thought that it might undermine collaborations between universities but foster a multi-disciplinary approach to doctoral education:

There are relations between the universities, but it may become milder if we focus on our own university. We have now to focus on our own universities, there is no funding to support universities’ operations. But, I think there are good things too. Especially in big universities where students can benefit from courses in different disciplines, e.g., in humanities or law or theology.

But the reform could impact the smaller institutions which may no longer be able to benefit from these national networks to rely on their colleagues’ resources.

2.2 Postdocs and contract-researchers

Discussions on the role of doctoral students naturally led several interviewees to present their perceptions on the role of doctoral graduates when they work their way up the ladder of the academic profession. Research assistants and postdocs are here considered jointly since both were characterized by the cross-cutting theme of “bottleneck deferral”. There was however convergence in actors’ perceptions only regarding the research contribution of postdocs, and only in Denmark, Finland and Sweden.

2.2.1 Deferred bottleneck

Nordic countries increased the number of doctoral students in the late 1990s and early 2000s, but the standardization of doctoral programs was associated with a transformation in the role of doctoral students. The postdoc is now characterized as the new research training period. A Danish postdoc said, “I now have been given this opportunity to pursue for another three years; I have made up to myself that [research] is something I would like to do.” The representative of a

Swedish faculty union explained that the postdoc has become a pivotal position in order to then apply for a “junior lecturer” position, a “senior lecturer” position and then professorship.

Using herself as an example, a member of the Swedish research council recalled using her postdoc position to do research, acquire teaching experience, apply for external funding and, in the end, get a lectureship position. The postdoc was perceived as more suitable in preparing scholars to obtain a permanent position since, as a Norwegian researcher explained, “postdoc is the most productive period in terms of first-author articles,” “the person is more dedicated to research” and “many postdocs have written their project.”

The bottleneck leading from a temporary to a permanent academic position has thus moved up the ladder and, due to fiercer competition. One Danish postdoc interviewed described the relationship between a deferred bottleneck and research production as follows:

Then the bottleneck arrives at a later stage. Previously it was difficult to even enter the academia as a Ph.D. but that has become a lot easier... [The postdoc] is to a large extent a period in people’s career where they are expected to contribute a lot more than for what they are paid; because it is sort of the investment they need to make. They need to over-produce or they won’t get anything after this temporary period.

Because of their dedication and “over-production,” one professor in the natural sciences in Denmark considered postdocs to be more profitable for research groups than PhD students:

A postdoc costs about 20% more than a PhD. Yet postdocs don’t have to do teaching. PhD students have to teach in order to cumulate a certain number of ECT points. Essentially half of the time of PhD students is already taken to do teaching and follow courses, which makes a poor investment [for research] compared to a postdoc. So many groups employ postdocs.

Interviewees also reported that governments and research councils were shifting their funding from doctoral to postdoctoral positions. As a Finnish researcher said, “The Academy of Finland used to emphasize doctoral training, and now the emphasis is on postdoctoral funding... because we have so many PhDs and it is obvious that the Academy cannot provide opportunities for everyone.”

Either before, after or instead of a postdoc, some doctoral graduates continue to work in academia as researchers on fixed-term positions. Although these positions resemble postdocs in providing an additional learning experience, they differ in that they are shorter, less prestigious and more constraining. Interviewees agreed that there was an increase in the number of fixed-

term positions. The administrator of a large university in Sweden described the situation as follows:

What happens after the PhD is a weak point in the system. There is no clear step... Since so much research money comes from the research council, we have a lot of people with research funding and no proper positions. They are employed as researchers, but they cannot have promotion, they cannot teach or examine students. They are technically like administrative staff even if they are part of the academic staff. They are not part of the faculty. I think we have 800 people like that... Since the research money is so decentralized, we cannot really plan the money as much as we would like. There is no way to anticipate who will get money from the research council and who will need tenure track position.

A faculty union representative gave the example of his department where “there are 9 full professors, 25 senior lecturers and as many people on fixed-contracts.” A senior government official in Norway also noted that “there is considerable tension regarding the high proportion of fixed-term contracts in the higher education sector compared to other sector.”

There was, however, an absence of convergence regarding the contribution of these people. Considering the structure of academia, a Finnish researcher considered her role to be essential for conducting research projects:

Contract-researchers facilitate the research because the normal structure is that we have projects head by a professor and the professor is not entitled to receive any funding from the project. So, unless we have the contract-researchers, implementing projects would be difficult. External researchers are needed to get the project going and produce output. As you probably heard, most of the professor complain of a lack of research time. Indeed, it is a substantial problem, and they have pressure to running research project as well, so they need to employ people to conduct the research.

Moreover, as explained by a Danish professor, a lack of continuity altered professors’ capacity to undertake important research projects:

There is a clear lack of continuity when we rely so much on postdocs. I mean this department has almost the same number of postdocs than scientific staff members. So, if you rely to that extent, on two-year contracts that are by definition “no continuity”; that is lost. If I have a postdoc and I ask him to do some kind of programming, then once he leaves, it is hard to continue the program that he made because it is extremely tough to make a program accessible to someone else afterwards.

Similarly, the representative of a Finnish granting organization explained that, in some cases, “contracts are too short and they [contract-researchers] are not able to finalize the report or the scientific writing before the project funding ends.”

2.2.2 Temporarity

A second-order thematic analysis suggested the organizing themes listed above was connected to a global theme tentatively named with the neologism “temporarity”, which appeared as an underlying dynamic in Nordic HES. Temporarity refers to the extensive use of fixed-term contracts in various forms. In an interview with a doctoral student in Finland, it was stated that such temporary contracts or forms of employment can be established and renewed for a researcher for up to 20 years. A representative from a Swedish faculty union also stated that “you can spend at least 10 years on different kind of time-limited position without ever getting close to a permanent position.” For the actors interviewed, it was common to find contract-researchers around 40 years old who had completed their PhD a decade ago and still strived for a permanent position.

For some interviewees, these contracts are also necessary because they allow HES to absorb a larger pool of PhD graduates and provide them with the opportunity to either gain experience, compete for permanent positions or find work outside academia. A Finnish researcher made the following comment:

This contract funding has attracted many students; more than there would be without it. The characteristics of universities are such that there are places where students come and work for a period of time and develop their own skills as researchers and get a degree. In that sense, it has a positive impact. And there is a competition based on that and, for the most successful, funding will continue after the contract. It provides an evolution.

Temporary positions would give time for researchers to prove themselves to the academic community. According to a Finnish professor: “It is very important that they are not in a permanent position. The good ones will always further quickly and will become competent for professorship, and the not so good ones will remain.”

This situation becomes problematic when researchers run on temporary contracts for years, which risks altering the appeal of the academic profession and in turn discouraging the brightest students from pursuing a career in academia. One Finnish doctoral student made the following observation:

It is true that for many people they have contracts and will continue on those temporary contracts between 1 to 20 years. It is a problem. Some universities have recognized that it is always the same people [working as contract researchers] so they gave them a permanent status... Maybe I'm sceptical, but on the other hand, the Trade Union of Researchers and Teachers in Finland did a survey among the academic staff and it showed that many people were thinking about leaving universities because the careers are very unsecure because of the contract researcher types.

This has created a precarious situation for universities that, as a university researcher stated, “don't want to build a young generation of postdocs who are already bitter when they start their career.”

Interviewed actors explained the proliferation of temporary contracts by an increase in this type of funding. A Norwegian union representative gave the example of a “researcher who worked for 23 years – one year at [a] time – on part-time contracts” before obtaining a permanent position. Despite a law forcing public organizations to hire employees if they have worked for more than three years, he reported that universities argued that they could not take the risk of offering a permanent position and losing funding three years later. A university administrator gave the same explanation:

What we are seeing is that there has been a shift in the funding paradigm... This means that you are now much more dependent on running projects that are fundable. And these projects are of limited duration. So you have to staff these projects with people who are hired temporarily. But you are not supposed to hire people temporarily. On the other hand, as you are running your project, you may want to run another project funded by the EU and might want to hire people who worked on your projects as postdocs, and you want to keep them because they have a lot of expertise. So you want to hire them as temporary workers. So you are getting into problems because you are creating a new class of scientific workers. What about these persons' future? Because they are not on the track that leads to professorship, they cannot through their work claim a scientific position. If they have a permanent position, they can have a status raise. If they are on a permanent position, they cannot raise to another category.

With the increase in temporary research funding, universities seem increasingly unable to provide permanent positions. Although it is practical at the institutional level, there is convergence in institutional actors' perspectives regarding the negative implications of the temporary nature of early-career researchers' work for long-term research projects. A Finnish professor noted that the turnover is problematic because it creates a puzzle for professors who have to hire researchers on a regular basis and it becomes expensive to train researchers who might leave the group before the project ends due to lack of funding:

Almost all of our contracts are short-term. And that makes it difficult for us to hire people and plan the research because you may not know who actually will be carrying out your project. Professors' job nowadays is a huge puzzle work. Turnover is a good word. It takes a lot of work to educate a young researcher and make them useful to the group. But when they have learnt, you don't know for how long you can maintain funding for them.

It was argued that contract-researchers and postdocs need to produce and publish more than their contract stipulates in order to make it through academic bottlenecks, and that a temporary workforce is needed to implement large-scale research projects and to produce the output for which principal investigators have been funded.

In this study, some doctoral students and postdocs thought that, although contract-based positions involve many tasks, insecurity and dependence on permanent staff significantly limits one's power. As one Danish postdoc said, "A lot of people refer to postdocs as slaves because they are here only on a temporary contract, so if they don't over-produce, they won't get anything afterwards."

In sum, one could wonder if academic work could really be seen as having a positive contribution to scientific capital accumulation, given the concern about the large number of researchers on temporary contracts. The analysis presented above suggested potential negative consequences of temporariness in the long term. However, at the time of the interviews, system actors agreed that doctoral students, postdoctoral fellows and other researchers on fixed-term contracts significantly contributed to the overall level of scientific research production.

3 Summary

The present chapter focused on the rules, categories, protocols, procedures and structures contributing to the division of academic labor between different institutions as well as between individuals within those institutions. Following interviewees' comments, I sub-divided "academic structure" into two second-order global themes: "institutional differentiation" and "academic work."

First, interviewees made contradictory comments regarding a possible hierarchy between institutions, the specialization of higher education institutions and the role of both new universities and other higher education institutions. Whether it was based on disciplines, research subjects or missions, specialization was acknowledged by actors in the four countries as

promoting excellence while preserving equity. It should be added that horizontal specialization was considered to have a stronger positive impact on new universities than on old comprehensive universities. Although it was not part of the initial design of the current study, the theme of “mergers” was considered to have a positive impact in both Finland and Norway.

Second, according to interviewees, there are now more doctoral students in Nordic countries and these students have a positive impact on HES’ research output. Postdocs are also perceived as having a positive impact in Denmark, Finland and Sweden, because they are completely dedicated to research and often “over-produce” in order to reach a permanent position. The expansion of doctoral education combined with the prominence of external funding and a limited number of permanent positions has increased the amount of research staff on fixed-term positions, which grants flexibility to the system, yet might also undermine the continuity needed for long-term projects.

Chapter 10 Governance and funding

The two previous chapters explored the cultural-cognitive and normative pillars supporting academic research in Nordic HES. Chapter 8 revealed that the societal belief that higher education contributes to the public good as well as the tradition of academic freedom are perceived to positively impact academic research production. Chapter 9 further analyzed the “academic structure” and, although it appeared impossible to reject the null hypothesis regarding the role of institutional differentiation, the thematic analysis suggested that the expansion of doctoral education and other temporary positions were generally perceived positively. This chapter focuses on the regulative pillar of Nordic HES and analyzes how the distribution of authority – either in its legal or financial form – influences academic research production. The first section analyzes relationships between academic actors and their external environment, while the second section focuses on the impact of four different streams used by public authorities to allocate funding for research activities.

1 Governance

Inspired by Clark’s (1983) definition, governance here refers to the distribution of authority, power and control across the various levels of Nordic HES. Governance is a broad global theme that includes public authorities, steering mechanisms and institutional management. Due to breadth of this theme, it may appear to some that most organizing themes are only barely addressed. Table 17 below presents the few themes that achieved saturation in the analysis.

Table 17

Saturation in themes related to governance

Denmark	Finland	Norway	Sweden
Dialogue between governments and universities			
Quality assurance programs have no impact on academic research			
Policy-making and implementation	Influence of parliaments		Policy-making and implementation
Legitimacy	Institutional autonomy	Legitimacy	
		Positive impact of performance indicators	

1.1 The influence of public authorities

As part of the global theme of governance, participants were asked about the role played by public authorities – such as national governments, parliaments and local actors – on Nordic HES.

1.1.1 National governments

Participants found the impacts of government decisions difficult to assess. In the four countries, there were as many interviewees who perceived governments' decisions to have more positive than negative consequences. For example, a Nordic-level actor took the example of Sweden and considered that given the 2004, 2008 and 2012 research policies and the additional research funds, "it would be really problematic to say that a government that allocates so much additional funding would have a negative impact." A representative from a Swedish funding organization, however, noted that "in recent years, we have seen more and more instructions from the government, often motivated by the belief that somehow research may solve all social and economic problems immediately."

Similar comments were made by Danish, Finnish and Norwegian participants who questioned their government's understanding of HES dynamics. Looking at Denmark's initiative to streamline the process *From Research to Invoice*, a professor said "you cannot do that... I do research and nobody knows what it might lead to." In Finland, a national-level actor criticized the fact that in his country the Ministry of Education and Culture was responsible for all levels of education and yet did not fully understand academic research.

Participants' perspectives were so nuanced that only two organizing themes achieved saturation. These themes were the distinction between policy-making and policy-implementation, on the one hand, and the relationships between governments and universities, on the other. With regard to the second organizing theme, there was convergence in the four countries regarding interactions between university leaders (either rectors or chairmen) and government officials. These interactions were often based on the reports submitted yearly (or every two years) by universities to governments and/or parliaments. A Norwegian government official described the interactions as follows:

Regarding our contacts with institutions, we used to have meetings every year with universities and university colleges. Yet from this year, the meetings will take place every second year. We have a yearly process with universities where they deliver their proposal

and their report for the precedent year on March 1st. Then we consider their proposal for the governments' budget submitted in October. The documents submitted by institutions are the basis for our discussions with universities that happen in May-June... To a large extent, there is trust. Our goal in our bi-annual discussions with the institutions is to be a "critical friend", helping them to develop and point out challenges in a positive way.

In Sweden, as it is described below, the Government delegated part of its responsibilities to the National Authority for Higher Education (SNAHE) where dialogue with universities often occurred. The representative of a Swedish university association said its organization had "a lot of discussions with the Chancellor" responsible of the SNAHE. In addition to their association, university leaders also have direct relationship with civil servants and politicians. To obtain a large-scale radiation facility, a Swedish university administrator explained that he and his colleagues "were playing with the Government, and after many discussions... I convinced the Minister."

A Finnish government official also argued that public authorities needed to establish a dialogue with institutions in order to develop reforms or funding models. As to accusations that governments formulated policies with little knowledge of the higher education sector, he insisted that:

These models [are] prepared in collaboration with the universities and the organizations representing universities. They are not given from the sky, so they really have a say in how to develop these models. In Finland, this is done in collaboration with the other actors and bodies. So it is not arbitrary and it is not out-of-focus from what the universities want to do.

A university administrator shared the same view that higher education institutions and civil servants from the Ministry of Education and Culture had frequent meetings. He reported that "Almost every week there are seminars, discussions and events with the Ministry whenever they look at different things or prepare some new laws; they then ask the representatives of the university to come."

These interactions are also shaped by active associations of higher education institutions. The representative of one of these associations in Denmark explained that it was their idea to expand access to the PhD to further research, an idea that was then taken up by the Government. Without providing similar examples, her Norwegian counterpart also explained that his organization

interacts closely with local, national and international actors on matters such as strategic research policies, career paths, international recruitment and European research collaborations.

The other saturated organizing theme that emerged from the analysis concerns the distinction between policy-making and policy-implementation. Considering the amount of public support that higher education receives, one could imagine Nordic governments to be large, powerful and controlling. A number of national-level actors, however, stressed that the distinction between policy-making and implementation appears crucial for assessing the influence of governments on Nordic HES. In Denmark, a civil servant explained that the Ministry for Higher Education and Science is relatively small and relies extensively on external agencies to implement its policies:

In our system, the agency is not only the operational arm, but also the policy arm. Policy and operations go hand in hand. The thinking is that we have a very small Ministry and then we have agencies operating. In the research policy division, as it is indicated, we initiate research policies issues and initiatives. I would not describe us as a kind of think-tank because we also have issues related to already existing institutions. But we have quite substantial leeway in terms of finding new pathways for research policies, trying to materialize initiatives and pushing the boundaries for research.

Similar observations were made in Sweden with the exception that, in contrast to Denmark where the Government relies on multiple agencies, the operating arm in Sweden consists mostly of the SNAHE. A former government representative said that “The formal role of SNAHE is [to] carry out the Government’s policy.” Another national-level representative explained how these external organizations have to maintain some independence vis-à-vis governments:

The former University Chancellor was criticized not for being a civil servant, but for only listening to the government, only pushing what the government wanted, and not trying to understand what the universities and university colleges needed. It was a time when there was quite a debate around what quality insurance we should have and how could it fit with universities in a better way than the quality assurance system we had. Yesterday, we had a whole-day meeting for a strategy for the whole [SNAHE] here, and we were discussing about what is its role. Its role is to improve higher education, to make sure that higher education has the quality it should have, and that higher education is changing with time so we don’t get stuck in something which was okay ten years ago but doesn’t really work anymore.

Further details on the perceived role of quality assurance agencies will be given below, but for the purpose of this section, it should be noted that in both Denmark and Sweden governments consist of relatively small units relying on other “intermediate” organizations to implement policies.

1.1.2 Parliaments

Nordic countries are consensus-based parliamentary democracies, and it was hypothesized that parliaments – as legislative bodies – have an impact on Nordic HES. Only in Finland and Norway did the perceived impact of parliaments achieved saturation. In Finland, a university board member explained that the parliament exercised its influence through the budget, bills and parliamentary reviews. According to a national-level actor, the Finnish parliament has to review the development plan for research and education submitted by the Ministry for Education and Culture every four years. An expert interviewee gave the example of the parliament changing the law prescribing the proportion of external members allowed to sit on a university board (reducing it from 50% to 40%). In Norway, an institutional-level actor gave the example of the parliamentary conservative coalition that succeeded in passing a bill to charge tuition fees for non-EU students. A government representative noted that, like in all parliamentary democracies, members of parliament have a stronger voice in times of minority governments. In those instances, she explained that the “Committee on education and research has an impact because it finds higher education and research to be important.”

It is worth noting that parliaments were perceived to have an influence when they were also perceived to have the appropriate knowledge about higher education. Although one institutional-level actor considered that “most members of parliament have no knowledge of higher education,” the government representative cited above also reported that the Committee on education and research “has yearly meetings with the sector, it really listens to what the sector has to say, and it discusses the obstacles for researchers in Norway.” Her Danish counterpart also noted a relationship between “a quite potent parliamentary system” and “political sub-groups dealing with research and innovation quite actively involved.” In his view, parliamentary committees had an active and “horizontal” role in the sense that they set the broad policy framework for other organizations (including the Ministry) to operate. The Finnish parliament was also perceived to have knowledge of the HES since the Prime Minister acted as the Chair of the Research and Innovation Council where many other ministers were also present. These quotes would support the importance of the theme “legitimacy” in the sense that certain actors are perceived more positively if they are perceived by the higher education sector to have knowledge about the sector and to make appropriate policies.

1.1.3 Local actors

Considering the longstanding tradition of local parishes in protestant Scandinavia, it was hypothesized that local actors (such as municipalities) would have an influence on academic research production. That said, since flagship universities are located in large cities (often in the capital) close to political and economic power, it would appear that local actors interact more with smaller or non-university institutions. A senior official in an innovation network in Norway said that the influence of local actors depended on the institution's culture: "Some institutions have strong research environment but are not interested in international partnerships, yet collaborate with companies in their region for innovation."

A senior official in an accreditation agency explained that it was advantageous for most municipalities to ensure the workforce is well-trained, and then gave the example of the very close connection between the city of Aalborg and the University of Southern Denmark. Similarly, in Finland, a national-level actor acknowledged that the City of Tampere has been very active in supporting higher education, especially through its programs to enhance research in ICT, biomedicine and environmental studies, though he also considered that most cities have little say regarding universities.

On the other hand, polytechnics and university colleges were perceived to have closer ties with local authorities. The senior manager of a university of applied sciences depicted the situation as follows:

Sometimes you may wonder if relationships are too close because UAS are owned by cities and communities. For instance, some city representatives are sitting in our board. An important task for UAS is to help local areas to develop. Since you have different communities as your owner and very often the board members are local politicians, there can be conflicts of interest in the board between cities, communities or political parties. Sometimes, you have to ask whose benefits are we looking at? The UAS, the cities or political parties?

1.2 Steering mechanisms

Section 1.1 above described how system actors perceive the role of public authorities on Nordic HES. This section looks more closely at the regulative mechanisms used by these authorities to steer the system. Mechanisms include quality assurance programs, development contracts and performance indicators.

1.2.1 Quality assurance programs

Like most European countries, Denmark, Finland, Norway and Sweden have implemented quality assurance programs. Despite national differences, similar perspectives seem to converge across the four cases.

Firstly, quality assurance agencies are depicted as interstitial organizations with at least some level of independence from the national government, the rationale being to avoid a situation where the same organization would evaluate institutions and take decisions. In Denmark, the Minister appoints council members for the Danish Accreditation Institution, but the organization does not have to follow the Minister's instructions. It produces evaluations, which are then available to civil servants. The Finnish Education Evaluation Centre is "independent by Law" and, according to one representative, "no external actor has an influence on the results of our evaluations." Similarly, the Norwegian Agency for Quality Assurance in Education (NOKUT) was set up at the time of the 2003 Quality Reform as an independent organization. A representative explained the relationship with the government as follows:

We have the status of being public servants and we are affiliated to the Ministry in a certain sense. But we are governed by a Law, which says a few things about what this agency is supposed to do. And then this Law is further specified by the Ministry. But formally speaking, that's it. We interpret our mission through the Law and regulations, and then we operate independently within that framework. We meet the Ministry once a year to discuss how we have fulfilled our mission. The Ministry can suggest what it would like us to change, but they cannot instruct us to do it.

Secondly, quality assurance evolved from being external in the early 2000s to being increasingly internal, with the notable exception of Sweden. In Sweden, the SNAHE and its University Chancellor are appointed by the Government. The agency assesses programs and program areas and has the power to remove the right to award PhDs in certain areas.

In Finland, the agency works according to an audit model where all areas of education, research and management are assessed. For a representative, "its aim is to help institutions to enhance the quality of their operations by providing information for institutions and disseminating good practices within and between institutions as well as across the two higher education sectors." In Norway, a national-level actor explained that "all institutions are supposed to have an internal quality assurance system" and that the agency "has an accreditation standard, which is more

formal and based on inputs.” The standard highlights the ability of institutions to provide quality education and training.

In Denmark, the agency is now in the process of transferring quality assurance responsibilities to universities. Instead of evaluating programs individually, institutions may now develop their own quality assurance process and then become accredited. According to a representative, the five criteria include an ambitious quality assurance policy, robust internal accreditation processes, knowledge-based programs, consistency with the Danish Qualification Framework, and programs’ relevance for the job market. Accrediting internal quality assurance procedures however seems to be based on trust rather than any form of consequences. In Denmark, universities can either have their accreditation approved, conditionally approved or rejected. In the last case, institutions remain in the old regime (of evaluating programs individually) and cannot create new programs. A similar logic applies in Finland where quality assurance assesses management procedures rather than programs, so it “respects institutions’ autonomy.” And while the Finnish Education Evaluation Centre used to allocate centers of excellence in education, these centers are under the control of the institutions themselves, leaving little disciplinary means for the agency:

No one wants control, for example, by us. Since we do not have the centers of excellence in education instrument anymore, we do not have any financial incentives in our evaluations. Nor do we have any punishing means, like loss of degree-awarding powers resulting from our evaluations. Autonomy should be respected and again it is linked to the profiling. Universities themselves should know at what they are good and on what they should concentrate. And there is no high quality research without high quality education.

Thirdly, although quality assurance might have an impact on the quality of education programs, there was convergence regarding the little impact of quality assurance on academic research. In Denmark, the Accreditation Institution requires institutions to be involved in research. To assess this, it looks at bibliometric indicators, asks institutions for a report and professors’ curricula, hires a panel of experts and meets with professors, students and other staff. But as the representative said, “We do not have criteria on the type of research produced or a minimum level to achieve.” Nor does it evaluate research programs. In Norway, NOKUT does not evaluate research *per se*, and the representative questioned the impact of evaluations that had become a possible “evaluation game” where, after the evaluation, few things would actually change. In

Sweden, the SNAHE does evaluate the “legal aspects of postgraduate education,” such as individual study plans and supportive research environments. However, until the SNAHE and the SRC develop a national evaluation system for research, quality assurance is not perceived as having any impact on the level of academic research production.

1.2.2 Development contracts

A development contract is here defined as any formal agreement between public authorities and higher education institutions which identifies goals and sets up indicators to evaluate success. This sub-theme is only relevant for Denmark and Finland, though even in these countries few actors explicitly explained how they perceived the influence of development contracts on academic research. It is therefore not an easy task to identify convergence. But cross-cutting organizing themes mentioned above also saturated for development contracts, such as “dialogue” and “legitimacy.”

In Denmark, a senior university administrator described development contracts and they impact they could have on HES as follows:

A ‘development contract’ is not what it seems to be. It is not a contract; it is a strategic orientation document. It consists in a number of thematic areas where a given university would like to expand or rather to devote more interest. It would be at least 2 or 3 areas determined by the government, which are identical for all higher education institutions; and then there would be some self-choosing thematic indicators or target areas that the university itself would like to pursue actively. First, there is a large degree of diversity across the different higher education institutions. Secondly, the indicators, the benchmarks, the performance related part of this, is something determined in a dialogue between the Ministry and the leadership of the institutions... [Regarding the impact on academic research], the relevance of these contracts needs to be discussed and laid out at the faculty level. I think it is a discussion in itself whether this paradigm, which is a reflection of new NPM, has the same validity as it used to have. I mean, if you look at the governance structure paradigm, I think the new NPM, if it is not replaced, is supplemented by trust-based tools. I think it makes common sense to have a high degree of trust at the top of the relationships that we have. The indicators that underpin a given ambition are mostly suggested by the institution itself. For example, an issue highlighted from the side of the government could be to decide to enhance innovation. Then, the institutions would find suitable indicators to work on this ambition. There would be a discussion among the two parties and then the universities will put a number of indicators for this particular issue, like increase to the number of collaborative research projects by X%, they would enhance the issue of teaching entrepreneurship, they might even have numbers on their commercialization revenue. So, it could be at various levels, but I think that is pretty much determined by the institution... There is no money involved. It is a

strategic instrument. It is an instrument for dialogue between the board of the individual higher education institutions and the Ministry.

A Finnish government official also explained that, in Finland, “We negotiate a four-year plan with each institution, regarding their goals for doctoral and master’s education, as well as research. And we give funding accordingly.” Plans in Finland thus seem more constraining than contracts in Denmark. Quotes nonetheless emphasize three themes: dialogue, trust and policy-implementation. The interviewee suggested that the contracts themselves may not have a direct impact on research production, but that they serve as an instrument of dialogue between governments and institutions, where the former would define broad societal needs and the latter would define how it can contribute through specific objectives. This quote is also a reminder of the distinction between policy-making and policy-implementation. Finally, the analysis suggests that the question of trust and legitimacy is important when considering the influence of steering mechanisms. The administrator considered that, in his country, new public management instruments were supplemented by trust. The theme of trust and legitimacy was already explored in Chapter 8, and it seems that this cognitive predisposition also informs governance arrangements.

1.2.3 Performance indicators

Performance indicators here refer to quantitative evaluations of the activities performed by HES. They are the third type of NPM-inspired steering mechanism developed by governments to monitor HES. It is worth noting that both quality assurance programs and development contracts may rely to a large extent on performance indicators, as does a part of basic funding, as will be described in Section 2 below.

It should first be noted that the theme “positive impact of performance indicators” was only saturated in Norway. In Denmark, three actors perceived performance indicators positively, while two noted serious caveats. One senior university administrator considered performance indicators to have no impact on research and possibly a negative impact on other higher education activities:

Some of the performance measures might have a slightly negative impact... Some politicians think, for bad or good reasons, that Danish students in the universities are not very efficient in their use of the funding society pours into higher education (e.g., you have to work more, finish quicker, etc.). Then you start setting up measures. For instance,

Copenhagen University had to set up targets related to the number of classroom-hours. We agree: it should not be zero units of time where faculty and students are in the same room. However, it is not clear to me that we would generate a better output (within the resources we currently have) by increasing the number of hours from, for example, 10 to 13 hours per week. I would suggest that some of those targets are at the national level counterproductive. We are twisting the equilibrium.

In contrast, a senior leader in a Finnish university had a rather positive opinion of the newly established performance indicators, though the individual thought it was the role of the institution to establish the appropriate fitting factor to modulate the impact of performance indicators. More precisely, he explained that:

The publication forum is now part of the funding model. This changed the tradition: people try to publish in high-impact factor journals rather than only try to publish their article somewhere. As a Dean of Faculty of Sciences, I really tried to put a limit, i.e., the number of high-profile papers divided by the total number of papers. If you publish just to get published, it would become a negative indicator leading to more risk... The other trend is that humanities and social sciences say that they have to publish in Finnish (and in Finnish journals) for the local audience because this is how they have a societal impact. But there [has] also been an increase in the publishing in international journals in English... It definitely has been a trend and it is already impacting the ranking where they are now in the top-50 in the QS ranking... We will try to put incentives in the light of how we are funded. And we are also benchmarking how it is done in Finland. A lot of universities who use this model just put the fitting factors. If you would channel this into the faculty, you need a fitting factor. If medicine is three times more expensive, so you fit the parameters for the status quo and then you develop a funding model. We did that 10 years ago. Now we have a 4-year strategy and we will not change the budget; but we will decide how to distribute money in the future.

Four other Finnish interviewees perceived the same performance indicators to have a negative impact on academic research production. One faculty union representative was particularly concerned about the impacts of performance indicators on the core missions of universities, on the scientific process and on research ethics:

The model of the university becomes closer to firms and businesses... A neo-classical model of economics has gained policy in higher education... There is much more competition than there used to be... But it is also important to consider on what indicators we measure effectiveness. It can create big problems if the indicators are badly chosen or estimated wrongly. When there are a lot of competition based on publications, it might have side effects like questionably ethical practices. Yesterday I heard of the example of one doctoral dissertation. It was an empirical thesis with a quantitative study, but the person who did the thesis did not actually make those tests. The results were made up to look a little more interesting than they were... We try to put universities to compete with monetary rewards, but this is a trivial way to motivate people who are honest and

scientifically ambitious. I think that not a single important scientific research has ever been motivated by monetary incentives.

There was convergence in actors' perspectives regarding the triviality of monetary rewards to motivate academic research production. Yet there was almost unanimity in actors' perspectives about the positive impact of performance indicators insofar as they clarify the demands of the public authorities while respecting the academic tradition of meritocracy.

For a senior advisor of a Nordic research funding organization, "bibliometric measures are important not because they affect funding, but because they identify issues in some areas and potential avenues. It is a managerial way to use it." For this international-level actor, performance indicators influence research because of the discussions they generate and because of a signaling effect, particularly felt among younger researchers. A Norwegian union leader said "we can see that publications increased and [the research information system] may be one of the reason." The representative of an association of universities explained that, in Norway, "the culture of publishing your work in international journals is new (from 10 to 20 years old), especially outside the hard sciences." According to this interviewee, the publication system was assessed and the report showed that "it functions very well." He further noted that "counting things that were not counted before [...] changed the way people are working." For a senior university administrator, the system is essential in that "for the first time, it made clear for the researchers that they were accountable for their research. It was not up to them anymore to do research or not. Research has to be published, things have to come out."

Considering the egalitarian nature of the system, researchers are not individually rewarded or punished based on their publication. The state allocates a small part of the basic funding based on the indicators but unions make sure it is not reflected within institutions, making sure wages remain relatively similar. Yet according to the same university administrator, universities can still cut the funding of a department, reject a professor's promotion or deny a sabbatical year based on the results. That said, he considered the effect to be mostly psychological, since the impact of funding is small. As a final note he added that "Of course we operate on tight margins and the small amounts of money are important, but the psychological effect was larger, and it became efficient."

In Sweden, some national-level actors thought the evaluation of bibliometric indicators might encourage institutions and individuals to organize differently, though one union leader said the Research Council had published a report recommending re-designing the research information system. One senior university administrator wondered to what extent the signaling effect of performance indicators would work if they did not measure what they were intended to measure:

You must be really sure that you actually measure quality and performance, and not end-up measuring differences in a mix of fields. If the measures tend to favor one type of publication more than another, it means that some universities which have more of those fields and publish in that way will do better.

1.3 Institutional autonomy

After having analyzed the role of public authorities and of the steering mechanisms used by them to direct the HES, it is important to question the level of autonomy granted to institutions. There was a strong convergence in actors' praise of institutional autonomy, with noticeable divergence regarding what "institutional" means and the extent to which higher education institutions in their country benefit from it. For one representative of a Nordic cooperation organization, the latest reforms in Nordic countries showed a clear trend towards greater institutional autonomy.

All Nordic countries tried in some way to reform their universities. In Finland, the university governance has been in central political issues, as in other Nordic countries. We had the university reform in 2010. Denmark had a reform a little bit earlier. Sweden renewed, for example, their university act... There is a tendency to reform, which separates the universities from the state, so it is typical for this period.

Despite this claim about the four Nordic HES, saturation for the theme "institutional autonomy" was only achieved for interviews conducted in Finland. This does not necessarily mean that institutional autonomy is lower in Norway, Sweden or Denmark (the latter being the first Nordic country to grant legal autonomy to universities), but it does indicate that for these countries the null hypothesis regarding the positive impact of institutional autonomy cannot be rejected.

In Finland, the University Reform was implemented in 2010. A Finnish government official stated that, with that reform, "universities got their autonomy and funding was changed: they are now semi-private foundations." A union representative in the same country said that "We got a university law and it changed our status and relation with the Government." As was revealed above, the Government elaborated steering mechanisms in the form of development contracts

and performance indicators (among others) to ensure institutions' contribution to society. But within the framework of those mechanisms, institutions retain a certain level of autonomy. For instance, as one university association representative explained, "The Ministry sets up indicators, but it cannot tell us what study programs we need to create or what kind of research to do."

An institutional leader added that "We [universities] can decide the number of students we accept by ourselves because we are autonomous." Interestingly, the academic community might not yet be fully aware (cognitive pillar) of its newly gained formal autonomy (regulative pillar). A government official noted for that "Universities have always wanted to have autonomy, now they possess it and they are surprised they have don't have to ask permissions from the ministry anymore." A senior university administrator agreed: "For the first time, universities have the autonomy to make decisions. So far they have not been very successful in doing that. I think the old culture still influences people to think the old way."

It should be noted that autonomy, in the cases above, was perceived as potentially contributing to academic research in that it increased efficiency and strategic planning. For instance, a university leader in Finland was planning to use autonomy to promote collaborations between faculties, establish joint degrees and create multi-faculty doctoral schools—projects that would be difficult to accomplish if funding was allocated directly to units based on the number of students or individual articles published. A professor in the natural sciences also thought autonomy was positive since it allowed institutions to focus on some research areas.

There were some interviewees in Norway and Sweden who asserted that universities had some level of autonomy, but saturation in both cases was prevented by the presence of four and three dissenting opinions, respectively. A Norwegian professor in the health sciences said that in his country, "there is still too much political involvement" and that "all new and old universities remain State agencies." In Sweden, a university association representative also criticized the Government's strict regulations undermining university autonomy:

The Government has some idea about what should be achieved with a fixed amount, but they do not need to look at every single little money spent on education. If you are a teacher and you have to do 25% teaching and 75% research, it has to be divided like that. It cannot be 26% and 74% because you do something wrong with the money.

Governments in both Norway and Sweden have proposed granting more autonomy to the higher education sector, but this has been rejected by institutional actors. A Norwegian civil servant recalled that “There was a proposal then years ago to make universities more autonomous from the Ministry, making them independent foundations. The proposal was rejected by a united higher education sector and the issue was not raised again.” Her Swedish counterpart told a very similar story:

In Sweden, universities are State authorities so they work directly under the Government, taking order from it and carrying out government policies. But I do not think it is a good role for universities. They should have an organizational independence from the Government. We introduced the possibility to turn some of the universities into foundations; foundations being self-governing organizations. But they did not want to have that. All question marks were raised, e.g., how would students’ influence should be organized? That would have been left to the foundation, but student associations wanted that kind of detailed regulation.

Despite the opposition, both countries did increase university autonomy, though the institutions themselves were described as reluctant to take full advantage of the power they had gained.

According to a senior official in a university association:

The ministry has delegated a lot of decisions to institutions. They are quite autonomous within the Law of universities and higher education institutions. It is delegated at the institutional level. But the challenge is that the room to maneuver that institutions have may not be exploited by the institutions themselves.

A senior university administrator agreed and concluded that “There’s no point in having autonomy if you’re not able to convert it in an efficient strategy.”

The question of financial autonomy was particularly salient in the four Nordic HES. In Finland, the government representative explained that changes in legislation and changes in the university funding model had to go hand in hand. In Denmark, the financial issue was used to nuance a potential positive impact of university autonomy. A professor in the natural sciences made the following observation:

I think this autonomy is a blessing in disguise because it is not really autonomy. Autonomy is to some extent economical. For instance, a law concerning universities was drafted last year saying that we have to do additional teaching, so-called “talent trick.” We have to provide an additional 20% of teaching. This Law was approved last year, but it was also written in the Law that the ministry would not give additional funding.

A board member also perceived that funding mechanisms were tightly steering institutions' behavior:

For instance, the university receives a certain amount of the money per student depending of the field. Furthermore, you get a bonus if the student finishes within a certain deadline (no more than one more year according to what it is expected). There are special bonuses for that and about how many students we can send out and how many students from abroad we can attract. The ministry decided to introduce incentive to steer the universities.

The senior official of a quality assurance agency explained that, in Norway, universities were granted more autonomy in the 2003 reform but had specific tasks to accomplish and received funding accordingly. A university administrator summed it up in the following way: "If you have autonomy without fiscal freedom, that isn't worth much. If you do not have funding, autonomy is not that important." This relationship between funding and autonomy was also observed by the representative of a Swedish university association who thought that institutions' inability to keep surpluses greatly undermined their autonomy:

Governmental authorities ask universities to spend the money the year they get it... However, we say that, in order to have the possibility to take risks, the universities must be able to save money to feel safe and take risks. Today, some institutions are sitting on saved funds as they were able to save up over the years, but the government is looking at that and we are afraid by the possibility that it wants to take this money back. There is a lot of funding also remaining in the research groups. Indeed, they get grants and they save up money because they want some security for the future... We are saying "let them do that," it should be possible because it gives freedom and even up to a yearly turnover.

To sum up, governance provided a broad global theme encompassing a myriad of complex intricate organizing themes, most of which would likely have required more interviews to be accurately unpacked. This first analysis nonetheless suggests that Nordic governments rely on external semi-independent organizations which have both the knowledge about higher education and the legitimacy to implement policies. Institutions formally enjoy more autonomy, but laws, funding and mindsets seem to prevent the possibility of a more radical shift.

2 Public-sector research funding

The factor of public-sector research (PSR) funding is closely connected to the factor of governance. After all, funding can be perceived as a powerful governance instrument shaping HES. That said, the governance factor unpacked in section 1 already included too many

components, while PSR funding can also be broken into different streams of its own that deserve attention. As showed in Table 18, four themes cut across the four countries. First, there was saturation regarding the importance of PSR funding being public and concentrated into universities rather than into businesses or public research institutes. Second, regarding funding streams, the positive impact yet time-consuming characteristics of competitive funding also saturated.

Table 18

Saturation in organizing themes related to public-sector research funding

Funding streams	Denmark	Finland	Norway	Sweden
PSR funding	Public funding Funding concentration in university			
<i>Funding streams</i>				
Basic funding	Positive impact; Equity.	University autonomy.	Positive impact; University autonomy.	Negative impact.
Performance-based component	Positive impact; Quality research; Signaling effect.	Managerial tool; Inefficient.	Positive impact; Quality research; Signaling effect; Efficiency.	Complicated formula.
Competitive funding	Positive impact Time-consuming			
	Quality research			Winner takes all
Excellence funding	Positive impact.			
	Quality research; Stability; Concentration; Inequity.		Quality research; Stability; Concentration; Inequity.	
Strategic funding	Responding to societal challenges; Political steering; Increasing resources.			
	Negative impact.			Positive impact; University autonomy; Inequity.

The first element, namely the important of research funding being public, concerns the specificities of public funding in Nordic HES. In economic downturns, Nordic HES would retain a skilled workforce and outsmart the market with counter-cyclical investments in research, consolidating their comparative advantage. As reported by a Finnish researcher, “the research funding has increased dramatically; we were affected by a depression in the early 1990s and after, there was a common consensus in Finland that higher education would be the way to rise.”

On a similar note, a government official reported that “We have to bear in mind that there have been huge increases in the level of funding in Finland and Finland is in the top-three to five of nations putting the highest share of their GDP into R&D expenditures.”

Similarly, a Swedish representative from a quality assurance agency reported that during the 2008 economic crisis, “while most other countries were cutting in their research budget, Sweden was not; it was possible to keep up with the international competition in terms of citations or ERC grants.” Public funding is more stable, perceived as “freer,” and explains “the level of scientific activities and publications.” The representative of a university association acknowledged the role of private funding but also felt that public funding could not be replaced:

I think every institution would try to have more private funding and more diversified income streams. However, for research, I think public funding is important and there should be a lot of basic funding to universities. We need to do all types of research, developmental work of course, but we need a large fraction of free public research funding.

The second cross-cutting theme, namely “funding concentration,” reached saturation in all countries but Norway. In Norway, universities have resisted reforms that would have allowed them to become more socially relevant. Instead, institutes continued to protect academic freedom since researchers “could afford not to apply for applied projects.” In a Humboldt orthodoxy, universities conduct basic research while institutes do applied research, as explained by the representative of a Norwegian granting organization:

The institute sector was developed in 1960s-1970s because we needed research on marine sector, transport, petroleum, etc. There was a view that universities could not cope with this kind of research... Institutes cooperate quite well with industries. And there might be a reason why universities are less connected to industries.

However, according to a university association representative, “institutes are in competition with universities for money and do quite well.” Although such competition puts new demands on universities, merging them with institutes and concentrating public funding reinforces academic centrality in Nordic societies. According to a representative from a Nordic cooperation organization, Finland and Denmark merged universities and institutes in order “to increase the quantity and quality of research.” A Finnish national-level actor suggested that “mergers and collaborations are important in a small nation because there are limited resources.”

Concentration was perceived as essential in countries where populations are smaller. As a Finnish university association representative wondered, “How many research-intensive universities can you support? If you look at the Netherlands, Denmark, Switzerland or the U.S., it seems to be that the amount of research-intensive universities is roughly one per one million people.” A quality assurance representative in Sweden made a similar observation: “Universities perform better because they don’t spread out their funding and they don’t have tons of scientists. They are really emphasizing excellence so they create really good environments, and they find a way to keep that excellence.”

As shown in Table 18, funding streams are here divided into four categories: basic, competitive, excellence, and strategic funding. Basic funding (some interviewees use the expression “block funding”) refers to direct allocations from governments to institutions. Although most funding streams include some element of competition, competitive funding specifically refers to a response-mode mechanism where external research grants are allocated to researchers through publicly-funded research councils. Excellence funding is part of a broader international move towards ‘research excellence initiatives’. The excellence funding stream is characterized by a systemic re-structuring of the research landscape through long-term and large-scale grants to research groups of an exceptional quality. Finally, the strategic funding stream encourages institutions and individuals to conduct research in priority areas as designated by governments or mission-oriented agencies. The perceived impact of the four streams is presented below.

2.1 Basic funding

Basic funding was initially considered as a single organizing theme, but over the course of the interviewing process it became apparent that the “basic component” (based on historical grounds, number of students or input measures) was perceived differently than its “performance-based component” (based on measures such as publications, citations and external grants). Although it was impossible to distinguish the two in the quantitative analysis, this section explores both separately.

First, the basic component was perceived positively in Denmark and Norway because of its stability and equitable character. According to a Danish government official:

It is important to have a funding system which is not one-sided; so we have a long-term, continuous and stable block funding for research into the universities. It is more or less the same amount in a three-year perspective, which means that institutions can plan and operate in another way than in the past where we only gave one year of budget commitment.

Unlike competitive funding given to researchers, universities can count on basic funding to adopt their strategic plan, maintain their infrastructures and foster continuity and diversity in research production. For a Norwegian system-level actor, “free funding can be used in a more strategic way” by universities. Universities in Finland became autonomous in 2010 and for a representative of their association, “The Government says that if we are doing well in terms of external funding, publications and credits, then we have funding. But they don’t tell us what kind of research to do.” Regarding the advantages at a micro-level, a Danish professor explained:

We are a small country and even though we are uniting ourselves with the rest of the world, we need more diversity in our research *per capita* than the large countries. You have a number of small groups and, if you don’t get anything from the Research Council, you should continue to receive some funding to hire master and PhD students and do some experiments.

The senior administrator in a Norwegian granting organization also reported that “in the humanities, block funding is important because [researchers] do not have the same tradition of applying for external funding.” Basic funding (or block-funding) therefore seems an equitable way to disseminate funding to more research groups and support areas receiving less external funding.

Negative perspectives about basic funding need to be treated cautiously. Comparing his country with the U.S., a Swedish granting organization representative concluded that “block funding should not be too large in terms of proportion.” For two national-level actors, basic funding would be a disincentive for Swedish academics to excel in their work. Other reasons motivate a similar answer from the representative of a university association. For her, basic funding has a negative impact because it is “determined by historical data instead on what the university wants to do in the future.” Moreover, the system would appear less flexible and the government’s control would impede institutions’ capacity to fulfill their mission. The same representative said that she understood that the government had to give assignments in research, but that the government should care less about how funding is used and more about institutions’ achievements.

Second, as noted by the senior advisor for a Nordic research funding organization, “There is a very strong tendency to take basic funding from universities and to make it competitive funding through mechanisms by which universities have to perform in terms of outputs.” Analyses reveal convergence in Danish and Norwegian actors’ perspectives regarding the positive impact of this performance-component on research production, especially in Norway where half of the interviewees mentioned it as an important factor. According to a university college faculty member who was also member of the committee that developed the system in Norway:

Each publication carries out a price tag. We developed a two-level system. Any researcher in Norway can propose or nominate the name of a journal or publishing company in the system. The most prestigious publications will take place on Level 2 (20% of all publications). That carries on average three times the amount of money coming from publications at Level 1. So there are big pushes to publish in the most prestigious journals and publishing houses... It was very controversial when it was introduced in 2007-2008, but it is very successful and was copied in other Nordic countries... And yes, the system has increase[d?] publications *per capita*.

Similarly, in Denmark, the research information system was perceived to be successful in clarifying expectations and increasing publications of quality research in international journals. A Danish national-level actor said that “the additional growth in block funding given on the basis of volume of research [was] a significant incentive for increasing scientific output and publications.”

Compared to other streams, the performance-based component may appear small but its effect is that of a signaling effect that is potentially inducing a culture shift in academia. A university administrator recalled that “For the first time, it made clear for the researchers that they were accountable for their research; it had an important psychological effect.” Beyond its financial impact, the performance component seems to use symbolic capital as an effective incentive. In Norway, an institutional-level actor recalled that, before 2003, “universities were given funding according to the number of researchers they had, so, the universities and researchers complained that once they were good or productive, they were not rewarded; the incentive-based financial model drives a lot of universities’ effort in research.”

In Finland, the Publication Forum and funding formula were also perceived as “good pressures” by five interviewed actors, though three other actors expressed a negative perspective regarding performance-based funding, and saturation was therefore not achieved. A faculty union

representative admitted that universities should be accountable but wondered about the meaning of effectiveness in the context of higher education missions:

Competition might be good if the rules are good... When there is a lot of competition based on publications, it might have side effects like questionable ethical practices. Focusing on the quantity is also a challenge... It is a form of economic Darwinism. If other institutions improve more than we did, we lose money. The logic here is that competition is a tool that the government is using in order to make the university sector more efficient. The part of this logic is, of course, that the not-efficient research dies out. This is called profiling. This worries me a little. It is not enough to be very good, you need to be better than the other one. If universities cannot compete in this new world, they have to give up something. Perhaps some universities might close some departments. Is it the objective pursued?

Finally, as explained above, there was a slight convergence in Swedish actors' perspectives regarding the negative impact of basic funding. It was, however, impossible to obtain convergence regarding both the positive and negative impact of a performance-based component since, at the time of data collection, the research assessment model was undergoing a reform process. Swedish interviewees indicated that the formula was complicated. One university administrator said that "It is impossible to understand this model even for people who work full-time to understand it."

2.2 Competitive funding

The theme "positive impact" of competitive (response-mode) grants given to researchers by research councils was saturated in the four countries. Unlike basic funding, which was perceived as having a more negative impact on Swedish research production, with some negative components of an otherwise positive part of the system highlighted throughout the discussion. As a senior university administrator contended, competitive funding is believed to be linked to higher quality research: "Of course, there is something good with it in the sense that the best research applications by the best scholars will be more funded than the others, and it generally drives quality." The impact of competition on quality was also important to a university board member who stated when interviewed that if competition is too small, "you would lose the edge." Finland has been in the process of renewing its research system, notably with additional competitive funding. In general, this was perceived as positive by the actors interviewed.

According to one government official, “Increased competitive funding represented a major instrument to enhance the quality of research in Finland.” His Norwegian counterpart also considered that “the RCN allocates funding for those who are the most performing so it has the most impact.” A Norwegian researcher said that “on the positive side, [competitive funding] attracts postdocs, creates dynamism, encourages the formulation of interesting projects and fosters inter-disciplinarity.” Competitive funding also improves quality by allowing research groups to hire staff and buy equipment for their experiments. According to a Finnish professor, “in natural science, you cannot really do your research with the budget from block grants because it only gives you your salary, computers, but no infrastructures.”

If competitive funding tended to be perceived positively, interviewees at the institutional level lamented the time it took for investigators to write application projects. For a Finnish professor in the health sciences, “The number of working hours for professor to acquire a unit of research funding seems to increase year after year.” Facing a similar trend, a Danish professor in the natural sciences reached the following conclusion:

I need to spend 10-15% of my time to apply for competitive research, and the acceptance rate is about 7%. So I have to do a lot of applications to get money. If I don't get money, I cannot do research. In my opinion, we are all doing “zero research” every time we write an application because I have a 7% hit rate on average. So, I have to write 20 applications before one is accepted. This is “zero time” spent for nothing, every time I do it.

A Norwegian professor in the natural sciences said her department asked her to apply for ERC grants but her response was that “I do not have the time to write these huge applications in addition to writing papers and supervising graduate students.” Another researcher also considered that, despite the large sums given, “the time invested in writing applications is worth more than the money obtained at the end.”

A final caveat achieved saturation in Sweden and relates to a “winner-takes-all” phenomenon (or “fat-car syndrome”) where the same few researchers are obtaining grants from multiple organizations. A professor in the health sciences made the following statement:

On the negative side, the most skilled researchers received an excess of money and there is a risk that you do not get the best out of that money. Unfortunately, often the winner takes it all; we need to be better to identify young talented people and support those. We have also to try to identify the areas of highest future potential and support those.

A representative from a granting organization agreed that “the system is not sufficiently diversified because many funding agencies often support the same type of initiative.” The result will be that some brilliant academics “will get money from all the agencies and will have more money that they can spend.” There would thus be an issue in terms of efficiency.

2.3 Excellence funding

With the exception of Sweden, where excellence funding was also considered strategic funding, there was convergence in participants’ perspectives regarding the positive impact of excellence funding on academic research production. According to a Finnish government representative, “one of the policies in order to get successful is the center of excellence.” A representative from a granting organization in Norway agreed:

During the last decade, new tools for research policies have been introduced, such as the Norwegian centers of excellence in order to increase the quality of research. You will find the best researchers in these centers. This instrument has stimulated research production... The two researchers in NTNU who got the Nobel Prize were part of a center of excellence.

There was near-unanimity in Norwegian interviewees regarding how excellence funding has solved two issues in the system, namely, the issues of scattered funding and pre-defined fields in competitive funding. One Norwegian professor remarked that “research had little focus and less funding” than other countries, while a doctoral student explained that centers of excellence “created a critical mass, it concentrated resources, so it created an opportunity to do something.” For a senior official in a university association, centers of excellence were “highly specialized yet could choose the topic of their research themselves.” Similarly, a Danish professor commented that the DNRF had been essential to support expensive scientific fields such as molecular biology.

Another saturated theme in Denmark and Norway concerned the “stability” of funding as a positive element contributing to research production. For a Norwegian institutional actor, centers of excellence are important because “they give funding for ten years.” For a doctoral student, this potentially means that “you can go towards more dangerous lands,” since the determination of excellence is not based on a single project. As one networking agency official explained, “research is not a linear path; in universities, it is important to give researchers time and space and it can be done through centers of excellence.”

Another element that was perceived as a core positive feature was the size of excellence funding. A senior official in a Danish granting organization explained how this stream had improved research quality in his country:

We invest important sums: 100 million DNK over ten years. The money gives the possibility to build-up an infrastructure, so you can continue to be an excellent researcher and you can hire administrative staff to alleviate the burden... If you were to look at these centers as one institution and compare them to the top-5 institutions in the US or Europe, you would see that DNRF performs as well as top institutions... We have no strategy except excellence. Yet, surprisingly, if you look at these centers in terms of spin-off, collaboration with private businesses and intellectual property rights, [centers of excellence] are actually the strongest knowledge builders for commercial interests. These centers have 20% of public patents, but the [DNRF] has only 2% of the money.

The analysis of excellence revealed a tension between *research quality* and *equity in funding dissemination*. A Norwegian senior university administrator recalled that “in the 1960s, everybody was supposed to be equal, so money was spread among everybody and you did not get enough volume.” Similarly, a student union representative explained that in Finland, the full potential of excellence funding was not achieved because the Academy of Finland “wanted to give funding to as many researchers as possible, so instead of five-year grants, they give grants for two years.” Excellence funding, in contrast, fosters quality by preferring larger grants to fewer groups.

While the funding stream is equitable in the sense that it does not pre-select fields or institutions, institutional-level Danish and Norwegian actors argued that it was neither equitable nor efficient to provide massive funding to research units that were already highly performing. In the words of a Danish professor in the natural sciences: “If they are already strong, why do we support them?”

One international-level actor perceived equity as a bedrock for diversity and science progress:

What about the renewal of the research? You only give to the ones who have already proven themselves and are running the international top layer. Where is the risk funds for the young generation who may have good ideas, but they have not proven themselves yet?

It is worth noting many actors perceived that excellence grants have a positive impact on groups’ reputation and symbolic capital.

2.4 Strategic funding

Finally, there was convergence and saturation in Denmark, Finland and Norway regarding the negative impact of strategic funding (i.e. research grants given to projects fitting priority areas as defined by governmental or industrial interests) on academic research production. According to a Danish university administrator:

First, the competition is not very intensive. Second, researchers, in order to get the money, essentially adapt their preferences in ways that are not meaningful. I think that many targeted grants are not really research funding but moderately hidden subsidies to parts of industry... Another thing is that in some strategic research programs draw a very blurry line between research and simple innovation R&D... Some of the consultancy that I have done for pay presented a higher scientific quality than a lot of the things I have seen passing for [strategic] research funding.

Strategic funding was viewed as causing a decrease in research quality. Government representatives aside, there was convergence between institutional- and other national-level actors regarding the decrease in research quality incurred by political steering. One Norwegian university administrator explained that politicians earmark funding because “it is not very glamorous if you are a politician to say that you gave so much money to some unspecified research.” The representative from a Danish networking agency argued that

The problem is that you have areas defined for political reasons and not so much based on evidence. Some years ago, Denmark was so impressed by Finland and Nokia, so we decided to have the same in Denmark. But nanotechnology never got big in Denmark because we did not have that kind of competences.

Similarly, according to a Norwegian university college representative, the danger with strategic funding is that “applied research becomes very short-term and often dictated by politics, ideology or business needs.” Unlike more traditional grants conferred by research councils, the soundness of the strategic stream was questioned. According to a Finnish researcher, “the process is not entirely transparent; it has not been an open dialogue,” while for the representative of a Swedish official in a networking agency, “it is always a bit problematic when you decide what the strategic areas are.” The opposite perspective was nonetheless put forward by a former vice-chancellor who said that “the Swedish Research Council and vice-chancellors advised the Government [on strategic research areas]” and that “it was not something a couple of civil servants chose by themselves; it was the result of careful discussions.”

Although utility is often a criterion for defining research quality, actors' perspectives regarding strategic funding highlighted the tension between these two parameters. Academics themselves might have been involved in defining strategic areas, yet participants perceived that this stream often implied political steering, and that political steering lowered research quality. According to the representative of a Swedish university association, "The government will always put money into things that seem important and are important, or things in which we can progress and come up with new solutions." In this vein, a senior government official from Norway felt it was sound for public authorities to use research and rely on evidence-based policy-making: "One of the reasons we have so much funding going to particular programs is that research needs to be used to solve different problems of society, such as health or environment."

Research utility actually appeared to be linked to the public support it could attract. A Danish professor in biochemistry recalled having succeeded in obtaining large grants when biotech became a priority and "the Government wrapped it into something more applied." A Danish government official agreed that "setting directions for thematic research prioritization... gave a boost to many of the preconditions for quality research like research infrastructures."

Only in Sweden was there convergence in actors' perspectives regarding the positive impact of strategic funding. The allocation of strategic funding in Sweden appeared slightly different from in the other three countries, for instance including some features of the excellence stream. A former senior government official described the program as follows:

In the 2008 Research Bill, we introduced the concept of "Strategic Research Areas" where part of the new money was given to a number of areas. The feeling was that the Government should not be too involved in defining research areas but that Sweden was lagging behind because of a lack of focus. We are a small country and we cannot cover everything. We have to define the areas where Sweden is and can be stronger. We introduced all together 24 strategic research areas. In each area, there were relatively large amount of money and universities had to compete to participate in that program... The task for university leadership was to define not what they are good at today, but what they have to do to be at the international forefront in additional activities in 5-10 years.

The initiative was therefore conceived as a way to both promote university autonomy, since vice-chancellors could disseminate funding based on their development strategy, and to counter a form of Matthew Effect (Merton, 1968) by encouraging institutions to focus on their potential rather than their past achievements. The program, however, was also characterized as inequitable because few strategic areas were from the social sciences and humanities, and because, in the

end, “it was a way to allocate 1.8 billion Swedish crowns to the most successful research universities,” as noted by a former vice-chancellor.

3 Summary

This chapter focused on the regulative pillar of Nordic HES, namely governance and public-sector research funding. First, governance included multiple intricate organizing themes, but the analysis nonetheless suggested that Nordic governments relied on external semi-independent (or buffer) organizations to implement their policies. These organizations had both the knowledge about higher education and the legitimacy to implement policies. Higher education institutions formally enjoy more autonomy, and laws, funding and mindsets seem to prevent the possibility of a more radical shift. Second, regarding funding, two themes cut across the four countries and the four funding streams. These themes are the importance of research funding being public and the concentration of any funding for research into universities rather than into businesses or public research institutes. Competitive funding was perceived as having the most impact and strategic funding the least impact on research production, basic and excellence funding being somehow in the middle.

My interpretation of these results is that funding streams seem to have the greatest perceived impact when they are consistent with core academic values such as meritocracy, diversity and universalism. In addition to a traditionally strong basic stream, granting a smaller premium to high-performers, either through a performance-based component or to competitive funding, would respect equity, efficiency and quality participants’ concerns. This interpretation also fits the analysis of the “governance” factor, in which public authorities were more positively perceived when they were believed to have knowledge about higher education or to rely on external organizations who possess such knowledge and legitimacy. Similarly, actors generally had a more positive opinion of steering mechanisms when they were considered legitimate and trustworthy. After having analyzed the cultural-cognitive, normative and regulative pillars influencing academic research in Nordic HES, the next chapter will explore relationships established between Nordic HES and national and international partners.

Chapter 11

Networking and Internationalization

The objective of this thesis is to analyze the perceived importance of six systemic factors in four Nordic HES. Chapter 8 revealed that academic traditions and societal beliefs were perceived to positively impact academic research production. Chapter 9 found little evidence regarding the impact of institutional differentiation, but concluded that the expansion of doctoral education and other temporary positions had a positive impact. Chapter 10 analyzed the impact of two other factors, namely governance and public-sector research funding. It suggested organizations, steering mechanisms and funding streams had a greater impact when they were considered as legitimate and trustworthy by the academic field. The current chapter will analyze the perceived impact of networking between academic and non-academic actors and internationalization. Both factors refer to relational systems (Scott, 2008) that generate social capital for academic actors.

4 Networking with non-academic actors

At the start of this thesis, it was hypothesized that one factor explaining the strength of scientific capital accumulation in Nordic HES was the top-down incentives encouraging academic institutions and private industries to collaborate. The thematic analysis partly supports this hypothesis. As shown in Table 19 below, the prominent perspective in Denmark, Finland and Sweden was that networking had a positive impact, mostly for reasons related to funding, knowledge exchange and improvement in education programs.

Table 19

Saturated themes associated to networking with non-academic actors

Denmark	Finland	Norway	Sweden
Positive impact		No impact	Positive impact
Change in attitudes		Change in economic structure	
Knowledge exchange		Knowledge exchange	
Improves education			
	Increases funding		Increases funding

Saturation regarding the global theme of networking was reached for transcripts of interviews with Danish, Finnish and Swedish actors. For the three Nordic actors interviewed, networking “is mostly a good thing” which contributes to both academic research and economic development. For an external university board member in Sweden, university-industry collaborations (UIC) are “definitely a strong factor” in explaining the highly successful research production in the country. If the impact on economic development can be easily imagined, a government official in Denmark stresses that:

In terms of knowledge creation, collaborations are a good thing not only [for] commercialization purposes, but also for scientific publications. Many of the private companies in Denmark are not only obsessed with patent and those kinds of commercial activities; they could be engaged in scientific publications in order to enhance or support those publications.

In Sweden, the representative of an organization funding UIC made a similar statement. According to a report made by the funding organization, collaborations would indirectly increase scientific publishing by providing a stimulating research environment:

When we evaluate our own programs, we see that collaborations positively affect the research production... There are effects in terms of the climate around those kinds of universities where business would be positively affected. Yet these are indirect relationships. There is no relationship between results and individual projects... What we need to focus on is the fact that purely academic results would be positive when you collaborate with non-academic actors in terms of publications, citations and also, access to funding and career advancement, those things that appeal to an academic as well.

The representative of another networking agency in Sweden made similar observations and considers that Sweden occupies a good position in medical and engineering fields partly because of the collaborations between academic and non-academic actors:

We have seen that, in fact, if you publish together with people from the industry, you get more citations. You're also getting connections to develop interesting applications. Then you are addressing a real problem. You are doing better science. That is one part of the scientific process. In engineering and in clinical medicine, it's obvious that you have to look at the needs. But, of course, in other areas like science, you should be totally free to think and not ask yourself what will be the use of your research.

Institutional actors in Denmark, Finland and Sweden were also perceiving collaborations positively. A Finnish professor in the health sciences explained the following:

Overall, my main attitude is strongly positive. I am in favor of being allowed to collaborate with commercial companies and I am strongly in favor of giving freedom of choice to research groups that would like to collaborate with companies, including funding from these commercial businesses. They would exchange funding for the knowledge gained by the research group. I am willing to trade my knowledge for the funding. I am strongly in favor of outsourced R&D; which used to be quite fashionable among some commercial companies.

Other participants were more nuanced, however, in praising networking between academic and non-academic actors. According to the representative of a networking agency in Sweden, governments should only encourage collaborations in areas where industry is reluctant to invest because of the risks. By sharing risks, government would not only lower the cost of R&D but also maintain a closer link between commercialization and basic research. The interviewee explained it as follows:

If you let the industry get too much control, there are people in industry that make strategies and ask governments to subsidize. That lowers the cost but it does not make the company competitive. Government money should be used by the company to invest in areas they would not normally invest because it is too bold.

4.1 Positive attitudes and knowledge-intensiveness

Before delving into the perceived impacts of networking, it is worth underlining that the positive impact of networking seems to be associated with a change in the structure of society. For actors in Denmark and Finland, UIC were explained by a change in attitudes within academia.

Comparing his country to the United States, the external member of a Danish university perceived that “old-fashioned opinions about capitalism, free research and stuff like that” are “changing as we speak, and I am sure that it is becoming less and less of a problem.”

Both in Denmark and Finland, changes in attitudes were associated with generational change, government intervention and the presence of external members on university boards. The administrator of a networking agency in Denmark reported that “Two years ago, the Ministry noticed that, although Denmark is a small country, there was too little collaboration from the national and regional sides in terms of clusters. So the Ministry for Science and Innovation made a national cluster strategy with a coordination from all partners.” The external member of a university board in Finland also considers that networking with non-academic partners is a trend

in the European Union, perceptible with the documents produced by Horizon 2020 and the ERC, and that this trend influences national policies that in turn influence local researchers. In a changing environment, universities are “putting programs on how to support scientists in finding business partners.” Universities would even have to “explain that collaborations are not forbidden; they are allowed and even desired.”

Secondly, according to the representative of a Danish networking agency, the academic research culture has undergone a generational change. She explained that “many young researchers are more interested in these collaborations” and that “they want to test their hypotheses and share their knowledge, unlike ‘classical’ researchers who do all their work behind closed doors.” A senior administrator in a Finnish university association concurred:

When I did my PhD in molecular biology, one professor took a job in industry and the other professors said that this professor had sold his soul. I rarely see this attitude anymore. Overall, it has become much more accepted. In Europe, we do our work with taxpayers’ money and they have a right to know that we are aware of the problems there are in society so, when we find something useful, we know where to bring it. We are not only looking at test-tubes, we [are] understanding the bigger picture.

Finally, the representative of a Danish networking agency considered the formal introduction of external members on university boards to have contributed to a change in attitudes regarding networking with non-academic actors. For her, external members were a “game-changer” that forced “Universities to open up, engage and talk with the society outside. The smart universities totally engaged and took companies as ‘hostages’ to push forward an agenda.”

It should however be stated that few interviewees supported the hypothesis regarding the positive impact of external members on university boards. Interviewed board members explained that they had a positive impact in challenging rectors and other senior administrators, supporting fundraising for research and setting up guidelines for evaluating academic activities. A Norwegian senior administrator agreed that some external members come from companies, but he said “somebody is not chosen because he is from a company, but because of his capacity.” Similarly, a representative from a networking agency in Sweden thought “it is good to have a board where there are good discussions from different points of view,” and that as long as the “right people” sit on university boards he did not believe “the prevalence of business executives on the board determines the research output.” His Norwegian counterparts also believed universities “need people who are able to see the big picture; but it depends on people and they

can come from inside the university as well.” At this point, it is therefore impossible to reject the null hypothesis regarding the impact of external board members on academic research production in Nordic HES.

Norwegian and Swedish actors, in contrast, associated the importance of UIC to the changing structure of the economy. A knowledge-based economy driven by knowledge-intensive industries would appear as a “mediating variable” in explaining the relationship between networking and scientific capital accumulation. The relationship, however, is at this stage strictly based on interviewees’ statements regarding the positive influence of knowledge-intensive industries in Sweden and the negative influence of a resource-based economy in Norway.

As mentioned in Chapter 8, research has been perceived as important in Sweden since the 1950s. As a government official explained, “Sweden has relied a lot on large exportations companies that have been, to a relatively large extent, research-based.” Sweden thus has a relatively long tradition of harbouring large-scale exporting sectors that rely on the knowledge produced by HES. A professor in the health sciences explained the cordial and productive UIC as follows:

Regarding science, medicine and pharmacy it is now recognized that it is important to make sure researchers don’t publish results until they have IP protection, patents filed. For example, we have open discussions with pharmaceutical industries and have trustful relations. It is my opinion that Sweden has been superior to any other country in the sense that academic research in relevant areas like that I am engaged in is well connected to pharmaceutical companies. The major companies are fundamentally based on the research done in academia. The attitude regarding collaboration with industry has changed dramatically.

A Swedish senior university administrator agreed that the presence of a knowledge-intensive industry has an impact on networking and he suggested that differences in the research production between Denmark and Sweden could be partly explained by the growth of the Danish pharmaceutical industries. In his words:

The Danish pharmaceutical industry, in the last 10 years, has grown by 61% in terms of the number of new employees, while the Swedish industry has gone down by 43%. The Danish pharmaceutical industry is now bigger in Denmark than in Sweden. This connects to research since medical and pharmaceutical fields are very strong in publishing, so I think it has been very important for research in Denmark. Also, part of the American scientific society is co-financed by the military sector. If you look at the budget - the federal budget of research - half is military. Because if you have to be the strongest

nation in the world for military, then you also have to have the strongest high-tech industry. So you have a lot of projects. So that's the American way of going around.

For this interviewee, the use of new knowledge by national industries would therefore contribute to academic research production. In contrast, networking with non-academic actors would have little impact on research production in countries where the natural or manufacturing sectors drive the economy. Interestingly, Norwegian actors' perspectives converged regarding the undermining impact of a less knowledge-intensive exporting sector on their academic research. A university professor also suggested that, since Norwegians are "backed up by wealth and good economy, [they] do not need to be that 'clever' and to compete." For these two interviewees, a rich country building its wealth on natural resources would not necessarily encourage its population to undertake long university studies and compete in highly-specialized areas more connected to academic research. The challenge for academia would be that Norway counts very few large private companies outside the natural resources sector. The few knowledge-intensive enterprises would be too small to support massive investments in partnerships with academic actors. For the representative of a Norwegian university association:

There is a challenge because of the economic structure and the business structure in Norway. We have very few really big companies that can act as motors for private sector research. The private sector is not doing so much research, partly because of their business structure. We have few locomotives and a lot of small firms that don't have the muscles to invest in a long-term perspective R&D (that would pay in 20 years). It is not that universities do not want to do it, but there is a challenge for resources.

The Norwegian economy is largely driven by an oil sector that has enriched the country and greatly contributed to the welfare state. Comparing Norwegian and Swedish economies, a professor in a Norwegian university college said:

Norway is the richest of the Scandinavian countries so that makes us a little lazy... Young people are less encouraged to enter into research. We believe in the value of science, but if you look at the Norwegian economy, 90% of the businesses are SMEs. Norway is very dependent on raw materials or semi-manufactured goods. Sweden is completely different: they have big international competitive firms; they are very entrepreneur-minded and innovative. Denmark is the same. They are also both members of the common European market (so is Finland). Dependence on gas in Norway made us a little lazy.

The representative of a networking agency also mentioned that the Norwegian government was considering implementing a tax-reduction scheme in order to encourage a larger pool of

enterprises to invest in academic research project. Referring to the government, she said that, “They see that they need more new companies in; not the same companies doing almost the same projects over and over.” It therefore appears that the impact of networking (as a form of social capital formed through partnership with private actors) on scientific capital accumulation is mediated by the broader economic and cultural context, namely the attitudes of academics towards networking with non-academic actors and the level of knowledge-intensiveness of the industrial sector.

4.2 Networking would contribute to research through ideas, education and funding

After having understood in what context networking is perceived to have an impact on research production, it is important to pay closer attention to the mechanisms perceived to explain that impact. The explanation that achieved saturation in Denmark, Norway and Sweden was the concept of “knowledge exchange.” As explained above, according to some actors interviewed, sharing knowledge across sectors would increase its production. The representative of a networking association in Denmark said that, “it would be difficult for SMEs to fund research since they don’t even have their own R&D department.” She then explained SMEs could enhance academic work by providing an application space where academics can develop projects or validate hypotheses:

Normally, a researcher doesn’t have many opportunities to test his conclusions. He might have some competences for dialogue and interaction, but it would normally be a smaller population with which he interacts. So the cluster provides more companies to test or validates his findings, or develop new innovation projects. It creates a better setting for research and find a broader scope for testing and developing new research.

This perspective was shared among other actors within the Norwegian and Swedish HES. A faculty union representative in Norway considered that networking “can bring ideas from the university to the private sector and from the private sector to the university, trying to find the biggest challenges in some industries and how they can be solved through basic research.” Networking would thus enable involved researchers to be at the forefront of societal problems and to develop new ideas for their research projects. The representative of a networking agency made the following observation:

[Researchers] get ideas they would not have gotten without collaborations. So it is a purely academic way of building on your career. It is not always easy to foresee before you enter into collaborations. It is this kind of thing we try to impose on people we speak to, because once you try, you never want to go back to purely scientific research without any kind of extra-stimuli because it is a lot more rewarding.

Networking would be academically and economically rewarding since it would generate research ideas and would reinforce a division of labor according to which academics, who can be inspired by practical issues, would conduct research projects without thinking about commercial output, and industries would use research results to develop concrete applications. For a Danish university board member,

[Academics] should develop without thinking to commercial benefits. They should develop top-notch research, ideas and technologies. Then, of course, once they have developed, they should be willing to work with the industries. It should not be their task. To illustrate the point, neuroscience has 600 people inventing and trying to develop opportunities from the research. How can you ask a professor to do the same? It would be a complete waste of time and energy...So there can be a lot of influence in terms of ideas.

Secondly, networking can contribute to academic research through an improvement of the higher education being provided. This perspective seems to be shared by multiple actors in Denmark, Finland and Norway. These countries have for instance established “industrial PhD schemes” where students are hired by a company and enrolled at the university at the same time. As a senior government official said, “We also now have new types of PhD positions: industrial PhD and public-sector PhD. The business or the public sector pays half of the cost and the PhD does research work on a theme that is useful for the enterprise/organisation where the candidate is employed.”

And even outside this scheme, students in Denmark in engineering or health sciences collaborate with industries or clusters during their PhD studies. As the representative of a Danish networking agency said, “We support some companies regarding the industrial PhD scheme, but I must say it is not the most typical form of collaboration between business and research. It is more a classical way where you would need someone with a PhD to do some of the research work.” In Denmark, the connection between academia and the world of work is part of the quality assurance evaluation and cuts across graduate and post-graduate programs. A representative of an accreditation agency explained:

Early in the quality assurance system, we had this focus on external relations and programs' relevance. In 2007, we were among the very few including a criterion based on programs' relevance for the employment market. No matter what program were evaluating (e.g. philosophy, engineering or language), we had to verify that the program was relevant and had close links with employers in that area.

Some actors thus perceive a potential for UIC regarding the quality and relevance of post-graduate education. A Norwegian professor in the health sciences saw it as a positive thing when his PhD students obtained funding for their PhD project through collaboration with pharmaceutical companies. Another professor in communications and journalism mentioned that the focus of his institution was to find placements for students in local businesses or local government organizations. He also mentioned inviting external partners to give lectures to students. As it was explained in Chapter 8, the Nordic HES train an important number of students and, for this professor in the natural sciences, "My colleagues and I are much concerned about the future of our students and people in our field, so to collaborate with business partners brings us together, and it creates possibilities for some of us to find a job afterwards." For another institutional actor, networking benefits to students who get an opportunity to work on "real-world" projects and develop network.

Saturation in actors' perspectives regarding the importance of networking for education was not reached in Sweden. As one senior university administrator commented, "You need science, you need competences, but more importantly, you need education. And I think we have a little missed that in Sweden." It was actually suggested by two other interviewees that massive investments had largely supported research production while neglecting the training of future researchers.

Thirdly, while the literature on academic capitalism (e.g., Slaughter and Rhoades, 2004) emphasized the importance of networking in raising funding for academic research, the portrait appears slightly different in the Nordic countries. As explained by a senior university administrator, "Historically, industries in Finland have not been paying universities; it is different from other countries." Yet academics can increase research resources by partnering with non-academic actors since UIC are supported by public organizations. The same interviewee said:

In Finland, collaborations with private companies have been funded by TEKES. Finland invests a lot in R&D, and through TEKES goes a lot of money for academics to do

research with industry. There are also pressures for universities to become innovative and help the new Finnish economy, but industries themselves prefer to ask the government to fund innovation rather than do it themselves.

In Sweden, the representative of a networking agency explains, with the block sum invested by the government in the 1990s, his organization is able to fund networking activities between academic and non-academic actors. Enterprises do not have to spend monetary resources, but they are required to contribute the equivalent of 50% of the costs of the project in-kind, such as equipment, services and working hours. As he said, “Business usually co-funds in-kinds. They don’t participate with cash funding usually, but with their own time invested in projects. So in terms of the cash that’s 100% on us, but the industry participation is important.”

The institutional actors interviewed did not oppose monetary investments from private sources, but strongly emphasized the importance of preserving academic freedom. One Swedish professor who also held an administrative position made the following comment:

There is also funding coming but, very often, that funding goes frequently to projects where there are also engagements from people in the industry. We are positive to have grants and donations from industry as long as it does not prohibit us to do whatever we want to do. The industry must of course never dictate what we are supposed to do and we publish our results wherever we want.

A Finnish professor admitted some companies attempted to be directive, but that he did not mind as long as he could use that side money for other research projects. As he exclaimed, “Funding is always a possibility! It is like a lottery, if you never try you never win. If you keep doing this, as a whole you win.”

In a context of positive attitudes and a knowledge-intensive economy, networking between academic and non-academic actors therefore appears as a form of social capital that can be converted into cultural capital (in the form of knowledge exchange and education) and material capital (in the form of funding and other resources). Although it did not reach saturation, some actors in Denmark, Finland and Norway suggested that the social capital based on UIC was not automatically converted into scientific capital, especially when it was perceived that the industrial and academic fields were competing for the same output. For a Norwegian institutional actor, “There are conflict situations regarding patents and publishing. Sometimes, the partner does not want the researcher to publish because it would reveal company secrets.”

Government schemes may also increase tensions between the two fields when the focus is solely on industrial activities. For a former senior administrator of a funding organization in Finland, it is problematic that TEKES is under the responsibility of the Ministry of Employment: “They do not really understand the role of scientific research for innovation. They only look at industrial activities and the collaboration between universities and industries.” Focusing on the economic output might therefore enter into conflict with research production and may discourage academics from engaging in such activities. The representative of a Danish networking agency explained as follows the challenge facing cluster secretariats that seek to encourage university researchers to participate in joint-projects with industry:

They have problems in engaging researchers in projects. They offer millions of crowns to researchers for a project, and beg researchers to take it; the researcher takes it and sometimes does not give anything back to the project. So it is a problem of engaging and providing incentives. I thought it was the government’s fault in the sense that they reward professors based on publications. So [for researchers], having a lot of publications is better than collaboration with other organizations.

5 Internationalization

Internationalization is the sixth and last factor tested in this study. It is defined as the relationships between individual, institutional and national actors across countries. For all interviewed actors, internationalization was perceived as one of the most important factors in promoting academic research production in the Nordic HES. Moreover, as shown in Table 20, a deductive thematic analysis revealed convergence between actors’ perspectives regarding three of the organizing themes related to international activities: international collaborations between researchers, the recruitment of foreign scholars and European funding.

An inductive thematic analysis also revealed that three facets could be interpreted through the different benefits they generate for academic research production. The internationalization effect can therefore be broken down into four benefits: ideas, resources, status and opportunities.

Table 20

Themes related to internationalization that achieved saturation in Denmark, Finland, Norway and Sweden

Global themes	Organizing themes
International activities	Research collaborations Recruitment of foreign scholars European funding
Internationalization effect	Positive impact Knowledge exchange Resources Status Opportunities

Whether it operates at the institutional, national or international level, internationalization is a core component of academic research production. Although the four Nordic countries are not internationalized at the same level, an international-level actor noted that there is nonetheless an “internationalization effect” in all of them promoted by a variety of international activities.

There is a sort of internalization effect. It is very difficult to pin-point, but it is there. It appears when foreign students come to the university campus, just hang out and participate in the classes. It appears when Swedish or Finnish scholars go abroad and meet other colleagues. It is there when you have international collaborations even if you don’t travel, but just communicate and track with peers abroad. There is something here that stimulates the human mind and human behaviors. Essentially any funding organization that has at least some interest in collaborations would probably say the same thing.

For a Finnish professor in the natural sciences, internationalization “is not only useful, it is essential. All my work is tied to international collaborations.” Later, this professor said that “it is known that people who have international collaborations publish more articles in better journals.” For a Danish national-level actor, internationalization encourages the use of English and, consequently, access to the science produced globally. And, for a Finnish researcher, international networks multiply the number of publishing opportunities:

When you have these networks then it is easier to contribute to internationally-edited volumes and comparative analysis, so there are much more opportunities to publish than before. And to publish now refers to peer-review journals rather than publishing monographs in Finnish.

Internationalization is not unique to Nordic countries, but in the specific Nordic context, international networks, exchanges and funding might compensate for a small population size. As

it was explained by a senior official in a Nordic cooperation organization, “We are five small countries, so it is important to get new contacts and new networks because, when we do it together, it is easier and we have a greater impact.”

If Nordic cooperation is perceived as an effective political instrument, it is worth noting however that it is not perceived as being particularly useful for promoting research production. First, the level of research funding is relatively small compared to the European funding sources, and even compared to national research funding. As noted by a representative of the Finnish government:

If you compare the figures, the funding from NordForsk is not for the research activity *per se*, but to promote collaborations. It is a great difference. ERC and Horizon 2020 are huge in comparison with the grants that you can get in smaller nations. So it is very advantageous in comparison to Nordic funding. You cannot compare a scope of European research funding with a scope of Nordic research funding.

Internationalization thus extends beyond Nordic borders to compensate for their smaller size. As the senior administrator of a university association explains, “There is an increased understanding of how it is important to bring in the expertise because we are a small country.” A Danish national-level actor similarly asserted that, “since Denmark is a small country, we already have a lot of collaborations with partners abroad.” Internationalization brings expertise to the country, but it also allows researchers in a specialized field to connect with other researchers. As one Finnish doctoral student explains:

I think in general that [internationalization] is a positive development especially because Finland is a very small country. In some fields, they might have only one researcher in, so it is obligatory for them to have these connections. These kinds of “opening up” are becoming more popular. It’s a good idea.

Scientific fields become increasingly specialized globally, but in countries with between five and nine million inhabitants or with five universities (in the case of Denmark), it is described as critical to be able to go abroad. One researcher in Norway explains how in his specific field of marine ecology, international conferences may allow many more scholars to connect compared to Nordic conferences:

In Norway, it is small. It is a microcosm and one realizes it while going to international conferences. I went to the Conference on Marine Ecology in Quebec City and there were more than 2,000 researchers. That is four times bigger than what we find when we go to big conferences in Norway.

5.1 Ideas

As mentioned above, given the rapid expansion of knowledge, scientific fields gradually become narrower and more specialized, and it not unusual for a professor to be the only expert in a sub-field in one university and, in some cases, in the whole country. In that case, it is important for the institutional-level actors interviewed to maintain relationships with researchers abroad to share knowledge and methods. A Danish professor in the natural sciences explained that international collaborations compensate for the size of his department:

I like it because it brings new ideas and new perspectives on the ideas that I have myself. We are a very small department and, in some cases, groups count only 1 or 2 people. In my field, we are 2-3 staff members, which limits what we can discuss. We can meet on a daily basis and we can also discuss the ideas we have, but external inputs are very welcomed.

International collaborations also stimulate the exchange of ideas, data, theories and methods, thus encouraging new areas of investigation or new approaches. As a union representative in Norway explained:

Two brains working together create a synergy that facilitates research. Research does not mean you sitting alone in your office. You can do it and, if you are a genius, something will get out of it. But if you work together with people from different environments, different traditions, different universities, will bring your research forward.

This theme of idea exchanges also includes the fact that academic research is advanced when researchers feel challenged by their peers. For a Finnish researcher, it is important to “share your data” and have “intellectual exchanges based on different readings and discussions in various countries.” A representative from a Swedish granting organization explained that collaborations encourage Swedish professors and their doctoral students to challenge their perspective and communicate in English:

At times you need an irritant, somebody who comes and tells you that there is a different way to do things. This forces you to think about your *modus operandi*. And of course all the knowledge that “outsiders” bring with themselves is excellent for doctoral students. It is very enriching, because we speak intellectually different languages, even if we communicate in English. This stimulates research.

5.2 Resources

Beyond the exchange of ideas, internationalization brings very concrete resources that are perceived very positively for the development of science. Resources are abstract enough to achieve saturation, though it is worth noting that resources were understood as either equipment (material resources), funding (financial resources) or competences (human resources). First, regarding material resources, a Danish professor in the health sciences explained that twenty years ago his field was not well recognized and so did not attract the necessary funding to build equipment. His research group could, however, rely on the resources of colleagues in Germany where the field had achieved higher status:

We collaborate with a group in Germany and we can have access to large facilities we could never afford here. Twenty years ago, we did not have the recognition as a field so we were relying on other people's facilities. We collaborated with them for 25 years and have student exchanges. It was inspiring and rewarding in terms of experimentation.

And even considering the level of funding invested in academic research, his colleague from the natural sciences asserted that, without an international network, he would not have been able to access beam time at CERN. This facility is of course a very specific example showing the need for nations to pool efforts together to further the advancement of science and make way for breakthrough discoveries:

CERN was initially constructed because it was understood that no European country could do this on its own. So all European countries pooled together to run this facility, and one can apply to go there. It works very well. It would be completely excluded to have such facilities in Denmark. CERN has one billion Swiss Francs per year; it would be impossible in Denmark.

Benefiting from equipment abroad was also perceived necessary for the director of a Danish innovation network. For her, biotechnologies require a variety of equipment that might not all be found in a country the size of Denmark. Providing funding for graduate students so they can make their experiments abroad was therefore positively perceived:

Biotech people have different test facilities so specialized that you cannot find them all in Denmark. So the cluster helps young entrepreneurs and PhD students to find the right kind of test facilities and provide them small funding so they can go abroad. Internationalization also helps to find the right test/validation facilities.

International networks are also important because they can facilitate funding. An international project enables the pooling of financial resources from different countries and, as explained by a Finnish researcher, the development of more ambitious projects:

Also, funding opportunities are larger, so you are able to apply for national funding from various countries. Again, international networks are highly appreciated and it can be considered as an asset for international funding.

In fact, European funding was a sub-theme that achieved saturation. A Finnish professor explains that his country was largely dependent on European funding sources because of the money it brought, but also because of the way it promoted other forms of internationalization, such as student mobility and the recruitment of foreign scholars:

We are also depending on EU funding, which automatically brings you together with the international community. You get money to hire somebody who is not from your own country. Then students have to spend a short period of time in some other institute. When you are a member of this international community, you get funding targeted for international students and then, if you are successful, you get a lot of students who have an interest to come.

In addition to the opportunities it provided, European funding was perceived positively because it consists in important sums for a relatively long period and, in the case of European Research Council grants, that are “open.” Compared to the “seed money” provided by NordForsk for example, European funding is considered as huge influx.

A Danish professor explained that funding opportunities provided by the European funding organizations were very attractive because they “represent a lot of money” and they allow professors “to employ few postdocs and several PhD students.” For a national-level actor in Norway, European funding is an important tool to promote excellence because it forces researchers to compare themselves to other researchers in Europe, thus potentially boosting research quality:

EU funding is attractive and it is a tool for excellence. I don't know which of those are most influential. I would guess the EU funding has the most effect because it is for all institutions (including smaller universities and universities colleges). All institutions are also challenged to apply for ERC, Marie Curie, etc. In the future, EU funding will be a main driver for us because it is not just a question of being good in doing applications, it is a question of academic excellence because you are now competing on a European level.

Unlike the preceding Framework Programs, the new framework of Horizon 2020 was considered by a few interviewees as burdensome and orienting research in pre-defined strategic areas, funding from the European Research Council was considered open and solely based on excellence. For a Danish national-level actor, “ERC is much less administratively cumbersome [than Horizon 2020]. ERC is more prestigious because it is excellence-driven and curiosity-driven.” As it was explained in the chapter on PSR funding, funding from the Research Council of Norway (RCN) was sometimes perceived as too difficult to obtain and as encouraging research in specific areas. In that context, ERC funding was perceived by one Norwegian national-level actor as complementing RCN funding by offering funding opportunities for curiosity-driven projects:

What I like especially from the ERC is that, when they give out funding, they look at what is best and then give money. In Norway, there is very little money for individual researchers, most money will go to programs. I think the ERC has done what the RCN used to do. When I first applied in 1994, it was much easier for an individual doctoral researcher to get funding.

In addition to material and financial resources, there was strong convergence between actors’ perspectives on internationalization as a means of increasing the level of human resources, such as skills, expertise and human resources. Even when there is no physical mobility of individuals, research collaborations allow scholars to pool skills and competences together and build a stronger team for a research project. As a Norwegian researcher explains, “if I lack competences in statistics, I will get them through my colleagues.” A Finnish professor shares the same perspective and is part of an international network where the expertise of different research groups is combined for greater results:

We cannot know all methods and have all the know-how. In a project, we have mice from Japan, structural 3-D analysis with a Spanish group, we did part of the study with a group from Harvard; a similar protein was found by a French researcher, and he came to do a postdoc here.

International collaborations allow researchers to work with those who possess the cutting-edge expertise in their field and thereby to increase the quality of their work. A Norwegian professor explained her collaboration with an American professor as follows: “The reason why he sends [stem cells] to me is that he is one of the leading researcher in this field and he knows that my model is probably the best in the world.”

For the Nordic countries, research collaborations with colleagues abroad allow researchers to pool together ideas, equipment, funding and skills. Yet when the global theme of internationalization was brought up during the interviews, many actors at different levels from different countries agreed that recruiting doctoral students, postdocs and professors from abroad contributed to an increase of academic research production because of the knowledge they brought and the work they helped realize. As a senior university administrator from Denmark put it, “All kind of internationalization can happen by having foreign scholars, students and people with expertise.” A senior government official in Norway also praised the exceptionally high proportion of foreign doctoral students in her country:

When it comes to doctoral students, Norway has a lot of international students. Two-thirds of those completing a doctorate in technology in Norway are foreigners. And, overall, one-third of all doctorates in Norway are foreigners. The reason is first that they are very well paid. And we think this is very positive.

Without explicitly making any causal link, a Danish representative from a granting organization noted that, in centers of excellence, “more than 60% of postdocs and more than 40% of PhD students are international” and that most leaders also come from abroad. A Norwegian researcher who was from another country suggested that the highly mobile researchers who prefer to work in the best environments also tend to be more ambitious and possibly more dedicated to their research:

Among my colleagues, there are 12-13 nationalities. And there are benefits to welcome people who come from elsewhere as this creates a dynamism. Generally, those who move are those who want to do research the most, unlike those who prefer the comfort. It's very dynamic and interesting.

A postdoctoral researcher in Denmark also noted how dedicated international postdocs are. She explained that “there is a whole industry to hire Chinese postdocs to do contract research here because they are willing to work like maniacs for limited-time period while most Danish people would never do so.” And then she considers problematic that “it is actually pretty rare we are able to offer these postdocs a position afterwards.”

It was indeed noted by many actors that, although recruiting foreign scholars is relatively easy, especially at the doctoral or postdoctoral level, most of them tend to leave the country after their research stay. According to a Danish university administrator, it is expensive to train a PhD locally and it is “cleverer to simply recruit internationally,” though he noted that many PhD and

postdocs leave after their stay. According to interviewees, some foreign scholars leave because of weather conditions, language, or because “there is a cap on what you can offer as a salary for top professors,” or because “Universities here don’t function in the same way than American universities, in terms of resources available.” Other foreign scholars would stay but it is hard to get a permanent position. As a researcher from abroad who worked in Norway stated, “people do not stay and their skills are lost after three years; they should be able to stay but it’s not done yet.” Yet even if they are paid by national resources and leave after a short-term stay, a Norwegian government representative believed there is a benefit to having many PhD students graduating from Norway in terms of promoting their educational system and values:

So they had full-pay for four years and then they leave. But, so far, our policy has been that this is part of the global knowledge exchange. When they do their PhD in Norway, they do research, they influence the research environment and, when they leave, they take our knowledge out in the world, they have this background so they have connections. In general, this is a very positive thing.

Two institutional-level actors from Norway and Denmark explained that students who had worked in Nordic universities and then had returned to their home country maintained relationships and contributed to an international network favorable to academic research production. The Norwegian professor said:

I keep in touch with the best of them and we continue to work together. These guys are clever and I have the equipment and the money. So when they are at an early stage in their career, it benefits them to work with me since we can run a big experiment in a week and they can analyze the data and go back.

In short, international collaborations allow the pooling of human, financial and material resources for research projects, while international funding provides additional financial resources and international recruitment expands countries’ pool of knowledge and expertise. All these international components also appear to increase the status of researchers, institutions and countries.

5.3 Status

Status refers to the symbolic capital generated from being associated with prestigious researchers from other countries, obtaining funding from international sources recognizing your work as of

superior quality, or attracting scholars to study or pursue research in the institution or the country.

European funding is both a “prestigious” and “powerful” instrument because it allocates large sums to projects considered to be scientifically excellent. As one Norwegian institutional-level actor explains, “European grants are very prestigious and give prestige to the receiving universities who are very happy.” Beyond the size and the fact that grants are given to the best researchers picked from a larger pool of candidates, it is interesting to note that national regulative frameworks encourage universities and their researchers to apply. In the four countries, some parts of the basic funding given to universities is based on external funding, but there seems to be a greater push to attract European funding from the Norwegian public authorities. For instance, the representative of a Norwegian granting organization stated that they have to motivate researchers to apply because they felt that Norway was not receiving its proper share of European funding:

In the last long-term plan for research, we receive quite a lot of money to mobilize researchers in participating to Horizon 2020. Norway pays a lot to be part of Horizon 2020 because it is not a member of the EU. And we have to get something back for this money.

Beyond the prestige of funding, internationalization seems to also increase the visibility of researchers, their institutions and countries. For researchers, international collaborations increase the number of citations. A national-level actor from Finland, for instance, cited reports by the Academy of Finland and stated:

That is true [it increases the number of articles] and improves the quality because there will also be another perspective and a broader discussion based on that. There are reports by the Academy of Finland where the citation indexes are compared according to institutions involved. The difference was remarkable: when researchers from another institute are involved, the citation increases a lot.

An academic union representative suggested that it is indeed the large number of international collaborations that has allowed Sweden to become visible in the global scientific community:

If Swedish research has not become stronger, it became more visible. Sweden will remain a small country, but something about the Swedish society is interesting to others and that is what we try to report. We want to be part of the international research community and do research that other people will value. It is a contribution to an international discussion.

If international collaborations can enhance individual researchers' status, partnerships between higher education institutions can also enhance their status. In Sweden, a senior administrator explained that his institution had built strong strategic alliances with Belgian, Dutch and German institutions in order to facilitate EU funding, apply for ERASMUS programs and lobby international organizations. The same institution was also part of a global network that facilitates institutional learning and serves to certify the reputation of the institution. And whether collaborations occurred at the individual or institutional level, it made countries more visible internationally. As this Finnish professor explained:

In general, internationalization makes Finnish science more known and the collaborations are strengthened by having those kinds of activities where people are engaged with the Finnish science. It is also a method of measuring the Finnish national quality and standards with the foreign scholars.

Internationalization is thus perceived as a way of making local science known abroad. It is also described as a way of increasing one's reputation locally. In that sense, it is interesting to note how international collaborations play into academic competition. For example, a postdoc in Denmark suggested that "One not so recognized aspect of international collaborations is that those people that you collaborate with are usually not those who could become your competitors for positions." Any collaboration is therefore beneficial, though it remains riskier for a young researcher to share data, publications and reputation with a colleague against whom he or she might have to compete in the near future.

Young researchers who go abroad can learn new methods and theories, participate in other research projects and develop a network. Researching abroad is also perceived as a way of enhancing one's status back home. A Finnish national-level actor stated that, "There is a tradition that, after their doctoral dissertation, the most ambitious young doctors would go abroad, in the US but also in Canada." And even when one has become a professor, international networks remain important because, as one Finnish professor put it, "You need to be a strong part of the international community, so that everybody respects you, and get your shares in everything, which will give you a major role in Finland." The same logic applied to institutions for a Norwegian national-level actor: "If you want to avoid being a small regional university, you need a lot of international collaborations."

Internationalization brings status because actors become known abroad and can compare themselves with international peers. This also gives them a head-start when competing locally. It should also be mentioned that international recruitment was perceived by some actors as a way to compensate for a tendency in universities to hire those they trained. For the representative of a Norwegian university association, “people in Norway now have to compete internationally for positions nationally” because it secures “fair and meritocratic recruitment.”

5.4 Levels of internationalization

There was a visible convergence between actors’ perspectives on the benefits of internationalization. There was divergence, however, in actors’ perspective regarding the level at which international collaborations should be initiated. For academics and the national-level actors representing them (e.g., staff unions or research councils), a bottom-up approach to internationalization made more sense because only academics know who are the best researchers in their field and who possesses the resources needed for research projects. A Finnish professor lamented the fact that governments and institutions demand international collaborations rather than supporting what this professor considered to be more meaningful collaborations:

They over-rate the number of collaborators. We all know that having a single good collaboration can outnumber in utility a large number of weak ones. One should not be only looking at the number, but more at the quality of the collaborations. Indeed, it is very important for researchers to have full freedom to choose their collaborations, and the organizations supporting us should facilitate our search for them; they should give us carrots rather than pre-requisites.

For the representative of a Swedish granting organization, institutional partnerships have little value for science because they are not based on researchers’ research interests:

I don’t think that administrators should initiate anything. They should know their place, they should be there for us, researchers. But very often the reverse is the case: we, researchers, are expected to do what administrators have cooked up. To give you an example, there is an agency that has set aside funds for research collaboration with Saudi Arabia.

A top-down approach was perceived as either constraining or facilitating in the interviews. For a senior university administrator, partnerships allow institutions to share their experience and expertise and promote institutional learning:

So, for instance, we have quite a lot of partnerships with Stanford University; we have learned quite a lot from them, we were looking to them recently, we are looking at the

MOOCs for instance. By looking at MOOCs, we also learn about how people learn. We learned from Stanford planning from unplanned meeting when building our campus. We moved spaces so we can create open space for both for student and for scientist.

For a Swedish government representative, these partnerships are a way to handle global competition. In a logic of symbolic capital accumulation, this actor suggested that Swedish institutions were increasingly establishing selective cooperation agreement with prestigious institutions abroad, and once the partner was found, areas for collaborations had to be elaborated:

And the global competition is increasing. One of the way to handle that is to go through partnerships. For a number of years, many institutions in Sweden got very broad range of agreements, now they are a bit more selective. The best Swedish universities should really try to partner with the best universities abroad and gradually, on all levels, try to define the areas to work on.

Partnerships can also be established at the national level between countries that see an interest in exploring a specific area. A Finnish national-level actor used the example of vital energy research to show how research in strategic areas can be forwarded by these types of partnerships:

It is very helpful for the research community because if they have good partners in areas qualified as high priority, there is a possibility to make that kind of collaboration. Like there has been a program with research funders in Brazil concerning the energy sector. It has been very helpful for researchers in Finland working into vital energy research and they could compare with partners in Brazil who use different programs, ideas and materials. Those are unique possibilities to support international high-quality collaborations.

Without specifying with whom academics should conduct research, the top-down approach at the national level includes a requirement for either international funding or international collaborations. For instance, in Finland, a senior university administrator explained that some criteria for a part of the basic funding to universities “are about publishing in foreign journals” and that, in 2010, the Ministry of Education and Culture released its internationalization policy for Finnish academic research.”

If institutional constraints to orient international collaborations were perceived somehow negatively by academics, there were at the same time favorable opinions towards support for collaborations established in a bottom-up fashion. For instance, a Norwegian professor said that he had a hard time establishing partnerships because he did not have sufficient resources:

In my group, it is a lack of resources from outside that prevents international collaborations. You need a group that, at the time when it is right, you have the right person to undertake the collaboration. But it really depends on us. And it would be a way forward to have these collaborations.

In short, although it is not clear at what level it should occur, the convergence regarding the positive impact of internationalization appears obvious in the four Nordic countries. International collaborations and recruitment seem to contribute to international networks, which in turn provide opportunities for knowledge exchange, publications and funding, as well as increase human, financial and material resources for academics.

6 Networking between academic actors in the same country – An omitted factor

The two factors examined in this chapter relate to the conversion of social capital into scientific capital. At this stage, findings support the hypothesis that collaborations with non-academic partners and international partners, whether academics or not, does in some contexts contribute to scientific capital accumulation. That said, it was suggested in an expert interview that the specific characteristics of the partner matter less than the simple fact of collaborating in a research project.

Considering the small size of Nordic countries, the representative of a funding organization in Finland considered that it is essential for researchers who still work alone in their office to “share their expertise with similar groups, either in Finland or abroad.” Similarly, according to a Finnish researcher, international events have a positive impact in that they allow Finnish scholars to meet one another. She explained that:

One obstacle, and it is very bizarre, is that we do not know what our colleagues in the same corridor are doing. We don't have the culture of doing seminar, weekly discussion among the scholars working in the same research environment. So it is our job to go in international conferences to meet each other. But it is not always necessary to build international network because some interesting colleagues could be found closer.

For the representative of a Danish funding organization, centers of excellence have indeed established working environments so conducive to national collaboration that “they can compete without international collaborations.”

Considering the deductive nature of this investigation, it is not possible to test a new hypothesis, such as the impact of networking between academic actors working in the same country. This should, however, be proposed as an idea for future research.

7 Summary

The current chapter has analyzed the perceived impact of networking between academic and non-academic actors and internationalization. First, the prominent perspective from interviewees in Denmark, Finland and Sweden was that networking had a positive impact, mostly for reasons related to funding, knowledge exchange and improvement in education programs. Networking between academic and non-academic actors therefore appears as a form of social capital that can be converted into cultural capital (in the form of knowledge exchange and education) and economic capital (in the form of funding and other resources). Interestingly, Norwegian actors' perspectives converged regarding the undermining impact of a less knowledge-intensive exporting sector on their academic research. In the four countries, however, few interviewees supported the hypothesis regarding the positive impact of external members on university boards.

Second, internationalization in the Nordic context was perceived as compensating for a small population size, and convergence regarding the positive impact of internationalization appeared obvious in the four Nordic countries. International collaborations and recruitment seemed to contribute to international networks, which in turn provided opportunities for knowledge exchange, publications and funding, as well as increase human, financial and material resources for academics. There was however divergence in actors' perspective regarding the level at which international collaborations should be initiated.

This chapter concludes Part III regarding qualitative findings. Chapter 8 suggested there were multiple inter-connections between the two cultural-cognitive frameworks of societal beliefs and academic traditions. The perceived utility of higher education was linked to its public funding. Equality of opportunity and funding contributed to an equitable access to higher education, while access and status in turn generated demand for higher education. Both perceived utility and equality of opportunity tended to contribute to the social status and trust conferred on higher

education. Equality and trust supported academic freedom, while utility had the potential of undermining the tradition of collegiality.

Chapter 9 focused on the rules, categories, protocols and structures contributing to the division of academic work between institutions and between individuals within those institutions. Although interviewees made contradictory comments regarding a possible hierarchy between institutions, institutional specialization was acknowledged as promoting excellence while preserving equity. The expansion of doctoral education, postdoctoral fellowships and other temporary research contracts were perceived as having a positive impact on Nordic HES' research output; however, it could undermine continuity in research projects and the recruitment of promising scholars in the long run.

Chapter 10 explored the regulative pillars of Nordic HES, namely governance and PSR funding. An analysis of governance suggested that Nordic governments relied on semi-independent external (or buffer) organizations to implement their policies. Regarding funding, competitive funding was perceived as having the most impact and strategic the least impact on scientific capital accumulation. Two themes also cut across the four funding streams: the importance of public research funding and funding concentration into universities rather than into businesses or public research institutes.

Finally, as stated above, this chapter analyzed the perceived impact of collaborations between, on the one hand, academics and non-academic actors and, on the other hand, academics and international partners. While networking with non-academic actors was perceived positively in Denmark, Finland and Sweden, internationalization was perceived as having a very positive impact on scientific capital accumulation in the four Nordic HES.

The Methodology (chapters 5, 6 and 7) explained that this thesis relied on a convergent parallel mixed-method design where points of convergence between quantitative results and qualitative findings would contribute to tentatively reject the null hypothesis regarding factors' impact. The next two chapters will present quantitative results. A factor analysis will first assess the psychometric quality of the survey, and might frame factors differently. I will then present a quantitative assessment of the importance of systemic factors across countries, and examine variations among countries.

Part 4
Quantitative Results

Chapter 12

Survey assessment and factor analysis

The objective of this thesis is to identify systemic factors contributing to scientific capital accumulation in Nordic HES. Thirty-nine possible explanations were selected as indicators and inductively merged into six factors. The indicators served both as interview questions and survey items. While interviews allowed for an in-depth understanding of factors' impact, the survey and following quantitative analyses allow me to draw broad tendencies and make more conclusive statements regarding the perceived impact of systemic factors.

Although the survey was reviewed by various participants and experts, its psychometric qualities remained unknown until its dissemination to the sample. The first purpose of this chapter is to assess and evaluate the instrument (i.e. the survey), because quantitative findings would have no value if they were based on an unreliable instrument.

The 39 indicators were grouped into six factors based on a qualitative review of the literature, though the six-factor structure remained to be tested. The factor analysis included in this chapter has the function of indicating the survey's internal consistency as well as to further explore the factor structure underlying my original hypotheses. In short, this chapter provides the basis upon which to conduct the appropriate analyses in view of answering the research objective stated above.

1 The original database

As it was mentioned in Chapter 6, from a total of 3,435 participants contacted, 565 clicked on the hyperlink to answer the survey and 456 actually completed it. Table 21 assesses each item based on the responses from these 456 participants. It first shows the number of participants who answered from 1 (i.e., "has a strong negative impact") to 5 (i.e., "has a strong positive impact") to survey items, thus excluding those who checked the "I don't know" box. The table also shows the mean, standard error, skewness and kurtosis.

Table 21

Descriptive statistics (N = 456)

Indicators	N	Mean	Std. error	Skewness		Kurtosis	
				Stat	Std. error ^a	Stat	Std. error ^a
Academic freedom	448	4.70	0.67	-2.83	0.12	9.30	0.23
Professors' influence	445	4.09	0.90	-1.11	0.12	1.27	0.23
Higher education should serve the public good	441	4.14	0.89	-0.97	0.12	0.69	0.23
Local actors	430	3.14	0.96	-0.25	0.12	-0.33	0.24
Equitable access to high quality higher education	441	4.14	0.92	-1.00	0.12	0.67	0.23
Importance of STEM	434	4.27	0.86	-1.24	0.12	1.33	0.23
Importance of SSHA	403	3.94	0.85	-0.87	0.12	1.06	0.24
Non-university sector	408	3.16	0.85	-0.42	0.12	0.11	0.24
Hierarchy between universities	385	3.35	1.11	-0.25	0.12	-0.64	0.25
University specialization	426	3.52	1.08	-0.53	0.12	-0.45	0.24
Professors' time	442	4.03	1.37	-1.17	0.12	-0.14	0.23
Contract-researchers	424	3.33	1.22	-0.34	0.12	-1.06	0.24
Doctoral schools	441	4.07	0.97	-1.08	0.12	0.76	0.23
Doctoral students	448	4.19	0.99	-1.35	0.12	1.24	0.23
The national Government	439	2.94	1.21	0.05	0.12	-1.11	0.23
Research policies	443	3.61	1.08	-.82	0.12	.00	0.23
The Parliament	413	2.99	0.95	0.04	0.12	-0.39	0.24
University autonomy	444	4.27	0.87	-1.36	0.12	1.78	0.23
The low level of bureaucracy	408	3.84	1.18	-0.90	0.12	-0.08	0.24
Quality assurance mechanisms	440	3.36	1.09	-0.55	0.12	-0.39	0.23
Development contracts	420	3.22	1.10	-0.33	0.12	-0.78	0.24
Research funding concentrated in universities	419	4.19	0.92	-1.46	0.12	2.47	0.24
Prominence of public funding	436	4.13	0.90	-0.97	0.12	0.57	0.23
Research councils	435	3.95	1.01	-1.12	0.12	0.93	0.23
Basic funding	439	3.79	1.18	-0.72	0.12	-0.56	0.23
Competitive funding	442	4.24	0.90	-1.42	0.12	1.99	0.23
Strategic funding	442	3.46	1.18	-0.52	0.12	-0.77	0.23
Excellence initiatives	439	3.77	1.21	-0.79	0.12	-0.50	0.23
"Third Mission"	436	3.47	0.90	-0.48	0.12	-0.04	0.23
External members	429	3.03	0.97	-0.10	0.12	-0.15	0.24
Incentives to collaborate with private actors	429	3.23	0.98	-0.38	0.12	-0.53	0.24
Innovation clusters	416	3.59	1.00	0-.65	0.12	-0.17	0.24
Private funding	429	3.51	0.98	-0.74	0.12	-0.16	0.24
International students	445	3.88	0.82	-0.57	0.12	0.53	0.23
Foreign scholars	450	4.37	0.76	-1.42	0.12	2.72	0.23
International collaborations	454	4.81	0.43	-2.22	0.12	5.51	0.23
European policies and funding	443	4.17	0.84	-1.34	0.12	2.40	0.23
Nordic policies and funding	432	3.78	0.73	-0.47	0.12	1.06	0.23
Institutional partnerships	439	4.33	0.68	-0.70	0.12	0.08	0.23

^a The standard errors for skewness and kurtosis are solely functions of the sample size, regardless of the values of the statistics themselves. If the *N* is similar, standard errors for skewness and kurtosis will be similar for all variables. See <http://www-01.ibm.com/support/docview.wss?uid=swg21481716>.

As it was explained in Chapter 7 and as it will be showed below (Section 2), all further analyses will be based on a “clean” database which removed cases with more than 5% of “I don’t know” responses, and thus includes 324 participants. Table 21 is provided solely on an indicative basis so the reader can compare the 456-participant database with the 324-participant database (see Table 22).

Participants had to answer every question, with the option to select “I don’t know.” The participants who did select this option are not included in the item-specific N—highlighting the interesting fact there was at least one “I don’t know” response for every indicator. The items with the most answers are “International collaborations,” “Foreign scholars” and “Academic freedom,” which are also items with high average scores. Conversely, the highest proportions of missing data are to be found in the indicators “Hierarchy between universities,” “Importance of SSHA,” and “Non-university sector.” Due to a technical problem, national-level participants in Norway did not see the item “Hierarchy between institutions” in their version of the survey, thus increasing the proportion of missing data for that item.

2 The “clean” database

Of the 456 participants included in the original database, all cases were deleted for which more than 5% of the questions remained unanswered. The rationale for removing these cases was that some statistical – such as factor analyses – are designed for complete data sets (see Cleophas & Zwinderman, 2012; Scheffer, 2002). For instance, an item with too many missing data would appear as having a lower average score and be correlated with items perceived less importantly, although in fact, the participants who answered gave the item a higher score. This means that all participants who answered “I don’t know” to more than two of the 39 items were not included. The sample thus includes 324 participants in total, of which 74 come from Denmark, 81 from Finland, 85 from Norway and 84 from Sweden.

Data imputation was attempted but it provided roughly the same results as the pairwise method. Data imputation methods included mean substitutions based on the grand mean and the country mean for each variable. Mean substitution is the most common and conservative imputation method (Meyers et al., 2013), and in the context, it was the only imputation theoretically sound.

It would have been inappropriate to use expected maximization, algorithms or multiple imputations based on the responses for other variables since each variable in the survey corresponded to distinct constructs, which before conducting a proper factory analysis, could not be assumed to be correlated. The following procedures are thus based on the responses provided by 324 participants.

2.1 Descriptive statistics

Table 22 below shows that items' mean, standard error, skewness and kurtosis in the "clean" database are roughly similar to the same items in the original database. The average score for all items (or Grand mean) is $M = 3.77$. The items with the highest average score are: "International research collaborations" ($M = 4.81$), "Academic freedom" ($M = 4.65$), "Institutional partnerships" ($M = 4.34$), "Foreign scholars" ($M = 4.33$) and "The importance of STEM in the global competition" ($M = 4.30$). Items with the lowest average scores are: "The national Government" ($M = 2.85$), "The Parliament" ($M = 2.95$), "External members on university boards" ($M = 2.98$), "Decision of local actors" ($M = 3.13$) and "The non-university sector" ($M = 3.13$).

Both Skewness and Kurtosis are zero in a normal distribution, so the farther away from zero, the more non-normal the distribution (Field, 2013). Any threshold or rule of thumb is arbitrary, but a generally recognized procedure is to compute the z -value for each value of skewness and kurtosis and then compare the obtained z -value with zero, using the z distribution (Tabachnik & Fidell, 2006). In samples including more than 300 participants, the significance level of skewness and kurtosis are not as important as the actual value for these statistics (Kim H-Y, 2013). According to Hair et al. (2014), a distribution is non-normal if the skewness and kurtosis values are greater than +1 or lower than -1. West et al. (1996) proposed a reference of substantial departure from normality as an absolute skew value of 2 and a kurtosis of 3. In sum, values between -2 and 2 will be considered as acceptable, while -3 and 3 will be considered as "extreme values."

Table 22

Descriptive statistics (N = 324)

	N	Mean	Std. deviation	Skewness		Kurtosis	
				Stat	Std. error ^a	Stat	Std. error ^a
Academic freedom	324	4.65	0.72	-2.65	0.14	7.96	0.27
Professors' influence	324	4.08	0.93	-1.16	0.14	1.41	0.27
Higher education should serve the public good	324	4.13	0.91	-1.01	0.14	0.80	0.27
Local actors	324	3.13	0.97	-0.22	0.14	-0.29	0.27
Equitable access to high quality higher education	324	4.14	0.95	-1.08	0.14	0.82	0.27
Importance of STEM	324	4.30	0.80	-1.15	0.14	1.02	0.27
Importance of SSHA	324	3.89	0.84	-0.85	0.14	1.26	0.27
Non-university sector	324	3.13	0.85	-0.41	0.14	0.14	0.27
Hierarchy between universities	324	3.38	1.08	-0.26	0.14	-0.54	0.27
University specialization	324	3.50	1.05	-0.51	0.14	-0.37	0.27
Professors' time	324	4.00	1.37	-1.13	0.14	-0.20	0.27
Contract-researchers	324	3.34	1.22	-0.32	0.14	-1.05	0.27
Doctoral schools	324	4.01	0.97	-0.96	0.14	0.38	0.27
Doctoral students	324	4.18	0.96	-1.30	0.14	1.21	0.27
The national Government	324	2.85	1.20	0.13	0.14	-1.09	0.27
Research policies	324	3.56	1.09	-0.81	0.14	-0.04	0.27
The Parliament	324	2.95	0.95	0.12	0.14	-0.27	0.27
University autonomy	324	4.28	0.87	-1.40	0.14	1.95	0.27
The low level of bureaucracy	324	3.81	1.17	-0.88	0.14	-0.03	0.27
Quality assurance mechanisms	324	3.34	1.11	-0.57	0.14	-0.42	0.27
Development contracts	324	3.20	1.08	-0.27	0.14	-0.74	0.27
Research funding concentrated in universities	324	4.19	0.89	-1.45	0.14	2.68	0.27
Prominence of public funding	324	4.12	0.92	-0.91	0.14	0.26	0.27
Research councils	324	3.93	0.98	-1.07	0.14	0.94	0.27
Basic funding	324	3.72	1.20	-0.68	0.14	-0.66	0.27
Competitive funding	324	4.23	0.90	-1.37	0.14	1.82	0.27
Strategic funding	324	3.39	1.16	-0.46	0.14	-0.81	0.27
Excellence initiatives	324	3.72	1.22	-0.73	0.14	-0.57	0.27
“Third Mission”	324	3.47	0.90	-0.42	0.14	-0.15	0.27
External members on university boards	324	2.98	0.95	-0.14	0.14	-0.09	0.27
Incentives to collaborate with private actors	324	3.18	0.99	-0.40	0.14	-0.51	0.27
Innovation clusters	324	3.55	0.99	-0.61	0.14	-0.16	0.27
Private funding	324	3.47	0.98	-0.66	0.14	-0.26	0.27
International students	324	3.94	0.80	-0.77	0.14	1.28	0.27
Foreign scholars	324	4.33	0.79	-1.43	0.14	2.80	0.27
International collaborations	324	4.81	0.44	-2.40	0.14	6.75	0.27
European policies and funding	324	4.17	0.87	-1.35	0.14	2.26	0.27
Nordic policies and funding	324	3.75	0.74	-0.54	0.14	1.24	0.27
Institutional partnerships	324	4.34	0.69	-0.75	0.14	0.06	0.27

^a The standard errors for skewness and kurtosis are solely functions of the sample size. In a given group, they will be the same for all variables. See <http://www-01.ibm.com/support/docview.wss?uid=swg21481716>.

According to Table 22, the following variables do not respect the normal distribution assumptions: “academic freedom”, “foreign scholars” and “international collaborations.” There was also an absence of outliers among cases, and according to the interviews and literature (e.g., Ahola, 2007; Maassen et al., 2008; Välimaa, 2005), it was not surprising to find that items such as international collaborations or academic freedom were considered by all participants as having a strong positive impact, thus leading to a ceiling effect. For instance, the standard deviation for the item “international collaborations” is only $s = 0.44$. Variable transformations were considered, but despite reflection, square root and logarithm attempts, results were neither more nor less acceptable. Raw data were thus retained.

2.2 Correlation matrix

Tables 23 and 24 show the Pearson correlations between survey items. Most items correlate significantly with one another so it is difficult at this point to distinguish separate factors. Yet it is worth pointing to the strongest coefficients to draw a preliminary portrait of the multiple interactions between factors. It has been argued (e.g., Field, 2013) that coefficients above $r > 0.30$ indicate a weak relationship, $r > 0.50$ indicate a moderate relationship and that $r > 0.70$ indicate a strong relationship.

Regarding beliefs, “Academic freedom” correlates with “Professor’s influence on decision-making bodies” ($r = 0.45$) and “University autonomy” ($r = 0.41$), suggesting that items related to academic traditions would form a more specific factor related to academic traditions. Moreover, the “Societal belief that higher education should serve the public good” correlates with both the “Societal belief in an equitable access to a quality higher education” ($r = 0.56$), “The importance of social sciences for countries’ welfare” ($r = 0.45$), and “The importance of STEM fields in the global economic competition” ($r = 0.40$). Participants who believed that higher education contributes to countries’ economy, welfare and public good also believed that it should be equitable and meet high standards. These relationships also suggest the possible existence of a new factor consisting only of societal beliefs.

Table 23

Correlation matrix – Part I (N=324)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1.Academic freedom	1.0																								
2.Professors' influence	.45**	1.0																							
3.Public good	.15**	.10	1.0																						
4.Local actors	.20**	.14*	.31**	1.0																					
5.Access	.20**	.13*	.56**	.23**	1.0																				
6. STEM	.03	.07	.40**	.28**	.32**	1.0																			
7.Ssocial sciences	.13*	.01	.44**	.28**	.40**	.28**	1.0																		
8.Non-universiy	.12*	.06	.17**	.23**	.19**	.14*	.18**	1.0																	
9.Hierarchy	.07	.13*	.01	.10	-.08	-.05	-.02	-.01	1.0																
10.University specialization	.03	.12*	.11	.13*	.07	.07	.07	.08	.26**	1.0															
11.Professors' time	.22**	.17**	.09	.17**	-.02	.03	-.08	.19**	.20**	.12*	1.0														
12.Contract-researchers	.04	.02	.00	.05	.00	.07	.10	.06	.30**	.28**	.15**	1.0													
13.Doctoral schools	.28**	.08	.14*	.22**	.18**	.15**	.21**	.10	.17**	.08	.15**	.25**	1.0												
14.Doctoral students	.21**	.13*	.07	.06	-.01	-.02	.11	.11	.09	.07	.18**	.34**	.27**	1.0											
15.National Government	.07	-.04	.16**	.22**	.12*	.15**	.21**	.12*	.13*	.22**	.17**	.15**	.21**	.12*	1.0										
16.Research policies	.10	.13*	.23**	.27**	.14*	.29**	.28**	.10	.13*	.24**	.17**	.09	.32**	.17**	.48**	1.0									
17.Parliament	.09	.01	.23**	.30**	.17**	.19**	.20**	.17**	.16**	.23**	.10	.13*	.20**	.04	.62**	.43**	1.0								
18.University autonomy	.41**	.32**	.15**	.13*	.17**	.02	.06	.11*	.11*	-.02	.21**	.00	.12*	.06	.02	.04	.04	1.0							
19. Bureaucracy	.16**	.23**	.09	.17**	.10	.09	.07	.07	-.03	.07	.22**	-.09	.05	-.01	.06	.20**	.08	.17**	1.0						
20. Quality assurance	.10	.09	.21**	.21**	.16**	.14*	.27**	.27**	.16**	.34**	.11	.21**	.30**	.18**	.37**	.41**	.36**	.08	.06	1.0					
21. Development-contracts	-.06	.01	.11	.14*	.01	.12*	.15**	.11	.22**	.28**	.13*	.26**	.31**	.18**	.50**	.43**	.40**	-.04	-.03	.52**	1.0				
22.Funding concentration	.23**	.17**	0.15*	.21**	.29**	.10	.13*	-.01	.20**	.08	-.01	.09	.23**	.00	.12*	.11*	.08	.19**	.00	.09	.05	1.0			
23.Public funding	.29**	.19**	.15**	.08	.14*	.05	.08	.01	.06	-.03	-.02	.00	.10	.13*	.02	.05	.01	.27**	.05	-.05	-.14	.26**	1.0		
24.Research councils	.19**	.11	.12*	.21**	.13*	.07	.18**	.16**	.08	.13*	.13*	.20**	.29**	.14*	.33**	.37**	.27**	.07	.19**	.24**	.24**	.17**	.24**	1.0	

** $p < .01$; * $p < .05$

Table 24
Correlation matrix – Part II (N = 324)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39		
25. Basic funding	.18*	.20*	-.03	.07	-.01	-.04	.05	.01	.02	-.06	-.03	.12*	.19*	.06	.04	-.06	.14*	-.02	-.02	.11*	.01	.06	.23*	.02	.10																
26. Competitive funding	.08	.07	.11	.12*	.21*	.10	.11	.05	.11*	.23*	.03	.22*	.22*	.12*	.21*	.20*	.19*	.15*	.09	.35*	.24*	.22*	.01	.34*	-.17*	1.00															
27. Strategic funding	.02	.05	.17*	.23*	.14*	.22*	.33*	.22*	.14*	.25*	.02	.17*	.28*	.22*	.45*	.49*	.30*	-.02	.06	.34*	.44*	.09	.09	.39*	.03	.20*	1.00														
28. Excellence initiatives	.04	.04	.11*	.17*	.10	.07	.10	.02	.28*	.40*	.06	.34*	.11	.11	.19*	.23*	.19*	.10	-.06	.35*	.29*	.27*	.08	.34*	-.21*	.41*	.33*	1.00													
29. "Third Mission"	.13*	.24*	.24*	.18*	.24*	.10	.25*	.19*	.04	.07	.10	.03	.16*	.09	.11*	.25*	.22*	.23*	.09	.09	.11*	.29*	.17*	.33*	.11	.10	.22*	.07	1.00												
3. External members	.00	.09	.19*	.24*	.13*	.18*	.17*	.16*	.09	.39*	.11	.27*	.22*	.11	.28*	.36*	.31*	.00	.12*	.31*	.27*	.14*	.06	.32*	-.03	.31*	.22*	.32*	.29*	1.00											
31. Collabor. with private	-.01	.07	.20*	.24*	.19*	.22*	.22*	.18*	.22*	.26*	.05	.29*	.18*	.18*	.30*	.35*	.22*	-.04	.09	.37*	.33*	.11	.02	.31*	-.04	.25*	.33*	.28*	.47*	1.00											
32. Innovation clusters	.09	.22*	.18*	.22*	.13*	.17*	.22*	.05	.31*	.17*	.11	.22*	.22*	.21*	.35*	.22*	.07	.27*	.29*	.29*	.29*	.11	.08	.33*	.09	.18*	.30*	.33*	.41*	.54*	1.00										
33. Private funding	-.04	.09	.07	.16*	.05	.12*	.11	.08	.18*	.08	.11	.09	-.02	.03	.11	.18*	.11	-.04	.06	.21*	.22*	.04	-.15*	.15*	-.06	.21*	.14*	.23*	.16*	.34*	.49*	.36*	1.00								
34. International students	.16*	.15*	.26*	.21*	.25*	.18**	.18**	.137*	.06	.173**	.05	.22*	.18*	.14*	.09	.10	.13*	.11*	.02	.09	.11	.21*	.15*	.13*	.02	.18*	.09	.11	.26*	.26*	.18*	.22*	.05	1.00							
35. Foreign scholars	.16*	.14*	.17*	.18*	.10	.11	.14*	.08	.22*	.16*	.07	.31*	.22*	.22*	.10	.22*	.22*	.16*	.05	.19*	.16*	.21*	.18*	.08*	.04	.30*	.00*	.31*	.22*	.22*	.29*	.22*	.22*	.18*	.48*	1.00					
36. Int. Research coll.	.32*	.20*	.19*	.17*	.21*	.19*	.00	.04	.08	.06	.07	.18*	.00	.00	.11	.14*	.11	.11*	.00	.08	.06	.26*	.16*	.21*	.11	.26*	.06	.17*	.11	.09	.11	.22*	.13*	.03	.37*	.37*	1.00				
37. European policies	.23*	.12*	.25*	.21*	.18*	.22*	.00	.04	.22*	.08	.22*	.34*	.16*	.33*	.33*	.33*	.12*	.12*	.22*	.11*	.33*	.27*	.11	.36*	-.06	.33*	.22*	.31*	.22*	.28*	.33*	.33*	.13*	.22*	.44*	.35*	1.00				
38. Nordic policies	.20*	.16*	.16*	.20*	.15*	.17*	.03	.00	.09	.01	.06	.22*	.22*	.19*	.22*	.11	.11	.13*	.11	.15*	.11	.19*	.11	.14*	.21*	.11	.34*	.17*	.22*	.22*	.11	.22*	.05	.22*	.22*	.22*	.44*	.44*	1.00		
39. Institution partnerships	.10	.16*	.29*	.13*	.22*	.17*	.07	.00	.11	-.05	.11	.11	.11	.11	.22*	.22*	.11	.06	.18*	.11	.22*	.11	.11	.11	.22*	.00	.22*	.22*	.22*	.22*	.22*	.22*	.07	.34*	.33*	.44*	.44*	.34*	1.00		

** p < .01; * p < .05

In terms of governance, there is a moderate relationship between “Development contracts/Performance agreements” and “Quality assurance mechanisms” ($r = 0.52$). Moreover, “Strategic funding” correlates with “National innovation and research policies” ($r = 0.49$), “The national Government” correlates with “National innovation and research policies” ($r = 0.48$) and “Strategic funding” ($r = 0.45$). These relationships would support the existence of a factor encompassing the different instruments used by public authorities to steer universities’ activities. Interestingly, strategic funding has a stronger correlation with items linked to the government than with the items on basic, competitive and excellence funding. This could be the result of the formulation of the stem for strategic funding, which was formulated as follows: “Government agencies funding research in priority areas.”

Items related to networking correlate significantly with one another. There is, for instance, a moderate relationship between “Innovation clusters” and “Government’s incentives to collaborate with private actors” ($r = 0.54$). In addition, “Government’s incentive to collaborate with private actors” correlates with “external members on university boards” ($r = 0.47$) and “private funding” ($r = 0.49$). Participants who positively perceived the presence of external members on university boards also had a positive perception of collaborations between universities and private actors.

Items related to internationalization also seem to group together. “The recruitment of foreign scholars” correlates with “International students” ($r = 0.48$), while “European policies and funding” correlates with “Institutional partnerships outside the Nordic and European regions” ($r = 0.45$) and “International research collaborations” ($r = 0.45$). Participants who believe in the recruitment of foreign scholars also believe in the recruitment of international students, and participants who consider positively the European incentives to collaborate also have a positive opinion of international collaborations between institutions and individuals.

Finally, certain correlations exist between items related to funding. “Basic funding” has weak but significant positive relationships with “Prominence of public funding” ($r = 0.23$), “Professors’ influence on decision-making bodies” ($r = 0.20$), “Doctoral students” ($r = 0.19$) and “Academic freedom” ($r = 0.18$). “Basic funding” also has weak but significant negative relationship with “Excellence funding” ($r = -0.21$) and “Competitive funding” ($r = -0.17$). These results suggest that, for some participants, basic funding is perceived as a funding stream (coming from the

public purse) that supports academia's core in terms of collegiality, freedom and doctoral education. In contrast, participants who hold a positive view of competition between individuals and institutions for research funding have a lesser opinion of basic funding, since the latter remains largely based on factors other than research performance. These negative correlations could undermine a scale related to research funding.

3 Factor analysis

An exploratory factor analysis with orthogonal rotation (varimax) was performed through SPSS on 36 items based on the data from 324 system actors. As it was explained in Chapter 7, an orthogonal rotation was preferred because of the apparent independence (and low correlations) between factors (Meyers et al., 2013). In a context of low correlations, the varimax rotation simplifies the correlation within each factor and the subsequent interpretation since each original variable is associated with few factors and each factor represents few variables (Abdi, 2003). Given the fact that some variables were not normally distributed, the unweighted least squares factor extraction method was preferred.

At the end of the survey, participants had the option of adding comments related to the structure or content of the survey. These qualitative data are important both at this stage to assess survey items, and at a later stage in view of improving the survey. Appendix 9 presents the findings of a qualitative analysis of these comments. Following that analysis, the items "A lower level of institutional bureaucracy" and "Professors' time for research" were removed because they were highly criticized by participants, but also because the following factor analysis showed that these items did not group with the others and, when removed, allowed for a more stable structure.

Although no participants expressed concerns about the item "Non-university higher education institutions," this item appeared problematic in the factor analysis. As shown in Table 23 and Table 24, the item had low and insignificant correlations with other items related to the academic structure. We can also hypothesize that it was difficult for participants to understand how "The non-university higher education institutions" could have an impact on "Universities' research production," as the question was framed in the survey. The item might have been rephrased to specify how the contribution of non-university higher education institutions is conceived.

Furthermore, I calculated the Cronbach's alpha for these items, and measures showed that they did not have an added value for their general factor. So, in total, the factor analysis was performed on 36 items based on the data from 324 participants.

The Kaiser-Meyer-Olkin measure verified the sampling adequacy for the analysis, $KMO = .85$, indicating that the present data exceeded the required level for factor analysis. Similarly, Bartlett's test of sphericity was significant ($p < .001$), indicating sufficient correlation between the variables to proceed with the analysis.

A total of nine factors had eigenvalues greater than the Kaiser's criterion of 1.00, cumulatively accounting for 57.80% of the total variance. The scree plot would justify retaining either 8 or 9 factors. However, the extraction sums of squared loadings stopped at 8 factors. Table 25 shows the factor loadings after rotation. The structure converged after 13 iterations.

In the factor analysis, only correlations $r \geq 0.30$ were accepted. Following several trials of the factor model, an 8-factor model was retained for its statistical robustness and theoretical soundness. According to Table 25, Factor 1 correlated with items related to different organizations having some form of authority over HES, such as national governments and research councils. Factor 2 clearly included all items related to networking with non-academic actors such as universities' third mission, external members on university boards or the incentives to collaborate with private actors. Factor 3 included all items related to internationalization such as international students, foreign scholars and international collaborations.

While Factor 4 seemed to include items related to societal beliefs, Factor 5 included items related to academic traditions such as academic freedom, professor's influence on decision-making or university autonomy. Factor 6 included items related to competitive, excellence and basic funding (which loaded negatively with Factor 6 but positively with Factor 5), but not strategic funding, which had a stronger correlation with Factor 1. Factor 7 appears to include items related to doctoral students, doctoral schools and contract-researchers, although the last item also loaded on Factor 8. Factor 8 included items related to a hierarchy between universities and universities specializing in some fields, although the item on specialization also loaded on Factor 2.

Table 25

Structure coefficients 8-Factor Varimax solution (N = 324)

Indicators	Factor							
	1	2	3	4	5	6	7	8
Academic freedom	.05	-.07	.11	.10	.68	.02	.12	.04
Professors' influence	-.02	.23	.08	.02	.60	-.09	-.01	.09
Higher education should serve the public good	.11	.08	.15	.71	.10	.03	-.00	.00
Local actors	.25	.16	.10	.32	.20	.03	.00	.05
Equitable access to high quality higher education	.03	.03	.10	.69	.19	.17	-.04	-.10
Importance of STEM	.13	.12	.21	.47	-.03	-.03	-.04	.01
Importance of SSHA	.19	.08	.05	.53	.05	.02	.17	-.05
Hierarchy between universities	.16	.07	.00	-.10	.16	.16	.11	.45
University specialization	.23	.31	.09	.02	.01	.22	.03	.28
Contract-researchers	.06	.19	.18	-.02	-.07	.21	.43	.40
Doctoral schools	.30	.00	.14	.16	.20	.13	.40	.04
Doctoral students	.10	.10	.10	-.01	.13	-.04	.58	.12
The national Government	.77	.08	.08	.10	-.00	.03	.01	.06
Research policies	.61	.24	.07	.18	.08	.06	.13	-.06
The Parliament	.66	.09	.19	.16	.00	.03	-.13	.12
University autonomy	-.01	-.05	.09	.08	.54	.07	-.01	.07
Quality assurance mechanisms	.46	.24	.01	.19	.02	.25	.13	.18
Development contracts	.60	.23	.01	.03	-.10	.09	.18	.22
Research funding concentrated in universities	.06	-.00	.15	.16	.35	.28	.02	.05
Prominence of public funding	-.02	-.05	.15	.06	.42	.03	.13	-.13
Research councils	.36	.21	.18	.01	.18	.31	.19	-.20
Basic funding	.06	.02	-.02	-.06	.34	-.37	.21	-.09
Competitive funding	.17	.16	.22	.08	.06	.49	.05	.06
Strategic funding	.53	.20	.04	.10	.01	.16	.26	-.09
Excellence initiatives	.19	.24	.12	.01	.06	.65	.09	.20
"Third Mission"	.21	.31	.22	.19	.21	-.08	.09	-.12
External members on university boards	.26	.49	.21	.12	-.01	.17	.10	.04
Incentives to collaborate with private actors	.24	.64	.14	.17	-.06	.15	.12	.08
Innovation clusters	.19	.64	.14	.11	.13	.02	.21	-.09
Private funding	.11	.60	.00	.05	-.07	.11	-.08	.13
International students	-.02	.12	.58	.24	.10	-.03	.11	.15
Foreign scholars	.09	.13	.62	.05	.12	.19	.19	.19
International collaborations	.05	-.00	.52	.14	.32	.13	-.05	-.00
European policies and funding	.30	.15	.46	.16	.15	.28	.13	-.11
Nordic policies and funding	.25	.10	.30	.09	.22	.04	.21	-.22
Institutional partnerships	.16	.13	.57	.16	.10	.13	.04	-.11

Table 26

Item-total statistics for eight factors ($N = 324$)

Factors and items	Cronbach's alpha	Scale mean if item deleted	Scale variance if item deleted	Squared multiple corr.	C. alpha if item deleted
<i>Public authorities</i>	.80				
The national Government		17.02	13.70	.65	.75
National innovation and research policies		16.33	14.65	.60	.76
The Parliament and its standing committees		16.93	15.46	.59	.76
Quality assurance mechanisms		16.54	15.06	.53	.78
Development contracts and performance agreements		16.68	14.85	.59	.76
The role of research councils		15.97	16.75	.39	.81
<i>Networking</i>	.75				
Universities' "Third Mission"		13.18	8.92	.36	.76
External members on university boards		13.66	7.95	.53	.70
Governments' incentives for universities to collaborate with private actors		13.46	7.34	.64	.66
Innovation clusters		13.09	7.54	.57	.68
The involvement of private businesses in research funding		13.15	8.07	.48	.72
<i>Internationalization</i>	.76				
The number of international students		21.42	6.19	.47	.73
The recruitment of foreign scholars		21.03	5.92	.56	.70
International research collaborations		2.54	7.37	.50	.74
Policies and funding from the European Research Area / European Research Council		21.18	5.67	.56	.71
Policies and funding from the Nordic Council of Ministers and its partner organizations		21.61	6.60	.41	.75
Partnerships with institutions		21.01	6.26	.57	.71
<i>Societal beliefs</i>	.73				
Belief that higher education should serve the public good		15.43	6.21	.61	.63
Decisions of local actors on higher education		16.45	6.91	.37	.73
Belief in equitable access		15.41	6.34	.53	.66
Belief that STEM fields are important		15.26	7.25	.44	.70
Belief that social sciences contribute to welfare		15.67	6.80	.49	.68
<i>Academic traditions</i>	.65				
Academic freedom for professors		16.64	5.59	.53	.55
Professors' influence		17.23	5.28	.41	.60
University autonomy in relation to governments		17.02	5.36	.45	.58
Public research funding concentrated in uni.		17.10	5.88	.29	.65
Prominence of public funding		17.18	5.43	.37	.61
<i>Funding streams^a</i>	.50				
Basic funding (<i>reversed scale</i>)		7.97	3.19	.23	.57
Peer-reviewed competitive funding		6.02	3.53	.38	.35
Excellence-based initiatives		6.53	2.66	.38	.28
<i>Early-career researchers</i>	.54				
The increase of temporary contract-researchers		8.17	2.43	.37	.43
The development of doctoral schools		7.50	3.26	.31	.50
A large number of doctoral students		7.34	3.06	.39	.39
<i>Institutional differentiation</i>	.42				
Hierarchy between universities		3.50	1.13	.26	-
University specialization/profiling		3.39	1.18	.26	-

^a Funding stream had a Cronbach's Alpha of $a = -.04$ in the initial FA because of a negative correlation between "basic funding" and the others two items. The scale of "basic funding" was thus reversed in this analysis to show the consistency of the scale. However, it did not change the Cronbach's Alpha for the overall structure.

Factors were constructed based on items' loading and, in borderline cases, on theoretical grounds. The internal consistency was then tested in SPSS. As shown in Table 26, the Cronbach alpha for the overall structure is almost excellent, $\alpha = .89$. The Cronbach's alpha is a measure of how closely related a set of items are as a group. Each factor's internal consistency was tested. Factors "Public authorities" ($\alpha = 0.80$), "Networking" ($\alpha = 0.75$), "Internationalization" ($\alpha = 0.76$) and "Societal beliefs" ($\alpha = 0.73$) seem to form internally consistent factors (Field, 2013). For their part, the Cronbach's alpha for the factor "Academic traditions" ($\alpha = 0.65$) can be considered questionable, while the factors "Early-career researchers" ($\alpha = 0.54$) and "Funding streams" ($\alpha = 0.50$) demonstrate a poor consistency.

Further precision needs to be achieved regarding the factor "Funding streams." This factor originally had a negative Cronbach's alpha ($\alpha = -.02$), which is usually observed when one item correlates negatively with the others (Field, 2013). As shown in the correlation matrix (Table 23 and Table 24), the item "Basic funding" had weak though significant correlations with "Competitive funding" and "Excellence funding." The scores for "Basic funding," however, made sense as they were and it would have been false to reverse the scale since participants who indicated "5" still meant that they perceived basic funding to have a strong positive impact on academic research production.

Factor 6, for its part, seems to relate more to the idea of competition and thus to correlate negatively with "Basic funding." It was therefore decided, solely for the purposes of the reliability tests, to reverse the scale of "Basic funding." This increased the Cronbach's alpha from $\alpha = -.02$ to $\alpha = .50$, which seems more appropriate since the item "Basic funding" showed a real and moderate negative correlation with Factor 6 in Table 25.

Deleting the item would have increase the Cronbach's alpha from $\alpha = 0.50$ to $\alpha = 0.54$. However, I decided keep the item because (1) the Cronbach's alpha for the scale does not increase by a large degree, (2) the Cronbach's alpha for the overall survey does not change, (3) the item is correlated with the other items of the scale, $r^2 = 0.23$, as well as because (4) it would affect the standard set of items to use in future reliability studies involving other samples, (5) and it would slightly increase reliability at the expense of validity (Schmit, 1996). The prominence of basic funding in Nordic HES was assessed in a number of studies (e.g. Benner & Öquist, 2012; Kalpazidou Schmidt, 2012; Sörlin, 2007; Välimaa, 2005) and, as argued by Helmes, Henze, Sass

and Mifsud (2006), “Implying that reliability is a characteristic of the scale rather than the sample encourages replacing theory-bound scales with empirically derived scales that could change from sample to sample” (p.642). Raykov (2008) later proved the following:

In particular, the index “alpha if item deleted” has been rather frequently inspected for this purpose. The present note highlights a validity related limitation of this statistic. The article shows that dispensing with a scale component to maximally increase coefficient alpha, can in fact entail considerable loss in criterion validity, a major aspect of behavioral measurement quality (p.14).

Finally, the factor “Institutional differentiation” ($\alpha = .42$) was the only factor to be considered unacceptable. I decided to remove it from further analyses, especially because it included only two items.

Through an extensive literature review (Chapter 4), I identified six potential factors. The factor analysis reorganized items into an eight-factor structure. One factor (“Institutional differentiation”) had clearly unreliable alpha coefficient and was thus removed from further quantitative analyses, but not from the qualitative analyses. In future quantitative analyses as well as in the discussion, the seven factors to be tested are: academic traditions, societal beliefs, public authorities, funding streams, early-career researchers, and networking and internationalization. Hypotheses are reformulated as follows:

H1: Academic traditions contribute to scientific capital accumulation in Nordic HES.

H2: Societal beliefs contribute to scientific capital accumulation in Nordic HES.

H3: Early-career researchers contribute to scientific capital accumulation in Nordic HES.

H4: Public authorities contribute to scientific capital accumulation in Nordic HES.

H5: Funding streams contribute to scientific capital accumulation in Nordic HES.

H6: Networking with non-academic actors contributes to scientific capital accumulation in Nordic HES.

H7: Internationalization contributes to scientific capital accumulation in Nordic HES.

4 Summary

To recapitulate, the purpose of this chapter was to evaluate the relevance of the survey as an instrument for assessing actors’ perspectives on the impact of systemic factors on academic research production in the Nordic HES. Descriptive statistics, correlations and a factor analysis

suggest that, although the survey would benefit from improvement before it is used in future research, it remains sufficiently robust to provide a rough estimate of the perceived impact of seven systemic factors on academic research production. While acknowledging the limitations of the survey results, the next chapter will focus on three quantitative analyses to better examine the perceived impact of the seven factors in the four Nordic HES.

Chapter 13

Survey scores, multiple comparisons and multivariate analysis of variance

The main research objective of this thesis is to identify systemic factors contributing to scientific capital accumulation in Nordic HES. Following a deductive approach, I initially identified thirty-nine possible explanations for the relatively high level of research production in Nordic HES. These thirty-nine indicators were merged into six systemic factors, which became six hypotheses to be tested empirically through the perspective of system actors. The previous chapter assessed both the instrument and the factorial structure. The analyses resulted in the exclusion of three of the original thirty-nine indicators and the grouping of the thirty-six remaining indicators (or variables) into a stable eight-factor structure.

The eight factors are: academic traditions, societal beliefs, institutional differentiation, early-career researchers, public authorities, funding streams, networking and internationalization. It should be noted that the factor “institutional differentiation” only included two items (in contrast to other factors which included at least three items) and presented an unsatisfactory Cronbach’s alpha. Consequently, “institutional differentiation” was excluded from further quantitative analyses. Based on the new seven-factor structure, two of the three research questions (RQ) guiding this thesis have been reformulated as follows:

(RQ1) What are the systemic factors perceived to have a positive impact on scientific capital accumulation in Nordic HES?

To answer this research question, three analyses (two quantitative and one qualitative) have been conducted. In Section 1, I examine the average score for each factor. In section 2, I present the results of a one-way (within-participant) repeated-measures ANOVA, followed by post-hoc *t* tests for each pair of factors. In the Discussion, these results will be compared to the themes which achieved saturation in the thematic analysis.

(RQ2) How do system actors explain the impact of the systemic factors on scientific capital accumulation in Nordic HES?

I have answered this research question by revisiting explanations provided in the qualitative analysis (Chapters 8 to 11).

(RQ3) How does the perceived impact of the seven systemic factors on scientific capital accumulation vary between Denmark, Finland, Norway and Sweden?

To examine any significant difference between participants in Denmark, Finland, Norway and Sweden regarding their perspectives on factors' impact, I conducted a multivariate analysis of variance (MANOVA). In Section 3 below, countries represent categorical independent variables (IV) and the average factor scores represent the pseudo-continuous dependent variable (DV).

1 Average scores and frequencies

Survey participants were asked to give a score from 1 to 5 to various indicators that were then grouped into seven factors. Table 27 gives the score of each indicator and the mean score of each factor. As briefly mentioned in Chapter 7, I only considered factors with a significantly higher mean, and indicators that had achieved an average survey score of $M \geq 4.00$. This decision is arbitrary, but provides a sound threshold since the overall average score (or Grand mean) is $M = 3.77$, and since responses between $M = 4.00$ and $M = 5.00$ referred to the response choice “strong positive impact.”

Academic traditions and internationalization are the only factors that have an average score above 4.00 in all countries, indicating that most participants tended to perceive the related indicators as having a strong positive impact on academic research production in their country. The indicators “International research collaborations” ($M = 4.81$), “Academic freedom” ($M = 4.65$), “Partnerships with institutions outside the Nordic and European regions” ($M = 4.34$), “Recruitment of foreign scholars” ($M = 4.33$) and “Societal belief that STEM fields are important in the global economic competition” ($M = 4.30$) also achieve the highest scores. It is worth noting that the factor “Societal beliefs” ($M = 3.92$) would have had an average score above 4.00 if it was not for the indicator “Decisions of regional/local actors” ($M = 3.13$). The Cronbach's alpha of the scale ($\alpha = .73$) would not have been improved by removing the item.

Table 27

Average survey scores for factors in decreasing order of importance ($N = 324$)

Factor / Country	Denmark	Finland	Norway	Sweden	Mean
<i>Academic traditions</i>	4.28	4.33	4.19	4.25	4.26
Academic freedom	4.62	4.82	4.60	4.57	4.65
Professors' influence	4.18	4.09	3.81	4.24	4.07
University autonomy	4.32	4.32	4.29	4.21	4.28
Funding concentrated in universities	4.16	4.32	4.12	4.17	4.19
Prominence of public funding	4.14	4.11	4.13	4.08	4.12
<i>Internationalization</i>	4.11	4.31	4.19	4.28	4.22
The number of international students	3.72	4.00	3.91	4.10	3.94
The recruitment of foreign scholars	4.27	4.28	4.32	4.44	4.33
International research collaborations	4.74	4.86	4.80	4.81	4.81
European policies and funding	4.00	4.37	4.08	4.24	4.17
Nordic policies and funding	3.66	3.90	3.72	3.70	3.75
Partnerships with institutions abroad	4.25	4.46	4.29	4.36	4.34
<i>Societal beliefs</i>	3.84	4.15	3.76	3.91	3.92
HE should serve the public good	4.01	4.36	3.99	4.16	4.13
Decisions of regional/local actors	3.11	3.25	2.95	3.21	3.13
Equitable access to higher education	4.05	4.56	3.94	4.02	4.14
STEM are important	4.28	4.49	4.12	4.32	4.30
Social sciences inform welfare	3.76	4.09	3.82	3.86	3.89
<i>Funding streams</i>	3.94	3.87	3.94	3.82	3.89
Basic funding to universities	4.06	3.25	3.74	3.84	3.72
Peer-reviewed competitive funding	4.14	4.45	4.14	4.21	4.23
Excellence-based funding	3.61	3.90	3.93	3.42	3.72
<i>Early-career researchers</i>	3.69	3.73	4.00	3.93	3.84
Temporary contract-researchers	3.03	3.09	3.70	3.50	3.34
Doctoral schools	3.88	4.12	3.93	4.10	4.01
A large number of doctoral students	4.16	3.98	4.38	4.18	4.18
<i>Networking</i>	3.32	3.33	3.27	3.41	3.33
Universities' "Third Mission"	3.38	3.40	3.55	3.55	3.47
External members on university boards	2.92	3.10	2.94	2.96	2.98
Incentives to collaborate with private actors	3.24	3.12	3.08	3.27	3.18
Innovation clusters	3.51	3.50	3.41	3.77	3.55
Private research funding	3.53	3.52	3.37	3.48	3.47
<i>Public authorities</i>	3.23	3.44	3.24	3.36	3.32
The national Government	2.70	3.04	2.96	2.70	2.85
Innovation and research policies	3.57	3.73	3.31	3.66	3.56
The Parliament	2.74	3.12	3.00	2.92	2.95
Quality assurance mechanisms	3.18	3.36	3.36	3.45	3.34
Development contracts	2.99	3.24	3.24	3.31	3.20
Research councils	4.10	3.95	3.58	4.11	3.93
Strategic research funding	3.32	3.65	3.22	3.35	3.39
<i>Total</i>	3.75	3.87	3.76	3.83	3.77

The factors "Networking" and "Public authorities," with the respective average scores of $M = 3.33$ and $M = 3.32$, are perceived as having the least impact. On the initial scale, a score of 3

represented “no impact” and any score lower represented a negative impact on academic research production. On average, the indicators “External members on university boards” ($M = 2.98$), “The Parliament” ($M = 2.85$) and “The national government” ($M = 2.85$) have scores that would imply that participants perceived them to have a weak negative to a negligible impact on academic research production. Also, within the factor “Funding streams” ($M = 3.89$), only the indicator “Peer-reviewed competitive funding” ($M = 4.23$) achieved an average score above 4.00 in the four Nordic HES. At this stage, the average scores suggest that internationalization, academic traditions and, to a lesser extent, societal beliefs are perceived as having the most impact on research production.

2 Multiple comparisons based on a one-way repeated-measures ANOVA

As I explained in Chapter 7, I decided to proceed to multiple comparisons between factors’ mean. In order to avoid the inflation of Type-I error (Field, 2013), I relied on a one-way (within-participant) repeated-measures ANOVA to detect if the variance in survey scores *between* factors is significantly higher than the variance in survey scores *within* factors. In this design, instead of comparing participants’ response at different time points, I compared the survey scores they gave to different factors. The IV was thus named “factors” and, following the factor analysis, included seven levels. The DV consisted participants’ responses to the items belonging to the seven factors. Providing a F-ratio that partitions the total within-participant variance between systematic and random variance, this method allowed me to examine if there were statistically significant differences between participants’ mean scores for each factor.

Mauchly’s test indicated that the assumption of sphericity had been violated, $\chi^2(20) = 590.30$, $p = 0.00$. Without sphericity, the degrees of freedom decrease and make the p value associated with the F-ratio less significant (Field, 2013). The usual correction employed is a Greenhouse-Geisser estimate, but since this estimate was above $\varepsilon = 0.75$ ($\varepsilon = 0.86$), it was argued by Girden (1992) to use a Huynh-Feldt estimate, in this case $\varepsilon = 0.876$. The estimate adjusts the degrees of freedom to make the F -ratio more conservative when sphericity is violated and to reduce Type-I error rate (Field, 2013). There is a significant difference between factors’ average score, multivariate test Wilks’s lambda $F(0.29, 318) = 128.03$, $p = 0.00$.

Since the F test rejected the null hypothesis and since my objective was to explore differences without firm expectations as to the direction of effects, I proceeded to unplanned comparisons in the form of post-hoc t tests between each pair of factor (NIST-SEMATECH, 2012). Post-hoc pairwise t tests revealed that there were several mean differences across the variables. T tests were preferred to non-parametric tests in order to calculate the effect size of each difference in each pairs of variables. The Bonferroni correction was used on multiple comparisons. As shown in Table 28, there are multiple significant differences between factors.

On the one hand, the average score for the factor “Academic traditions” is significantly higher than for “Public authorities” (I-J = 0.95, $p < 0.01$), “Networking” (I-J = 0.93, $p < 0.01$), “Early-career researchers” (I-J = 0.42, $p < 0.01$), “Funding streams” (I-J = 0.38, $p < 0.01$), and “Societal beliefs” (I-J = 0.34, $p < 0.01$). Similarly, “Internationalization” has a significantly higher average score than “Public authorities” (I-J = 0.90, $p < 0.01$), “Networking” (I-J = 0.89, $p < 0.01$), “Early-career researchers” (I-J = 0.37, $p < 0.01$), “Funding streams” (I-J = 0.34, $p < 0.01$), and “Societal beliefs” (I-J = 0.30, $p < 0.01$). All in all, these findings suggest that academic traditions and internationalization are perceived by participants as the systemic factors having a strongest impact on academic research production.

Conversely, the factors “Public authorities” and “Networking” appear to be perceived as the systemic factors with the weakest impact on academic research production. For instance, “Public authorities” has a significantly lower average score than “Academic traditions” (I-J = -0.95, $p < 0.01$), “Internationalization” (I-J = -0.90, $p < 0.01$), “Societal beliefs” (I-J = -0.60, $p < 0.01$), “Funding streams” (I-J = -0.57, $p < 0.01$), and “Early-career researchers” (I-J = -0.53, $p < 0.01$). Similarly, “Networking” has a significantly lower average score than “Academic traditions” (I-J = -0.93, $p < 0.01$), “Internationalization” (I-J = -0.89, $p < 0.01$), “Societal beliefs” (I-J = -0.59, $p < 0.01$), “Funding streams” (I-J = -0.57, $p < 0.01$), and “Early-career researchers” (I-J = -0.52, $p < 0.01$). Finally, the factors “Societal beliefs,” “Funding streams” and “Early-career researchers” somehow appear in the middle.

These findings, based on survey results, partly answer RQ1 by indicating that participants gave significantly higher scores to items related to internationalization and academic traditions. This would imply that they perceived these two systemic factors to have the strongest positive impact on academic research production in the Nordic HES.

Table 28

Pairwise comparisons (N = 324)

(I) Factors' average scores	(J) Factors' average scores	Mean difference (I-J)	Standard error	Sig.	95% Confidence interval for difference	
					Lower bound	Upper bound
Public authorities	Networking	-.01	.04	1.00	-.13	.11
	Internationalization	-.90*	.04	.00	-1.03	-.78
	Societal beliefs	-.60*	.04	.00	-.74	-.47
	Academic traditions	-.95*	.05	.00	-1.10	-.80
	Funding streams	-.57*	.04	.00	-.70	-.44
	Early-career researchers	-.53*	.05	.00	-.68	-.39
Networking	Public authorities	.01	.04	1.00	-.11	.13
	Internationalization	-.89*	.04	.00	-1.00	-.78
	Societal beliefs	-.59*	.04	.00	-.72	-.46
	Academic traditions	-.93*	.05	.00	-1.07	-.79
	Funding streams	-.56*	.04	.00	-.68	-.43
	Early-career researchers	-.52*	.05	.00	-.66	-.37
Internationalization	Public authorities	.90*	.04	.00	.78	1.03
	Networking	.89*	.04	.00	.78	1.00
	Societal beliefs	.30*	.04	.00	.20	.41
	Academic traditions	-.04	.03	1.00	-.14	.06
	Funding streams	.34*	.04	.00	.23	.45
	Early-career researchers	.37*	.04	.00	.25	.50
Societal beliefs	Public authorities	.60*	.04	.00	.47	.74
	Networking	.59*	.04	.00	.46	.72
	Internationalization	-.30*	.04	.00	-.41	-.20
	Academic traditions	-.34*	.04	.00	-.47	-.22
	Funding streams	.03	.05	1.00	-.11	.17
	Early-career researchers	.07	.05	1.00	-.08	.23
Academic traditions	Public authorities	.95*	.05	.00	.80	1.10
	Networking	.93*	.05	.00	.79	1.07
	Internationalization	.04	.03	1.00	-.06	.14
	Societal beliefs	.34*	.04	.00	.22	.47
	Funding streams	.38*	.04	.00	.26	.50
	Early-career researchers	.42*	.05	.00	.27	.56
Funding streams	Public authorities	.57*	.04	.00	.44	.70
	Networking	.56*	.04	.00	.43	.68
	Internationalization	-.34*	.04	.00	-.45	-.23
	Societal beliefs	-.03	.05	1.00	-.17	.11
	Academic traditions	-.38*	.04	.00	-.50	-.26
	Early-career researchers	.04	.04	1.00	-.10	.18
Early-career researchers	Public authorities	.53*	.05	.00	.39	.68
	Networking	.52*	.05	.00	.37	.66
	Internationalization	-.37*	.04	.00	-.50	-.25
	Societal beliefs	-.07	.05	1.00	-.23	.08
	Academic traditions	-.42*	.05	.00	-.56	-.27
	Funding streams	-.04	.04	1.00	-.18	.10

* $p < 0.05$

3 Multivariate analysis of variance (MANOVA)

Table 27 indicated that some factors obtain higher scores in some countries than in others. Before conducting any formal test of statistical significance, one can observe, for instance, that “Academic traditions” obtained the highest average survey score in the four countries. But one could also observe that average scores for this item are higher in Denmark and Finland compared to Norway and Sweden. Similarly, “Internationalization” was perceived as having a strong positive impact in most countries, but more so in Finland and Sweden than in Norway or Denmark. It should also be noted that the factor “Societal beliefs” only obtained an average score above 4.00 in Finland, and its lowest score was in Norway. Regarding the factors that were considered on average to have a lesser impact on academic research production, the factor “Early-career researchers” obtained a larger mean in Norway and Sweden than in Denmark and Finland, while the factor “Funding streams” obtained a larger mean in Denmark and Norway than in Finland and Sweden. Moreover, “Networking” and “Public authorities” had lower scores in Norway and Denmark than in Finland and Sweden.

In light of these noticeable differences, I decided to proceed to formal procedure. A MANOVA was conducted to explore how the means of the seven systemic factors (DVs) vary across the four levels of a categorical IV representing the four countries. A MANOVA, however, includes multiple assumptions that need to be checked (Field, 2013; Tabachnik & Fidell, 2006):

- Independence: residuals should be statistically independent;
- Absence of outliers: outliers can produce either Type I or Type II errors;
- Multivariate normality: the sampling distribution of means of the various DVs in each cell and all linear combination of them are normally distributed;
- Homogeneity of variance-covariance matrices: the variances in each group are relatively equal for each DV, and correlations between any two DVs is the same in all groups.
- Linearity: linear relationships among all pairs of DVs
- Sample size: more observations than DVs to avoid reduced power;
- Absence of multicollinearity and singularity: the power of MANOVA depends on a combination of the correlation between DVs and the effect size to be detected.

As shown in Table 8, group size is similar. Observations were also independent in the sense that the response of one participant in one country did not affect the response of another participant in another country.

Table 29

Descriptive statistics for factors by country

Factor	Country	Mean	Standard deviation	N
Early-career researchers	Denmark	3.69	.79	74
	Finland	3.73	.70	81
	Norway	4.01	.82	85
	Sweden	3.93	.72	84
	<i>Total</i>	3.85	.77	324
Funding streams	Denmark	3.93	.57	74
	Finland	3.86	.61	81
	Norway	3.94	.69	85
	Sweden	3.82	.69	84
	<i>Total</i>	3.89	.64	324
Academic traditions	Denmark	4.28	.53	74
	Finland	4.33	.48	81
	Norway	4.19	.62	85
	Sweden	4.25	.61	84
	<i>Total</i>	4.26	.56	324
Societal beliefs	Denmark	3.84	.66	74
	Finland	4.15	.50	81
	Norway	3.77	.65	85
	Sweden	3.93	.64	84
	<i>Total</i>	3.92	.63	324
Internationalization	Denmark	4.10	.46	74
	Finland	4.31	.47	81
	Norway	4.19	.59	85
	Sweden	4.27	.41	84
	<i>Total</i>	4.22	.49	324
Networking	Denmark	3.32	.63	74
	Finland	3.33	.68	81
	Norway	3.27	.68	85
	Sweden	3.41	.73	84
	<i>Total</i>	3.33	.68	324
Public authorities	Denmark	3.23	.76	74
	Finland	3.44	.63	81
	Norway	3.24	.83	85
	Sweden	3.36	.79	84
	<i>Total</i>	3.32	.76	324

As was mentioned in Chapter 6, the sampling was not random and so the following findings must be treated with caution. The multivariate normality was tested using test normality of each DV as a proxy. Five systemic factors had skewness and Kurtosis indicators between -1.00 and 1.00, yet data distributions for internationalization (skewness = -1.45; Kurtosis = 4.48) and academic traditions (skewness = -1.54; Kurtosis = 3.92) did not follow a normal curve (West et al., 1996). As discussed in the previous chapter, however, these results make sense since the

factors of internationalization and academic traditions were considered to have a strong positive impact by most participants in most countries.

A MANOVA also requires that the variances in each group are equal and that the correlation between any two dependent variables is the same in all groups. I used The Box M to test the homogeneity of covariance matrices. The test was significant ($p = 0.02$) and indicates that further results must be treated with great caution. Although sample sizes were equal, the heterogeneity of covariance matrices encouraged me to select a more conservative post-hoc test.

And finally, the sample size ($N = 324$) is slightly too small to reach the full potential of the MANOVA. With 7 DVs and 4 groups, it is recommended to count 14 cases per cell to have an estimated power of .70 using an alpha of $\alpha = 0.05$ (Stevens, 1992), but I counted 11 cases per cell. A larger sample size could have increased the significance of the following results, but it remains relevant at this stage for the identification of preliminary differences between countries. It is worth noting that the few remaining missing data were treated as pairwise in the analysis.

The one-way MANOVA revealed significant differences ($p < 0.01$) among three factors, Pillai's Trace = 0.15, $F(21, 948) = 2.42$. Pillai's trace is more robust than the other statistics when model assumptions are violated; in this case, the violated assumptions here include multivariate normality and the homogeneity of variance-covariance matrices. This result suggests that at least one country differs from the others for at least one of the seven factors. A test of between-subject effects reveals a significant group difference for the factors "Societal beliefs," $F(3, 2.23) = 5.90$, $p < 0.01$; and "Internationalization," $F(3, 0.70) = 2.91$, $p = 0.04$.

Levene's test of equality of error variances was however not significant for all factors but "Public authorities," $F(3, 320) = 2.67$, $p = 0.05$. Considering the significance of the Box M and Levene's test for one factor, I chose to use the Games-Howell procedure because it generally has the best performance (Field, 2013) though it is worth noting that it produced similar results as the Tukey, Bonferroni and Hochberg's GT2.

Table 30 only shows the results produced by the Games-Howell procedure, since they appear to be the most reliable. Societal beliefs obtained significantly higher scores in Finland than in Denmark ($IJ = 0.31$, $p = 0.01$) and Norway ($IJ = 0.38$, $p < 0.01$), which suggests that society's belief in the contribution of higher education to society was perceived as having a greater impact

for Finnish participants than for Danish or Norwegian participants. Internationalization also obtained a higher average score in Finland than in Denmark ($IJ = 0.21, p = 0.03$).

Table 30

Games-Howell multiple comparisons for two factors (N = 324)

Dependent variable	(I) Country	(J) Country	Mean difference (I-J)	Std. error	Sig.	95% confidence interval	
						Lower bound	Upper bound
Societal beliefs	Denmark	Finland	-.31*	.09	.01	-.55	-.06
		Norway	.07	.10	.89	-.20	.34
		Sweden	-.09	.10	.80	-.36	.18
	Finland	Denmark	.31*	.09	.01	.06	.55
		Norway	.38*	.09	.00	.15	.61
		Sweden	.21	.09	.08	-.02	.45
	Norway	Denmark	-.07	.10	.89	-.34	.20
		Finland	-.38*	.09	.00	-.61	-.15
		Sweden	-.17	.10	.33	-.42	.09
	Sweden	Denmark	.09	.10	.80	-.18	.36
		Finland	-.21	.09	.08	-.45	.02
		Norway	.17	.10	.33	-.09	.42
Internationalization	Denmark	Finland	-.21*	.08	.03	-.41	-.02
		Norway	-.09	.08	.74	-.30	.13
		Sweden	-.17	.07	.08	-.35	.01
	Finland	Denmark	.21*	.08	.03	.02	.41
		Norway	.13	.08	.41	-.09	.34
		Sweden	.04	.07	.93	-.14	.22
	Norway	Denmark	.09	.08	.74	-.13	.30
		Finland	-.13	.08	.41	-.34	.09
		Sweden	-.09	.08	.69	-.29	.12
	Sweden	Denmark	.17	.07	.08	-.01	.35
		Finland	-.04	.07	.93	-.22	.14
		Norway	.09	.08	.69	-.12	.29

* $p < 0.05$

4 Summary

This chapter provided the quantitative results that, in turn, have partially answered RQ1 and RQ3. The results bring forth two salient points. Firstly, according to multiple comparisons based on a one-way ANOVA, “Academic traditions” and “Internationalization” are perceived as the systemic factors with the strongest impact on academic research production across the four Nordic HES. In the Discussion, these results will be compared to qualitative findings and the resulting convergence should offer both support and nuances to the assertions made here.

Secondly, the MANOVA here presented reveals that there are few yet significant differences between countries regarding the factors “internationalization” and “societal beliefs.” One could wonder how these differences affect the logic of this thesis. The core research objective of this thesis is to identify systemic factors contributing to scientific capital accumulation across the four Nordic HES. The rationale was that, following Holmes’ (1981) problem approach, Nordic welfare regimes were conceived as an ideal type facilitating the analysis of contextual contingencies. The robustness of the ideal type does not imply, however, that it is monolithic.

Accordingly, the third research question of this thesis was to analyze how the perceived impact of systemic factors on scientific capital accumulation varied between Denmark, Finland, Norway and Sweden. Results do not challenge the robustness of the Nordic ideal type, but do point to noteworthy distinctions. Surveyed Finnish system actors gave significantly higher scores to items related to “Internationalization” than their Danish counterparts, as well as significantly higher scores to items related to “Societal beliefs” than their Danish and Norwegian counterparts. There are thus significant differences for two of the seven factors in three of the four countries under study. These differences will be put in context with data from interviews in Chapter 15. It is probable that further studies (respecting the homogeneity assumptions and based on larger samples) could identify more significant differences among the four Nordic HES.

Part 5
Discussion

Chapter 14

Convergence Between Data Sets Regarding the Factors Contributing to the Accumulation of Scientific Capital in Nordic Higher Education Systems

Following Münch's (2014) theory of academic capitalism and Holmes' (1981) problem approach to comparative education, the objective of this thesis, as has been stated previously, is to identify the systemic factors conditioning Nordic HES' comparative advantage in accumulating scientific capital. More precisely, it aims at answering three core research questions:

(RQ1) What are the systemic factors perceived to have a positive impact on scientific capital accumulation in Nordic HES?

(RQ2) How do system actors explain the impact of systemic factors on scientific capital accumulation in Nordic HES?

(RQ3) How does the perceived impact of systemic factors on scientific capital accumulation vary between Denmark, Finland, Norway and Sweden?

Thus far, Part I described four theoretical frameworks (academic capitalism, the varieties of capitalism approach, welfare regimes typology and neo-institutionalism) used to intellectualize the problem of scientific capital accumulation in the context of the Nordic countries. Part II explained the methodological approaches guiding the analyses, namely the multi-level governance framework and a convergent-parallel mixed-method design. Part III presented qualitative findings regarding the six factors - beliefs, academic structure, governance, public-sector research funding, networking and internationalization. Part IV included two chapters related to quantitative results. The factor analysis revealed an eight-factor structure where the seven following factors were sufficiently reliable to be further tested: academic traditions, societal beliefs, early-career researchers, public authorities, funding streams, networking and internationalization. Average survey scores and multiple comparisons based on a one-way repeated-measure ANOVA revealed significant differences between factors' perceived importance.

Part V now draws points of convergence between the qualitative and quantitative data sets in order to formally test the robustness of the seven factors. This chapter first presents and analyzes

the factors that remain unrefuted across the four Nordic countries. The next chapter, Chapter 15, discusses the few significant differences between cases. Finally, Chapter 16 proposes a new frame to compare varieties of academic capitalism and lays the groundwork for the identification of a Nordic variety of academic capitalism.

By following a deductive approach, the first step of this discussion is to merge quantitative results and qualitative findings and reject null hypotheses when there is convergence between data sets.

H1: Academic traditions contribute to scientific capital accumulation in Nordic HES.

As shown in Table 31, numerous organizing themes (or indicators) related to the factor “academic traditions” were saturated at the stage of qualitative analysis. Most of these indicators also obtained an average score above $M \geq 4.00$ in the survey. Finally, the factor’s mean was significantly higher than the means of all the other factors, with the exception of “internationalization.” Convergence between data sets makes it possible here to reject the null hypothesis and consider H1 as tentatively unrefuted.

H2: Societal beliefs contribute to scientific capital accumulation in Nordic HES.

As shown in Table 32 below, three organizing themes (or indicators) related to the factor “societal beliefs” were saturated at the stage of qualitative analysis. Two of these indicators also obtained an average score above $M \geq 4.00$ in the survey. Finally, the factor’s mean was significantly higher than the means of the factors “public authorities” and “networking” while significantly lower than the means of “academic traditions” and “internationalization.” The null hypothesis can therefore only be partly refuted.

H3: Early-career researchers contribute to scientific capital accumulation in Nordic HES.

As shown in Table 32 below, two organizing themes (or indicators) related to the factor “early-career researchers” saturated at the stage of qualitative analysis. One of these indicators also obtained an average score above $M \geq 4.00$ in the survey. Finally, the factor’s mean was significantly higher than the means of “public authorities” and “networking” but significantly

lower than the means of the factors “academic traditions” and “internationalization.” The null hypothesis can therefore only be partly refuted.

H4: Public authorities contribute to scientific capital accumulation in Nordic HES.

Although some indicators related to “governance” (here reformulated as “public authorities”) saturated at the stage of qualitative analysis, the only indicator obtaining an average score above $M \geq 4.00$ in the survey was “research councils” in Denmark and Sweden. Moreover, the factor’s mean was significantly lower than the means of all the other factors, with the exception of “networking.” Convergence between data sets in this case prevents me from rejecting the null hypothesis and H4 must therefore be considered refuted.

H5: Funding streams contribute to scientific capital accumulation in Nordic HES.

As shown in Table 32 below, some organizing themes (or indicators) related to the factor “funding streams” saturated at the stage of qualitative analysis. Three of these indicators also obtained an average score above $M \geq 4.00$ in the survey. Finally, the factor’s mean was significantly higher than the means of “public authorities” and “networking” but significantly lower than the means of the factors “academic traditions” and “internationalization.” The null hypothesis can therefore only be partly refuted.

H6: Networking with non-academic actors contributes to scientific capital accumulation in Nordic HES.

Although some indicators related to “networking” saturated at the stage of qualitative analysis, no indicator obtained an average score above $M \geq 4.00$ in the survey. Moreover, the factor’s mean was significantly lower than the means of all the other factors, with the exception of “public authorities.” Convergence between data sets prevents me here from rejecting the null hypothesis and H6 must therefore be considered refuted.

H7: Internationalization contributes to scientific capital accumulation in Nordic HES.

As shown in Table 31 below, numerous organizing themes (or indicators) related to the factor “internationalization” saturated at the stage of qualitative analysis. Most of these indicators also obtained an average score above $M \geq 4.00$ in the survey. The factor’s mean was significantly

higher than the means of all the other factors, with the exception of “academic traditions.” Convergence between data sets prevents me from rejecting the null hypothesis and H7 is therefore considered as tentatively unrefuted.

In the following section 1, the four theoretical frameworks introduced in Part II are used to recontextualize the factors that are perceived as having the strongest positive impact and cannot be refuted. Section 2 discusses three other factors that, while not perceived as most important, are still perceived as relevant in the context of Nordic HES.

1 Factors perceived as having a strong positive impact

Among the seven factors listed above, qualitative and quantitative data sets converge regarding the strong positive impact of academic traditions and internationalization across the four Nordic HES. Table 31 presents points of convergence between factors with statistically significant higher means, indicators obtaining an average score above 4.0 and organizing themes achieving saturation in the deductive thematic analysis.

Table 31

Convergence between factors with the highest means, indicators with an average score above M ≥ 4.00 and saturated organizing themes

Factors	Denmark		Finland		Norway		Sweden	
Data source	Quantitative	Qualitative	Quantitative	Qualitative	Quantitative	Qualitative	Quantitative	Qualitative
Academic traditions	Academic freedom Prominence of public funding							
	Funding concentration into universities					Funding concentration into universities		
	University autonomy Professors' influence		University autonomy Professors' influence		University autonomy Professors' influence	University autonomy Professors' influence	Professors' influence	
Internationalization	Research collaborations Foreign scholars European funding							
	Institutional partnerships		Institutional partnerships		Institutional partnerships		Institutional partnerships	
			International students				International students	

Qualitative and quantitative analyses both tentatively suggest the positive impact of public funding, funding concentration into universities, as well as the prominence of public funding and academic freedom, international research collaborations, the recruitment of foreign scholars and European research policies and funding.

1.1 Academic traditions

Based on system actors' perspectives, academic traditions would appear to be the most important factor in explaining the comparatively high level of scientific capital accumulation by Nordic HES. As proposed by Clark (1983), beyond mechanistic structural arrangements, beliefs (or the cultural-cognitive pillar) may play a significant role in shaping HES and, we could add, in shaping their comparative advantage. Mendoza (2009) has also noted interaction between the academic work and the overarching academic culture that transcends disciplines and institutions. The notion of culture employed by Mendoza includes themes of academic freedom, collegiality, production of knowledge, education of the youth and service to society. In this case, according to the factor analysis, academic traditions include academic freedom and collegiality, and also of funding concentration into universities and the prominence of public funding.

1.1.1 Academic freedom

Academic freedom had the second highest score in the survey (after international research collaborations) and its importance was confirmed by a significant number of actors who perceived that, as stated by the senior official of a research council, "it is essential that researchers be able to do what they are most interested in, and that there are opportunities to concentrate on research, no matter in which area they are." Academic freedom was perceived by system actors as an academic tradition that facilitates scientific capital accumulation by increasing professors' motivation and dedication, and truly respects the scientific process, seeing as it is impossible to predict discoveries or breakthroughs.

Up until the 1960s, Nordic universities were influenced by German ideals of education, which included a strong protection from the government and the Humboldtian integration of research and teaching, academic freedom and collegiality (Askling, 2012). These ideals and the traditional schema (Scott, 2008) associated with them still permeate the Nordic HES, giving rise in turn to the ideal of a "Republic of Science" (Degn, 2014) which follows an adaptation of the

Humboldtian ideals (Välilmaa, 2001) where academic freedom and collegiality are connected with a promise to serve the public good under the financial support of the state (Benner, 2011). This points to an interesting interaction between the autonomous and heteronomous poles of the academic field.

Bourdieu (1988) and Münch (2014) noted the conflicting nature of the interaction between an autonomous pole characterized by the endogenous demand for knowledge and control over university-specific capital, and a heteronomous pole characterized by the broader external demands for relevance and accountability. Münch (2014) also claimed that the heteronomous pole (and especially economic thought) has co-opted the academic field, making social and economic capital more determinant in researchers' career advancement than their contribution to the pursuit and edification of science. In the case of Nordic HES, Askling (2012) noted that the autonomous pole's longstanding Humboldtian rhetoric in Sweden had been counterbalanced by the 1977, 1993 and 2007 reforms which strengthened public control, accountability, transparency and institutional leadership. Similar statements have been made about Finland (Ahola et al., 2014), Denmark (Aagaard, 2011) and Norway (Frølich et al. 2010).

That said, the findings lean rather in the direction of complementarity and mutual reinforcement than in the direction of conflict and contradiction between the autonomous and heteronomous poles. For instance, researchers' academic freedom is supported by broader regulative and normative elements. Nordic laws on higher education safeguard academic freedom within the boundaries of ethics, institutional frameworks and national considerations (Nokkala & Bladh, 2014). To exemplify the complex balance between the interest of society and academic freedom, a senior faculty member in a Norwegian university college cited the first paragraph of the higher education law and its protection of researchers' freedom to choose whatever approaches and methodologies they deem best.

Academic freedom is also protected by the symbolic power embedded in social trust and professors' legitimacy. As explained by Meyer and Rowan (1977), the legitimacy principle states that organizations that succeed in becoming isomorphic with their environment gain legitimacy and the resources to survive (Meyer & Rowan, 1977).

The role of trust in Nordic academic traditions indeed presents a key to understanding the balance between academic freedom and societal expectations. Münch (2014) claimed that, in

American and German societies, a shift had taken place in from trust to suspicion. But Nordic societies seem to have remained trust-based. According to Välimaa (2001) and as shown by the European Commission's (2010) survey, Nordic citizens demonstrate a greater trust in science than the EU-27 average. Trust appears to be a form of symbolic capital through which academics secure a capital of credit (Bourdieu, 1988). Freedom for professors is perceived as a legitimate demand for recognition in order to better contribute to society. Despite Münch's (2014) claim that a shift from trust to suspicion has taken place, participants reported that "there is an unusual high level of trust" and "open and supportive communications" between academics and public authorities.

As explained in Chapter 3 above, the Nordic ideal type is characterized by philosophical positivism, rationality and pragmatic decision-making. Arter (2008) reports that, in Nordic democracies, experts and technocrats have a strong influence in shaping bills before they are presented to parliaments. Ahola et al. (2014) studied the academic profession and observed that one crucial way in which HES protect their autonomous pole was by training their own future workers. Added to this are the facts that the academic profession carries high prestige and its operations are based on such complex knowledge as to prevent intervention from external actors. The content of academic values of course has to respond to social changes, but the "selfless devotion to academic work" still serves to justify academics' influential occupations (Ibid). Taking the example of Sweden, Glimell (2004) had suggested that the emergence of the knowledge society was, in Nordic countries, placed under firm scientific control. While the autonomous pole advocated for its superiority in the public sphere, Swedish scientists became the ethical safeguards in the face of political and commercial intervention.

Bourdieu (1975) had already observed that, in French society, the scientific field had the monopoly of scientific competence, in the sense that only actors belonging to it could legitimately speak with scientific authority. I would extend this observation to the broader social frame. As will be further explained in Section 2.1 of this chapter, Nordic academics actively participate in public policy-making and are trusted to pursue science for the benefit of the overall society. The autonomous pole, namely the researcher or professor's academic freedom, is thus partly protected by his or her personal influence on the heteronomous pole insofar as the academic is regarded as a social and political authority.

A similar conclusion emerges from the analysis of funding streams in Section 2.2 of this chapter. Could the autonomous pole, however, not also be protected by the public prominence of the heteronomous pole? Marginson (2006) has argued that social-democratic regimes place greater value on the “public benefits” of university research than do liberal regimes. As Calhoun (2006) has explained, “public” does not mean academic research is accessible to the common discourse but that the pursuit of knowledge is funded by the public purse and benefits the overall society, thus enshrining the academic’s freedom to the extent that this freedom allows the academic to conduct research which, although not understood by society at large, is nonetheless seen to benefit it.

1.1.2 Public funding

According to both the surveys and interviews, the prominence of public over private funding in Nordic HES contributes to the accumulation of scientific capital. One might wonder how one justifies placing funding under the purview of academic tradition. As was stated in Chapter 4 above, the Humboldtian ideal and its Nordic variation both envision higher education institutions as public and academic research as publicly funded (Välilmaa, 2001). The public nature of education is a symbol of the relationship between public authorities and universities, a symbol that originally meant that nations would benefit from investing important sums into curiosity-based research conducted in their universities. Although private funding has accounted for between 3.42% and 5.11% in Nordic countries in recent years (OECD, 2014), Nordic countries have among the highest public expenditure on higher education and academic research (Kalpazidou Schmidt, 2012)

Beyond the vast amount of funding granted to academic research, which no doubt contributes to the comparative advantage of Nordic HES, it is the *public* nature of this funding that especially fosters the Nordic comparative advantage. As demonstrated by Kim (2013), in economic downturns CMEs retain a skilled workforce and outsmart the market with counter-cyclical investments in research, consolidating their comparative advantage. As was reported in the interviews, research funding in Nordic countries remained stable over the course of the early 1990s and throughout the 2008 crisis, allowing higher education institutions to flourish and keep up with the international competition. When the economy recovered, some Nordic countries had a head-start in terms of knowledge production. Interviewees consequently perceived public

funding to be more stable, less constraining and abler to protect academic freedom and to partly explain the high level of scientific activity in their countries.

More details regarding funding will be presented in Section 2.2, but it is worth mentioning here a factor that was not included in the initial design, though it did appear as important for some interviewees. In addition to traditional research councils, Denmark, Finland and Sweden count many so-called “private foundations” which make important investments into academic research. Some of these foundations – like the Carlsberg Foundation in Denmark – are established by private companies as part of their “social responsibilities” and give funding to both STEM and non-STEM fields without strings attached. Other foundations were originally publicly funded but now act as independent actors. For instance, the Swedish Knowledge Foundation (2015) received in 1994 a lump sum from the Government of SEK 3.6 billion (CAD\$ 556 millions) and, through clever investments, now has SEK 8.2 billion (CAD\$ 1.2 billion) of capital to invest in applied research projects at new universities. A future study might further examine the role of these independent research foundations.

1.1.3 Funding concentration into universities

Funding concentration was perceived as essential in countries with smaller populations. Concentration had two parallel meanings for system actors: merging higher education institutions together, on the one hand, and merging higher education institutions with government institutes, on the other.

Some system actors wondered how many research-intensive universities their country could support. A national-level actor in Finland gave the example of the Netherlands, Denmark, Switzerland and the U.S. to suggest that there could be one research-intensive university per million inhabitants. The primary rationale for encouraging mergers is efficiency and an economy of scale. Interviewees frequently referred to Denmark, which merged its twelve universities into five comprehensive universities and three specialized universities (Pinheiro, Geschwind & Aarveaara, 2015). Norway has also been affected by mergers, especially between university colleges. There were more than a hundred university colleges in the 1990s and there are now twenty-six. Interestingly, while the Social-Democratic Party and the Conservative Party usually adopt different policies, both pushed for mergers in Norway, the former underlining the advantages in terms of managerial costs, and the latter in terms of competition. In Sweden, there

were also many mergers in the Stockholm-Uppsala region, yet in these cases, mergers were bottom-up and sometimes even hostile take-overs. The Social-Democratic Government then had to put a moratorium on such mergers. Pinheiro et al. (2015) remark that these reforms were costly, conflictual, lengthy and that their outcomes are difficult to assess at this point.

Funding concentration, according to interviewees, also referred to the state concentrating its research investments into academic institutions rather than into governmental institutes or R&D subsidies for private businesses. Although the indicator “funding concentration” achieved a score of 4.12 in Norway (the average for the four countries is 4.19), the same organizing theme did not reach saturation as it did for the three other countries. In Norway, Bauer and Kogan (2006) note that universities have resisted reforms and their movement towards greater social relevance. Institutes serve as protectors of academic freedom since they are mandated to do the applied and strategic research (on the marine sector, transport and natural resources) requested by public authorities as well as connect with businesses, while academic researchers can afford not to apply for applied projects and continue to work on more basic or curiosity-based research. In some ways, this does follow the Humboldtian orthodoxy which distinguishes between universities conducting basic research and governmental institutes conducting applied research. More details regarding the specific case of Norway will be provided in chapter 15.

The Swedish R&D system has long been characterized by a clear concentration of research funding into universities (Norden, 2014a). Denmark and Finland, for their part, possess numerous governmental research institutes, though policymakers have become aware that these institutes are competing with universities for access to research funds and the recruitment of bright researchers. Therefore, although government in these countries has placed new demands on universities (such as conducting strategic research and demonstrating their relevance to society), merging institutes and universities has had the effect of reinforcing the central position of academia (Askling, 2012; Bégin-Caouette et al., 2016). To create performing and visible research environments, Denmark incorporated most of its governmental research institutes with universities, while Finland has followed a more incremental process of merging institutes together and then integrating some of them into university structures (Norden, 2014a).

Mergers seem to fit the category of social mechanisms aimed at constructing excellence (Münch, 2014). By increasing the size of institutions and converting their research into universities’

research, Nordic HES accumulate more scientific capital. Münch described the German Excellence Initiative as an example of symbolic construction of excellence whereby states reinforce existing hierarchies and channel competition.

Münch also identified social mechanisms at work constructing and reproducing status hierarchies in the academic field. One example of such a mechanism is institutional size, which increases a center's or an institution's scientific capital accumulation and contributes to its visibility. Olson and Slaughter (2014) considered "excellence initiatives" to be a feature of CMEs' response to academic capitalism. But although they follow a similar logic, Nordic HES distinguish themselves from other (Continental) CMEs. Mergers appear as an alternative to excellence initiatives where the resulting institutions become institutional beacons, achieve greater output as well as the critical mass for cutting-edge research (Pinheiro, 2007).

In sum, in Nordic countries, the symbolic capital inherent to trust protects the academic freedom needed for science and encourages the increase, maintenance and concentration of public economic capital into consolidated academic institutions. It should be noted that professors' influence and university autonomy obtained high survey scores, but the qualitative analysis revealed divergence in actors' perspectives, thus preventing any conclusive statements on these two traditions. There was also divergence on the levels of organizational, financial, staffing and academic autonomies (Esterman et al., 2011). It was recognized that autonomy may favor strategic decision-making, but actors felt that their autonomy was constrained by "little fiscal freedom" and "too much political involvement." Similarly, collegial influence achieved saturation in Sweden, while Danish and Finnish actors criticized a "very hierarchical process."

1.2 Internationalization

Internationalization was hypothesized as having a positive impact because its inherent symbolic and relational carriers (Scott, 2008) increase the material, social, cultural and symbolic capital of HES, which are then converted into scientific capital. The factor did achieve saturation in all four countries, and obtained a significantly higher mean than all other factors except academic traditions, discussed in the previous section. It follows, then, that internationalization seems to play a significant role in shaping the comparative advantage of Nordic HES.

Although internationalization is important for many countries, in the Nordic countries, it was framed by system actors as compensating for their nations' population size (Maassen et al., 2008). As stated by representatives from Nordic cooperation organizations, Nordic countries are small and can have a greater impact when they work jointly. As was mentioned in Chapter 3, Nordic countries have a long history of collaboration, from the Kalmar Union to the formation of a monetary union in 1873, the establishment of an Inter-Parliamentary Association in 1907 and a Council of Ministers in 1971. This council and the committee of senior officials for higher education and research developed many instruments in order to foster R&D (NordForsk) and student mobility (NORDPLUS). Vitola (2014) reports that Nordic governments welcome the coordination process as a way of avoiding overlap and duplication in research policies and thereby increasing efficiency.

But if Nordic cooperation has been perceived as an effective political instrument, qualitative findings and quantitative results both suggest that it does not have a strong positive impact on academic research production (thus its absence from Table 31). The level of Nordic research funding is relatively small compared to European funding sources. The programs of the Nordic Centers of Excellence, for instance, provide small additional funding to increase research groups' visibility, networks and capacity to develop ties in the broader European region (Norden, 2014b). NordForsk, for its part, lacks cohesion because it is primarily governed by national research funding bodies (Ibid).

So the international activities contributing to the Nordic HES' comparative advantage seem to be those that extend beyond the Nordic region. In Chapter 9, the "internationalization effect" was broken down into four benefits: ideas, resources, status and opportunities. Adopting the lens of academic capitalism, the present section explores how internationalization, as a form of social capital, increases HES' symbolic, cultural and material capital, which can then be converted into scientific capital.

1.2.1 Symbolic capital

International networks generate symbolic and economic capital. A study conducted by Norden (2014b) suggests that international mobility increases researchers' international networks, opportunities for knowledge exchange and participation in research projects. Many studies – such as the one conducted by Li, Liao and Yen (2013) – have already showed that international

networks increase researchers' number of publications and citations. Moreover, publishing an article in collaboration with a prominent author projects a positive signal on the quality of the publication, and can strengthen the position of the co-author in the wider academic community. A report from the Academy of Finland (2014b) revealed that international co-publications have a greater scientific impact than publications written by researchers working in Finland alone. This may partly explain why the indicator and organizing theme "International research collaborations" both reached saturation and obtained the highest survey score (4.81) across all Nordic HES.

At the macro-level, international research collaborations can increase HES' symbolic capital. In the interviews, national-level actors explained that, although Nordic countries are small, they are important players in the global academic community because of the multiple networks they have developed and their high number of co-publications with international partners.

Internationalization as a systemic factor is supported by cultural-cognitive, normative and regulative elements. First, as noted in the interviews, the increased use of English in university courses and scientific publications is a cultural-cognitive shift encouraging the dissemination of research produced in Nordic countries. Second, there is a norm and an expectation for young researchers to develop international networks. Norden (2014a), for instance, noted that it is hardly possible today to move from a postdoc position to a permanent professorial position without a stay abroad. This is seconded by findings from Kitagawa et al. (2015) which suggested that international research collaborations may facilitate the likelihood of obtaining an assistant professor position.

Third, regulative frameworks – such as development contracts, funding formulas and quality assurance mechanisms – have also been put in place to encourage universities and their researchers to publish in prestigious journals and to apply for international funding (Ibid). The Quality Reform in Norway, for instance, encouraged universities and university colleges to enter into cooperation agreements with a large number of foreign institutions (Norden, 2014a). In Finland, universities have used internationalization in their goal of making local science known abroad in order to encourage profiling, i.e., focusing on units' strengths (Pietilä, 2014). These units can then apply for large and very competitive European funding. Interviewees reported that ERC and Horizon2020 grants were often more valuable than national grants and, beyond their

impact in terms of material capital, interviewed researchers perceived obvious benefits to obtaining these grants insofar as they increased their reputation both internationally and nationally.

International social and symbolic capital thus appear to mutually reinforce one another and to contribute to the production of internationally-recognized academic research. International networks represent a form of legitimacy and social esteem for the Nordic academics and institutions. By becoming more known abroad, Nordic researchers may attract prestigious partners of international repute to work with them. This could lead to a “Closing Effect” (Münch, 2014) where actors possessing such symbolic power cooperate only with each other in order to protect their status. This is particularly the case with international partnerships between institutions that are positively perceived by institutional leaders because these can promote institutional learning and institutions’ symbolic power. In the survey, “institutional partnerships” obtained an average score of 4.34, but as shown in Table 31, the organizing theme did not reach saturation in the interviews. In fact, a few researchers, union leaders and research council representatives felt that top-down international initiatives would hamper spontaneous collaborations based on shared interests. According to Münch’s (2014) theory of academic capitalism, collaborations established on the sole basis of symbolic or economic capital may reinforce institutions’ symbolic power but limit the accumulation of scientific capital since only the individual researchers know who are the collaborators with whom they need to pursue meaningful scientific projects.

On a final note, it is interesting to distinguish between international collaborations and international mobility. OECD (2013) data regarding international co-authorship as a percentage of total publications between 2007 and 2011 suggest that Nordic countries are among the countries with the highest proportion of co-publications: Denmark being at 53.5%, Sweden at 52.9%, Norway at 49.9% and Finland at 47.9%. As a point of comparison, the USA is at 27.0% and the United Kingdom at 42.3%. At the same time, however, a study by Norden (2014b) showed that Nordic researchers are less mobile than their non-Nordic European counterparts, 47% of the former having spent a research stay abroad in contrast to 57% of the latter. Yet among those who go abroad, a greater proportion (67%) of Nordic researchers stay longer than six months when compared to their non-Nordic European counterparts, for whom the proportion is 50%.

1.2.2 Cultural capital

Internationalization serves to pool cultural capital such as ideas, knowledge, data and competences. Scientific fields become narrower and it is not unusual in a smaller country to find few experts in any given sub-discipline. In countries with between five and nine million inhabitants or with eight universities (in the case of Denmark), the possibility of going abroad is considered critical.

Multiple studies have already demonstrated that international networks increase research teams' capacities. As Ulnicane (2014) has noted, high-quality expertise and the combination of different mindsets are definite reasons for establishing international networks. Once established, these networks allow the pooling of competences and the building of stronger teams. The Norden study (2014a) revealed that international networks contribute to young scholars' learning as well as their capacity to build a relatively independent career platform. Kyvik, Vabø and Alvsvag (2015) showed that informal research collaborations with partners abroad strengthened research leadership, contributed to research environments, made for the development of more adapted research strategies and helped achieve the critical mass needed to conduct more demanding research projects. One could argue here that collaborations between academics within the same country would accomplish a similar effect, but the authors suggest that international networks bring more benefits than national networks.

Internationalization also increases Nordic HES' cultural capital through the recruitment of foreign scholars. International recruitment reached saturation in the interviews and obtained an average score above 4.27 in the four countries. While outbound mobility appears more limited in the Nordic HES, this sort of internationalization "at home" is more common. In Denmark, the number of admitted international students increased by 18% between 2010 and 2012 (Ibid). In Sweden, international students represent 37% of all doctoral students (SNAHE, 2012), and, according to the OECD (2014), the proportion is 23% in Denmark. In Norway, non-Norwegian citizens account for 36% of the doctoral degrees awarded, including 51% of degrees awarded in the natural sciences and 65% in technology (Bruen Olsen, 2014).

Doctoral students, postdocs and professors from abroad contribute to an increase in academic research production because of the knowledge they bring and the work they help realize. A Norwegian researcher explained that mobile researchers tended to be more motivated and

ambitious. Since Nordic countries are small and count few large universities, it was not unusual until recently for graduates to work in the same institution that granted them their PhD. For instance, in the mid-1990s, 89% of the senior lecturers at Uppsala Universities had obtained their doctorate from the same institution (SOU, 1996). According to Riis (2012), international recruitment has helped counter this form of academic in-breeding.

Münch (2014) has characterized international recruitment as a “gift-exchange situation,” where scholars carry out research, make contacts to further their academic careers and afterwards, whether they stay in the country or leave to work in another country, they praise the institution where they obtained their PhD, thus contributing to its symbolic capital. As a Norwegian government representative mentioned in an interview, the policy of her government has been to recruit scholars so that they may in turn become carriers of Norwegian knowledge abroad. Interestingly, this symbolic capital furthers the recruitment of prestigious scholars who, according to the Potlatch Effect (Münch, 2014) come to Nordic HES to pursue their cutting-edge research, thus facilitating scientific capital accumulation.

However, it is worth noting that many researchers come for short-term stays and leave at the end of their contract. Norden (2014a) considered the following possible explanations. In Sweden, the lack of tenure-track positions may discourage non-national applicants from making a long-distance international move. In Finland, the comparatively low level of remuneration combined with the dependence on short-term funding was described as challenging for foreign scholars. While the relative equality of conditions between academic and non-academic workers within Nordic countries seems to contribute to the social status of higher education (see Section 2.1 below), it may for the same reason prove less attractive to foreign academics of international repute.

Another explanation is somewhat subtler and more controversial. One might connect the difficulty for foreigners to establish themselves in the Nordic region with weather conditions and language considerations. Pratt (2008) characterized Nordic societies as homogeneous, consensual and based on collective interests. The cohesion, cooperation and self-regulation would have likely been fostered by the emigration of Nordic populations and low immigration. Although recruited scholars often leave after a short-term position, they are nonetheless perceived as consolidating HES’ networks, reputation and research production.

All Nordic countries have established regulative frameworks to overcome these barriers. For instance, in 2005 they adopted the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers. In 2007, the Green Paper titled “The European Research Area: New Perspectives” was published, which identified the importance of an adequate flow of competent researchers. Finally, in 2010, the European Partnership for Researchers was founded, which encourages institutions to systematically open up research positions to all European researchers and research councils to ensure the portability of research grants (Norden, 2014a). To counter the comparatively lower wages of professors, Sweden introduced tax incentives for foreign researchers and scientists. Norway implemented the YGGDRASIL Mobility Program offering additional grants to highly qualified young researchers visiting Norway. Finland requires its universities to advertise professor positions internationally, and has implemented a tax relief for foreigners. Also, through the Academy of Finland and TEKES, the Finland Distinguished Professor Program was created to provide the best conditions to promising foreign scholars (Academy of Finland, 2014b).

1.2.3 Material capital

International networks are a form of social capital which can be converted into material capital, such as equipment and funding. With regard to equipment, despite Münch’s (2014) criticism of what he considered to be over-investments in science, some interviewees argued to the contrary that countries need to pool their resources in order to fund the large facilities needed for scientific breakthrough. The Finnish Ministry of Education and Culture (2014) recognized that Finnish discoveries have benefited from such European facilities as the CERN, the European Organization for Nuclear Research and the Biobanking and Biomolecular Resources Research Infrastructure. On a smaller scale, a Danish professor of bio-chemistry related that, twenty years ago, his field was not well recognized and that consequently he was not able to attract the necessary funding to build the equipment he needed, and so had to collaborate with a German researcher. To the same point, the director of a Danish innovation network also considered that internationalization can facilitate access to equipment and funding. In their study, Li et al. (2014) argued that obtaining non-redundant resources from foreign research groups is a decisive factor in co-authorship networks’ scientific production.

Another way in which international networks can be converted into material capital is through the benefits they offer to the fundraising process. In order to obtain any European funding, research groups must include members from more than one European country. European policies and funding obtained an average score of $M = 4.17$ in the survey. In the interviews, actors explained that European research funding is crucial because it grants important sums for relatively long periods. Some distinctions need to be made between the different funding instruments, however. While Horizon 2020 (and the previous Framework Programs) was considered by some actors to be burdensome and orienting research towards pre-defined areas (though remaining important because of a € 50 billion budget), funding from the European Research Council was considered more open, with excellence as its sole criteria. For smaller countries, these important grants create the opportunity for building stronger research groups, buying cutting-edge facilities and conducting breakthrough research, which all contribute to the accumulation of scientific capital.

To summarize, small-size Nordic HES rely on international networks as a form of social capital to generate symbolic, cultural and material capital, which in turn are converted into scientific capital. Extending networks increases the number of connections academics can mobilize in the context of global academic capitalism. Drawing from Section 1.1 above in which I spoke of the relationship between the autonomous and heteronomous poles, I could hypothesize that the heteronomous pole of the academic field not only protects the core of the autonomous pole, but serves as a “transmission belt” through which the development of foreign scientific fields supports the growth of the autonomous pole.

2 Other factors of interest

As has been stated previously, this study follows Popper’s (2005) falsification process, according to which a factor is not yet falsified so long as there is convergence between significant quantitative results and saturated themes emerging from the qualitative analysis. According to this approach, academic traditions and internationalization are considered to be not yet falsified in the specific context of Nordic HES and are perceived by system actors to play a more important role than the other five factors.

As shown in Table 32, however, three other factors besides academic traditions and internationalization feature an observed convergence between saturated themes and indicators obtaining a score above $M \geq 4.0$ in the survey. As systemic factors, societal beliefs, funding streams and early-career researchers obtained significantly smaller means than academic traditions and internationalization, but significantly larger means than public authorities and networking. In other words, these three factors can be considered as part of the broader picture, and therefore meriting their own discussion, while remaining tentatively less relevant than the factors academic traditions and internationalization.

Table 32

Convergence between factors with high means, indicators with an average score above 4.0 and saturated organizing themes

Factors	Denmark		Finland		Norway		Sweden	
Data source	Quantitative	Qualitative	Quantitative	Qualitative	Quantitative	Qualitative	Quantitative	Qualitative
Societal beliefs	Higher education should serve the public good / Higher education contributes to society							
	Equitable access / Egalitarian values							
	STEM fields are important	Status of higher education	STEM fields are important	Status of higher education	STEM fields are important		STEM fields are important	Status of higher education
			SSH inform welfare					
Funding streams	Competitive funding							
	Basic funding					Basic funding		
		Excellence funding		Excellence funding		Excellence funding		Strategic funding
ECR	Doctoral students		Doctoral schools		Doctoral students			
		Doctoral schools		Doctoral students			Doctoral schools	

2.1 Societal beliefs

Societal beliefs include the effects of societal rules and mental patterns used by individuals to generate meaning (DiMaggio & Powell, 1983). This factor was discussed in Section 1.1 on academic traditions to the extent that the two refer to the cultural-cognitive pillar that holds HES together and contributes to some actors' symbolic power (Scott, 2008; Swartz, 1997). This earlier discussion was brief, however, because the two factors remain ultimately distinct, stemming from different poles (namely, the autonomous and heteronomous) The correlation

matrix presented in Tables 23 and 24 (Chapter 12) indeed showed positive correlations between academic freedom and the belief that higher education should contribute to the public good, $r = 0.15$, $p. < 0.01$, and the belief in an accessible quality higher education, $r = 0.20$, $p. < 0.01$. The present section will attempt to explain why societal beliefs are perceived as important, or at least more important than public authorities (IJ = 0.60, $p. = 0.05$) and networking (IJ= 0.59, $p. = 0.05$).

Firstly, the belief that higher education serves the public good obtained a high survey score (an average of $M = 4.13$) and was saturated in interviews. The literature already suggests that there is a long tradition of viewing education as useful in Nordic countries. Since their inception, Nordic medieval universities were useful in training the Lutheran Clergy and civil servants (Välilä, 2001). In the 19th century, they contributed to the industrialization process. Around the same time, education became the root of progressive and democratic Nordic societies. Danish intellectuals, for instance, developed the notion that the “intelligence of the peasantry” could be developed by rural schools (Musial, 2000). As Välilä (2012) reported, the academic field contributed to establish the idea of a civic society outside of bureaucracy, while student associations offered models to emerging political parties and various newspapers and books were published by students and professors with the aim of educating society.

As stated in Chapter 3, the Nordic ideal type includes a philosophical inclination towards positivism. Some interviewees indeed explained that their country had a long tradition of involving scientists in developing policies. Science was described by Elam and Glimell (2014) as a “third power” in the development of social-democratic institutions between 1950 and 1990. In many Western countries, this period corresponds to rapid scientific and technological changes, as well as the emergence of the societal belief that research and science will solve countries’ problems. In the Nordic “Golden Age of Social-Democracy” (Esping-Andersen, 1990), however, this period was also marked the self-regulation of science perceived as an autonomous motto of progress and close interaction between policymakers and scientists (Glimell, 2014).

In Sweden in 1962, scientists (or rather the academic research subfield) contributed to a phenomenon of *Forskningsberedningen* (“research policy advising”) in which they undertook the task of preparing research policies and explaining directly to politicians what researchers needed. In Sweden, medical sciences defined the national elite (Börjesson, Lidegran, Palme & Broady, 2014) and the natural sciences played a dominant role in national narratives about modernization

and industrialization (Asdal & Gradmann, 2014). Surveys in Sweden as early as the 1950s already showed university professors to be the most highly esteemed professional group (Tomasson, 1970).

During a period that saw the increasing politicization of science from the 1990s onwards, Elam and Glimell (2014) observed that, in the case of Sweden, the academic research subfield succeeded in casting itself as the “only reliable guardian of Swedish democracy” (p.50). When a social debate about stem cells broke out, civil society looked to the Swedish Research Councils before its own government. As a consequence, the ethics of stem cell research remained under the control of the autonomous pole of the academic field instead of passing through a form of “democratic accountability” where the general public or its representative would have had any say on the issue.

The societal belief that higher education should serve the public good seems to contribute to the accumulation of both symbolic and material capital. Nordic citizens seem to trust and praise their researchers a great deal. Interviewees noted that citizens share a curiosity for research and a conception of science as an activity contributing to their well-being. A senior government official in Denmark also said that researchers have a lot of credibility and are appreciated by the general public. As mentioned in Section 1.1, this societal belief in the utility of higher education ultimately contributes to higher education’s legitimacy and capacity to act autonomously. Universities are not set free for their own sake, in a sense, but rather with the expectation that increased autonomy will prove to be useful in the new global knowledge-based economy.

The symbolic capital generated by societal beliefs such as this one can then be converted into material capital by means of public investments. The general public support for higher education is cited as a reason why Nordic governments invest so massively in both research and PhD education. As it has been explained by a Danish government representative, public trust in science is a precondition for the allocation of resources to academic research. Indeed, the percentage of the GDP associated to higher education expenses in R&D (HERD) is 0.95 in Denmark, 0.92 in Sweden, 0.77 in Finland and 0.52 in Norway, while the OECD average is 0.43 (OECD, 2014). In addition to funding research, governments have also increased graduation rates at the doctoral level above the OECD average (OECD, 2014), as a way of developing potential in a small population.

Interestingly, accessible higher (and postgraduate) education is both the cause and the indirect consequence of public support for academic research. As one Finnish interviewee explained, one of the reasons university education and research are perceived as important activities is high enrolment rates in higher education and the perceived equal access to the academic research field. This field is not conceived as a secret place reserved for elite researchers conducting studies that no one understands. It is rather conceived as an open and fair milieu. In this way it connects to a second societal belief: equality. In the survey, the indicator “equitable access to a quality higher education” obtained an average score of 4.14. In the interviews, system actors extended the discussion to the inherent egalitarian values of the Nordic ideal type (Esping-Andersen, 1990; Fritzell, 2001; Markkola, 2006; Pratt 2008).

In political economy (e.g., Barr, 2004), the concept of equality can be conceived either as an equality of opportunity (such as the possibility for everyone with the right capacity to access higher education) or an equality of condition (such as ensuring that citizens who are not capable or do not want to enroll in higher education institutions have satisfactory living conditions). Analyzing higher education participation and funding, Pechar and Andres (2011) found that, while Anglo-Saxon welfare regimes prioritize equality of opportunity and Continental European welfare regimes prioritize equality of condition, Nordic welfare regimes avoid that trade-off by promoting both at the same time.

As a Finnish doctoral student stated during an interview, Nordic countries need to develop the potential of their small population as much as possible, and one way of doing this is to ensure that education is a basic right and that access to higher education does not depend on families’ socio-economic status. University enrolment rates below 20% in Finland (not including enrolment in polytechnics) do not mean that every applicant is admitted, but rather that every applicant has a fair chance to access higher education, depending on his or her capacity (Ahola et al., 2014). Students might not always be able to enroll in the most restrictive programs (like medicine or Law), but they have good chances of being admitted if they apply to multiple programs. Moreover, unlike their Continental European counterparts, it is often possible in Nordic HES to start one’s studies in a field in one type of institution and later, provided adequate experience or grades, to move to another type of institution. Of course, as Bourdieu (1975) has noted, it takes more time and energy to acquire the recognized knowledge and qualifications as scientific knowledge increases. Combined with the increasing support of Nordic states for

postgraduate studies, we can more easily understand a possible academic inflation (see Section 2.3 below).

This meritocratic attitude in Nordic countries is balanced against the societal concern with providing equal working conditions to all. According to Pechar and Andres (2011), Nordic countries are concerned with preserving the living conditions of those who cannot or choose not to enter the higher education stream. Union representatives and professors who were interviewed confirmed that academics are definitely not poor, but that their salary is not significantly higher than the average salary either. It seems that, on the one hand, citizens who choose to pursue an academic career will be supported by their society through publicly-funded access, loans, scholarships and salaries, and they will enjoy a notable status as contributors to the development of their country. On the other hand, citizens who remain outside of academia, either by choice, lack of interest or capacity, will also have satisfactory living conditions.

This may be a dubious inference, but one could wonder if this equality of condition contributes to the social support for higher education and, ultimately, academic freedom. Citizens living in a society which treats them equally to academics are less likely to harbor envy towards them and might be more willing to grant the resources (material capital) and freedom (symbolic capital) to “non-elitist” academics who contribute to their country through their research.

Despite the claim made by Slaughter and Rhoades (2004) about the end of the “public good regime” in higher education and the rise of the “academic capitalism regime,” this section suggests that the Nordic ideal preserves a conception of knowledge as a public good, and of science as a field that interacts with economy and policy without being dominated by it (Münch, 2014). In sum, the perceived utility of higher education seems to contribute to its public funding, while egalitarian values and public funding contribute to access, and the utility and access in turn contribute to the status of higher education in Nordic countries.

2.2 Funding streams

Funding streams, as a factor, also obtained a significantly larger mean than public authorities ($IJ = 0.57$, $p. = 0.05$) and networking ($IJ = 0.56$, $p. = 0.05$). This factor includes the academic subfield of resource allocation and most particularly the accumulation of material capital (Münch, 2014). In the survey, competitive funding obtained more than $M \geq 4.00$ in all countries

(grand mean of $M = 4.23$) and saturated in all countries but Sweden. Basic funding obtained an average of $M = 4.06$ in Denmark, and saturated in Denmark and Norway. Excellence funding saturated in all countries but Sweden, the only country where strategic funding was saturated.

Basic funding was historically established to ensure a minimum of research funding for all higher education institutions (Hicks & Katz, 2011). In academic capitalism theories, Slaughter and Rhoades (2004), and Münch (2014) argued there was shortage in public resources, and that the New Public Management-inspired reforms slowly replaced basic funding by external and competitive funding. Based on previous studies (Bégin-Caouette et al., 2016; Kalpazidou Schmidt, 2012; Sörlin, 2007), Chapter 4 asserted that basic funding was at the core of the Nordic HES. At this point, findings suggest that only Danish and Norwegian system actors consider basic funding to have a strong positive impact.

The amount of basic funding continues to decrease, but as an evaluation panel reported, “In Denmark, as in many other European countries, the ratio of third-party university funding has reached a critical limit. The government should ensure that in the future, sufficient core funding is provided for the universities” (DNRF, 2013:18). Some studies (e.g. Öquist & Benner, 2012; Münch, 2014) indeed argued that equality in funding allocation and research quality are inherently linked since funding bodies cannot know in advance where path-breaking discoveries will occur. Interviewees in Denmark and Norway felt that, unlike competitive funding given to researchers, universities could count on basic funding to elaborate their strategic plan, maintain their infrastructures and foster continuity and diversity in research production.

An increasing proportion of this basic funding in Denmark and Norway is now based on researchers’ performance. According to some interviews (see Chapter 10), this performance-based component has an impact in that it engenders a signaling effect which may in turn potentially induce a culture shift in academia. The signaling effect concept originates from Spences’ (1906/1973) idea of asymmetric information. The concept was used to explain the greater impact of external research grants on small or less well-established academic institutions (Blume-Kohout, Kumar & Sood, 2014). In the case of Denmark and Norway, where the proportion of basic funding is larger, governments emphasized the importance of publishing by granting a premium based on performance. Beyond its financial impact, the performance component seems to use symbolic capital as an effective incentive. Analyzing the impact of the

Norwegian Publication Indicator, Bloch and Schneider (2016) found that the average publication counts, the participation in publishing of universities, the share of publications in prestigious journals, and number of co-authors per paper had increased substantially in eight years.

Competitive funding obtained scores of $M = 4.14$ in Denmark and Norway, $M = 4.21$ in Sweden, and $M = 4.45$ in Finland, the latter being the country where the proportion of competitive funding is the largest (Kalpazidou Schmidt, 2007). Furthermore, the organizing theme of competitive grants given to researchers by research councils saturated in all four countries. According to interviewees, granting research funds to projects identified as the most promising by peer scholars increases research quality. As one institutional leader reported, in a context of relatively equal wages, competitive funding becomes an incentive to conduct research, design robust projects and disseminate results. A study conducted by the Finnish Ministry of Education and Culture (2013) indicated that the publications of professors funded by the Academy of Finland received more citations and had greater impacts. The number of highly-cited researchers among Academy-grantees was also 23% higher than the world average. My findings in the present study also converge with previous studies based on bibliometric databases (e.g., Aghion et al., 2009; Marginson 2006; Salmi 2009).

Competitive funding was distinguished in this study from excellence funding in that the latter consists in larger sums given to research units over longer periods of time. The organizing theme “excellence funding” saturated in Denmark, Finland and Norway. In interviews conducted in Norway, there was near-unanimity regarding how excellence funding had successfully solved two issues in their HES, namely scattered funding and pre-defined fields in competitive funding. In the three countries noted above, system actors argued that concentrating funding allocation into fewer units fosters critical mass and that stability allows them to conduct riskier research.

In the wake of decreases in basic funding and the concentration of resources into fewer units, acceptance rates for competitive and excellence funding has diminished. Langfeldt et al. (2015) observed that acceptance rates in Denmark and Norway have halved in the last ten years, which might be increasing the cumulative mechanism in science known as the “Matthew effect” (i.e. the disproportionate visibility given to articles from acknowledged authors). Interviewed academics lamented the time it takes them to write applications, potentially causing inefficiencies in the system. Although their study was conducted in Italy, Falavigna and Manello

(2014) made an assertion that may be relevant here: costly equipment forces research units to devote more time to external funding and that the time it takes to attract competitive funding implies higher inefficiency.

Excellence funding, on the other hand, was perceived to be more stable than competitive funding, but survey participants did not consider that, on average, it had a strong positive impact. For Münch (2014), excellence funding creates oligopolies where concluded contracts improve the chances to be offered further contracts. There would be an inherent over-investment of capital on prestigious research units accompanied by a falling marginal utility. Bloch and Sørensen (2015) cited studies confirming this falling marginal utility with an Inverted-U relationship between the scale of the project and the scientific output. A study by Von Hippel and von Hippel (2015) also suggested that acceptance rates below 20% were likely to drive at least half of the active researchers away from external funding.

My interpretation of these results is that funding streams seem to have the greatest perceived impact when they are considered legitimate and trustworthy, as well as consistent with core academic values such as meritocracy, diversity and universalism. In addition to a traditionally strong basic stream, granting smaller premiums to high-performers, either through a performance-based component or competitive funding, respects equity, efficiency and quality. Bourdieu (1988) argued that, in the academic field, dominant groups (or prestigious research units) used conservative strategies (or status reproduction mechanisms) to maintain their position. In doing so, they maintain the homogeneity of the field and undermine breakthrough scientific discoveries. Nordic HES appear to be subject to a similar tendency, although system actors seem to consider that small premiums based on research performance and a diversity of research projects funded by research councils contribute greatly to the accumulation of scientific capital by a plurality of academics and institutions.

2.3 Early-career researchers

In the factor analysis described in Chapter 9, the original factor “academic structure” was subdivided into two factors: institutional differentiation (not considered because of an unreliable structure in the survey) and academic work, here relabeled “early-career researchers” because the only indicators included in it are “doctoral students,” “doctoral schools” and “temporary contract-researchers.” However, in a future version of the survey, the factor could potentially

expand to include professors' salary, time spent on research, teaching and administrative work and the career path leading to professorship. Whatever name it bears, academic work remains an important factor, for as Clark (1983) stated, the division of labor and the organized efforts of individual academics constitute the primordial elements of HES. In this study, the factor "early-career researchers" obtained a mean significantly higher than "public authorities" ($IJ=.53$, $p. = 0.05$) and networking ($IJ=.52$, $p. = 0.05$). The qualitative analysis, for its part, revealed the particular importance of the themes "doctoral students" and "doctoral schools."

The first indicator, "doctoral students," obtained an average of $M = 4.18$ and obtained less than $M < 4.00$ only in Finland. That said, it saturated as an organizing theme in all four countries. As some interviewees explained, the perceived utility of higher education has led to the increase in the number of funded positions at the doctoral level. In the late 1990s, both Denmark and Finland made the strategic choice of increasing access to PhD education in order to boost research production: human capital contributing to the accumulation of scientific capital. Between 2002 and 2011, the number of doctoral degrees conferred by Nordic universities increased by 32% (Myklebust, 2013). Norwegian PhD students, called "research scholars," still form a third of all academics in the country to this day (Kyvik, 2015). Most interviewees recognized that the policy had had the intended positive impact.

The establishment of doctoral (or research) schools was part of these broader policies to increase the number of doctoral students. The indicator "doctoral schools" obtained a survey score of $M= 4.12$ in Finland and $M = 4.10$ in Sweden, and the same organizing theme saturated in Denmark and Finland. In the four countries under study, doctoral or research schools were created at a time when it was perceived that PhD education would further the development of societies.

Thanks to its 1995 policy, Finland introduced nation-wide doctoral schools (now university-based), and increased doctoral graduation rates by 3.5 times (Ahola et al., 2014; SNAHE, 2006). Norway also implemented doctoral schools and doubled the number of international students in twenty years (Olsen, 2014). As it was originally the case in Finland, Norwegian doctoral schools span multiple universities. In areas considered priorities, the government funds doctoral programs across various institutions so that the most renowned professors can supervise students attending other universities. In Finland, since 2010, universities have become autonomous

entities and the government has decided to give back the doctoral schools to individual institutions.

Doctoral students are not, however, traditionally considered “students” since (with the exception of Finland where the situation is blurrier) they work on a contract, are paid by the university or by their supervisor (who obtained a research grant) and receive social benefits. The doctoral students and postdocs interviewed argued that these comfortable conditions gave them the autonomy and security to develop as prominent scholars. The quality of their publications was described as essential to the survival of laboratory groups in many faculties (Åkerlind, 2005). Looking at Germany, Münch (2014) estimated that, between 2002 and 2006, 69% of the variance in professors’ publications was explained simply by the number of PhD students under their supervision. It is also worth noting that, like in many other countries, doctoral students in Nordic countries increasingly publish their theses in the form of articles rather than in the traditional monograph format (SNAHE, 2006).

Doctoral students contribute to academic research production insofar as there are more of them and because they produce quality research. But it also seems that, in a context of short-term project funding, their flexibility is an asset. Section 2.2 above indicated a growth in competitive funding. As a result, many interviewees admitted to relying on a growing number of PhD students to conduct research projects. Aarrevaara (2014) noted that senior academics on permanent positions in Finland tend to delegate research responsibilities to their junior peers because of the burden of administrative tasks. Öquist and Benner (2012) also criticized the erosion of block grants forcing professors to find external funding to maintain research activities, thus leading to a “shadow career model” where researchers at all stages (including the PhD) depend on external funding. This trend, of course, extends beyond the Nordic region. In Australia, Broadbent et al. (2013) observed that professors’ evaluation based on the grants they obtained actually limits their capacity to conduct the research for which they were funded.

A second-order qualitative analysis revealed that part of the impact of early-career researchers could be explained by an underlying theme that I named “temporality.” Temporality refers to the extensive use of fixed-term contracts in various forms. Temporality could partly explain the impact of doctoral students in that they would need to produce and publish more than their contract stipulates in order to make it through academic bottlenecks. This situation was seen as

reasonable by some national-level system actors since it allows the most promising scholars to thrive. But following Broadbent et al.'s (2013) “core-periphery” analogy, universities rely on a small number of permanent staff and a large number of ECRs working on temporary contracts. As Goode (2007) put it, doctoral students, along with postdocs and research assistants, accumulate most of the scientific capital that is then converted by the core into material capital – in the form wage increase or external grants – or symbolic capital – in the form of positions, responsibilities, authorship or citations.

Cantwell and Kauppinen's (2014) study was specifically concerned with the micro-dynamics of laboratory management in the US, but my findings suggest that their conclusion can be expanded to the macro-dynamic of Nordic HES:

People and money were reciprocating resources. Generating research findings was necessary to consistently prevail in grant competitions, and generating research outputs was difficult without graduate students, postdocs, and technicians working in the laboratory. Such an arrangement cast students and postdocs as employees whose labor is an indispensable ingredient in production, but who are also expendable when resources become scarce. (p.493)

The impact of academic capitalism observed by Münch (2014) in other HES might also apply to the Nordic case. The increase in the number of doctoral students (in contrast to a relatively stable number of permanent professor positions), the shift from basic funding to competitive and excellence funding and the global competition for symbolic power all introduce new types of more “industrial-like” research processes in which lots of research assistants work under the direction of few permanent professors (who increasingly act like managers), with few of these young scholars having the space, time, autonomy and supervision necessary to build an academic career.

In sum, the factor “early-career researchers” – and especially its indicators related to doctoral education – was perceived as having an impact on scientific capital accumulation. Using the lens of neo-institutionalism, we can assert that this factor relies on a combination of regulative pillars (e.g., PhD reforms and funding), normative pillars (e.g., the expectation to publish more in order to obtain an academic position) and cultural-cognitive pillars (e.g., the employee status of doctoral students). Early-career researchers appear at the core of the research production process, but at the periphery of academia in terms of decision-making, prestige and job security. Temporary academic positions have also been used by professors, laboratories and institutions to

absorb a greater pool of doctorates and adapt the context of an audit culture and external research funding. But the temporary nature of their work could prevent institutions from retaining high-caliber researchers or professors to ensure continuity in long-term research projects.

3 Summary

The objective of this thesis has been to identify the systemic factors contributing to scientific capital accumulation in Nordic HES. More precisely, it analyzed system actors' perspectives regarding six (later seven) pre-defined hypotheses (or factors). The falsification process – relying on convergent-parallel mixed method design – revealed that the hypotheses regarding the impact of academic traditions and internationalization could not be falsified in the specific context of Nordic HES. Three other hypotheses (or factors) were only partly falsified in that they included elements that had to be considered as part of the broader dynamic, while their impact was perceived as relatively weaker by system actors. These three other factors were “societal beliefs,” “funding streams” and “early-career researchers.”

Through the combined lenses of academic capitalism, the varieties of capitalism approach and neo-institutionalism, this chapter has explained the importance of each of the above factors for the accumulation of scientific capital. Following a “public good regime” rhetoric, HES are perceived as an accessible field that contributes to the development of Nordic societies. The resulting public trust in academics (symbolic capital) protects their academic freedom and encourages public investment of material capital. This investment takes various forms, but findings suggest it has the most impact when funding streams are considered legitimate by the autonomous pole of the academic field, as well as consistent with its values, which include meritocracy, diversity and universalism. Forwarded by a concern for equitable access to higher education, by massive public investments and by the symbolic capital associated with the academic profession, the expansion of doctoral education and the establishment of doctoral schools has contributed in an important way to the accumulation of scientific capital. Finally, Nordic populations are small and therefore Nordic HES need to rely on international networks as a form of social capital to generate symbolic, cultural and capital, which is then converted into scientific capital.

This chapter suggests that Nordic HES' comparative advantage resides in the primacy of the autonomous pole in the academic field. Bégin-Caouette et al. (2016) had already asserted that Nordic HES were “academically central” in that they were at the core of the research production process. The same conclusion emerges from the analysis presented above. The heteronomous pole of the academic field – which includes, among other things, citizens' beliefs, governance structures and funding allocations – appears to act in support of rather than steer or dictate the endogenous development of the autonomous pole of the academic field. This is not to say that research is conducted in isolation and is impermeable to the development of societies, but rather that the accumulation of scientific capital is facilitated when, in the interaction between autonomous and heteronomous poles, there is a deep concern to preserve complex and long-standing academic traditions.

Referring back to the problem raised in the introduction, one might be taken aback by the seeming triviality of this conclusion. It is indeed more than logical that, if we take as a starting point metrics based on core academic activities (such as publications, citations and prizes), an analysis of the most performing system would indubitably lead to the conclusion that what works is what protects and supports these academic activities. In other words, since I have only looked at the academic side of research production, it makes sense that “academically central” HES should appear in the present study as higher-performing. In the next two chapters, I will compare the four Nordic HES and then the Nordic HES with their Anglo-Saxon and Continental European counterparts with the hope of positioning these findings in a broader perspective.

Chapter 15

Variations Across Nordic Higher Education Systems

The previous chapter (Chapter 14) analyzed the factors perceived as having a positive impact on scientific capital accumulation across the four Nordic HES. The rationale was that, following Holmes' (1981) problem approach, Nordic welfare regimes are conceived as an ideal type facilitating the analysis of contextual contingencies. The robustness of the ideal type does not imply, however, that it is monolithic. Accordingly, the third research question of this thesis was to analyze how the perceived impact of the six systemic factors on scientific capital accumulation varied between Denmark, Finland, Norway and Sweden.

The MANOVA presented in Chapter 13 revealed that there were few significant differences between countries regarding the factors “internationalization” and “societal beliefs.” The thematic analysis presented in chapters 8 to 11 contributed a more nuanced portrait in which some additional differences were outlined. The present chapter analyzes these perceived differences between the four countries and attempts to better understand how the ideal type of Nordic welfare regimes has evolved along different paths.

1 Denmark

The history of Danish higher education begins in 1479 with the foundation of the University of Copenhagen, a seminary for catholic priests. Three centuries later in the 18th century, a large number of teacher colleges were established in connection with the expansion of general primary education. With industrialization in the 19th and early 20th centuries, Denmark assisted the creation of the College of Advanced Technology (now the Technical University of Denmark), the Royal Veterinary and Agricultural University (1856), the Danish University of Pharmaceutical Science (1892), two business schools and the University of Aarhus (1928). Finally, during the more recent expansion of higher education, Denmark created the university of Odense (1966), Roskilde (1972), Aalborg (1974) and the Danish University of Education (2000) (Gregersen & Rasmussen, 2011).

Denmark also has a long tradition of broader access to education. One has to note the major contribution of N.F.S. Grundtvig (1783-1872), a theologian, writer, philosopher and educationist who developed the idea of a folk high school (or *Folkehøjskole*) that would provide popular education to the peasantry and other people from lower socio-economic backgrounds (Lawson, 1989). This form of progressive adult education was built upon the fellowship of teachers and students, the awareness of our “common humanity” and enlightenment about life. The movement spread to Norway, Sweden, Finland, as well as Germany, the USA, UK, Japan and Switzerland. Denmark also has a long tradition of seminaries (the oldest dating back to 1760) that later became university colleges, as well as a long tradition of liberal arts adult education through the former folk universities that became part of an open university framework in 1989 (Rasmussen, 2004).

Today’s Danish HES remains entirely public and consists of three tiers: business academies (short-cycle programs), university colleges (medium-cycle programs primarily educating welfare state professionals) and university institutions (Thomsen, 2014). This coherent structure, in addition to development contracts (which encourage access and degree completion) and increased public funding, have resulted in a massive rise of admitted students. According to the Ministry of Education’s projections, more than 62% of all students who were 15 years of age in 2012 will complete a higher education program (Ibid).

Despite a long tradition of broader access to higher education, Denmark and Norway show lower enrolment rates in tertiary education than Finland and Sweden (Pechar & Andres, 2011). This could partly explain why societal beliefs obtain a significantly lower score in Denmark than in Finland ($IJ = -0.31, p = 0.01$). The indicator “equitable access to a high quality higher education” obtained a survey score of 4.05 in Danish participants compared to a 4.14 average survey score. This does not mean to suggest that Danish society does not believe in equitable access to high quality education, but rather that the system actors perceived its impact on academic research production to be weaker than for other countries

The same observation could be made about the indicator “social sciences inform the welfare society,” which obtained a score of 3.76 in Denmark compared to an average of 3.89. Although this indicator did not achieve saturation as an organizing theme, some Danish interviewees admitted that, in the process of expanding PhD education, the focus had been mostly on the

natural sciences since they were perceived as necessary to promote the development of the country. Asdal and Gradmann (2014) also noted that in Denmark the natural sciences occupied a more prominent position.

Regarding the “accessibility” indicator of the factor “societal beliefs,” it should be noted that although the Danish HES has increased access in the last decades, the most recent reforms have focused on other ways of promoting academic research production. Development contracts encourage relevance to society and institutional autonomy. The 2003 reform introduced a partially external governance system in which new boards are composed of a majority of external members (Degn, 2014). Already appointed by the board rather than elected since 2003, the rectors gained more influence in the 2011 Act. Denmark also reshaped its resource allocation academic subfield by establishing the Danish National Research Foundation and merging the Strategic Research Council and The Danish Advanced Technology Foundation to strengthen links between research and innovation (Öquist & Benner, 2015). The most profound reform, however, involved mergers between universities, university colleges and governmental research institutes. In February 2006, the 12 universities and 13 governmental research institutes had two months to draw up expressions of interest for mergers. Aarhus University adopted a grand-growth strategy, the University of Copenhagen followed a more incremental and profiling strategy while Aalborg University adopted a federal structure (Aagaard, 2015). The success of the initiatives remains to be confirmed, but findings suggest that, although access and completion rates remain important, significant transformations may have altered societal beliefs.

The concern for broad access to tertiary education may have also been overshadowed by a deeper concern for doctoral education. Öquist and Benner (2012) asserted that there is a “risk of overemphasizing the role of postgraduate education in Danish research” (p. 39). From 1996 to 2012, the number of awarded PhD degrees has risen from about 700 to 1,600 (Ibid). This is accompanied by the reinforcement of the postdoc career system. The question of “postdocs” was not included in the initial design, which is why it was absent from the survey. But it is worth remembering that it nonetheless achieved saturation in the analysis of Danish interviews. One professor in the natural sciences explained that postdocs represent a more profitable investment than PhDs because they do not have to cumulate a certain number of credit points, complete courses or accept teaching positions.

A last point about Denmark concerns funding streams. As I explained in the previous chapter, Denmark is the only country where the indicator “basic funding” achieved a score above 4.0 in the survey (4.06 compared to a 3.72 average). In contrast, the two other streams obtained below-average scores: competitive funding obtaining 4.14 compared to an average of 4.23, and excellence funding obtaining 3.61 compared to an average of 3.72. Similar inferences can also be made based on the qualitative analyses. Danish participants praised the stable and equitable character of basic funding, as well as the positive signaling effect generated by the performance-based component. The Danish *Globalization Strategy* did increase floor funding and, today, 56% of public funding is allocated directly through the basic stream, against 45% in Sweden and 50% in Finland (Bloch and Sørensen, 2015). The thematic analysis is also consistent with Välimaa’s (2005) observation that innovation in Denmark is more academically-focused and that policy-makers are more concerned with supporting basic research than innovation. It should be remembered that in Denmark research institutes were merged with universities, and that the D NRF channeled a massive increase of funding into highly competitive schemes supporting individuals from all fields with projects for groundbreaking basic research (Öquist and Benner 2012). As a result, Denmark has produced high levels of highly-cited publications per inhabitant (Forskningsbarometer 2013).

2 Finland

According to the Games-Howell multiple comparisons (see Chapter 6), the factor “societal beliefs” obtained a significantly higher survey average score in Finland than in Denmark ($IJ = 0.31$, $p. < 0.05$) and Norway ($IJ = 0.38$, $p. < 0.05$). The previous section suggested that part of the explanation may reside in a milder concern for equitable access to higher education in Denmark. This section suggests that a larger part of this explanation resides in the crucial role which higher education has played in the continuous development of Finland.

The Finnish HES can be considered rather distinctive because of the multiple influences it has faced over the course of its history. Between 1249 and 1809, Finland was part of the Kingdom of Sweden. In the 17th century, the king decided to increase the intellectual capacity of his kingdom and the training of his civil servants by establishing new universities, such as the University of Turku in 1640 (Välimaa, 2001). In the 18th century, still under Swedish rule, Finnish identity and

patriotism flourished in universities where young scholars studied Finnish history and folklore (Välimaa, 2001). Sweden lost Finland to Russia during the Napoleonic wars of 1803-1815. The Czar Alexander 1st granted Finland internal autonomy and the right to keep its Lutheran heritage. This was the historical period during which Finnish nationalism developed, mainly flourishing in the Imperial Alexander University (the former University of Turku and today known as the University of Helsinki). One hundred years later, following the First World War, Finland finally became an independent nation and its universities adopted an adaptation of the Humboldtian model (Välimaa, 2005).

With the collapse of the Soviet Union, Finland faced a hard economic recession that gave rise to an ambitious strategy to build a knowledge-based society. First, Finland focused on broadening access to higher education. As mentioned in Chapter 3, the right to education is written in the Constitution and, as was confirmed by Finnish interviewees, this right is perceived both as an end in itself and as a way to promote the competitiveness of the Finnish welfare society. In addition to its Open University (founded at the beginning of the 20th century), Finland established polytechnics in 1991, and these polytechnics now grant more degrees than the universities, most of the degrees being in the fields of business, healthcare and engineering (Vossenteyn, 2008). Overall, Finland has among the highest enrolment rates in tertiary education in the OECD (Pechar & Andres, 2011). It is therefore not surprising that Finnish survey participants presented the highest score to the societal belief in equitable access to higher education (4.56 compared to an average of 4.14). The analyses of Finnish transcripts also revealed the importance of a broad access to higher education for system actors. As one professor explained, “In Finland, our statement has been for many years that the whole economy and well-being are based on the higher education of the whole population.”

According to survey results, other societal beliefs obtained higher scores in Finland than in the other Nordic countries. The belief that higher education should serve the public good obtained 4.36 (compared to an average of 4.13), the perceived importance of STEM-fields in the global competition obtained 4.49 (compared to a 4.30 average) and the contribution of social sciences to the welfare society obtained 4.09 (compared to an average of 3.89). These quantitative results converge with the qualitative findings. Interviewed system actors felt that there was a strong societal support for higher education as the engine of their country’s social, economic and

political development. Academic research was perceived as supporting industry-related innovation, promoting evidence-based policy-making, and fostering a rational society.

The literature confirms that higher education has played an important role in the economic development of Finland. The year 1983 saw the establishment of the Finnish Funding Agency for Innovation (TEKES), which developed into a powerful organization with a budget twice the size of the main research council, The Academy of Finland (Öquist & Benner, 2012). Together with industries (which provide 37% of the funding), TEKES and the Academy of Finland developed strategic centers for science, technology and innovation (SHOKs). These centers of excellence specialize in health, forestry, ICT, metallurgy, engineering and energy, and allow Finnish academic research to generate an economic activity of € 813 million. In addition to its contribution to Finnish culture and citizenship, higher education seems intrinsically connected to the economic development of the country.

The Games-Howell comparisons also indicated a significant difference between the score obtained by the factor “internationalization” in Finland and Denmark ($IJ = 0.21$, $s = 0.08$, $p = 0.03$). In fact, four indicators related to internationalization obtained the highest scores in Finland; “International research collaborations” obtained 4.86 compared to an average of 4.81, “European policies and funding” obtained 4.37 compared to the average 4.17, “international partnerships between institutions” obtained 4.46 compared to 4.34, and “Nordic policies and funding” obtained 3.90 compared to 3.75. The only indicator obtaining a below-average score was “the recruitment of foreign scholars” (4.28 compared to an average of 4.33).

These results were unexpected since the literature clearly identifies Finland as the least internationalized Nordic country. An evaluation of the Ministry of Education and Culture (2009) has even characterized Finland as “exceptionally inward-looking” (p.38). Öquist and Benner (2012) also observed a relatively low level of international networking and collaboration in Finnish academic research. Internationalization primarily takes place in networks comprising industrial interests and their counterparts in public administration, rather than among academics. International activities were perceived positively by system actors in Finland, but these seemed to include European funding and publications in international scientific journals in their list of activities rather than international research collaborations and the recruitment of foreign scholars.

Finland has indeed suffered from an unbalanced flow of researchers and has faced specific challenges with regard to attracting researchers from abroad. Viljamaa and Lahtinen (2012) argued that limited career opportunities, few permanent positions and a dependence on short-term funding hinders internationalization in Finland. Viljamaa, Lehenkari, Lemola and Tuominen (2010) also identified a comparatively lower level of remuneration for researchers as a particular obstacle to attracting foreign talent. Saarinen (2012) stated that Finnish universities have traditionally been seen as nation-state projects and that, although internationalization has been a criterion in the funding formula since the 1990s, the focus has been to provide students with adapted competences for a changing workplace.

There appears to be a significant gap between what the literature suggests and what is perceived by the system actors I interviewed and surveyed. There might be many explanations for this gap, but two seem most plausible. The first explanation concerns the validity of data collection instruments. It is possible that, in the case of both the survey and the interviews, system actors indicated that they perceived internationalization as an important factor that *should* be more present in Finland, rather than as a factor that *is* present and *has* an actual positive impact in their country.

The second explanation concerns the impacts of the recent Finnish strategy. Finland might have lagged behind its neighbors in terms of internationalization, but the government and universities have in the last five years implemented various measures that might have a positive impact on academic research and be perceived positively by system actors. The Finnish Ministry of Education and Culture (2013) recognized that it was more difficult for Finland to attract talent because of its peripheral geographical location, but also acknowledged that the strategy implemented in 2009 resulted in a significant engagement from universities. Non-native nationalities now account for 13% of the research staff, 17% of the doctoral students and 18% of the postdoctoral researchers (Ibid). The Academy of Finland (2014b) also noted that the number of international publications from Finnish scholars have recently increased. Future research might provide a more definite explanation for the gap observed here.

3 Norway

The Games-Howell comparisons revealed a third significant difference, this time between the scores obtained for “societal beliefs” in Norway and Finland ($IJ = -0.38, p. < 0.01$). As was discussed in the previous section, part of this difference can be explained by the central role of HES in Finland. A part can also be explained by the trajectory of the Norwegian HES, which brings us to discuss the particularities of Norway’s higher education system.

The Norwegian HES is relatively young. The first Norwegian university, the University of Christiania (later renamed the University of Oslo), was founded in 1811, following Norway’s separation from Denmark. Then were founded the University of Tromsø, the Norwegian University of Science and Technology and the Norwegian School of Economics and Business Administration (Kvil, 2004). These universities acted as public agencies and fulfilled a mission of training civil servants. Their focus was on certification and teaching based on state examinations. The first ministry to be created in Norway after its independence from Denmark was the Ministry of Church Affairs and Education (Gornitzka & Langfeldt, 2008). Inspired by the modern German universities, Norway included research provisions and academic freedom (*Lernfreiheit*) in its laws and regulations (Kehm, Michelsen & Vabo, 2010). In the 1970s, the Norwegian HES developed into a binary system. The Parliament then gave colleges the right to develop graduate research-based degrees (Nybord, 2007).

What makes the Norwegian HES distinctive is the strength of government research institutes. Inspired by the American, British, French and German examples, public research institutes emerged in 1919 in order to help small and medium-sized companies pool their technological resources (Guldbrandsen & Nerdrum, 2007). Institutes were also established in Denmark, Finland and Sweden, but these did not have as much importance as they did in Norway. In 1963, half of the total R&D in Norway was carried out by institutes (Ibid). When oil was found in the late 1960s, the institute sector provided most of the expertise and grew rapidly with the massive investments of R&D funding.

In some ways, the establishment of government research institutes protected the Humboldtian orthodoxy of letting universities be free to conduct basic research and teach as they see fit, while institutes focused on applied research and had the required flexibility to adapt to a rapidly changing economy. At the same time, the strength of government research institutes could

explain why the factor “societal beliefs” obtained a significantly lower score in Norway. A more detailed analysis reveals that the indicator “higher education should contribute to the public good” obtained the lowest score in Norway of all four Nordic countries (3.99 compared to an average of 4.13). So did the indicator “STEM-fields are important to compete globally” (4.12 compared to an average of 4.30). These results converge with multiple other quantitative and qualitative findings.

The theme “funding concentration” did not reach saturation in Norwegian interviews and the corresponding indicator obtained its lowest score in Norway (4.12 compared to an average of 4.19). In fact, as it was explained by national-level actors, research funding is sparsely distributed to a plurality of actors, including universities but also private companies, university colleges and research institutes. To date, institutes perform 25% of the country’s R&D, conduct more applied research than universities (RCN, 2014), employ 25% of the PhD holders and more employees than most other European countries (Kaloudis & Rørstad, 2006; Kyvik, 2015), and can even obtain international research funding in the fields in which they dominate, such as ICT, geology, fisheries, oil, transport and gas (Gornitzka et al., 2008). In Norway, it seems that the academic field is able to accumulate less symbolic capital (in the form of reputation and prestige), and less of this can be converted into material capital in order to fund cutting-edge research. Analyzing Norway’s research performance, Kaloudis and Rørstad (2006) conclude the following:

Some aspects of this underperformance in the natural sciences could be explained by the fact that the majority of scientists and engineers in Norway, measured in R&D man years, work in research institutes, not the universities. The propensity to publish research results in Norwegian research institutes is far lower than universities. (p.12)

Norwegian universities preserved their symbolic position in disciplines related to the social sciences and humanities (Maassen, Moen & Stenskaer, 2011), but research institutes have appropriated much of this position in the natural sciences, performing 30% of the country’s STEM-fields related research (NIFU, 2014). Interviewees reported that citizens with a lower level of education can easily get well-paid positions in these fields where the job market holds more sway than academia. Some interviewees felt the Norwegian HES might have a slightly lower status than its Nordic counterparts. A professor in the health sciences in Norway explained that the social status of the academic is slightly lower in his country. A rich country building its

wealth on natural resources will not necessarily encourage its population to undertake long university studies and pursue an academic career, especially in the natural sciences. Although Norway has implemented innovation policies, it is the only Nordic country that faces the challenge of having to stabilize its decreasing demand for higher education (Kalpazidou Schmidt, 2007).

4 Sweden

According to the Games-Howell comparisons, none of the factors had means that were significantly higher or lower in Sweden than in the other Nordic countries under study. However, there is convergence in survey scores and the saturation of organizing themes regarding potential difference in the importance of networking between academic and non-academic actors and the positive impact of strategic funding, which saturated in the interviews.

The history of Swedish higher education started in 1477 with the foundation of the first Nordic university, Uppsala. In 1836, the King of Sweden (who was a representative of Napoleon) implemented a formal state contribution to universities and, in 1937, all higher education institutions became part of a state-owned system (Clark, 1998). Facing population and economic growth, the Social-democratic government of 1977 proposed a major reform promoting equality, access, continuing education, regional representation and work preparation. The reform created a National Board for Universities and Colleges, established local campuses of a “Sweden University” in all regions, unified programs within five sectors according to uniform study lines, and replaced the “automation” funding system by a multiyear plan in which the Parliament would decide how many positions it would fund (Bauer et al., 1999). In 1980, an academic network published a paper entitled “University in Crisis.” In 1993, the newly elected Conservative government implemented the *Freedom for Quality* reform. It is interesting to note that once it came back into power in 1994, the Social-democratic government removed the right of institutions to their own land and maintained the right to appoint the University Chancellor (President of SNAHE) and university Vice-Chancellors (Schmidt, 2007). In 2010, however, yet another reform granted more autonomy to institutions and strengthened university leadership (Hedmo, 2014).

Today, Sweden remains one of the most social-democratic countries in the world. It has the second highest percentage of GDP collected as taxes, namely 48.8% (Bengtsson, Holmlund &

Walderström, 2012), the second highest public social spending as a percentage of its GDP (OECD, 2012), and the third lowest Gini coefficient of income inequalities, namely 0.25 (UNDP, 2011). Coupled with the exportation of iron ore, timber and hydroelectric power, the knowledge-intensive industry makes Sweden the 4th most competitive economy in the world, with a GDP of 381.237 billion PPP (Purchasing Power Parity – WEF, 2009). The country is the top OECD member in terms of R&D *per capita* (Brundenius, Göransson & Ågren, 2011). Universities dominate the research production process and, together with university colleges, they receive more than 75% of total public funds allocated to research (Hallonsten & Hungander, 2014).

A striking feature of the Swedish HES is the longstanding tradition of collaboration between academic researchers and knowledge-intensive industries. Academic research has been perceived as important in Sweden since the 1950s. As interviewees reported, the Swedish HES has contributed to the growth of large exporting companies (such as pharmaceuticals) and has achieved a comparatively good position in the medical and engineering fields partly thanks to the support of the private sector, which has often compensated for fluctuations in public funding. Interestingly, strategic funding in Sweden has been perceived as in line with the “highest of academic standards in programs dedicated to long-term economic performance” (Glimell, 2004:6). As it was argued by interviewees from the Swedish Government and the SRC (see Chapter 10), academics had an important say in defining strategic areas to be funded.

Interviewees were also clear that they had the means to protect their academic freedom. As Glimell (Ibid) has noted, science and industry have been able to interact and provide impulses to one another. Benner (2012) also observed that, in Sweden, the 16 semi-public research and innovation foundations created since the 1990s have blended academic and societal constructs, thus providing a balance between the autonomous and heteronomous poles of the academic field. As Bégin-Caouette et al. (2016) have commented more recently, the Swedish HES can be characterized as both academically central and responsive to market forces.

5 Summary

The initial research objective of this thesis is based on the assumption that Denmark, Finland, Norway and Sweden form a relatively consistent ideal type, referred to as the Nordic welfare

regime. Emerging from similar political-economic structures, Nordic HES and their academic research production processes can be conceived in many regards as similar. Quantitative and qualitative analyses however revealed significant differences between the countries. As a factor, societal beliefs were perceived to have a stronger positive impact in Finland than in Denmark and Norway, while internationalization was perceived to have a stronger impact in Finland than in Denmark.

This chapter has presented more detailed explanations of these differences. In Denmark, concerns for broad access to higher education appear to be overshadowed by concerns for supporting basic research, strengthening universities' strategic development and expanding the number of doctoral and postdoctoral fellows. In contrast, broad access to higher education seems to be at the heart of the development of Finnish society. Finland is the country where the academic field appears able to accumulate the most symbolic capital, to be then converted into material capital funded by both public and private actors.

The Norwegian academic field, for its part, competes with a strong institute sector in its attempt to accumulate cultural, social, material and symbolic capital. Universities are prestigious institutions, but Norwegian institutes attract many young researchers, obtain important research grants, develop closer relationships with industries and, in the end, are perceived as greater contributors to the economic development of the country. In Sweden, the situation is significantly different. Since the 1950s, the HES has attracted most of the public funding for research, putting it in an advantageous position to partner with large exporting companies and benefit from their accumulated material capital, while preserving the integrity of its autonomous pole and its capacity to accumulate scientific capital.

In the end, differences between the Nordic countries are significant and should nuance further analyses. However, these differences only concern two of the seven factors, and do not undermine the consistency of the Nordic ideal type. The next chapter will carry the discussion to a more political-economic level and compare responses to academic capitalism in Nordic, Anglo-Saxon and Continental European HES.

Chapter 16

The Political Economy of Scientific Capital Accumulation

The core objective of this thesis is to identify systemic factors contributing to scientific capital accumulation in Nordic HES. The current study has relied on theoretical frameworks drawn from political economy to outline the specificities of the Nordic welfare regimes. But the original intent was not to distinguish Nordic HES from their Anglo-Saxon and Continental European counterparts. Based on convergences between quantitative and qualitative data, Chapter 14 concluded that the hypotheses regarding the positive impact of academic traditions and internationalization across the four Nordic HES could not yet be falsified. Three other factors were also considered in that chapter, namely societal beliefs, funding streams and early-career researchers. These factors are not necessarily unique to the Nordic context and may have a strong positive impact in other HES, but they are definitely perceived as having an impact in the Nordic countries. Taking this line of thought further, one could hypothesize that the Nordic context interacts in a specific way with these factors and gives them a distinct meaning.

Although the initial focus of the study was on identifying commonalities rather than differences, I believe that noting significant differences between the four cases has improved the validity of the findings. In Chapter 13, significant differences regarding two systemic factors were identified. Societal beliefs (particularly regarding accessibility and the utility of higher education) were perceived more positively in Finland than in Denmark and Norway. Internationalization also obtained a higher average score in Finland than in Denmark, despite a body of literature suggesting that Finland is the least internationalized Nordic country. These differences nuance claims regarding the consistency of the Nordic ideal type.

The present chapter returns to the initial problem of a global academic race for scientific and symbolic capital and re-interprets the impact of systemic factors through the lens of political economy. More precisely, it explores how the trajectories of the Nordic welfare regimes may have shaped HES' response to the global struggle for excellence. Analyzing and comparing countries' political economies make it possible to understand how actors' strategies are conditioned by the institutional ecology in which they are embedded (Bleiklie, 2007). This chapter merges the theory of academic capitalism with the varieties of capitalism approach

(VoC) to propose a new comparative framework: the varieties of academic capitalism approach (VoAC).

1 From varieties of capitalism to varieties of academic capitalism

Hall and Skoskice (2004) developed the varieties of capitalism (VoC) approach to analyze how actors' responses to macro-economic challenges are conditioned by their country's political economy. Their approach affirms that different political economies can achieve similar outcomes but that the factors supporting their performance reflect distinct adjustment paths. In this sense, the concept of "comparative advantage" does not imply that a political economy is inherently better than another one at producing goods (which would be called the "absolute advantage"), but rather than it can produce one specific good at a lower opportunity cost.

A classic example comes from Ricardo (1817/2004) who compared the number of hours necessary to produce one unit of "cloth" and "wine" in England and Portugal. Although Portugal could produce both wine and cloth with less labor than England (absolute advantage), the fact that cloth needed less labor than wine in England (comparative advantage) encouraged industries in that political economy to focus on that specific good. The VoC thus focuses on the political-economic factors that maximize institutions' capacity in CMEs and LMEs.

Chapters 2 and 3 presented various studies suggesting relationships between political economies and HES (e.g., Bégin-Caouette et al., 2016; Benner, 2011; Pechar & Andres, 2011;). In those chapters, the following statement was cited from the work of Cantwell and Kauppinen (2014):

Nearly all aspects of higher education (e.g. student recruitment and learning, governance, organizational administration, public policy, and the academic profession) are embedded in the political economy with links to the market, non-profit and nongovernmental organizations, and the state. (p.3)

Although they focused on academic capitalism as a global trend affecting all HES, Münch (2014) and Slaughter and Rhoades (2004) acknowledge the role of national contexts in mediating institutions' response. Notwithstanding their focus on economic capital (e.g., Slaughter & Rhoades, 2004) and symbolic capital (e.g., Münch, 2014), these authors contend that the core of

academic capitalism lies in a principle of capital accumulation according to which the political-economic structure conditions academic actors' strategies to pursue profit and increases the initial value of their capital. Since the global academic work order and the rankings on which it is based (Hazelkorn, 2013) are partly based on the capacity of academic actors to generate knowledge, one can infer that scientific capital – as a specific form of cultural capital (Bourdieu, 2004) – constitutes a core form of capital from which further economic and symbolic capital can be derived.

The VoC approach provides a cogent framework within which to analyze HES' comparative advantage in accumulating scientific capital. Olson and Slaughter (2014) have used the VoC approach to compare the American and German HES. Based on secondary sources, their analysis suggested that liberal market economies (LMEs) support capital accumulation by means of competition, protection of property rights and free markets, while coordinated market economies (CMEs) – which they consider less performing – support capital accumulation by means of channeled competition, state intervention and collaboration between actors.

In another study, Kauppinen and Kaidesoja (2014) compared the American and the Finnish HES and noted significant differences in their responses to an “uneven” global academic capitalism. Academic capitalism in the US involves the treatment of tuition fees as a key revenue, the institutionalization of copyright revenues and a bottom-up movement towards NPM-inspired governance structures. In Finland, these structures were implemented through top-down policies. As a result of societal values and academics' resistance to change, the “public good” rhetoric of higher education would remain salient and would shape HES' response to global academic capitalism.

The VoC approach was originally developed to analyze businesses' behaviors, but since the global knowledge society seems to have fostered an academic capitalism race, I propose the foundations for a varieties of academic capitalism (VoAC) approach. This approach is in line with one of the underlying objectives of this thesis, which is to understand how political-economic conditions shape Nordic HES' comparative advantage in accumulating scientific capital. Thinking about academic capitalism in terms of *varieties* allows for a nuanced approach to complex “glonacal” struggles and dynamics (Marginson, 2006). The VoAC acknowledges the role of global scripts but considers them insufficient as explanations for global reforms. The

VoAC consequently pays close attention to the interaction between local and global scripts (Maassen et al., 2008). As Münch (2014) has proposed, different levels of authority in higher education sometimes adopt distinct yet inter-influencing strategies to respond to the global pressure of academic capitalism. These strategies might include international research collaborations at the individual level, performance-based budgeting at the institutional level, and research information systems at the national level.

The VoC approach only distinguishes between LMEs and CMEs. I believe a more fruitful VoAC approach would have to further differentiate HES. Previous studies have indeed shown differences between Anglo-Saxon, Continental European and Nordic HES (Benner, 2011; Maassen, 2014; Pechar & Andres, 2011). The present study has attempted, among other things, to delineate the contours of a Nordic VoAC, but one question remains: Is the approach here developed compatible with the existing body of literature on other HES? The next section attempts to frame the VoAC as an approach that systematizes comparisons between academic research production processes.

2 Framing the varieties of academic capitalism (VoAC) approach

Before presenting the contours of the VoAC approach, it is worth recalling the methodology used to achieve the findings upon which that approach is based. This methodology began with the deductive problem approach developed by Holmes (1981, 1988). The problem was intellectualized through the lens of academic capitalism and finally articulated in terms of the accumulation of scientific capital. The problem was then superimposed on the contextual contingencies of the Nordic welfare regimes ideal type, which yielded a list of thirty-nine possible explanations for Nordic HES' performance. Each explanation became both an indicator for quantitative analysis and an organizing theme for the qualitative portion of the study. By adapting the framework developed by Clark (1983), the thirty-nine indicators were inductively grouped into six factors, which were then tested as six different hypotheses. The factorial analysis, for its part, suggested the existence of eight systemic factors, seven of which were proven sufficiently reliable for further quantitative analysis.

What makes this study innovative is its combination of a deductive problem approach combined with a multi-level governance (MLG) framework to collect data (Bleikie & Kogan, 2006). Considering that very few countries fit the Nordic welfare regimes ideal type, it was not possible to conduct a large-scale quantitative study based on country indicators. Following the examples of Degn (2014), Elken et al. (2014) and Vitola (2014), I relied on the aggregated perspectives of multiple actors located at different levels of authority within the Nordic higher education systems.

The MLG framework is an actor-centered framework that emphasizes how different levels are “traveled” by the various institutional and non-institutional actors populating the policy network (Piattoni, 2009). Using a comparative approach, Bleikie and Kogan (2006) applied the MLG framework to develop their theory of policy regimes. They conducted a horizontal comparison of countries, as well as a vertical comparison of micro-, meso- and macro-level institutional changes in order to identify causal regularities (Skocpol, 1980). This synoptic model recognizes the existence of a formal hierarchy of organizations, while emphasizing the multilevel character of HES and retaining an analytical openness towards the multiple social forces that interact in the decision-making process (Becher & Kogan, 1992).

Similarly, the VoAC approach was developed with an understanding that different levels of authority in a HES contribute jointly to the process of scientific capital accumulation, and influence one another in their choice of strategies. The core of this approach resides in the macro-systemic factors that are perceived as having a strong positive impact for multiple actors across systems. The approach’s concern with convergence motivated me to choose a convergent-parallel mixed-method design (Creswell & Plano Clark, 2011), according to which surveys and interviews target the HES stratum in four countries, and results are merged at the interpretation stage. The “multi-level problem approach” – as we could call it – that emerged from this design contributed to the emergence of the VoAC approach by giving voice to system actors in order to reveal in a holistic way some of the keys contingencies of academic capitalism.

2.1 An eight-factor model to systematize comparisons

An extensive review of the literature led to the identification of thirty-nine possible explanations for the performance of Nordic HES. These thirty-nine indicators were merged into six broad factors: beliefs, academic structure, governance, funding, networking and internationalization.

An exploratory factor analysis, however, revealed that if three poorly-formulated indicators were removed, it was possible to group the remaining thirty-six remaining indicators into eight factors rather than six. These eight factors were “Public authorities” ($a = .80$), “Networking” ($a = .75$), “Internationalization” ($a = .76$), “Societal beliefs” ($a = .73$), “Academic traditions” ($a = .65$) “Early-career researchers” ($a = .54$), “Funding streams” ($a = .50$) and “Institutional differentiation” ($a = .42$).

With Cronbach alphas below $a = .60$, the three last factors in the list showed poor reliability. The possibility remained that an instrument that included more items might improve the reliability of such factors. After all, while the other five factors included at least five indicators, the three last only included two or three in the present study. In a future survey, funding streams might also include items related to independent foundations (Wijkström & Einarsson, 2004), research councils’ acceptance rates (von Hippel & von Hippel, 2015), and might distinguish between basic funding allocated based on historical grounds from basic funding which bases its allocation on student numbers or research-performance (Kalpazidou Schmidt, 2012). The factor of early-career researchers might also be broadened so as to cover other areas of academic work, such as postdocs (Åkerlind, 2005), tenure-tracks (Välilmaa, 2012), researchers’ working conditions (Kyvik, 2015), and the proportion of time academics do spend on teaching, research and administration (Aarrevaara & Pekkola, 2010). Finally, institutional differentiation might be elaborated so as to include items on the unitary or binary structure of the HES (Ahola et al., 2014), the involvement of university colleges in academic research production (Maassen et al., 2012), as well as mergers between universities, university colleges and governmental research institutes (Pinheiro et al., 2015).

As we can see, multiple elements could be added that would help strengthen the instrument. Nonetheless, the eight-factor structure proposed in this thesis appears fairly comprehensive and brings together multiple factors identified in the literature. Benner’s (2011) research governance models were built upon three factors: academic self-organization, policy discourse and the structure of support. The first factor closely connects to academic traditions in that it refers to the prescribed role of academics in the innovation system, while the second refers to some of the elements here included in the factor “public authorities,” and Benner’s third factor includes elements connected to both funding streams and societal beliefs.

The correspondence analysis performed by Bégin-Caouette et al. (2016) also yielded three dimensions: academic centrality, research workforce and responsiveness to market forces. Academic centrality included variables related to funding support, co-publications and doctoral education. As mentioned in Chapter 11, the conversation on academic centrality mirrored quite closely the current thesis' discussion of academic traditions and the prominence of the academic field's autonomous pole. Bégin-Caouette et al.'s second dimension, "research workforce," included variables related to the proportion of researchers working in higher education, governmental and business settings. To some extent this second dimension relates to the factor "early-career researchers" or, if expanded, to a new factor that might be named "academic work." The third dimension regarding responsiveness to market forces clearly includes many aspects related to networking with non-academic actors.

Chapter 1 and Table 1 provided a list of institutional and systemic factors identified by Aghion et al. (2009), Marginson (2006), Morhmann, Ma and Baker (2008) and Salmi (2009) which explain excellence in world university rankings. Interestingly, this table helped frame the hypotheses in Chapter 4, but it can also be reorganized according to the eight systemic factors identified in the current study.

Academic traditions include the elements of unrestrained scientific inquiry and funding concentration into the best institutions, as identified by Salmi (2009), as well as institutions' capacity to create degrees, as identified by Aghion (2010). For Marginson (2006, 2007), the success of Anglo-Saxon HES partly depended on societal beliefs such as the prominence of the Anglo-American culture of English as the language of teaching and publication. Salmi (2009) also identified the importance of competition as a contributing factor. For Aghion (2008) and Marginson (2006), a vertical hierarchy between research-intensive, comprehensive and primarily undergraduate institutions favors a more efficient use of resources to promote world-class universities.

Public authorities were mentioned by Aghion (2010), Marginson (2007) and Salmi (2009). The three authors cited decentralization, delegation of power and independence from the state as factors contributing to the success of universities in Anglo-Saxon HES. Funding streams also contributed to academic excellence according to them. While Morhman et al. (2008) merely indicated the need for diversified sources of funding, the cases analyzed by Marginson (2007)

and Salmi (2009), as well as the regression analysis performed by Aghion et al. (2009), indicated the strong positive impact of competitive research grants. Morhman et al. (2008) also identified networking between academic and non-academic actors, while Aghion et al. (2009) demonstrated the positive influence of private funding. Finally, Morhman et al. (2008) and Marginson (2007) argued that internationalization – whether in the form of international collaborations, or international recruitment of supra-national funding – had a significant impact on HES' performance.

If the non-specific labeling of hypotheses was open to criticisms in the background section, it is at this point a strength in that it leads to the foundation of a more general framework, which allows to systematically compare varieties of academic capitalism. The same could be argued for indicators that were supported by the literature about Nordic HES, but also mirrored the broader literature about academic research production in other systems.

2.2 The Nordic VoAC

Following Holmes' (1981, 1988) problem approach, the context of this study was understood through the lens of the Nordic welfare regimes ideal type. The Nordic welfare regimes are characterized by small capitals, a concern for the environment, a Lutheran cultural heritage, strong positivist beliefs in science, ideals of peace and cooperation, consensus-based democracies and the development of universal social policies. The Nordic HES are identified as a sub-component of the overall ideal type and characterized by broad access, public trust, massive public investment and high levels of academic research production.

Chapter 15 revealed significant differences regarding two systemic factors. It brings nuances to the analysis, but it is also worth highlighting that ideal types are not perfect representations of a context but an abstract and intellectually-constructed model that nonetheless allows for specific differences between countries (Esping-Andersen, 1999; Holmes, 1981; Weber, 1924/1968). Although societal beliefs are perceived as being more important in Finland than in Denmark and Norway, and internationalization as being more important in Finland than in Denmark, the “Nordic exceptionalism” and its regulative, normative and cultural-cognitive filters still seem to mediate in a relatively similar way the transnational pressure of academic capitalism (Kauppinen & Kaidesoja, 2014; Maassen, 2014).

The present section connects the systemic factors explored in Chapter 14 with the core components of the Nordic welfare regimes. The intent is to show how the VoAC might explain the Nordic comparative advantage. First, regarding the factor of academic traditions, the symbolic capital inherent in trust protects researchers' academic autonomy and encourages public funding. Trust-based Nordic democracies are built on long traditions of demographic homogeneity, a protestant work ethic and local governance (Arter, 2008; Markkola, 2006; Pratt, 2008). Nordic countries were too small to sustain a conservative upper class and sparsely populated parishes reinforced solidarity and laid the ground for equal social conditions.

In the Nordic VoAC, the public's trust contributes to academic freedom and public support. Bégin-Caouette et al. (2016) have suggested that Nordic academic centrality is partly conditioned by a socialization of risk (Yang, 2014). According to Marginson (2006), social-democratic regimes (such as those in Nordic countries) put high value on the public benefits of the pursuit of knowledge and protect the academic field's autonomous pole from market logics. The prominence of the public sector in the Nordic "welfare mix" (Esping-Andersen, 1990) also allows this VoAC to accumulate scientific capital despite economic downturns and to consolidate its position for when the economy recovers.

The factor "networking with private actors" is conditioned by similar political-economic patterns. With the inherent risks of academic research being "socialized" through public investments, the academic field's autonomous pole has a prestigious profile and is less under the influence of private interests. This does not mean, however, that there is no collaboration. Actually, the Nordic VoAC includes a responsiveness to industries' needs (Bégin-Caouette et al., 2016; Benner, 2011; Sörlin, 2014). But this responsive character is motivated by a concern with being socially relevant rather than by lack of funding. Such an interpretation mirrors Hall and Thelen's (2009) conclusion regarding institutional stability. For these authors, although globalization and liberalization have reinforced the role of markets in CMEs, there remains a substantial difference between CMEs and LMEs because of the particular cooperative arrangements between various stakeholders in CMEs.

The societal belief in broad access to higher education and the large proportion of doctoral students are two factors potentially conditioned by de-commodification and productivism. Productivism is defined by Esping-Andersen (1999) as a political-economic strategy through

which welfare states maximize the productive potential of citizens by providing education, work opportunities and motivation. The Lutheran work ethic contributes to a goal of full employment (Markkola, 2006) in that it compels citizens to follow secular vocations with as much zeal as a religious vocation. Education appears to be a crucial factor in fostering citizen employment, and to this day, constitutions clearly state that governments should enable citizens' rights to education and work.

De-commodification is a concept that represents citizens' immunity from market mechanisms in fulfilling their needs (Esping-Andersen, 1990). De-commodification results in a larger pool of students who can then, if they have the interest and capacity, pursue graduate studies and contribute to scientific capital accumulation. This juxtaposition of choice and equality appears to be a core feature of the Nordic VoAC. According to Lundberg (2006), the Nordic model of welfare emerged as a third-way between socialism and capitalism. The goal was to support young people in their free choice of education and occupation. Pechar and Andres (2011) observed this Nordic balance between equality of opportunity (choice) and equality of condition in their correspondence analysis. Marginson (2011) believes that political economy has partly conditioned the "public imaginary" of higher education. He notes that in the "social-democratic" imaginary of higher education is defined in emancipatory terms. Equality and the collective freedom of society motivate broad access policies and satisfactory living conditions for citizens who choose not to enroll in higher education.

This means that if citizens choose to follow a career outside of academia, the state protects their living conditions. If on the other hand they have the capacity and the interest to pursue doctoral studies, they will not have to bear a financial burden. Except in Finland where the situation is more nuanced, PhD students are considered university employees in Nordic universities who enjoy high wages and public benefits (Ahola, 2007; Jensen, 2007). Meanwhile, they are expected to contribute massively to scientific capital accumulation, especially if they wish to obtain a permanent position in the academic field.

Regarding funding streams, the Nordic VoAC seems to further scientific capital accumulation by protecting the pluralistic essence of science (Münch, 2014). Basic and competitive funding streams are seen as in line with the academic field's autonomous pole. Either through a performance-based component or a peer-review process, small premiums contribute to the

diversity of research projects and limit an oligopolistic appropriation of material capital by the most prestigious actors. Nordic countries increasingly rely on excellence funding and mergers, while institutional arrangements still aim at enhancing competition, variety, creativity and openness of knowledge evolution (Neidhardt, 2006). In Münch's (2014) terms, performance-based distribution of funds is absorbed by the deep structure of the academic field.

The factor related to public authorities seems to be conditioned by CMEs' buffer organizations and consensual decision-making processes (Hall & Skoskice, 2004). Hall and Thelen (2009) argue that the stability of institutions depends on the availability of meta-institutions for deliberation and rule-making. Nordic consensual- and expert-based democracies encourage collaboration between system actors and the development of legitimate buffer institutions involving actors from the academic field. Traditional vertical relations between public authorities and institutions are complemented by horizontal relations with policy-advising organizations as well as other sectors from society (Maassen, 2014). In the midst of this institutional complexity, it becomes difficult for the state to take over non-state groups, even if most of their funding is public.

The involvement of scientists and experts constitutes another singularity of the Nordic governance system. Information feeds through networks and potent technocrats, bargaining is achieved through formal corporatist meetings, and decisions are made through consensus (Campbell & Pederson, 2010). The government often makes its rulings based on feedback from the social sciences, and this relationship between science and policy-making extends to the public service sector, which has institutionalized scientific expertise and its processes (Musial, 2000). Such reliance on scientists contributes to their symbolic and material capital, which can then be converted into scientific capital.

Finally, the Nordic VoAC relies on semi-independent "buffer organizations" to implement government policies. This study's qualitative analysis revealed that one saturated theme relating to governance revolved around the distinction between policy-making and policy-implementation. Considering the amount of public support for HES, one could imagine Nordic governments to be large, powerful and controlling. A number of national-level actors, however, stressed that ministries are relatively small and rely extensively on external agencies to implement their policies.

In Sweden, the Swedish National Higher Education Authority (SNHAE) is a prime example of a “buffer organization” in the sense it acts as the government’s semi-independent operating arm. The 1977 reform established a National Board for Universities and Colleges and contributed to the unification of the Swedish HES within a single “University of Sweden” comprised of numerous local campuses. The Conservative Party tried to decentralize the system but, after returning to power, the Social-Democratic Party created the SNHAE in 1995 with, as its head, the University Chancellor (Swedish university rectors having the official title of vice-chancellors). As a quality assurance agency, the SNHAE conducts audits in universities and has the power to remove institutions’ right to award degrees.

In addition to its function as a quality assurance and accreditation agency, the SNAHE obtains much delegated power from the government. A senior civil servant that was interviewed said that the role of the agency is to implement the government’s policies. Other interviewees rather emphasized its purpose as a coordinating agent. The representative of a Swedish university association said that much of the dialogue between universities and public authorities occurred through the SNHAE. A national-level representative explained that the government depends on the SNHAE to evaluate higher education and propose policy solutions.

Although the Finnish government has the reputation of intervening more directly in academic matters, it was described by interviewed actors as symbolically constrained by the Academy of Finland. The Academy of Finland is primarily regarded as a research funding organization, but it has a strong advisory role with the government. For instance, it forms a majority of the Finnish Research Infrastructure Committee and has published the country’s first national research infrastructure strategy (Finland Ministry of Education and Culture, 2014). The influence of the Academy is built upon the respect which its members attract from the general academic community (Finland Ministry of Education and Culture, 2013). It is perceived as a key factor in the country’s transition towards a knowledge society. Aware of this symbolic position, the Finnish government delegates control of strategic funding instruments to the Academy in order to improve their academic legitimacy. It is worth noting that the governmental research institutes in Finland also have to compete for funding from the Academy, and one might wonder if this grants the academic field’s autonomous pole a strong influence on the way government-based research is conducted.

No organization in Denmark has an influence on government and policy comparable to that of the Academy of Finland or SNAHE. Rather, the Danish governance system is built upon a tight network of elite stakeholders that transcend the boundaries of government, universities, funding, organizations and committee (Öquist & Benner, 2012). There is a Research Policy Council which debates academic strategies, an Agency for Research and Innovation which implements government policies, as well as external actors shaping the implementation of policies, such as the Council for Independent Research, the Danish National Research Foundation, the Accreditation Institution or the Agency for Innovation. University rectors and faculty deans also have a strong influence on the coordination of higher education in Denmark.

In sum, as suggested in Chapter 14, the Nordic comparative advantage resides in the primacy of the autonomous pole in the academic field. Researchers benefit from an academic freedom protected by multiple societal beliefs related to the role and equitable character of the HES (although the utility of higher education is more contested in Norway and equitable access is more contested in Denmark). The amount and stability of public support also protects its endogenous development, and allows HES to be responsive to, without being dominated by, market forces. Interestingly, the societal belief in the importance of higher education and the amount of public funding could result in government intrusion and the subordination of the autonomous pole under the heteronomous pole. But the involvement of scientists in policy-making, the deliberation meta-structures (i.e., consensus-based democracies) and the delegation of public authority to buffer organizations, which have academic legitimacy, seem to protect the centrality of the academic field.

2.3 Extending the VoAC approach to other contexts

As demonstrated above, the VoAC approach helps to understand how the political economies of Nordic countries condition Nordic HES' comparative advantage in accumulating scientific capital. But can this approach be extended to other HES beyond the Nordic context? Table 32 is a first attempt at articulating how the eight systemic factors emerging from the current study may systematize comparisons between Nordic, Anglo-Saxon and Continental European HES' responses to academic capitalism. Again, one must remember that the focus of this research was on Nordic HES and that no data were collected on Anglo-Saxon or Continental European HES. Based on the literature already consulted for this project, I nonetheless developed this framework

hoping to make clearer how political-economic structures might condition strategies to accumulate scientific capital. The reader should however note that these are broad generalizations based on second-hand data. Generalizations need to be treated with caution, especially in the case of Continental European HES where there is considerable variation between countries such as the Netherlands, France and the Eastern block for example (Bégin-Caouette et al., 2016; Clark, 1983; Esping-Andesen, 1999).

Table 33

Comparing eight systemic factors in Nordic, Anglo-Saxon and Continental European HES

Factors	Nordic HES	Anglo-Saxon HES	Continental European HES
Academic traditions	Academic freedom Public funding Funding concentration	Academic freedom Institutional autonomy Public and private funding	Academic freedom Domination of established disciplines
Societal beliefs	HE serves the public good Equitable access	Anglo-American culture Equality of opportunity	Early-tracking Restrained access Equality of conditions
Institutional differentiation	Horizontal differentiation Mergers	Horizontal and vertical differentiation	Horizontal and vertical differentiation
Academic work	Doctoral students Doctoral schools	Graduate students Graduate schools	Research institutes
Public authorities	Dialogue Legitimacy Coordination	Power delegation Decentralization Coordination	Centralization Direct intervention
Funding streams	Competitive funding Basic funding	Diversified funding Competitive funding	Excellence initiatives
Networking	Private funding Knowledge exchange	Private funding Triple helix	Third party funding
Internationalization	Research collaborations Foreign scholars European funding	Global mission Worldwide recruitment for students and faculty	European funding Student mobility
Related political-economic concepts	De-commodification Socialization of risk Public welfare mix Universalism Productivism Consensus Buffer organizations	Residual state intervention Private welfare mix Competitive arrangements Market relationships Private property rights	Relational contracting Corporatism Public welfare mix Class-based benefits Familialism Differentiation Channeled competition

2.3.1 Anglo-Saxon VoAC

The (liberal) Anglo-Saxon welfare regimes were established in the context of the English political economy of the 19th century (Esping-Andersen, 1990, 1999). Inspired by Adam Smith's

(1776/1994) ideas, these regimes have developed a faith in markets and entrepreneurship and a conception of needs-based social assistance, according to which social programs and redistribution mechanisms only cover citizens who can prove they need them. Analyzing a variety of public policies, Esping-Andersen (1999) noted a prominence of the private sector in what he called the “welfare mix.” This welfare mix seems to influence the eight systemic factors in a number of ways. Firstly, Salmi (2009) argued that Anglo-Saxon universities’ capacity to charge tuition fees (private funding) contributes to the accumulation of abundant material capital that can then be used to fund research, recruit prestigious researchers or give grants to prolific graduate students. For Münch (2014), this corresponds to actors’ material capital rather than scientific capital determining their position in the academic field.

A study of the Anglo-Saxon VoAC shows that there exists a strong tradition of academic freedom for professors, but also that the heteronomous pole of the academic field has a strong influence on the autonomous pole. Bégin-Caouette et al. (2016) characterize Anglo-Saxon HES as “academically peripheral” partly because competitive funding being allocated by external organizations (including research councils). Clark (1983) has also noted that the American tradition of universities is responsive to their surrounding community, which has a majority of members on their board.

In fact, Olson and Slaughter (2014) have observed that Anglo-Saxon systems are characterized by an open higher education system that allows individuals and firms to continually redefine the skills that are needed. The state reduces its intervention in the education system and restricts its role to ensuring the protection of private property rights, free markets, and free trade in order to promote radical innovation. Slaughter and Rhoades (2004) have noted the embeddedness of profit-oriented activities as a point of reorganization by higher education, and the expansion of managerial capacities within universities in order to supervise new flows of resources and demands from new partners in the economy.

In the same vein, the prestige of entrepreneurship and the strength of private corporations foster networking with non-academic actors. Universities in Anglo-Saxon countries have a long tradition of having external members on their boards and of fulfilling a Third Mission of “serving the community.” Since the 1950s, this mission has increasingly involved collaborating with private partners (Roper & Hirth, 2005). Smith (1997) noted that industries in the US and

UK have a powerful role in shaping research priorities in academia. In Canada, 7% of university research is funded by industry and the federal government puts in place generous incentive programs for industries to invest in academic research (Sá and Litwin 2011). The UK saw a massive increase of industry-university joint scientific publications that now accounts for 50% of all industrial scientific output. As Benner (2011) explained, the mechanisms to integrate HES with the market are exceptionally well developed in Anglo-Saxon HES. In the US, academics have long been encouraged to undertake entrepreneurial activities without departing from their academic positions.

The Anglo-Saxon VoAC can thus use its long-standing tradition of collaborating with private actors as a form of social capital to be converted into material capital (in the form of spin-offs or research contracts), and finally into scientific capital. Market-like behaviors extend beyond networking and traditions, however, and include other types of competitive arrangements (Hall & Skoskice, 2004), such as funding mechanisms in which academics must prove there is “demand” for their research. Although basic research remains publicly funded – the state assuming the “bad risks” of basic research – funding streams in Australia, New Zealand and the UK are characterized by Auranen and Nieminen (2010) as “output-oriented core funding with great share of external funding” (p.824). In the US, Kennedy (2012) has noted that government support for development has outpaced investments in basic and applied research.

Institutional differentiation represents another way in which the Anglo-Saxon (liberal) political economy shapes HES’ responses to academic capitalism. According to Hall and Skoskice (2004), LMEs ensure coordination through market behaviors and hierarchies, the latter often being the result of the actor’s performance in the field. Looking at academic research production, Benner (2011) observed a similar process. The American example, for example, shows that a limited number of institutions have reinforced their position in the academic field through aggressive managerial strategies aiming to recruit leading scientists, develop large endowments and, in the end, divert the capital accumulated by others. The process appears more bottom-up in the US. In the UK, Hewitt-Dundas (2012) believe that the Research Assessment Exercise (RAE) has had a similar effect in reducing complexity to marks and ranks, and in allowing already well-performing institutions to use this additional symbolic capital to divert other institutions’ scientific capital and create an oligopolistic academic field (Münch, 2014).

Further studies will have to be conducted to confirm the present interpretation, but it seems at this point that the factors which differentiate the Anglo-Saxon from the Nordic VoAC are the following: academic traditions, public authorities, institutional differentiation and networking with non-academic actors. In both the Nordic and Anglo-Saxon varieties, competitive funding seems to be positively perceived. The same goes for early-career researchers and internationalization. Aghion (2010) and Salmi (2009) have argued that part of the success of American world-class universities could be explained by graduate schools and the large proportion of graduate students. International students and scholars also constitute an important part of the research workforce. The US remains the destination for the largest number of international students and, from 1989 to 2003, the share of science and engineering doctorates awarded to international students increased by 40% (Avveduto, 2010).

2.3.2 Continental European VoAC

What Esping-Andersen (1990) named the “conservative welfare regimes” emerged in Continental Europe in the mid-19th century when liberalism played a marginal role and socialists were excluded from the political arena. Welfare mechanisms were established through compromises between monarchies, traditional corporations and religious authorities. In 1833, Bismarck initiated the first remedial measures of State Socialism, which included health insurance, old age pensions, workers’ protection and children’s protection. Where it had influence, the Catholic Church encouraged states to continue to rely on families for child and elderly care, a strategy which Esping-Andersen (1999) refers to as “familialism.”

It is hazardous to make conclusive claims about a Continental European VoAC since it includes many countries that have noticeably different HES (Clark, 1983). Nonetheless, the literature suggests some common features. First, as in the Nordic and Anglo-Saxon VoAC, professors in the Continental European VoAC enjoy some level of academic freedom. However, regarding the centrality of the autonomous pole, Bégin-Caouette et al. (2016) argued that the Austrian, Dutch, German and Swiss HES were more academically central than the Belgian, French and Italian HES. The Humboldtian tradition was more salient in the first group while a more Continental/Napoleonic tradition had greater presence in the second. In all the countries belonging to the latter group, Bonaccorsi (2007) argued that the “old disciplines” (e.g., biology, chemistry and physics) that have benefited from large experimental facilities in the early 20th

century now benefited from enough symbolic and material capital to prevent the growth of new fields.

Regarding societal beliefs and institutional differentiation, Pechar and Andres (2011) have argued that Continental European countries impose tracking systems at the youngest age and are the most generous to citizens who cannot access higher education. Exam results often determines the type of institution a student can attend. This VoAC is thus characterized by an explicit hierarchy between general and applied education institutions (Benner, 2011). Moreover, large-scale and powerful governmental research institutes conduct applied research, while higher education institutions train the workforce and conduct basic research (Meyer-Krahmer, 2001). In Germany, Helmholtz Centers, Max Planck and Fraunhofer societies as well as other institutes are in explicit competition with universities for public funding and, taken together, represent 80% of university research in the country (Schmoch 2011). France has a dual system in which universities have non-selective entrance policies and limited research infrastructures (Krull 2013), while the *Grandes Écoles* are elitist, well-endowed and professionally-oriented institutions. There remain exceptions, however, such as the Netherlands where universities conduct most of the research (OECD 2008).

In this VoAC, system coordination occurs through non-market mechanisms in which actors from corporations, higher education institutions and public authorities meet and share information. Although academic institutions can limit state intervention in training the elite civil servants, the decision-making process nonetheless appears more centralized. A telling example is the development of excellence initiatives. Germany was the first to develop its *Exzellenzinitiative*, which consisted in allocating additional funding to already-performing institutions in order to help them achieve top positions in rankings (Nature, 2010). The French initiative started in 2011 with a 7.7 billion Euro budget aimed at developing 5 to 10 research clusters (ANR, 2010).

This type of initiative corresponds to a symbolic construction of excellence (Münch, 2014) through channeled competition between few actors (Halls & Skoskice, 2004). There is an interesting link to be made between this core strategy of the Continental European VoAC and the political-economic tendency to preserve class differentials. Instead of granting large sums to the winner of a competition between all possible actors (like in the Anglo-Saxon VoAC) or allocating smaller sums to all actors (like in the Nordic VoAC), the Continental European VoAC

establishes, through non-market mechanisms, the winning institutions and concentrates its resources in order to make them institutional beacons of excellence.

The two last factors listed above relate to social capital and, again, reflect the intervention of national and supra-national authorities. Networking is often based on clusters and influenced by existing industrial strongholds (ANR, 2010). One cannot analyze the Continental European VoAC without mentioning the strong influence of the regionalization process, although the Nordic countries and the UK also take part in the Europeanization process. In 2011, the twenty-seven European ministers set 2020 as the target by which an EU average of at least 20% of higher education graduates should have had experience abroad (Myklebust, 2011). In addition to mobility, the Horizon2020 funding program for strategic research has a budget of €77 billion (ERC, 2013). In terms of research production, more than 45% of scientific publications are co-authored with foreign research teams (Cour des Comptes, 2013). Like the Nordic VoAC, the Continental European VoAC can thus rely on large-scale supra-national funding to accumulate social, cultural, symbolic and material capital to be then converted into scientific capital.

3 Summary

This chapter has proposed a varieties of academic capitalism (VoAC) approach in order to compare in a more systematic way how different political-economic structures condition HES' comparative advantage in the global race for scientific capital accumulation. The VoAC approach focuses on how, in the face of a similar global script, different levels of authority in HES adopt distinct yet inter-influencing strategies. There is, however, considerable room for additional research since the approach presented above was mostly based on a detailed analysis of the Nordic region; the analysis of the other two varieties being dependent on the existing literature, it has obvious limitations.

At this stage, the eight factors identified in the current thesis served as a base for the comparison of Anglo-Saxon, Continental European and Nordic HES. While funding streams, early-career researchers, internationalization seem to be interpreted in a similar way across varieties, the following factors seem to present points of distinction between the three varieties of academic capitalism: academic traditions, societal beliefs, public authorities, institutional differentiation and networking with non-academic actors.

The Anglo-Saxon variety is characterized by a stronger involvement of the private sector in the “welfare mix.” HES are based upon a long tradition of collaborating with their neighboring community. Researchers are encouraged to undertake entrepreneurial activities. Competition and vertical hierarchies between institutions (based upon performance) ensures coordination.

In contrast, although the Continental European variety includes a diversity of academic traditions (Humboldtian or Napoleonic), “old scientific disciplines” appear to dominate academic fields in this variety. Societal beliefs include a strong support for equality of conditions between citizens, early-tracking and a vertical and horizontal differentiation between institutions. Channeled competition exacerbates status-based differences and artificially create beacons of excellence. While some universities thrive, the rest of the academic field is in symbolic competition with powerful government research institutes. Governance includes elite actors from the field, while the decision-making process remains centralized.

Finally, the Nordic VoAC shows in what ways the Nordic context interacts in its own particular way with the eight factors and gives them a distinct meaning. The Nordic comparative advantage appears to be built upon the protection of the prominence of the academic field’s autonomous pole, coupled with strong support from the heteronomous pole. Academic freedom, public funding and funding concentration into universities are fostered by a general public trust in science as well as by meritocracy in the context of equality of conditions. Nordic governments also increase material capital in the form of research funding and of a new generation of PhD candidates, who then in turn contribute massively to scientific capital in order to obtain a position in academia. The comparative advantage is conditioned by the following political-economic concepts: productivism, de-commodification, public welfare mix, balance between equality of opportunity and conditions, network coordination and buffer organizations. This last statement on the Nordic VoAC presents my answer to the core research question of this thesis by explaining how the Nordic HES manager to accumulate comparatively high levels of scientific capital in the context of the global script of academic capitalism.

Chapter 17

Conclusion

Higher education systems (HES) are at the core of many of the social changes being driven by today's global knowledge society. In addition to being the repositories of knowledge, HES provide the ever-increasing expertise needed by societies as they face new global challenges (UNESCO, 2005). Higher education also plays a crucial role in countries' science diplomacy (The Royal Society, 2010). The corresponding economic realm produces and consumes science, intellectual property is increasingly the object of debate, and the sciences that produce the most wealth are most highly regarded (Bonneuil & Joly, 2003).

Investigating how HES integrate with the new economy, Slaughter and Rhoades (2004) developed a theory of academic capitalism. The theory is most useful when applied to Anglo-Saxon countries (Välilmaa, 2014), and even there, the involvement of academia in commercial endeavors remains fairly limited (Geiger & Sá, 2009). Their focus on material capital accumulation omits a distinct albeit intersecting logic that is presently transforming academia, a logic which Hazelkorn (2013) observes as a new "academic world order" fostered by the knowledge society and structured by a quantitative measure of performance in research.

Some universities, embedded in specific systems of higher education, are known to contribute massively to academic research, whether in terms of publications, citations or patents. Based on these metrics, some researchers (e.g., Aghion et al., 2009; Marginson, 2006; Morhman, Ma and Baker, 2008; Salmi, 2009) have concluded that the Anglo-Saxon HES are the most performing systems because of institutional autonomy, a competitive culture, private investments, segmentation and competitive funding. In contrast, Pestre (2003) claimed that "different arrangements and regimes co-exist, and there is no obvious hegemony (or evidence of superiority) of one mode of production (of knowledge and society) over another, and the questions remain largely of a political nature" (p.255).

For instance, on a *per capita* basis, Nordic HES achieve comparatively high results in terms of world-class universities, publications and citations. In a previous study (Bégin-Caouette, 2014), I have analyzed Nordic universities' institutional features and concluded that, like their Anglo-

Saxon and Continental European counterparts, most Nordic universities are old, comprehensive, research-intensive and focused on the natural and health sciences. Of particular interest was that these universities appeared well-supported by systems that do not adequately fit the factors identified by Aghion et al. (2009), Marginson (2006) or Salmi (2009). Out of this last observation and its ensuing question was born the objective of this thesis, which has been to explain how the Nordic HES achieve a comparatively high level of academic research production and to identify the systemic factors contributing to this production.

To meet this objective, I have used Holmes' (1981) hypothetical-deductive problem approach to comparative education. The approach includes five steps: intellectualizing a problem, formulating hypotheses based on a theory of social change, identifying the context in which the problem will be studied, predicting the outcomes of the hypotheses in the specific context, and comparing the logical predictions with observable events.

The problem was “intellectualized” through the lens of the sociology of science. In his book *Homo Academicus*, Bourdieu (1988) described the academic field as partly autonomous in that it is mostly concerned with the endogenous demand for the production and reproduction of knowledge, and partly heteronomous in that it is influenced by broader external social reproduction schemes. Münch's (2014) theory of academic capitalism re-examined the academic field in the wake of the global quest for prestige fostered by globalization, rankings and the knowledge society. His theory explained how academics, higher education institutions and countries accumulate material, social and cultural capital, and convert it into scientific capital in order to maintain or enhance their prestige in the academic field. Considering my interest for academic research production, I chose to focus solely on scientific capital accumulation rather than on the symbolic benefits resulting from it. Scientific capital was viewed as the accumulated labor by academic actors to produce science (as a form of cultural capital) for material and immaterial profits. Objectified scientific capital would then include articles published in peer-reviewed journals, books published by a recognized publisher, papers presented to scientific conferences, patents and other means of dissemination recognized by the scientific community that allows actors to make socially-recognized achievements and claims (Bourdieu, 2004).

The context of the study was described using two political-economic theories: the varieties of capitalism (VoC) approach and the welfare regimes typology. The VoC approach was developed

by Hall and Skoskice (2004) in order to analyze the factors that condition the adjustment paths of political economies in the face of macro-economic challenges. The concept of “comparative advantage” is particularly useful for understanding how the institutional structures of a particular political economy provide businesses (or HES) with advantages for engaging in a specific type of activity. The theory developed by Hall and Skoskice distinguished between coordinated market economies (CMEs) and liberal market economies (LMEs).

One issue with the VoC approach is that CMEs do not consider differences between Nordic and other Continental European countries. In contrast, Esping-Andersen’s (1990, 1999) welfare regimes typology relied on three types of regimes: liberal (Anglo-Saxon), conservative (Continental European) and social-democratic (Nordic). Esping-Andersen defined welfare regimes as specific configurations which involve the state, the market and households, and through which welfare is produced. He also observed that the different regimes adopt different strategies to respond to the transformation of social risk.

Nordic welfare regimes were used as an ideal type (Weber, 1924/1968). According to this ideal type, Nordic countries are to be seen characterized by small capital cities, a concern for nature and the environment, a Lutheran cultural heritage that fosters the ideal of equality and local governance, strong positivist beliefs in the sciences, and a concern for peace, international cooperation and universal social benefits (Derry, 1979; Pratt, 2008; Välimaa, 2005). Nordic countries are also, with the exception of Finland, to be seen as constitutional monarchies and consensus-based democracies where parliaments, their standing committees and invited experts have a great deal of influence on policies (Arter, 2008). The Nordic region has also demonstrated the lowest levels of income inequality in the OECD, and this is partly a consequence of their high employment rates and world-class childcare systems (Christiansen & Markkola, 2006; Lundberg, 2006).

Influenced by the political-economic structures in which they are embedded, Nordic HES have expanded access while providing good conditions for citizens who cannot “get in” (Pechar & Andres, 2011). Nordic HES are also characterized by egalitarian traditions, high levels of research production, public trust and massive public investments (Ahola et al., 2014). Finally, Nordic ARS would be considered both “academically central” and “responsive to market forces” (Bégin-Caouette et al., 2016).

The theories cited above helped me to formulate the following three research questions:

(RQ1) What are the systemic factors perceived as having a positive impact on scientific capital accumulation in Nordic HES?

(RQ2) How do system actors explain the impact of systemic factors on scientific capital accumulation in Nordic HES?

(RQ3) How does the perceived impact of systemic factors on scientific capital accumulation vary between Denmark, Finland, Norway and Sweden?

After an extensive review of more than two hundred documents, I listed thirty-nine widely acknowledged explanations for Nordic HES' level of scientific capital accumulation. These explanations were grouped into six broader systemic factors, which then became the hypotheses to be tested. Hypotheses were framed based on an adaptation of Clark's (1983) and Benner's (2011) frameworks. A factor analysis later resulted in seven factors, or seven hypotheses:

- H1. Academic traditions contribute to scientific capital accumulation in Nordic HES
- H2. Societal beliefs contribute to scientific capital accumulation in Nordic HES
- H3. Early-career researchers contribute to scientific capital accumulation in Nordic HES
- H4. Public authorities contribute to scientific capital accumulation in Nordic HES
- H5. Funding streams contribute to scientific capital accumulation in Nordic HES
- H6. Networking contributes to scientific capital accumulation in Nordic HES
- H7. Internationalization contributes to scientific capital accumulation in Nordic HES

1 Summary of the findings

Holmes' (1981) problem approach requires that researchers adopt a deductive approach, address contexts holistically and find a way to grasp idiographic phenomena. To meet these challenges, I utilized a MLG framework as well as a convergent and parallel mixed-method design (Creswell & Plano Clark, 2011). Qualitative and quantitative data were analyzed independently and merged during interpretation. Indicators and factors were considered robust when quantitative and saturated qualitative findings converged.

Systems being mostly immaterial, this study relied on actors' perspectives and on a structured and focused comparison of cases (Bleiklie & Kogan, 2006) to assess the importance of the seven factors described above in a limited number of countries. I aggregated the perspectives of actors located across three levels of authority (international, national and institutional) and fourteen

strata: Nordic organizations, governments, quality assurance agencies, research councils, innovation networks, university associations, academic staff unions, and in one case-university per country, external board members, administrators, faculty members, doctoral students, contract researchers, as well as one polytechnic/ university college.

Qualitative data collection took the form of one-hour semi-structured interviews with fifty-six senior officials, faculty members, researchers and doctoral students. These interviews were divided into four parts: background, general perspective, stratum's perspective and comments about survey findings. If participants agreed, the interview was recorded in order to be correctly transcribed and summarized. Transcripts were sent for review, modifications and approval. Of the fifty-six interviewees who received the transcript of their interview, twenty-five returned the transcript with minor revisions. Using QSR-NVivo, a deductive and theoretically-driven thematic analysis was also executed on the transcripts. Factors became global themes, and the thirty-nine indicators became organizing themes. Codes were then generated inductively to identify what was meaningful. Saturation was considered at the stage of analysis when new information produced little change to the codebook.

In parallel, a survey based on the thirty-nine indicators identified in the literature was developed and its validity was assessed through focus groups, cognitive interviews and expert reviews. The survey relied on Likert-type scales and asked participants to indicate to what extent each of the indicators has a positive, negative or no influence on the level of research production in their country. The survey was disseminated to groups of employees who had knowledge about academic research production. Of the 3,435 online and anonymous surveys disseminated, 456 (13%) were completed. All cases were deleted for which more than 5% of the questions remained unanswered, resulting in a final database of 324 participants.

Based on the 324-participant database, a factor analysis revealed an eight-factor structure with very good and almost excellent internal consistency ($\alpha = .89$). Each factor's internal consistency was also tested. The factors "Public authorities" ($\alpha = .80$), "Networking" ($\alpha = .75$), "Internationalization" ($\alpha = .76$) and "Societal beliefs" ($\alpha = .73$) formed internally consistent factors. For their part, the factor "Academic traditions" ($\alpha = .65$) presented a Cronbach's Alpha that could be considered questionable, while the factors "Early-career researchers" ($\alpha = .54$) and

“Funding streams” ($\alpha = .50$) demonstrate poor consistency. The factor “Institutional differentiation” ($\alpha = .42$) was considered unacceptable and removed from subsequent analyses.

Other analyses included calculating each item’s average score. Items with scores above 4.0 were kept for future analyses. I then conducted multiple comparisons based on a one-way repeated-measure ANOVA to note if there was a significant difference in participants’ responses to items belonging to different factors (the seven factors representing here seven “experimental conditions”). I followed with unplanned comparisons in the form of post-hoc t tests between each pair of factor, and revealed that there were significant differences between factors’ mean score.

Finally, to observe any significant difference in terms of the perception of the importance of each factor among the four groups, a multivariate analysis of variance (MANOVA) was processed. In this analysis, countries represented the categorical dependent variable and the scores for each factor became the six pseudo-continuous variables.

1.1 Systemic factors contributing to scientific capital accumulation

Holmes’ (1981) problem approach relies on a falsification process (Popper, 2005) according to which researchers work against their own hypotheses and attempt to disprove them. Hypotheses surviving this falsification process are considered tentatively true in the selected context. The present thesis adopted a convergent-parallel mixed-method design (Creswell & Plano Clark, 2011) in which hypotheses were considered not yet falsified when there were notable points of convergence between significant factors and saturated organizing themes.

Results show that there is a significant difference between the average scores of each factor. The multivariate test Wilks’s lambda is $F(0.29, 318) = 128.03, p = 0.00$. Post-hoc pairwise t tests (with Bonferroni correction) revealed that there were several mean differences across the variables. The mixed-method design revealed that the hypotheses regarding the impact of academic traditions and internationalization could not be falsified in the specific context of Nordic HES. Moreover, three other hypotheses (or factors) were only partly falsified in that they included elements that had to be considered as part of the broader dynamic, although their impact

was perceived as relatively weaker by system actors. These three other hypotheses/factors were “societal beliefs,” “funding streams” and “early-career researchers.”

Following a “public good regime” rhetoric, HES are perceived as an accessible field that contributes to Nordic societies’ development. The resulting public trust in academics (symbolic capital) protects their academic freedom and encourages public investments of material capital. These investments take various forms, from increasing public-sector research funding to expanding doctoral education. Findings regarding research funding streams suggest that participants considered financial incentives to have the most impact when they are perceived as legitimate by the autonomous pole of the academic field.

Nordic populations are small and their HES need to rely on international networks as a form of social capital to generate symbolic, cultural and material capital, to be then converted into scientific capital. Extending networks increases the number of connections academics can mobilize in the context of global academic capitalism. In the discussion, I hypothesized that the heteronomous pole of the Nordic academic field not only protects the core of the autonomous pole, but also serves as a “transmission belt” through which the development of foreign scientific fields provides additional support for the growth of the autonomous pole.

In sum, according to my final hypothesis, Nordic HES’ comparative advantage resides in the primacy of the autonomous pole in the academic field. The heteronomous pole of the academic field – which includes, among other things, citizens’ beliefs, governance structures and funding allocations – appears to support rather than steer or dictate the endogenous development of the autonomous pole. This is not to say that research is conducted in isolation from the social, political and economic spheres, nor that it is impermeable to the development of societies, but rather that the accumulation of scientific capital is facilitated when, in the interaction between autonomous and heteronomous poles, there is a deep concern to preserve complex and long-standing academic traditions.

1.2 Differences between the four Nordic HES

The initial research objective of this thesis is based on the assumption that Denmark, Finland, Norway and Sweden form a relatively consistent ideal type, named the “Nordic welfare regimes.” Quantitative and qualitative analyses revealed few differences between countries.

Societal beliefs were perceived to have a stronger positive impact in Finland than in Denmark and Norway, while internationalization was perceived to have a stronger impact in Finland than in Denmark.

In Denmark, concerns for broad access to higher education appears to have been overshadowed by concerns for supporting basic research, which has led to the strengthening of universities' strategic development and the expansion of the number of doctoral and postdoctoral fellows. By contrast, broad access to higher education appeared at the core of the evolution of the Finnish society. It was in Finland that the academic field appeared capable of accumulating the most symbolic capital, to be then converted into material capital funded by both public and private actors.

The Norwegian academic field is forced to compete with a strong institute sector in order to accumulate cultural, social, material and symbolic capital. Universities are prestigious institutions, but the country's institutes attract many young researchers, obtain important research grants, develop closer relationships with industries and, in the end, are perceived as contributing more than their academic counterparts to the economic development of the country.

According to the Games-Howell comparisons, none of the factors had means that were significantly higher or lower in Sweden than in the other Nordic countries under study. The thematic analysis, however, led to the identification of a number of singularities in the Swedish case. Since the 1950s, the Swedish HES has been able to attract most of the public funding for research, which has put it in an advantageous position to partner with large exporting companies, thus benefitting from their accumulated material capital while preserving the integrity of its autonomous pole and its capacity to accumulate scientific capital. Again, the differences stated here and in Chapter 12 are relatively minor and do not undermine the consistency of the Nordic ideal type.

1.3 Foundations for a Varieties of Academic Capitalism approach

This thesis concluded by proposing a varieties of academic capitalism (VoAC) approach which might allow a more systematic comparison of how different political-economic structures condition HES' comparative advantage. The VoAC approach focuses on how, while facing a similar global script, different levels of authority in HES adopt distinct yet inter-influencing

strategies. The eight factors identified in the thesis' analyses served as a base for the comparison of Anglo-Saxon, Continental European and Nordic HES. While funding streams, early-career researchers and internationalization seem to be interpreted in a similar way across countries and varieties, academic traditions, societal beliefs, public authorities, institutional differentiation and networking with non-academic actors appear to vary between the three varieties of academic capitalism.

The following description of the Anglo-Saxon and Continental European HES are exclusively based on second-hand data. However, at this stage, the Anglo-Saxon VoAC would be characterized by a stronger involvement of the private sector in the "welfare mix." HES are rooted in a long tradition of collaborating with the neighboring community. Researchers are encouraged to undertake entrepreneurial activities. Competition and vertical hierarchies between institutions (based upon performance) ensure coordination. In the Continental European variety, "old scientific disciplines" dominate academic fields. Societal beliefs include a strong support for equality of conditions between citizens, early-tracking and a vertical and horizontal differentiation between institutions. Channeled competition exacerbates status-based differences and artificially creates beacons of excellence.

Assessed through the lens of the VoAC approach, the Nordic variety carries at its center a desire to protect the prominence of the academic field's autonomous pole, along with strong support from the heteronomous pole. Academic freedom, public funding and funding concentration into universities are fostered by general public trust in science as well as by what I have named "meritocracy in the context of an equality of conditions." Nordic governments also increase their material capital in the form of research funding and of a new generation of PhD candidates who in turn contribute massively to the accumulation of scientific capital in order to obtain a position in academia. Finally, the comparative advantage seems to be conditioned by the reliance of governments on semi-independent buffer organizations to implement their policies. Along with the involvement of scientists in policy-making and deliberation meta-structures (i.e., consensus-based democracies), these organizations are perceived as legitimate by the academic field and as protectors of its autonomous pole.

2 Contributions

With four countries, three research questions, seven hypotheses and a mixed-method design, this project represented an ambitious opportunity for opening new horizons in factual, methodological, theoretical and practical terms.

2.1 Factual

The inspiration for this research endeavor came from witnessing over the course of the last decade the worldwide implementation of reforms on the liberal model—reforms that have generated turmoil in many HES (Bégin-Caouette & Jones, 2014; Bellei, Cabalin & Orellana, 2014; Rheingans & Hollands, 2013). Although academics have always compared themselves since the inception of the first universities (Neave, 2001), the knowledge society, globalization and world university rankings have encouraged public authorities to compare their higher education institutions and to mimic policies perceived as contributing to research excellence. Many studies (e.g., Aghion et al., 2009; Marginson, 2006; Morhman, Ma and Baker, 2008; Salmi, 2009) have focused on so-called “world-class” American and British universities and have identified institutional and systemic factors explaining the superiority (in raw numbers) of Anglo-Saxon HES.

These studies, however, rely on mainstream observations. Marginson and Salmi both counted the number of world-class universities in different countries and relied on these raw data to suggest the possible domination of the Anglo-Saxon HES. But large developed countries might count more such universities as a simple consequence of their size or of the number of universities within their territory. Aghion et al. (2009) tried to resolve this issue by using regional indexes that take into account population sizes. However, Aghion et al.’s measures of central tendency remained biased towards Anglo-Saxon HES and fails to take into account such “outliers” as small countries with few universities which nonetheless succeed comparatively well in terms of research.

The “academic world order” (Hazelkorn, 2013) is more diverse and plural than what these studies suggest (Pestre, 2003). Countries outside the Anglo-Saxon regions also have universities that are achieving comparatively high levels of research production, and in these cases other factors conditioned by different political-economic structures might explain their performance.

Adopting a *per capita* perspective (in order to account for countries' capacity to support HES), I have noted that, as a group, Nordic HES count more publications, citations, world-class universities and patents than Anglo-Saxon HES. Their performance, however, can hardly be explained by the studies mentioned above. I have therefore adopted a post-positivist approach and tested seven systemic factors based on their perceived impact on academic research production in Nordic HES.

The first contribution of this research has thus been to explain the performance of Nordic HES. As mentioned previously, I cannot at this stage reject the positive impact of academic traditions and internationalization on academic research production. The Nordic comparative advantage resides in a protected academic freedom, strong public support for research and the concentration of resources for research into universities. Since Nordic countries have small populations and few universities, they must also rely extensively on international networks to become known abroad as well as to obtain additional funding, recruit promising scholars and benefit from international partners' expertise and equipment.

The current research complements the numerous pre-existing studies on academic research production and lays the foundations for a better understanding of the ways in which social-democratic structures potentially shape HES' comparative advantage in the global race for research and publications. For instance, findings suggest that a public welfare mix and the socialization of risk have contributed to protect academic research in economic downturns. These same findings also suggest that de-commodification and consensus-based decision-making contribute to public trust in scientists and, consequently, academic freedom.

In short, this study proposes challenge to the belief in the homogenizing tendency of globalization, which has tended to highlight the Anglo-American model of higher education. The study does this by clarifying a Nordic model that has succeeded in combining excellence with social relevance and accessibility. The lesson to be learned here is that different political-economic choices can equally lead to high performing systems.

2.2 Methodological

Beyond its findings, the innovative character of the study lies in the way it combines approaches, frameworks and designs to respond to the challenge of assessing, in a robust and confirmative

way, the impact of multiple and inter-influencing systemic factors in a limited number of countries.

Following Holmes' (1981) deductive problem approach, I listed thirty-nine possible explanations for Nordic HES' performance and then grouped them into six (later seven) factors to be tested. The first advantage of Holmes' problem approach is that it focuses on specific hypotheses generated by a theory of social change and an ideal-typical normative model (e.g., Nordic HES). The second advantage is that Holmes provides a clear roadmap for the collection and classification of data about a particular educational context. Instead of randomly collecting data, I focused my attention on specific hypotheses supported by empirical indicators. The third strength of Holmes' approach lies within Popper's (2005) scientific epistemology of falsification. This epistemology is post-positivist in the sense that it does not involve positive proof of truth but rather predictions (Holmes, 1981). This reconciliation of nomothetic (i.e., predictions) and idiographic (i.e., context) epistemologies is what makes the problem approach so powerful. Although it was not able to prove any causal relationship, this study was confirmative in that it made predictions about six (then seven) factors and only two predictions could not be disproven and the rest were thereby considered tentatively true (or not yet falsified) in the specific context of the Nordic HES.

This thesis also contributes to methodological debates in proposing a framework to analyze "immaterial" systems in cases where the number of cases is small and the use of national statistics is impractical. Since I focused on country-level generalizations and compared only four countries, I used Kogan et al.'s (2006) MLG framework to compare cases both horizontally (between countries) and vertically (between levels of authority). After having defined the "problem," I needed to identify organizations playing a role in the phenomenon under study that would be similar across the compared systems. In this case, three levels of authority (international, national and institutional) and fourteen strata were identified. The data collection process was purposeful since each stratum was targeted in a non-probabilistic way to account for the different components of the academic research process (maximal variation) and to ensure the compatibility of the data sets across countries (homogeneity).

Finally, since the falsification process requires a certain level of rigor, it was decided that the methods' limitations should be partially offset by a reliance on a convergent parallel design

(Creswell & Plano Clark, 2011) in which the two sets of data were analyzed independently and merged (point of interface) during the interpretation phase. This allowed me to compare, contrast and ultimately identify the level of convergence between two data sets considered of equal importance and priority. The analytical strategy was to reduce a plethora of factors, indicators, strata and data to what appeared both quantitatively and qualitatively congruent (Whittemore, Chase & Mandle, 2001). This methodology was innovative in that it made possible a study based on a limited number of cases which had the aim of disproving hypotheses, while increasing the generalizability of its results. It also allowed me to identify “immaterial” systemic factors in a more concrete way, while also giving voice to various actors who play a role in the HES in question (including the faculty members and researchers who actually do research), ultimately giving rise to a holistic portrait of some of the keys of success in Nordic countries.

2.3 Theoretical

The complex methodology depicted above has allowed me to further contribute to theories about higher education and academic research. Combining the lenses of Münch’s (2014) sociology of academic capitalism, Hall and Skoskice’s (2004) varieties of capitalism and Esping-Andersen’s (1990) welfare regimes typology, the resulting framework has shed new light on the political-economic processes interacting with scientific capital production in Nordic HES.

In Chapter 16, I compared my findings with those from studies about other HES and I proposed an approach which I call “varieties of academic capitalism” (VoAC). This approach compares in a more systematic way how different political-economic structures condition the comparative advantages of HES. Olson and Slaughter (2014) had already suggested differences in the responses of LMEs and CMEs to academic capitalism. Considering, however, the points of convergence between my findings and those of Benner (2011), Pechar and Andres (2011) and Bégin-Caouette et al. (2016), I have concluded that a more fruitful VoAC approach should differentiate HES beyond the CME-LME dichotomy presented by Olson and Slaughter, and rather compare Anglo-Saxon (or liberal), Continental European (or conservative) and Nordic (or social-democratic) varieties of academic capitalism.

The current thesis has exclusively focused on Nordic HES and many more studies will be necessary to understand, in the first place, how comparative advantages in scientific capital

production are conditioned by countries' political-economic structure, and, in the second place, to develop a robust VoAC approach.

2.4 Practical

Societies around the world are currently entering a new knowledge regime which is calling for leading-edge expertise to face new challenges such as climate change, the energy crisis and cyber-attacks. In this newly formed knowledge society and economy, HES are essential to nurturing a skilled workforce, producing economic growth, contributing to knowledge and raising countries' standings.

While access is often seen as incompatible with excellence, this study might prove helpful to policymakers and granting organizations that wish to achieve high levels of access without compromising research excellence. The only caveat is to not overextend the relevance of the present study's findings. Holmes' (1981) problem approach does not allow researchers to extend their conclusions beyond the specific context in which they conduct their study. In the field of comparative education, Sadler (1979) also provided valuable advice:

We cannot wander at pleasure among the education systems of the world, like a child strolling through a garden and pick off a flower from one bush and some leaves from another, and then expect that if we stick what we have gathered into the soil at home, we shall have a living plant (p.49).

I do not assume the findings presented in this thesis to be transferable to any context. They nonetheless suggest that distinct factors contribute to academic excellence outside the traditional Anglo-Saxon context. Network coordination and consensus-based decision-making can be an alternative to competition, public funding for research an alternative to attracting private contracts, internationalization a potential mitigator of the impacts of being a small nation, while public trust may encourage contribution to society as much as accountability measures.

Furthermore, comparative political economy might provide policymakers with insights into the academic traditions and political-economic conditions under which changes can be implemented. For instance, findings suggest that, in the Nordic context, policies aiming to increase academic research production need to be in one way or another suitable to, and legitimate in the eyes of, the autonomous pole of the academic field. Policymakers in the Nordic context should also be aware of the importance that public trust in institutions has for the protection of academic

freedom, and consequently might want to ensure that any control measures put into place do not undermine the reputation of the higher education sector. Finally, policymakers might consider focusing on supporting international connections that may compensate for limited human or material resources.

3 Avenues for future research

This was an ambitious study. While it attempted to be as robust as possible, it remains subject to numerous limitations and caveats (discussed in Chapter 7). The first avenues for future research would therefore need to aim at strengthening the present study. Further studies could, for instance, contribute to the development of the questionnaire. Three items had to be removed from the factor analysis because of poor psychometric qualities: namely, “professors’ time for research,” “a lower level of bureaucracy” and “the existence of non-university higher education institutions.” These items should be reformulated and re-tested. Moreover, while the eight-factor structure was stable and five factors proved internally consistent, three factors had Cronbach’s alphas below $\alpha = .60$. It was suggested in Chapter 15 that including more items in the survey might improve the instrument. Funding streams could include items related to independent foundations, research councils’ acceptance rates and performance-based basic funding. Early-career researchers could include items on postdocs, tenure-tracks and researchers’ working conditions. Institutional differentiation could include items on mergers, university colleges and the unitary or binary nature of the HES.

It might also be argued that a more powerful instrument would include clear measures of a dependent variable (DV). This would enable, for instance, performing a multiple regression to examine if systemic factors have a quantitatively measurable significant impact on academic research production. At a later stage, it might even become possible to develop a structural equation model in which some factors would only have an impact if other factors are present/absent or would only have an impact on another factor which in turn would have an impact on the DV. These studies would need to overcome the challenge presented in Chapter 7 regarding the difficulty of reconciling nomothetic and idiographic epistemologies. One option could be to include a subjective measure as a DV, such as the perceived level of academic research production in a country (possibly constructed as an index including many sub-

components), or to correlate the perceptions measured in the survey to an external measure of academic production. This would require that include many countries be included since the DV can only have one value per country: the DV does not vary per individual but per country.

Further studies might also reinforce my findings by targeting a broader sample. It could be argued that the sample used in the current research was not representative, particularly at the international and institutional levels. At the international level, representatives from European organizations were contacted but none accepted to be interviewed, thus reducing the “international scale” to a “Nordic scale.” At the institutional level, only one institution per country was selected. A future study could include interviewing different academic staff members working in different disciplines and institutions, and more than one representative per country of a non-traditional university (e.g., polytechnics, university colleges and new universities). It is also uncertain whether system actors (especially at the micro-level) would have a deep understanding of systemic factors and their often imperceptible impact on the academic research production process.

Once the methodology is made more robust, another set of studies could deepen our understanding of some of the findings presented in this dissertation. Some apparent contradictions between my findings and the literature provide interesting avenues for future studies. For instance, Nordic HES are known for their university budgets being largely funded by block grants. However, system actors seemed to feel that the competitive funding stream has a stronger impact on research production. It is also argued in the literature that Finland has the least internationalized and most inward-looking HES in the Nordic region, in which case one might ask why that factor’s mean was significantly larger in Finland than in Denmark?

In addition, this research assumes that Nordic countries have social-democratic welfare regimes and therefore concludes that social-democratic political-economic elements condition the Nordic comparative advantage. But can the factors identified in this thesis be applicable to other non-Nordic social-democratic contexts such as Scotland or the Canadian province of Quebec? In other words, are the systemic factors identified in this study conditioned by the Nordic context or by social-democratic features shared with other jurisdictions? Further studies comparing systemic factors within a “social-democratic” cluster could help define the parameters of a viable social-democratic alternative to the homogenizing neo-liberal discourse.

Future studies are definitely needed to bring additional evidence to bear on the subject and to support the development of a VoAC. Studies could start by collecting comparable qualitative and quantitative data in Anglo-Saxon and Continental European HES. Chapter 16 already suggested that factors potentially differentiating the Anglo-Saxon from the Nordic VoAC include academic traditions, public authorities, institutional differentiation and networking with non-academic actors. A MANOVA could test these hypotheses and find significant differences between systems. Another set of studies could use different methodologies based on internationally-comparable data to examine if some factors (such as internationalization, funding streams and early-career researchers) have an impact across varieties and if other factors have an impact only for some varieties.

I used rankings and other bibliometric measures as a starting point to my research and attempted to identify factors explaining countries' performance. But these measures are undermined by severe validity and reliability concerns (Gingras, 2014; Hazelkorn, 2013). By focusing on such measures – even if it is in the hopes of defining an alternative to the neo-liberal discourse – am I contributing to their legitimacy? And what about the societal and economic impacts of academic research on societies? I looked at the quantity of research produced (and quality if you consider citations as a proxy), but other studies also need to look at how the research is being used by public and private actors and how it improves or affects quality of life.

The introduction to this thesis argued that more research is needed in order to cope with the emerging global knowledge society. Although I stand by this statement, the underlying assumption also needs to be critically examined. To what extent do we need more knowledge? In the face of the complex systemic threats of climate change, terrorism and inequality, is the solution to be found in an ever-increasing *breadth* of knowledge and information, or does it rather reside in a nurtured *depth* of perception, which some might refer to as “wisdom”? This leads us to a triggering question for scholars in education: namely, do we know enough? (And I might add: when is enough really enough?) This is a philosophical question that remains outside the purview of this study insofar as it addresses one of the study's innermost assumptions, but further studies might benefit from being critically aware of its implications for the endeavor that I hope to have initiated in the present thesis. Meanwhile, the present study represents an additional step in understanding how Nordic political-economic structures mediate HES' responses to global pressures and transformations, such as academic capitalism.

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Appendix 1

E-Mail Scripts for Administrative Consent

Dear [NAME OF ADMINISTRATOR],

My name is Olivier Bégin-Caouette, PhD candidate in higher education at the Ontario Institute for Studies in Education (Canada). I am sending you this message to request your permission to conduct research within your organization. The purpose of this study is to better understand how Nordic higher education systems contribute to a relatively successful level of research production. While it really focuses on the research produced within universities, the study is very interested in the perspectives from a broad range of stakeholders in the higher education system. The study is based on a survey on stakeholders' perception of the impact of various systemic factors on research production as well as on interviews with key informants within the higher education systems. Your organization was identified because... [SEE RATIONALE BELOW].

1. the European Research Council supports academic research through its policies and funding programs.

2. the Nordic Council of Ministers supports research and innovation in the Nordic countries.

3. the Ministry of Higher Education and Research structures higher education systems and formulates research policies.

4. evaluation agencies assess the quality of the higher education, sometimes consider research outputs and may influence funding to higher education institutions.

5. research councils play an important role in providing funding and formulating best practices regarding academic research.

6. innovation networks support university research by encouraging partnerships between universities, businesses and other types of organizations.

7. university associations defend the interest of universities and are thus well aware of the challenges they face regarding the research production.

8. faculty associations defend the role of faculty members and are well aware of the factors contributing to or undermining their capacity to do research.

9. university boards can provide an institutional perspective regarding university research production.

10. the Vice-President for research is aware of the research production in the university and can explain what external factors may shape research productivity.

11. faculty members are responsible for research projects in universities.

12. contract-researchers contribute to universities' research production.

13. non-university institutions are an important part of the higher education system and can explain how their role contribute to research production.

14. centers of excellence are transnational academic research groups that contribute to research production.]

In the first phase of the study, a survey will be disseminated to thousands of representatives of the Danish, Finnish, Norwegian and Swedish government, evaluation agencies, research councils, innovation networks, university associations, faculty associations, universities, non-university institutions and centers of excellence. This survey asks participants to indicate to what extent various factors have an impact on research production in their country. It contains one question (with 40 elements) and takes 15 minutes to answer. The survey is hosted on a Canadian website and does not ask for your name or position. In a second phase, I would be conducting a one-hour (1h) interview with [NUMBER AND POSITION OF PEOPLE - SEE TABLE 3] in order to better understand why are some systemic factors important.

What I am asking from you and your organization is (1) to allow me to conduct this research project in your organization, (2) to disseminate an email inviting [NUMBER AND POSITION OF PEOPLE] to participate to the online survey and (3) disseminate an email inviting [NUMBER AND POSITION OF PEOPLE] for an interview. If it is not possible for you to disseminate the invitation email, I would need your permission to contact the participants myself.

Participants will be sent an invitation email and an attached consent form. They are asked to contact me directly if they have any questions about the project and to express their interest in participating. Participants may withdraw at any time or choose not answer to any question. The information gathered from both questionnaires and interviews will be kept in strict confidence and stored at a secure location in the researcher's apartment. The categories of the organizations contacted for this study will be mentioned in the methodology section, yet no quotation will be directly attributed to a specific employee of a specific organization and results will not be disaggregated by organizations. Participants will at no time be judged or evaluated, and will at

no time be at risk of harm. All raw data (i.e. transcripts, field notes) will be destroyed five years after the completion of the study.

Please note that this research was approved by the Research Ethics Board of the University of Toronto (Canada) and that it is funded by the Canadian Social Sciences and Humanities Research Council. You can follow the development of the project on the researcher's personal homepage: <http://olivierbegincaouette.yolasite.com>.

If you agree, please read and sign the attached letter below and return it to me by scanning and emailing it to me.

Should you have any questions about the study please contact me at:
olivier.begin.caouette@mail.utoronto.ca.

Should you have any concerns about the study, you may at any time contact my thesis supervisor Dr. Glen A. Jones at: 416-978-8292 or: gjones@oise.utoronto.ca You may also contact the U of T Office of Research Ethics for questions about your rights as a research participant at ethics.review@utoronto.ca or 416-946-3273.

Thank you in advance for your consideration of this request.

Sincerely,

Olivier Bégin-Caouette, Ph.D.c.

Doctoral candidate in higher education (comparative, international and development education)

Ontario Institute for Studies in Education

University of Toronto

Telephone: +1-514-447-5462

E-mail: olivier.begin.caouette@mail.utoronto.ca

Website: <http://olivierbegincaouette.yolasite.com>

Appendix 2

Invitation E-Mail for Interview Participants

Dear [NAME OF PARTICIPANT],

My name is Olivier Bégin-Caouette and I am a PhD candidate in higher education at the Ontario Institute for Studies in Education (Canada) under the supervision of Dr. Glen Jones. I would like to invite you to participate in a study on research production in Nordic higher education systems. The study is based on a survey from about 400 on stakeholders' perceptions in four different countries of the impact of various systemic factors on research production as well as on 50 interviews with key informants within the Danish, Finnish, Norwegian and Swedish higher education systems. Although this study focuses on research production within universities, it is really interested in getting other major stakeholders' perceptions of factors encouraging academic research production. Stakeholders include representatives of the Danish, Finnish, Norwegian and Swedish government, evaluation agencies, research councils, innovation networks, university associations, faculty associations, universities, non-university institutions and centers of excellence.

Your participation would involve an interview on your experience and views on higher education and research production in your country. I am particularly interested in your views on [RATIONALE DEPENDS ON THE POSITION

- 1.the role of the European Research Council in supporting academic research.
- 2.the role of the Nordic Council of Ministers in supporting research and innovation in the Nordic countries.
- 3.the role of the Ministry of Higher Education and Research in structuring the higher education system and formulating research policies.
- 4.the role of the evaluation agencies (if any) in the research process.
- 5.the role of the research councils in providing funding and formulating best practices regarding academic research.
6. the role of innovation networks in supporting university research by encouraging partnerships between universities, businesses and other types of organizations.
7. the role of university associations in defending university research.
8. faculty members' capacity to do research.

9. governance and university research production.
- 10.the external factors potentially shaping research productivity.
- 11.faculty members' responsibilities for research projects in universities.
- 12.contract-researchers' role in universities' research production.
- 13.non-university institutions' role regarding access and quality in higher education.
- 14.transnational academic research collaborations.]

After receiving your consent, I will contact you again to schedule a 60-minute interview. You will not be personally identified in my thesis or in any following work. If you agree to be recorded, you will receive a copy of the summary within two months of the interview and you will have the opportunity to modify, delete or add anything you would like. You can choose to not respond to a question or withdraw from the study at any time before the analysis starts and without any form of consequence.

By participating to this study, you contribute to a better understanding of research production in Nordic higher education systems. Moreover, the interview might provide an opportunity to reflect on how your work influences academic research production in your country. The study itself might benefit to governments, public agencies or universities wishing to envision changes that could potentially increase research production.

Please see the attached consent form for more details about this study and your rights as a participant. If it is possible for you, please print, sign and scan and send me back the consent form by email. If it is not possible, you can also give me the signed consent form when we will meet in person for the interview. Should you have any questions about the study, please contact me (Olivier Bégin-Caouette) at olivier.begin.caouette@mail.utoronto.ca.

Should you have any concerns about the study, you may at any time contact my thesis supervisor Dr. Glen A. Jones at: 416-978-8292 or: gjones@oise.utoronto.ca. You may also contact the U of T Office of Research Ethics for questions about your rights as a research participant at ethics.review@utoronto.ca or 416-946-3273.

Thank you in advance for your consideration of this request.

Sincerely,

Olivier Bégin-Caouette, Ph.D.c.

Doctoral candidate in higher education (comparative, international and development education)

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Appendix 3

E-Mail when Participants Consent to the Interview

Dear [NAME OF PARTICIPANT],

I thank you very much for consenting to be interviewed for this research. I will be in [NAME OF THE COUNTRY] between [DATE 1] and [DATE 2]. I can go to any location that would be convenient for you, at any time that fits your schedule.

Please tell me if you would agree to be recorded. You will not be personally identified in my thesis or in any following work. If you agree to be recorded for better transcription, you will receive a copy of the summary within two months of the interview and you will have the opportunity to modify, delete or add anything you would like. You can choose to not respond to a question or withdraw from the study at any time without any form of consequence.

I thank you again and am looking forward to meet you.

Sincerely,

Sincerely,

Olivier Bégin-Caouette, Ph.D.c.

Doctoral candidate in higher education (comparative, international and development education)

Ontario Institute for Studies in Education

University of Toronto

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Website: <http://olivierbegincaouette.yolasite.com>

Appendix 4 Invitation E-Mail to Complete the Survey

Dear [POSITION OF THE PARTICIPANTS]

My name is Olivier Bégin-Caouette and I am a PhD candidate in higher education at the Ontario Institute for Studies in Education (Canada) under the supervision of Dr. Glen Jones. I would like to invite you to complete a survey on research production in Nordic higher education systems. [NAME OF THE COUNTRY] seems particularly successful in terms of publications, patents and world-class universities *per capita* as well as in terms of citations per article. Although this study focuses on research production within universities, it is really interested in getting other major stakeholders' perceptions of factors encouraging academic research production. My objective is that more than 400 stakeholders respond to the survey.

I would thus appreciate to have your perspective on what elements contribute to research production in your country. You were selected because [SEE RATIONALE BELOW]

1. the European Research Council supports academic research through its policies and funding programs.
2. the Nordic Council of Ministers supports research and innovation in the Nordic countries.
3. the Ministry of Higher Education and Research structures higher education systems and formulates research policies.
4. evaluation agencies assess the quality of the higher education, sometimes consider research outputs and may influence funding to higher education institutions.
5. research councils play an important role in providing funding and formulating best practices regarding academic research.
6. innovation networks support university research by encouraging partnerships between universities, businesses and other types of organizations.
7. university associations defend the interest of universities and are thus well aware of the challenges they face regarding the research production.
8. faculty associations defend the role of faculty members and are well aware of the factors contributing to or undermining their capacity to do research.

9. university boards can provide an institutional perspective regarding university research production.

10. the Vice-President for research is aware of the research production in the university and can explain what external factors may shape research productivity.

11. faculty members are responsible for research projects in universities.

12. contract-researchers contribute to universities' research production.

13. non-university institutions are an important part of the higher education system and can explain how their role contribute to research production.

14. centers of excellence are transnational academic research groups that contribute to research production.]

The survey contains only one question (with 40 elements) and takes 15 minutes to answer. The survey is hosted on a Canadian website and does not ask for any information leading to the identification of participants. If you wish to withdraw from the study, you can stop responding to questions at any moment. However, because the survey is anonymous, it is not possible to withdraw from the survey once it is completed.

To participate, you will be asked to click on a link below following some more detailed information about the survey.

Please ignore this email if you have previously completed the questionnaire.

Note that this research was approved by the Research Ethics Board of the University of Toronto (Canada) and that it is funded by the Canadian Social Sciences and Humanities Research Council. You can follow the development of the project and will eventually be able to read the results on the researcher's personal homepage: <http://olivierbegincaouette.yolasite.com>.

Should you have any questions about the study please contact me at:
olivier.begin.caouette@mail.utoronto.ca.

Should you have any concerns about the study, you may at any time contact my thesis supervisor Dr. Glen A. Jones at: 416-978-8292 or: gjones@oise.utoronto.ca

I thank you in advance for your consideration of this request.

Sincerely,

Olivier Bégin-Caouette, Ph.D.c.

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Appendix 5 Administrative Consent Form



Title of Research Project: Academic Research Production in Four Nordic Higher Education Systems

Principal Investigator: Olivier Bégin-Caouette, PhD candidate in higher education (comparative international and development education), Ontario Institute for Studies in Education (OISE), University of Toronto.

Supervisor: Dr. Glen A. Jones, Professor at the Ontario Institute for Studies in Education (OISE), University of Toronto.

A) INFORMATION TO PARTICIPANTS

1. Research objectives

The aim of this SSHRC/Vanier-supported study is to investigate how Nordic higher education systems contribute to relatively successful levels of academic research production, while maintaining a social-democratic system committed to equity in terms of access to higher education. More precisely, the study looks at the systemic factors that may contribute to more publications, world-class universities and patents on a *per capita* basis as well as more citations per article than many other American or European higher education systems. The study is based on a survey on stakeholders' perception of the impact of various systemic factors on research production as well as on interviews with key informants within the higher education systems. If the survey provides an overview of the systemic factors at work in Nordic higher education systems, the purpose of the interviews is to explain why each factors might be important or not and draw any relationships between some factors. The study focuses on four cases - Denmark, Finland, Norway and Sweden - and includes representatives from governmental organizations, research councils, innovation networks, university associations, faculty associations, research-intensive universities, non-university higher education institutions and excellence centers.

2. Research Participation

What I am asking from you and your organization is to allow me to conduct this research in your organization. First, I would like your organization to disseminate an email inviting to participate in an online survey. This survey asks participants to indicate to what extent various factors have an impact on research production in their country. It contains one question (with 40 elements) and takes 15 minutes to answer. The survey is hosted on an American (United States) website and does not ask for any nominal information. If it is impossible for you to disseminate the survey, I would like to request the permission to contact the participants myself.

Second, I am asking you and your organization to allow me to conduct interviews with [NUMBER OF INTERVIEWEES - SEE TABLE 2] in your organization. Interviews will focus on participants' perceptions regarding research production in their country. The interview will last 60 minutes, at a time and location of participants' convenience. Videoconference (e.g. Skype) may be used where circumstances do not allow for a face-to-face interview. Granted that you approve this project, I will ask you to send potential participants an invitation email and an attached consent form. If participants agree, the interview to be audiotaped. Participants may withdraw at any time or choose not answer to any question they are not comfortable with. No judgment will be placed on their responses. Within two months of the interview, participants will receive by email a summary report of the interview and asked to correct any errors of facts, interpretation or omission. Again, they will have the opportunity to withdraw from the study and then the entire interview and the summary will be deleted.

3. Confidentiality

Surveys are anonymous and data will not be presented in a way that your organization could be identified. All data will be stored electronically and anonymously. The interview recordings will be erased in May 2016 or after the data analysis is completed. The categories of the organizations contacted for this study will be mentioned in the methodology section, yet no quotation will be directly attributed to a specific employee of a specific organization and the data will not be disaggregated by organization. It is impossible to guarantee the complete confidentiality of the organizations since there is often only a limited number of organizations of a specific type (e.g. research council) in each country. But the identity of participants will remain confidential (only generic categories will be used). Participants will be non-identifiable in the thesis or any article or book following the study. Given the nature of the project, some readers may suspect that specific individuals in key positions will have been interviewed for the study. Quotations will be presented in such a way so that participants cannot be identified. If that is not possible, then quotation will not be used.

To maximize confidentiality, general categories will be used to refer to participants in the thesis and other manuscripts (e.g. "a faculty member", "a key-informant working at the system level" or "a university administrator"). To maximize privacy, the researcher will conduct interviews in private settings and encrypt all emails from participants. The audio files will be in an encrypted file on the researcher's computer and the notepad will be put under lock and key in the researcher's apartment in one of the four Nordic countries. Only the researcher and the supervisor will have access to the raw data.

4. Advantages and Risks

By giving your administrative consent to this study, you contribute to a better understanding of research production in Nordic higher education systems. Moreover, the interview might provide participants an opportunity to reflect on how your work influences academic research production in your country. The study itself might benefit to governments, public agencies or universities wishing to envision changes that could potentially increase research production.

There are no foreseeable risks to participating in this study. Although the study is not intended to make judgments about people, it is conceivable that some participants might feel uncomfortable or worried about their opinion, experience or professional responsibilities. In that case, the participant may share their concerns with the investigator, so he can take their concerns into consideration in the writing up and dissemination of the case studies.

5. Right of Withdrawal

Participation is voluntary. Participants may withdraw from the study without consequence at any time. They can choose not to respond to any survey question and can cancel the interview at any moment, refuse to respond to a question, end the interview or ask the researcher to not take into consideration some of the things you said. Participants will receive an electronic copy (.pdf) of the summary of the interview within two months for review and make comments to the researcher. If there is have any modification, the researcher will then send a revised version of the summary. Again, participants will have the opportunity of changing, adding or deleting anything they want.

6. Compensation

There is no financial compensation for participating in this study.

7. Dissemination of results

The participants are invited to follow the development of the research process in the researchers' personal homepage: <http://olivierbegincaouette.yolasite.com>. When the thesis will be finally approved, a link leading to the results will appear.

B) CONSENT

I hereby declare to have read the information above and obtained answers to my questions about the study. I am satisfied with the explanations provided, have the authority to authorize the administrative consent requested, and am giving it. I understand the aim, nature, advantages, risks, and drawbacks of this study.

Signature: _____ Date: _____

Name: _____ First name: _____

I hereby declare that I have explained the aim, nature, advantages, and drawbacks of this study. I have also answered all questions asked, to the best of my knowledge.

Signature of researcher: Date: June 11, 2014

Name: Bégin-Caouette First name: Olivier _

For any question regarding the study or to withdraw from the study, you can contact Olivier Bégin-Caouette, at: +1 514-447-5462 or: olivier.begin.caouette@mail.utoronto.ca

Should you have any concerns about the study, you may at any time contact my thesis supervisor Dr. Glen A. Jones at: 416-978-8292 or: gjones@oise.utoronto.ca

Any complaints about your participation in this study may be addressed to the Office of Research Ethics, University of Toronto, at ethics.reviewutoronto.ca or +1 416-946-3237.

Appendix 6 Interviewee Consent Form



Title of Research Project: Academic Research Production in Four Nordic Higher Education Systems

Principal Investigator: Olivier Bégin-Caouette, PhD candidate in higher education (comparative international and development education), Ontario Institute for Studies in Education (OISE), University of Toronto.

Supervisor: Dr. Glen A. Jones, Professor at the Ontario Institute for Studies in Education (OISE), University of Toronto.

A) INFORMATION TO PARTICIPANTS

1. Research objectives

The aim of this SSHRC/Vanier-supported study is to investigate how Nordic higher education systems contribute to relatively successful levels of research production, while maintaining a social-democratic system committed to equity in terms of access to higher education. More precisely, the study looks at the systemic factors that may contribute to more publications, world-class universities and patents on a *per capita* basis as well as more citations per article than many other American or European higher education systems. The study is based on a survey on stakeholders' perception of the impact of various systemic factors on research production as well as on interviews with key informants within the higher education systems. If the survey provides an overview of the systemic factors at work in Nordic higher education systems, the purpose of the interviews is to explain why each factors might be important or not and draw any relationships between some factors. The study focuses on four cases - Denmark, Finland, Norway and Sweden - and includes representatives from governmental organizations, research councils, innovation networks, university associations, faculty associations, research-intensive universities, non-university higher education institutions and excellence centers.

2. Research Participation

Participation in this study will involve an interview about your perception concerning research production in your country (or in the Nordic countries in general). The interview will last 60 minutes, at a time and location of your convenience. Videoconference (e.g. Skype) may be used where circumstances do not allow for a face-to-face interview. You will be able to send a signed copy of this consent form electronically. You will be asked whether you want the interview to be audiotaped and only with your permission will it be done. You may withdraw at any time or not answer to any question you are not comfortable with. No judgment will be placed on your

responses. Within two months of the interview, you will be sent a summary report of the interview and asked to correct any errors of facts, interpretation or omission. Again, if you want to withdraw from the study, the entire interview and the summary will be deleted.

3. Confidentiality

All data will be stored electronically and anonymously. The interview recordings will be erased in May 2016 or after the data analysis is completed. Your identity will remain confidential (only pseudonyms will be used). You will be non-identifiable in the thesis or any article or book following the study. Yet, given the nature of the project, readers may suspect that specific individuals in key positions will have been interviewed for the study. Quotations will be presented in such a way so that you cannot be identified. If that is not possible, then quotation will not be used.

To maximize confidentiality, general categories will be used to refer to participants in the thesis and other manuscripts (e.g. "a Finnish faculty member", "a key-informant working from the Swedish government", "a Danish university administrator" or "a representative from the Norwegian university association"). To maximize privacy, the researcher will conduct interviews in private settings and encrypt all emails from participants. The audio files will be in an encrypted file on the researcher's computer and the notepad will be put under lock and key in the researcher's apartment in one of the four Nordic countries. Only the researcher and the supervisor will have access to the raw data.

4. Advantages and Risks

By participating to this study, you contribute to a better understanding of research production in Nordic higher education systems. Moreover, the interview might provide an opportunity to reflect on how your work influences academic research production in your country. The study itself might benefit to governments, public agencies or universities wishing to envision changes that could potentially increase research production.

There are no foreseeable risks to your participation in this study. Although the study is not intended to make judgments about people, it is conceivable that your participation might make you feel uncomfortable or worried about your opinion, experience or professional responsibilities. In that case you may share your concerns with the investigator, so I can take your concerns into consideration in the writing up and dissemination of the case studies.

5. Right of Withdrawal

Your participation is completely voluntary. You may withdraw from the study without consequence at any time before the analysis starts. You can cancel the interview at any moment, refuse to respond to a question, end the interview or ask the researcher to not take into consideration some of the things you said. You will receive an electronic copy (.pdf) of the summary of the interview within two months. You may review the summary and make comments to the researcher. If you have any modification, the researcher will then send a revised version of the summary. Again, you will have the opportunity of changing, adding or deleting anything you want.

6. Compensation

There is no financial compensation for participating in this study.

7. Dissemination of results

You can follow the developments of the study and access to the results on the researcher's personal homepage: olivierbegincaouette.yolasite.com.

B) CONSENT

I hereby declare to have read the information above and obtained answers to my questions about my participation in the study. I understand the aim, nature, advantages, risks, and drawbacks of this study.

After a reasonable time for reflection, I freely consent to participate in this study. I am aware that I can withdraw at any time without consequences, upon verbal notification and without any justification.

Signature: _____ Date: _____

Name: _____ First name: _____

I hereby declare that I have explained the aim, nature, advantages, and drawbacks of this study. I have also answered all questions asked, to the best of my knowledge.

Signature of researcher: Date: June 11, 2014

Name: Bégin-Caouette First name: Olivier _

For any question regarding the study or to withdraw from the study, you can contact Olivier Bégin-Caouette, at: +1 514-447-5462 or: olivier.begin.caouette@mail.utoronto.ca

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Any complaints about your participation in this study may be addressed to the Office of Research Ethics, University of Toronto, at ethics.reviewutoronto.ca or +1 416-946-3237.

Appendix 7 Interview Protocol

Thank you very much for agreeing to be interviewed. As you know, I am investigating the systemic factors contributing to the production of academic knowledge in Nordic higher education systems. By academic knowledge, I mean all the research that is produced by professors and researchers working in universities. Although this study focuses on research production within universities, it is really interested in getting other major stakeholders' perceptions of factors encouraging academic research production. This research uses the cases of four countries: Denmark, Finland, Norway and Sweden. I would yet like to focus on [COUNTRY]. When I will mention research production, I will talk about research in the overall country rather than in one institution.

Again, I very much appreciate your willingness to participate and I remind you that you can always choose not to respond to a question or end this interview at any moment. Also, if you agree, I would like to record this interview. I remind you that the interview is confidential and that you will not be identified at any moment. Moreover, you will receive a summary of the interview on which you will be able to make the modifications you want. Are there any questions you would like to ask before we begin?

Main question	Indicators
1. When did you first join [name of the organization]?	• The Humboldtian ideal of academic freedom
2. How would you characterize the level of research production in [country's] universities?	• The central role of professors in the academic organization
3. To the extent that you are familiar with the research production in other countries, how would you compare the research production in [country] with	• The assumption that higher education must serve the public good
- the other Nordic countries?	
- the other OECD countries?	• The relative importance of local and sub-national authorities
4. What, if any, changes in the research production in your country have you noticed since the beginning of your involvement within the higher education sector?	• The concern for providing the "best education" to all students
- What do you think may have contributed to these changes?	• The public's perception that STEM (sciences, technology, engineering and medicine) fields are important in a global competition
5. What do you think in the system of higher education encourages professors and researchers to conduct so many research?	
6. Is there any other systemic factor that you think is connected to [the factor mentioned]?	• The public's perception that social sciences further the country's welfare system
7. What do you think is the greatest challenge facing the universities in terms of research production?	• The differentiation between the university and the non-university sector
8. How would you characterize the impact of the following elements on research production?	• The field specialization within the university sector
- Beliefs	
- Academic structure	
- Governance	
- Funding	

- Networking
 - Internationalization
9. What role does [organization] and yourself play to facilitate research production?
 10. What do you think should be change in the system of higher education to encourage the production of research?
 11. Previously, I sent surveys to different organizations related to higher education and research in your country. I have computed the results and I would like to know what are your perspectives on the results.
 - Why do you think [factor] was considered as the most important in [country]?
 - Why do you think [factor] was considered as the least important in [country]?
 - Participants who think that [factor 1] is important also consider that [factor 2] is important. How do you explain this relationship?
 12. Is there any other factor(s) that we did not mention you think have an influence on the level of academic production?
 - Why do you say that this(ese) factor(s) is(are) important?
 13. To what extent do you think academic research is important for your country?
 - Why?
 14. Is there anything you would like to add or ask about this project?
- Faculty members' proportion of time spent on research activities
 - Proportion of temporary contract-researchers working in universities
 - The establishment of research/doctoral schools
 - Proportion of doctoral students in universities
 - The central place of the state as a planning and coordinating authority
 - State's innovation and research policy initiatives
 - Universities' institutional autonomy
 - The presence of external members of university boards
 - A lower level of institutional bureaucracy within universities
 - The presence of quality assurance mechanisms and premiums
 - The presence of development contracts/performance agreements
 - The concentration of public funding for research into universities
 - The prominence of public funding
 - The presence of research councils
 - Block grants (basic funding) to universities
 - Peer-reviewed response-mode (competitive funding) granted to the best project
 - Interventionist funding through State's mission-oriented agencies
 - Excellence-based initiatives where the "best" institutions receive more funding
 - The formal introduction of a "Third Mission" for universities
 - The promotion of innovation clusters
 - The policy incentives for universities to collaborate with private firms

- The involvement of private actors in research funding
 - The establishment of national innovation systems
 - Research collaborations with international partners
- The proportion of international students
 - The recruitment of foreign scholars
- International research funding
 - The establishment of supra-national research policies
- The cooperation among Nordic countries
 - The European integration
 - Partnerships with institutions outside the Nordic and European regions

B) SPECIFIC QUESTIONS

Organizations	Questions
Ministries of higher education and research	1. What are some of the initiatives the government of [country] has undertaken to improve the level of research production?
Innovation networks	2. How does the governance of the higher education sector contribute or not to the level of research production?
Universities AND university associations	3. What type of research funding do you think has the most positive impact on research production?
Faculty association	4. How does the networking of universities with private actors contribute to the level of research production in universities?
	5. How do universities compare with other higher education institutions in terms of research?
	6. I read that each university tends to specialize in its field of expertise (i.e. horizontal segmentation). Is that true? - How does this segmentation contribute to research production?
	7. What do you think was the impact of the introducing a "Third mission" for universities in terms of research production?
	8. How would you characterize the level of bureaucracy in universities? - How do you think it impacts research production?
	9. What is more or less the proportion of time that faculty members spend doing research? - How do you think it impacts research production?

- Non-university
institutions
- Centers of
excellence
- European Research
Council
10. What is more or less the proportion of contract-researchers in universities?
- How do you think it impacts research production?
 11. What do you think is the impact of doctoral students on research production?
 12. What is the mission of non-university institutions in the higher education system?
 13. How do you think different institutions with different missions can promote research production?
 14. How do you think international collaborations promote research production?
 15. What is the impact of the Nordic cooperation?
- How does it compare to the European cooperation?
 16. What is the importance of the European union in the production of research?
 17. How does the recruitment of scholars from other countries influence research production?
 18. What is the impact of European research policies on research production?
 19. What are the different measures the ERC undertook to promote research production?

Appendix 8 Survey

ACADEMIC RESEARCH PRODUCTION IN FOUR NORDIC HIGHER EDUCATION SYSTEMS

Research objectives

Higher education and academic research have acquired a fundamental position in the knowledge society. Nordic countries (e.g. Denmark, Finland, Norway and Sweden) tend to produce more academic research (i.e. done by professors and researchers in universities) than other countries in Europe or America. The objective of this study is thus to identify the systemic factors that contribute to a highly productive level of research in the Nordic countries. Although this study focuses on research production within universities, there is also a strong interest in getting other major stakeholders' perceptions of the factors that promote the production of academic research

Research participation

I invite you to complete this brief to minute survey. The survey is hosted on a US-based website and does not ask for any personal information leading to the identification of participants. If you wish to withdraw from the study, you can stop responding to questions at any moment. It is however not possible to withdraw your data once it has been submitted. The survey data are anonymous and will not be presented in a way that your organization could be identified. All data will be stored electronically and anonymously. The categories of the organizations contacted for this study will be mentioned in the methodology section, yet the data will not be disaggregated by organization.

BY CLICKING ON THE BUTTON "NEXT" BELOW, YOU HEREBY DECLARE THAT YOU HAVE READ THE INFORMATION ABOVE AND THAT YOU FREELY CONSENT TO PARTICIPATE IN THIS STUDY



If the survey does not open automatically, you can copy-paste the following link: [hyperlink]

Benefit and risks

Although you will not receive any direct monetary benefits for participating in the survey, the findings may benefit governments, public agencies, you will contribute to a better understanding of research production in Nordic higher education systems. The study itself might benefit governments, public agencies or universities wishing to envision changes that could potentially increase research production. There are no foreseeable risks to your participation in this study,

which has been approved by the Research Ethics Board of the University of Toronto. Although the study is not intended to make judgments about people, it is conceivable that your participation might make you feel uncomfortable or worried about your opinion, experience or professional responsibilities. In that case you may share your concerns with the investigator, so he can take your concerns into consideration.

Additional information

Please note that this research was approved by the Research Ethics Board of the University of Toronto (Canada) and funded by the Canadian Social Sciences and Humanities Research Council. A copy of the ethical approval can be provided on demand. You can follow the development of the project on the researcher's personal homepage:
<http://olivierbegincaouette.yolasite.com>.

Should you have any questions about the study please contact me at:
olivier.begin.caouette@mail.utoronto.ca.

As a stakeholder of the higher education system, please indicate the level of impact you think each of the following factors has on universities' research production in [COUNTRY].

1 = Strong negative impact;

2 = Weak negative impact;

3 = No impact;

4 = Weak positive impact;

5 = Strong positive impact;

X = I don't know



Example

"5" to the first item means that you consider that academic freedom for professors *INCREASES* the level of universities' research production in your country. "1" means that you consider that academic freedom for professors *DECREASES* the level of universities' research production in your country.

What level of impact do you believe the following has on universities' research production in [COUNTRY]?

Factors		Response
1.	Academic freedom for professors (i.e. freedom to teach, learn and research)	
2.	Influence of professors on university decision-making bodies	
3.	Society's belief that higher education should serve the public good	
4.	The influence of regional actors (e.g. city councils, administrative areas, provinces) on higher education	
5.	Society's belief in the importance of equitable access to high quality higher education	
6.	Society's belief that STEM (i.e. sciences, technology, engineering and maths) fields are important in a global economic competition	
7.	Society's belief that research in the social sciences should inform the country's welfare system	
8.	The non-university education sector (e.g. colleges, polytechnics, etc.)	
9.	Universities specializing in specific disciplines	
10.	Hierarchy between research-intensive, comprehensive and teaching universities	
11.	The amount of time university professors spends on research activities	
12.	The increase of temporary contract-researchers working in universities	
13.	The development of research/doctoral schools/units in universities	
14.	A large number of doctoral students in universities	
15.	The national Government (including all ministries and national agencies) as a planning and coordinating higher education and research	
16.	Innovation and research policies	
17.	The role played by the Parliament in higher education	

18.	University autonomy in relation to governments (including all ministries and national agencies)	
19.	The low level of bureaucracy within universities	
20.	Quality assurance mechanisms (e.g. national evaluation agencies auditing and assessing the quality of universities' education and research)	
21.	Government's development contracts and performance agreements concluded with universities (e.g. setting targets that are linked to funding)	
22.	Public research funding concentrated in universities (VS research institutes, private organizations or public agencies)	
23.	Universities receiving more public than private funding for research	
24.	The role of research councils	
25.	Block grants (basic funding) to universities regardless of the research output	
26.	Peer-reviewed competitive funding granted to professors	
27.	Government agencies funding research in priority areas	
28.	Excellence-based initiatives where the "best" institutions receive more funding	
29.	Universities' "Third Mission" (i.e. transfer of knowledge to the benefit of society)	
30.	External members on university boards	
31.	Governments' incentives for universities to collaborate with private actors	
32.	Innovation clusters (i.e. specific businesses, public organizations and universities joining forces to do research in a particular field)	
33.	The involvement of private businesses in research funding	
34.	Research collaboration with professors in other countries	
35.	The number of international students	
36.	The recruitment of foreign scholars	
37.	Partnerships with institutions outside the Nordic and European regions	
38.	Policies and funding from the Nordic organizations	
39.	Policies and funding from European organizations	

We thank you for taking the time to answer this survey. If you have any other comments regarding research production in the Nordic countries, please do so.

Click on the "SEND" button below to end the questionnaire



Appendix 9

An Analysis of Participants' Comments

At the end of the survey, participants had the option of adding comments related to the structure or content of the survey. Of the 456 participants, 79 (17%) left a comment. These qualitative data are important both at this stage to assess survey items, and at a later stage in view of improving the survey. Table 5.2 presents the findings of a qualitative analysis of these comments. Roughly a third of the comments concerned the framing of the survey. The survey stated the research objective as follows: “The objective of this study is to identify the systemic factors that contribute to a highly productive level of research in the Nordic countries.” Two participants disagreed that Nordic HES had a highly productive level of research. Potential participants could have accepted to complete the questionnaire and indicate what factors they thought worked in their country, while also believing that Nordic countries do not have a highly productive level of research. It is worth noting on this point that not all countries have a similar level of production and it may have been more accurate to comment only on the production of the country of the participants.

Following the research objective, a prompt question was presented: “As a stakeholder of the higher education system, please indicate the impact you think each of the following factors has on universities’ research production level in [country].” The expression “research production level” was problematic for eleven participants who hesitated between considering factors’ impact on the quantity of research produce (e.g., number of articles), on the one hand, and on the quality of that production (e.g., number of citations), on the other. Based on data regarding university rankings, citations, publications and patents, the assumption underlying my thesis was that Nordic HES have achieved high levels of research production both in terms of quantity and quality. One participant, for example, commented that the recruitment of foreign scholars can impact the quality of research but not the quantity since a local research could have produced the same number of articles though, possibly, of a lower quality.

Also, some participants did not understand whether they were being asked to reflect on the actual impact of factors at the time of their answering the survey or on the benefits a factor will bring to the level of research production in the future. The survey attempted to assess the actual and current impact of factors, but it seems this was not stated clearly enough and could explain some

distortions in the quantitative results. For instance, if the factor “Internationalization” was perceived as significantly more important in Finland than in the other Nordic HES, it would contradict studies suggesting Finland has the lowest level of internationalization in the region. Along the same line, some participants thought the question lacked a proper time frame since the effects of some factors vary over time, such as equitable access to higher education, which would initially reduce professor’s time for research but may increase the number of researchers over a longer period. Some participants lamented that there was no way they could distinguish the impact which factors have in different disciplines.

Table 5.2. Summary of participants’ comments to the survey (N = 79)

Type of comment	N (%)	Quote
<i>About the research question</i>	27 (34%)	
Disagreement with underlying assumptions	2 (3%)	“The questionnaire as a whole is based on a very positive hypothesis on how things are done in the Nordic countries. Not wanting to contradict the basis of this hypothesis, some parts of the questionnaire were impossible to answer because of this - the question in itself contains a claim that is not valid.”
Hesitation between quantity or quality	11 (14%)	“The questionnaire didn’t make difference between the quality and quantity of research (‘the level of research production’).”
Ambiguity between the current situation or a preferred future	9 (10%)	“The statements/questions were not unambiguous enough. For example, it was hard to know if what was meant by the statements was the present state of affairs in the areas indicated by the statement (as formulated clearly in some cases) or if what was asked for was the opinion of whether or not the matter indicated in the statement could, in principle, be beneficial (or detrimental) to research output.”
Incapacity to answer	4 (5%)	“Did not think that the questions and alternatives asked were relevant enough to our everyday life in academia. The survey seemed too geared toward external factors. There are other issues - relevant to our own scholarly goals - that play a role on how much we ‘produce’.”
Variation between academic fields	2 (3%)	“Since there may be great differences from different disciplines (e.g. art and natural science) it can be very hard to reply in general. Also one may have little personal knowledge of other disciplines so it would probably have been better to ask respondents to relate only to one’s own field.”
<i>About survey stems</i>	50 (63%)	
Validity	6 (8%)	“Most of your assumptions are wrong, so this questionnaire is obviously flawed. You should at least have another choice for ‘I do not agree with the statement’.”
Bias	18 (23%)	“Many of the factors in the questionnaire are biased. For instance, ‘low level of bureaucracy.’ If I happen to think that the level of bureaucracy in Finnish universities is high and that high level of bureaucracy indeed has a negative impact on researchers’ productivity, what am I to answer?”

Does not apply in the country	4 (5%)	“Two places I ticked ‘do not know’ because I did not think that the question posed were correct for the Norwegian situation.”
New items/explanations	21 (27%)	“The most productive ‘factor’ is the small team of researchers working on the same problem or clusters of problems with the aim of publishing results in prestige journals.”
<i>Other</i>	2 (3%)	
<i>Total</i>	79 (100%)	

The survey purposefully remained broad to allow participants with different perspectives and backgrounds to comment on the factors, as well as to adapt to the four national contexts. Four participants argued, however, that they could not give an informed response since it was difficult for them to think of a single digit that would represent the overall impact of broad “external factors” on the research production across all institutions, research groups and disciplines. This comment has to be taken into account as reflecting the limitations of the study since it undermines the claim that those who work in research are aware of the multiple macro-level factors that interact with the research production process. In the interviews, it was possible to link these systemic factors to micro-level observable events, but the same cannot be said for a survey disseminated on a large scale. Although the option to respond “I don’t know” had been added, one could still question the ability of survey respondents to answer such research questions. That said, it is worth noting that only four participants (less than 1% of the sample) were not comfortable answering.

Most participant comments regarded specific items that were “poorly conceived,” “inaccurate” and/or “not clearly written.” For instance, 16 comments refer specifically to the bias inherent in the item “A lower level of institutional bureaucracy.” The adjective “lower” was added by mistake and definitely created a problem for participants who perceived that the level of institutional bureaucracy was higher than before. One participant commented: “After reading about the ‘low level’ of bureaucracy at the university I kind of lost my spirit. There is an EXTREME BUREAUCRACY and the annual growth rate over the last 10 years has been around 20 percent per year (at least!).” For this reason, the item was removed from the factor analysis (see Section 3). Although fewer participants made comments about “Professors’ research time,” this item was problematic for some because certain participants wished to indicate that the time allocated for research has a positive impact, whereas the actual time they have has a negative impact. The item was therefore also removed from the factor analysis.

Finally, 21 participants wished to clarify their answers or suggest new factors for the study. One participant emphasized the importance of “privately owned autonomous science foundations,” which were unfortunately not included in the survey. Other elements included a “Nordic Research Council for PhD projects” and “Stability.” Participants also made comments such as “I believe that a higher research production is achieved by funding a larger number of good scientist (track record) than funding large centers of research that seems to be perceived hot at the moment,” and “The pressure in Norway to recover some of the Norwegian contribution to EU research funds is, in my view, profoundly counter-productive.”

These comments suggest that, in a revised version, the survey would have to be more time-, country-, discipline- and output-specific. It would benefit from providing specific examples to aid researchers in relating the macro-level factor to their personal experience. The survey would also have to remove or reformulate certain items, and possibly include new ones. The analyses below will allow for a deeper reflection on the instrument.