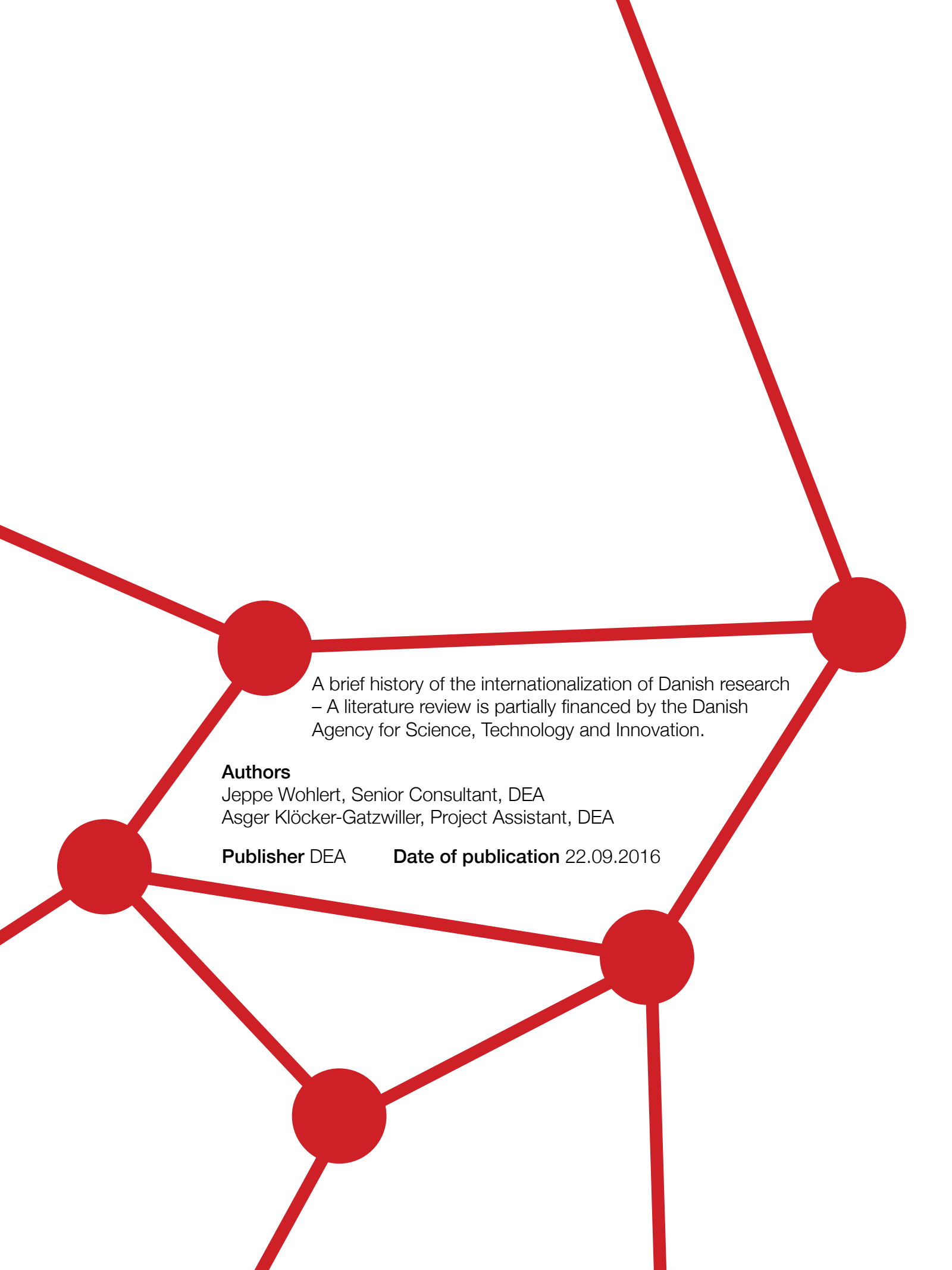


A BRIEF HISTORY OF THE INTERNATIONALIZATION OF DANISH RESEARCH

– A LITERATURE REVIEW





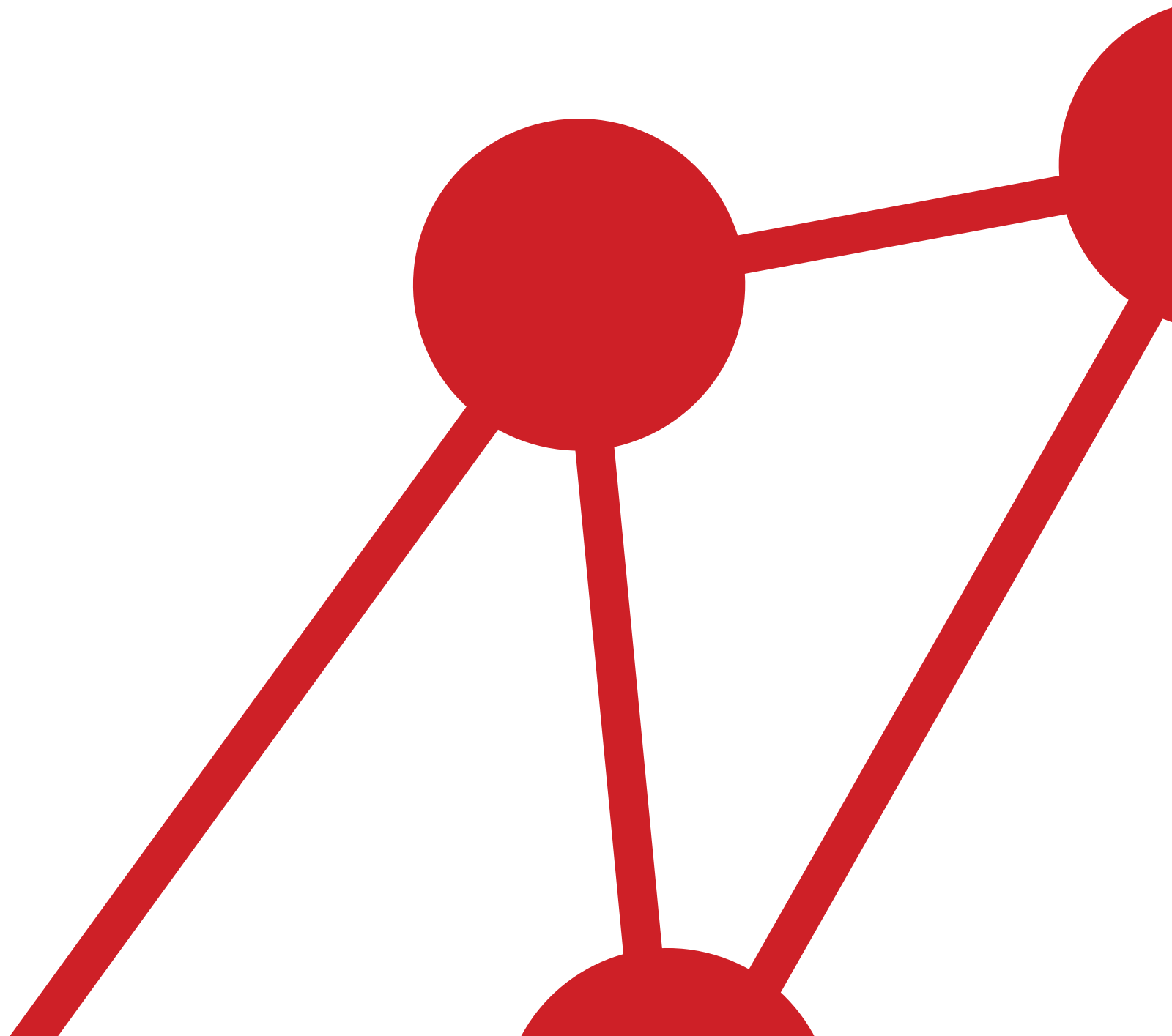
A brief history of the internationalization of Danish research
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A BRIEF HISTORY OF INTERNATIONALIZATION OF RESEARCH

The nature of scientific research has always been characterized by international outlook, whether talking about research mobility, research and publication collaboration, or other forms of knowledge sharing (Taylor 2004). What has changed since the 1980's, however, is the intensity and scope of internationalization of research (Huang, Finkelstein, and Rostan 2014; Dewey and Duff 2009). In particular, international collaboration on research publication has increased significantly during recent decades (Stek and van Geenhuizen 2016; Abramo, D'Angelo, and Solazzi 2011; Orwat et al. 2015; Cantner and Rake 2014; Kato and Ando 2013).

Today there are also emerging patterns of internationalization becoming increasingly formalized, and deeply rooted in the activities of universities (Gornitzka, Gulbrandsen, and Trondal 2003). Universities as well as governments are pursuing strategies of internationalization, such as stimulating the international mobility of its researchers, and attempting to secure publication in leading international journals (Rostan, Huang, and Finkelstein 2014). Furthermore, universities as well as governments in Europe have increasingly adapted to (and consequently been influenced by) international institutions such as the European Union (EU) and its Lisbon Strategy, as well as subsequent Europe 2020 strategy for economic growth (Kalpazidou Schmidt 2012; Trondal 2003).

This literature review looks at internationalization of university research, a process understood as an exchange of activities in research of various kinds among universities and institutions in different countries (Huang 2014). Today, this implies several things: human exchange and personal mobility of researchers across borders; establishing standards for research careers (such as academic titles) as well as transnational research

programs; and research project activities, including the organization of international conferences and joint research.

The first part of this review provides a brief overview of the role which internationalization plays for research in general and university research in particular. The second part of the review provides a brief overview of the internationalization of Danish research policy with a specific focus on the development of the institutional landscape and the influence of the EU.

THE DRIVING FORCES BEHIND INTERNATIONALIZATION OF RESEARCH

The economic and social influence of globalization is a significant driving force behind the internationalization of university research. This is best understood by distinguishing between different rationales, stakeholders, and motivations.

Societal rationales

Huang provides a rather thorough historical perspective on the internationalization of the academic profession, which he divides into four phases, starting with the twelfth century inauguration of European universities (Huang 2014).

In the **first phase**, incorporating the period between the thirteenth and eighteenth centuries, no nation-state existed, rendering the word international meaningless. Nevertheless, university faculties and scholars moved mainly between different regions and areas of Europe, finding common ground in the language of Latin, motivated mainly by an ambition of expanding Christian culture and values and spreading medieval culture.

The **second phase** emerged in Europe during the nineteenth century and is typically associated with the creation of a uniform national culture and national higher education systems. The mobility of faculty and scholars still played a dominant role during this phase, but was gradually supplemented by new forms such as the introduction of foreign-language taught programs in home institutions.

By the end of the eighteenth century, the centers of learning had shifted from France to Germany, and again at the end of World War II with a shift to the United States.

Concerning the **third phase**, occurring in the period between 1947 to 1991, Huang writes:

[T]he internationalization of the academic profession occurred in the background of the Cold War (1947–1991). Largely affected by political and ideological factors, internationalization of the academic profession was also considered as one of the effective instruments to facilitate economic development and to build up a national modern academic system and higher education system in many countries, especially in developing countries.

On an individual level, governments during this period supported the mobility of faculty or academic experts across borders with public funding through schemes such as the Fulbright program, which since the 1940's has sponsored the exchange of researchers between firstly the US and Europe, and then the world more collectively.

The **fourth phase** is one of international competition characterized by several factors: an increasing number of student enrolments at the level of tertiary education; an increasing expectation of universities to be publicly accountable, including their ability to generate revenues from external sources; and an increasing encouragement as well as support for universities to enhance their quality in research and education with the aim of becoming world-class universities. As Huang writes: “compared with what had happened prior to the early 1990's, the ongoing internationalization of the academic profession is much more strongly driven by both economic and academic factors in a more competitive environment and at a global level.”

Regarding Europe, the economic rationale behind the internationalization of research has been, and still is, a cornerstone of EU framework pro-

grams for research and technological developments. With this economic rationale the focus on internationalization of research has shifted away from cultural as well as political factors. Instead, there is a focus on the internationalization of higher education institutions as a means of accommodating the need for a more modern and global labor force; on joint international research and development projects to be competitive in the new technologies; and on marketing higher education internationally – viewing higher education as an export commodity (de Wit 1999).

The economic rationale behind internationalization of research is furthermore based on an ambition to improve economic as well as knowledge based competitiveness both nationally and regionally. Politically, there is also a rationale behind the internationalization of research focusing on tackling global issues of national interest (such as climate change and poverty) as well as an aim to expanding diplomatic relations and furthering international security (Universities UK 2008; European Commission 2009). For the EU, the political rationale behind European programs for cooperation and exchange in research, technology, and education has also been to stimulate the development of a European citizenship (de Wit 1999).

Motivation from a university perspective

According to Kalpazidou Schmidt, universities have become more international in conjunction with several factors: developing a closer collaboration between research environments across nations, an increasing collaboration between researchers, a rising in the mobility of researchers, and the result of more higher education students choosing short or long term stays at universities abroad (Kalpazidou Schmidt 2012). Furthermore, universities have also been driven to become more international by their need for supplementing their budget with external research funding from abroad (Kalpazidou Schmidt 2012).

From a university perspective, the primary drivers of internationalization are expanding the horizon of, improving the quality of, and increasing the critical mass in research, by linking national financial as well as human resources and knowledge with resources and knowledge abroad. This is a matter for universities of attempting to attract the greatest international talents to domestic universities. From the perspective of research environments, joint research activities are a means to solving scientific problems. In smaller research- and development intensive countries, international collaboration is a means to building greater, national research capacity (European Commission 2009).

Generally, international university research collaboration can be separated in two groups. On the one hand, there are a relatively limited number of strategic collaborations on an institutional level. On the other hand, there are the much more widespread number of international collaborations between and driven by individual researchers. A study among management at British universities concluded that while top-level management is active in developing strategic partnerships on an institutional level, management has a more facilitating role in individual partnerships between researchers (Universities UK 2008).

Motivation for the researcher

For most researchers in Denmark, pursuing a career in academia necessitates being internationally oriented for several reasons. **Firstly**, Denmark produces about one percent of global academic research, for which reason the quality of Danish research logically depends on the ability of Danish researchers to tap into global scientific communities¹.

¹ Danish expenditure on research and development accounts for less than 0.5 pct. of the world's total expenditure on research and development, when looking at gross domestic expenditure on research and development (GERD) adjusted for purchasing power parity (UNESCO 2016). Additionally, the Danish share of the total volume of scientific publications world-wide amounts to one pct. (Danish Centre for Studies in Research & Research Policy, Department of Political Science, Aarhus University).

Secondly, bibliometric studies have shown that publications based on international co-authorship are cited more frequently than publications where all authors are affiliated to institutions in one country (Nomaler, Frenken, and Heimeriks 2013). This may indicate that international research collaboration enables higher-quality or more original research, for instance, or that accomplished researchers (who tend to receive more citations) are more likely to be attractive as international collaboration partners with access to quality international academic networks. Regardless of any underlying explanation, however, the studies emphasize that internationalization and high-impact research are positively associated. In addition to this, the literature also suggests that internationalization is positively associated with academic productivity in the form of articles published in academic books or journals, research reports written for funded projects, and papers presented at scholarly conferences (Rostan, Huang, and Finkelstein 2014).

Thirdly, concerning experimental sciences, the necessary access to cutting-edge research infrastructure compels both individuals and teams of researchers to travel to highly specialized large scale research facilities and laboratories across the globe.

And **fourthly**, international research mobility is widely believed to be positively associated with better access to research funding (IDEA Consult 2013).

The literature suggests there are differences across disciplines and fields regarding individual international collaboration practices in research. One study points out a divide between the cluster of natural and medical sciences, where collaborating with international colleagues is more common, and the cluster formed by the social sciences, business, law, and humanities, where international research collaboration is less frequent (Rostan, Ceravolo, and Metcalfe 2014). According to a study of the Norwegian research system, there are different drivers of – or rather propensities to – internationalization across different research fields as well as environments. Thus, the individual researcher's

motivation for a more international outlook in their research is affected by the researcher's language of communication, degree of specialization, and the academic culture surrounding his or her research environment. In addition, access to research funding (as well as linguistic, cultural, and political barriers) plays a role in shaping the researcher's inclination to collaborate internationally. In this regard, researchers in smaller countries have a higher propensity to collaborate internationally – primarily with colleagues from neighboring countries – than researchers in larger countries (Aksnes, Frølich, and Slipersæter 2008).

Renewed internationalization and national needs

Parallel to the renewed strong internationalization of knowledge production and dissemination in the past few decades, the goals of research, innovation, and higher education have perhaps become even more rooted in government policies of national growth, improvements and competitiveness (Gornitzka, Gulbrandsen, and Trondal 2003). According to Gornitzka, Gulbrandsen, and Trondal, this paradox manifests itself through different tensions:

Internationalization through co-operation versus competition. On the one hand, internationalization is to a large extent motivated by the idea of co-operation and knowledge sharing. At the same time there is an increasing competition between universities on recruiting the best students and researchers. Both on an institutional and a national level, internationalization is considered – to a large extent – as a tool for strengthening competitiveness.

Convergence versus divergence. Across different countries, national strategies for internationalization can be difficult to separate from one another. While internationalization in different countries is driven by the need for differentiation from other nations in terms of accessing new knowledge and input from abroad, countries – both in their universities and governments – typically pursue the same types of collaborations with the same type of prestigious research institutions abroad.

Substitution versus synergy. There is a challenge in creating funding schemes and mechanisms that can support the undertaking of research that might not otherwise have been possible. Rather than substituting funding for research, which would have been invested in any case, research funding is often intended to support something in addition to, and differently from, that which extant research funding would have supported. This is a challenge in terms of the EU framework programs for research and technological development, where member states increasingly expect to get back what they invest in the research programs via their national contribution to the EU.

INTERNATIONAL MOBILITY

A significant aspect of the academic and policy literature is the acknowledgement of benefits of 'brain circulation' and the positive returns of sending researchers to institutions abroad. From this perspective, a research stay abroad is not considered a migration process with clear winners and losers (brain gain and brain drain); rather, it is considered a reciprocal process, allowing individuals and countries or regions to benefit from current collaborations and future returns (brain circulation). Thus, survey studies highlight that a large share of academic researchers maintain collaborative links with their home countries when going abroad. Nevertheless, little work has been done on job-to-job mobility, where researchers take up academic employment in other countries (Fernández-Zubieta, Geuna, and Lawson 2015).

Studies have established empirically that international mobility improves researchers' careers in the sense that it increases diversification of their research knowledge and experience in addition to having positive impact on researchers' productivity. Mobility is also widely believed to be positively associated with better access to research funding (IDEA Consult 2013).

On a national-structural level, motivational factors for researchers engaging in international mobility are primarily institutions scarcity of funding and

unattractive career-possibilities in the national research system compared to the possibilities abroad. Several European countries have developed repatriation programs aiming to motivate researchers and scientists to return to their home country, mainly through financial incentives and employment opportunities. However, impact studies show that there is little success with schemes intended to lure researchers back to their home countries. On an institutional level, international mobility is increasingly becoming part of the research career system, valued positively as a criterion for employment (IDEA Consult 2013).

On a personal level, researchers are motivated to emigrate primarily for research-related reasons, such as working on interesting research topics, the quality of the receiving institution, and career prospects, whereas salary plays a minimal role. Studies also suggest that personal or family reasons are the most important factor when explaining a return home. Furthermore, the research quality of the sending and receiving departments matter for the effect of the mobility, as mobility downward into a lower-quality department can decrease the mobile researcher's academic performance (Fernández-Zubieta, Geuna, and Lawson 2015).

Børing et al. suggest that exposing students to international mobility during the period of their university studies makes them more likely to become internationally mobile as researchers (Børing et al. 2015). However, several studies have identified numerous barriers to later researcher mobility. In the main, these constitute the following:

[U]n attractive employment conditions; the lack of competition-based internationally open recruitment; the lack of recognition of mobility in recruitment and career development; a lack of trans-national portability of grants/funding; a lack of adequate training and skills development for researchers; lack of funding for mobility; salary; quality and cost of accommodation; personal relationships; child care

arrangements; immigration rules; and the nature of contracts. These factors were defined as the result of policy and scholarly debates at EU level and were investigated using a survey administered in eight European countries, which yielded 3,365 valid responses (IDEA Consult 2013).

THE EUROPEANIZATION OF INTERNATIONAL RESEARCH

For most universities in Europe, the EU framework programs for research and technological development have become the primary source of international research funding (Aksnes, Frølich, and Sli persæter 2008). The EU framework programs are not only seen as a means of funding research, but as financial instruments aimed at securing Europe's global competitiveness by driving economic growth and creating jobs (European Commission 2016).

One can even talk about a Europeanization of the research policy and an internationalization within Europe. On the one hand, this Europeanization has grown with the supranational policy on EU-level, for instance with the establishment of the European Research Area (ERA) and the EU framework programs for research and technological development. On the other hand, Europeanization has been further strengthened by the convergence of national governments to EU policy on research and higher education (Gornitzka, Gulbrandsen, and Trondal 2003).

The EU framework programs for research and technological development has in a very direct way contributed to the Europeanization of university research by financing international collaboration with main emphasis being given to European collaborators. When European research policy was consequently criticized for being insufficiently international outside of these boundaries, the EU decided to open the ERA to research collaboration with the US, Canada, Australia, Latin America, Asia, and Africa (Kalpazidou Schmidt 2012).

The most significant driver of the internationalization of research still seems to be independent academic contact across borders, which is cultivated and pursued by individual researchers. In other words, external funding for research collaboration and formal framework agreements on research as well as higher education collaboration do not account for all of the increasing intensity of internationalization, which can be seen as occurring from the 1980's onwards. Despite the fact that the EU has had a very direct influence on research collaboration across Europe, (and from 2008 and onwards beyond Europe) the increase in scientific publications with authors from several different countries is far greater in the same period than the increase in international funding of research collaborations. The links between policy, funding and collaboration are loosely coupled, and the growth in international collaboration is a much broader, general phenomenon caused by a complex set of factors. With Norway as an example, the EU framework programs for research and technological development appear as the only political internationalization initiative that has had a direct effect on the internationalization of research and development (Aksnes, Frølich, and Slipersæter 2008).

NEW TRENDS IN INTERNATIONALIZATION OF RESEARCH

Internationalization has changed the way in which research and development has been structured throughout the last fifteen to twenty years. International research networks have become more extensive as a consequence of increasing globalization, new forms of communication, and cheap air fares. The internet has increased the accessibility of knowledge and changed the ways in which researchers collect and process information. Researchers pursue competent collaborative partners within their area of expertise, and geographical distances are no longer significant barriers. Additionally, governments and international organizations are increasingly willing to fund international research collaboration (Aksnes, Frølich, and Slipersæter 2008).

These trends, however, do not affect all researchers and university departments the same way. Internationalization has not developed as one common trend, but should be understood in the context of the thematic orientations of the departments and the larger institutions of which they are a part, which in turn have their own traditions and motives for seeking international funding and collaboration. Referring to internationalization in general terms and without context only obscures important variations and should thus be avoided (Slipersæter and Aksnes 2008).

INTERNATIONALIZATION IN DANISH RESEARCH POLICY SINCE 2000

Internationalization is not a new phenomenon in the Danish research environment, where trans-border collaboration has been the cornerstone of research for centuries. Since the 1980's, internationalization has become a rather common word within Danish research policy. It has developed from being a peripheral part of activities at the universities to becoming the crux of their institutional as well as national research strategies, and consequently a policy area with great public attention (Kalpazidou Schmidt 2012, 14).

In 1991, the national parliament of Denmark founded The Danish National Research Foundation as an independent organization with the aim of supporting excellent research at an international level (Retsinformation 1991).

The historical development of initiatives to support internationalization in Danish research policy since 2000 has been carefully described in Kalpazidou Schmidt 2012. Below follows some of the main recommendations and initiatives highlighted in this historical overview:

In 2000, The Danish Research Council recommended that university job postings for professors and associate professor positions were advertised internationally and aimed at a broader target group of applicants in order to increase competition for faculty positions. Furthermore, the council recommended that Danish universities make more use of internationally composed assessment committees and recommended more ambitious goals for attracting foreign PhD-students.

In 2001, The Danish Research Commission recommended the development of a national strategy for international researcher mobility, as well as bringing the share of PhD students coming from abroad to a minimum of twenty-five percent. According to Kalpazidou Schmidt, these

recommendations resulted in the university development contracts with the Danish Ministry for Science focusing on strengthening international collaboration, increasing mobility, and attracting foreign researchers.

In 2004, The Danish Act on Research Counseling became effective, among other things aiming to strengthen the foundation for the internationalization of Danish research by establishing The Danish Council for Research Policy, The Danish Council for Strategic Research, and The Danish Council for Independent Research. While the last two were established as funding organizations, The Danish Council for Research Policy was founded in order to counsel the minister of science on Danish and international matters of use to Denmark (Retsinformation 2003).

In 2006, the government for the first time put internationalization high on the agenda with the Danish Globalization Strategy, "Progress, Innovation and Cohesion". The underlying motivation of this strategy was to advance Danish economic growth and competitiveness. Internationalization of research was one focus area, including the possibility for Danish research councils to finance international research collaboration. Subsequently, initiatives were launched to double the number of PhD-students, improve the ability of Danish universities to attract foreign researchers, and increase the participation of Danish universities and companies in the EU framework programs for research and technological development. The initiatives partly followed an ongoing criticism of Danish universities' ability to increase the number of foreign PhD-students. This criticism was raised by the OECD – among others – in 2005, who also recommended that Denmark significantly increased the number of Danish students abroad.

The main argument behind the merger of the universities and other research institutions in 2007 was to strengthen Danish research environments internationally. Through the development contracts, the Danish universities subsequently committed themselves to benchmarks for the supply

of educations offered in English, the exchange of academic personnel with research institutions abroad, and the recruitment of foreign researchers. Kalpazidou Schmidt concludes that “while these initiatives [focusing on quantitative benchmarks] have had a positive influence on the resources for Danish science, they have in other ways shown inadequate, and should e.g. be aimed at, how one strengthens the collaboration with foreign research environments.”

Since 2006, the Danish government has established representation in Bruxelles as well as a number of Danish Innovation Centers in Silicon Valley (2006), Shanghai (2007), Munich (2008), São Paulo (2013), New Delhi (2013), and Seoul (2013), all aiming at strengthening the internationalization of Danish research institutions and the access to knowledge exchange for Danish companies. Furthermore, Danish research councils have been provided with the possibility of allocating up to twenty percent of their funding to international

fora such as – but not exclusively – EU initiatives like ERA-Nets, where the grant authority is given to independent committees. Previous counting has shown that approximately two percent of the funding in the years 2007-2008 were allocated to such purposes.

Adding to Kalpazidou Schmidt, the national parliament of Denmark passed the basis funding reform in 2009, whereupon twenty-five percent of the funding for universities would be distributed in accordance with the universities’ research publishing (bibliometrics). This basis of distribution encourages a particular publication behavior since scientific journals are ranked according to a number of indicators, including their international visibility. The most prestigious international journals thus result in receiving the most points, and the basis funding reform imbeds internationalization as a key research activity in the research environments (Schneider and Aagaard 2012).

Selected reforms and initiatives with relevance for internationalization of Danish research policy since 1990

1991	Establishment of The Danish National Research Foundation
2000	Establishment of The Danish Research Commission
2004	The Danish Act on Research Counselling (establishment of The Danish Council for Research Policy, The Danish Council for Strategic Research, and The Danish Council for Independent Research)
2006	The Danish Globalization Strategy
2007	The university mergers
2009	The basis funding reform
2014	Innovation Fund Denmark
2014	Establishment of The Danish Council for Research and Innovation Policy

Source: The selected reforms and initiatives are inspired by (Aagaard and Mejlgaard 2012) and extended for the period following 2009.

The Innovation Fund Denmark was established in 2014 as a consolidation of the Danish Council for Strategic Research, the Danish Council for Technology and Innovation, and the Danish National Advanced Technology Foundation. The purpose of the Fund is to fund advances in science and technology (including advanced technology) in order to boost research and facilitate innovative solutions for the benefit of growth and employment in Denmark, and funding development of knowledge and technology – including high technology – leading to stronger research and innovative solutions benefitting the economic growth and employment in Denmark (Retsinformation 2014). The Fund is provided with the possibility of allocating up to twenty percent of their funding to international fora, where the grant authority is given to independent committees.

The Danish Council for Research and Innovation Policy (DFiR) was established in 2014 and charged with the responsibility of providing policy makers with independent and expert advice on research, technological development, and innovation at a system level in an international context.

THE EUROPEANIZATION OF UNIVERSITY RESEARCH IN DENMARK

From the 1960's onwards, the OECD (and later on the EU) have influenced perceptions of challenges and solutions in Danish research policy. Especially since the late 1990's, the EU has been a significant factor in diffusing the idea that research should be favored in the national budgets in return for an expectation of research making contributions to economic growth and social development in society (Aagaard and Mejlgaard 2012).

In 1999 Denmark signed The Bologna Declaration, whereby European nations committed themselves to uniformize the structure and merits of the educational systems, (bachelor/master/PhD) in order to establish a cohesive European knowledge region (European Union 1999). In 2002, Denmark adopted the Barcelona objectives, whereby member states committed themselves to

raise investment in research and development to three percent of GDP by 2010. These objectives were part of the EU goal to become, by 2010, "the most competitive and dynamic knowledge-based economy in the world", what has become known as the Lisbon strategy (European Union 2002). In 2007, Denmark ratified the Lisbon Treaty, which among other things was aimed at strengthening the European research infrastructure, including the possibilities for the mobility of researchers. The ambition was that excellent research and research infrastructure would transform the EU into the world's most competitive and dynamic knowledge based economy (Official Journal of the European Union 2007).

The Bologna Declaration and the Lisbon Strategy have stimulated internationalization of research in Denmark by supporting and encouraging international mobility and recruitment of researchers and students, as well as introducing a rationale in research policy across Europe highlighting the significance of quality in research and education, and improving the international profile of universities in Europe (Kalpazidou Schmidt 2012).

The instruments for pursuing the objectives of the Lisbon Strategy have been the framework programs for research and technological development. The Seventh Framework Program for Research and Technological Development had a budget of more than fifty billion Euros. Today the program has been replaced by Horizon 2020 with a budget of roughly seventy-five billion Euros (Ministry for Higher Education and Science 2016). The Lisbon Strategy was replaced in 2010 by a new strategy for economic growth and job creation, Europe 2020 (European Commission 2010).

The significance of EU-funding for Danish researchers is unquestionable today, where the funding to Danish universities amounts to ten percent of all external funding². In the first two years of the present EU framework program for science and innovation, Horizon 2020, Danish researchers,

² Based on external funding in 2014 (Statistics Denmark 2014).

companies, and organizations have managed to attract 2,65 billion DKK in grants (Ministry of Higher Education and Science 2016). In comparison, this makes the financial influence of the EU program comparable to a fourth research program on par with The Danish Council for Independent Research (1,36 billion in grants in 2014), Innovation Fund Denmark (1,62 billion in grants in 2014), and the Danish National Research Foundation (0,69 billion in grants in 2014) (Danish Agency for Science Technology and Innovation 2015). The Danish share of the funding from Horizon 2020 at present is higher than it has been in the framework programs for the past fourteen years (Ministry of Higher Education and Science 2016).

The EU framework program for research and innovation also seems to be a point of orientation

for the Danish identification of promising areas for strategic investments in research and innovation. Thus, there are thematic overlappings between Danish strategic research funding, and the thematic focus in Horizon 2020's program for Societal challenges on prioritizing funding for research aimed at addressing challenges of particular relevance to society. The connection with the thematic areas in Horizon 2020 is mentioned explicitly both in the RESEARCH2020 catalogue, which forms the knowledge basis and foundation for decision making concerning the Danish Parliament's distribution of funds for strategic investments in future research (Ministry of Science, Innovation and Higher Education 2012), and in the INNO+ Catalogue, which identifies promising focus areas for strategic investments in innovation (Ministry of Science, Innovation and Higher Education 2013).

Selected research policy initiatives in the EU since 1999

1991	The Bologna Declaration
2002	The Barcelona objectives
2002	The Sixth Framework Program for Research and Technological Development
2006	The Seventh Framework Program for Research and Technological Development
2007	The Lisbon Treaty
2010	Europe 2020
2014	Horizon 2020

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