



Unpacking resilience in higher education: investigating twenty-first-century shifts in universities' academic cores

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Abstract

The political, social, and institutional environments in which contemporary universities operate have changed rather dramatically over the past two decades in ways that threaten the resilience of the academic core, both in its ability to map knowledge comprehensively and also to maintain a balance between the branches of the humanities, social sciences, and natural sciences. This paper traces historical changes (2003–2019) in the academic core of two “flagship” research-intensive universities located in Northern Europe. The results show that some branches of the academic core are undergoing dynamic processes of program churn that make them resilient. Furthermore, the data show that this resilience is enabled in large part by bridging different branches of knowledge by establishing what we term interbranch programs. In addition to the abovementioned findings, the paper links ongoing discussions regarding change in HE systems and institutions to the literature on organizational resilience, and it advances insights for a possible future theory of how adaptation plays out in the academic core over time.

Keywords Academic core · Resilience · Universities · Nordics · Interdisciplinarity · Interbranch

Introduction

That European Universities today are under pressure to change has been discussed broadly and for some time (Aghion et al., 2008; Maassen & Olsen, 2007; Marek & Andrzej, 2012). These discourses are variously grounded in a multitude of pressures coming from both inside and outside the university, from society, industry, and politics, and on levels ranging from local to EU to global. There are functionalist pressures for the university to expand and stretch its mission to accommodate shifting stakeholders' demands (Enders & Boer, 2009); shifting concepts of knowledge (Nowotny et al., 2003) in a context of supercomplexity (Barnett, 2000); pressures to be entrepreneurial (Clark, 1998), engaged, responsive,

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and ecological (cf. Sørensen et al., 2016). There are new global archetypes (Pinheiro & Stensaker, 2014) and policymaking attempts to “modernize” the university (Commission, 2006) often through the application of neoliberal ideas and new public management (NPM) in the politics and public administration of higher education (HE) (Pinheiro et al., 2019). These seek to re-frame the university as a quasi-business and emphasize efficiency, accountability, and objectives of “excellence” (Sørensen et al., 2016). In short, the environment (societal and sectoral) under which HE institutions operate has become increasingly complex, dynamic, and volatile, pressuring field-level actors to continuously adapt to emerging circumstances. In a broad sense, this article asks to what extent the university in the twenty-first century has exhibited resilience in response to these pressures and changes; however, it does so not by looking at universities as a whole (collectivities), but instead by examining micro level dynamics within what we term the “academic core,” i.e., the nature and scope of degree programs that make up the bulk of universities’ teaching mission.

Universities have maintained their position as a central societal institution for the past millennium (Bologna University was established in 1088) and making a case for their resilience may appear self-evident. However, there is a concern that the abovementioned pressures and governmental reforms aiming to make universities more responsive to both government priorities and market imperatives have made the university more “fragile” and “vulnerable” (Wright & Shore, 2017: p.18). We know from biological examples, such as coral reefs and animal species, that fragility comes from a lack of diversity and when faced with high levels of adversity can lead to system collapse (Walker & Salt, 2006). The question is whether modern universities could be on such a path. We contend that the academic core, the complete set of degree programs offered by the university, provides a window into this threat and, through the evolution of its three constituent parts (the branches of humanities, social sciences, and natural sciences), reveals whether and how the university exhibits resilience. Our work builds on an earlier study that identified changes in degree programs globally in the twentieth century (Frank & Gabler, 2006) and extends that into the first decades of the twenty-first century. We ask, what is happening to the academic cores of large comprehensive universities that operate in high-pressure national contexts in the early twenty-first century? Have these universities’ academic cores exhibited resilience, and if so, by what mechanisms?

University resilience, we argue, is initiated at the level of the academic core in the way it adapts to reflect the global state of knowledge while maintaining a tripartite division into three branches of knowledge. While there are functionalist internal and external pressures that may shift resources and strategies, we argue that the university’s academic core has the capacity to buffer itself and maintain a comprehensiveness that includes all three branches. This is what we identify as resilience; however, it should be noted that this does not mean that there is little change in the academic core; rather, the core evolves over time in ways that are observable through the composition of the programs that comprise it. Over time, existing programs are either maintained, modified, replaced, or eliminated, and new programs are introduced. The literature on historical institutionalism provides a useful framework for conceptualizing this, as the fields which form the foundations of programs are strongly path dependent but also subject to large shifts in the global understanding of reality (Frank & Gabler, 2006). In those situations where programs fail to reflect the current state of knowledge, they become outdated and are either cancelled or modified. At the same time, new knowledge is incorporated into the academic core either through these program modifications or through the introduction of new programs. Globally, Frank and Gabler (2006) found patterns of convergence, with universities across the world exhibiting a common academic core (structure and content) over time (p. 81), and further found that within

the core in the twentieth century, the relative size of the humanities declined, the social sciences increased, and the natural sciences remained relatively stable. They hypothesized that this was the result of three trends; namely, shifts towards programs that are rooted in horizontal assembly structures, dynamic network orders, and the rising importance of the human-based ability to act and know. These trends, it is argued, generate changes in the authority and legitimacy of fields of knowledge, resulting in shifts or adaptations in the composition of the academic core over time (p. 20). Given the multiple pressures facing universities, including the need to adapt to fast-changing and rather turbulent social, cultural, and technological environments (cf. Callender et al., 2020), we posit that these earlier trends will accelerate in the twenty-first century, and consequently, we should increasingly find programs that defy vertical and horizontal boundaries and, unless there are mechanisms of resilience present, a further decrease in programs in the branch of the humanities.

The paper makes three key contributions. First, it links the ongoing discussions regarding the change in HE systems and institutions to the literature on organizational resilience. Second, through the study of the degree programs in two universities in Northern Europe, it shows that the academic core is both volatile and subject to a large amount of program turnover wherein resilience is fostered through the mechanism of programs crossing branch boundaries. Third, based on the empirical findings, the paper advances insights for a possible future theory of how adaptation plays out in the academic core over time.

Resilience and resilient academic cores

The extant literature presents multiple perspectives on resilience (for a recent review, see Frigotto et al., 2022). The perspective with the most relevance for this article relates to the ability of an entity to remain within a threshold despite pressures that are pushing it to cross the barriers that bound its identity. This way of understanding resilience derives from biology and ecology and is associated with system thinking and complexity theory. It is particularly useful in the social sciences, as it allows a degree of change from the initial state, thereby refuting the critique that resilience is a conservative or even reactionary concept. It contends that resilience pertains to the ability of a given system to absorb external shocks (adapt) while retaining function and a sense of identity (Walker & Salt, 2006). Resilience, in other words, is not about remaining the same; rather, the key to understanding resilience is in its non-binary relationship between stability and change. Resilience is about exhibiting a degree of continuity in the face of adversity that necessitates a degree of change.

Frigotto et al. (2022) have identified three core elements of resilience: time, continuity of essence, and adversity. *Time* is essential because there must be a period over which resilience is either demonstrated or prepared for the future; it cannot exist in a single moment. In this study, we are interested in the beginning decades of the twenty-first century, as well as the projected future, in the sense that any trends in the academic core now will take time to play out in terms of changing the overall trajectory of the university both as an organization (goals and functions) and institution (formal and informal rules). Second, a *continuity of essence* is needed to claim that an entity exhibits resilience. If something changes completely, then it is not considered resilient. Third, the entity must face *adversity* at a level that threatens its continuity of essence, that is, adversity serious enough that it could drive the entity over a threshold into a new state of existence and identity.

The threshold which allows the university's academic core to remain resilient is the autonomous pursuit of knowledge and truth (Clark, 1983), or, in other words, the quest for mapping (social and natural) reality (Frank & Gabler, 2006). Placing primacy on truth as central to the societal role and legitimacy of the university through its academic core has a long tradition and deep roots in systems theory, as developed by Luhmann (see Young et al., 2017). Frank and Gabler (2006, p. 16; emphasis added) argue that "the university's defining feature lies *not* in its capacity to serve the needs and/or interests of society or its elites but rather in its devotion to enlighten the objective and universal truths of reality." The authors go on to explain the threat, if these are reversed, is that the university would become something different, for example a pharmaceuticals laboratory or policy think tank. The university would thus cross the threshold of what it is to be a university and would instead become another type of knowledge institution. The continuity of essence would be lost, and the university would become unrecognizable if the academic core were to stop broadly seeking objective and universal knowledge and be pruned to preselect only particular types of knowledge and truth in the interest of serving functionally defined needs of society. Similarly, the dismantling of the system of disciplines and/or the diminishment of one or more of the branches of knowledge would also render the university unrecognizable, as these are basic features which cut across national systems (Clark, 1983).

The academic core as a foundation for university resilience

Following Frank and Gabler (2006), the academic core is comprised of the fields of knowledge, or disciplines, within the university, and is divided into three main branches: natural sciences, social sciences, and humanities. Subsequently, the academic core is where the essence of the university is found. Frank and Gabler argue that the university is "definitionally committed to mapping reality" (p.14) and the academic core reflects a "globally institutionalized model of reality" (p.17), which is both socially constructed and based on the external world. The academic core both reflects and reacts to changes in the global discourse on what counts as valid or legitimate knowledge (Frank & Gabler, 2006, p. 19). We understand their ideas about truth and reality as constructivist; they are not absolute, but rather draw on what John Ziman calls a "rationality embodied in the scientific culture" which is grounded in "the social stability of scientific knowledge" (2008, p.319, p. 6). Ziman argues that despite being shaped by cultural and mental subjectivities, "the norms of academic science require scientists to behave as if they believed in a shared external world which is sufficiently uniform that they can usefully exchange information with one another about it" (Ziman, 2008; p.319). In terms of the academic core, this means that a particular field will either maintain a claim on truth that is socially credible within an ever-adapting globally institutionalized model of reality and persist, or, if it fails to do so, will disappear from the academic core and be replaced. The academic core should thus reflect what is considered credible knowledge at a given point in history. Frank and Gabler's argument relates directly to the concept of "requisite variety," which has been identified as one of the key elements in university resilience (Pinheiro & Young, 2017). Requisite variety refers to the extent to which the internal elements (endogenous features) of a given system (in our case, the academic core) mirror the degree of complexity present in the system's surrounding environment (in our case, what Frank and Gabler would call reality). Studies from ecological and social systems, organizations included, show that requisite variety fosters diversity which in turn is thought to enhance adaptability over time (Frigotto et al.,

2022). In short, if it is to be considered resilient, the academic core should display a degree of requisite variety. Given the ever-deepening and changing nature of the global knowledge society (Frank & Meyer, 2020), the academic core must accommodate for increasingly dynamic, complex, and interrelated societal environments.

In addition to their broad argument, showing that in the twentieth century, the relative makeup of the academic core had shifted with the humanities in decline, the social sciences ascending, and the natural science stable, Frank and Gabler (2006) proposed that within the core, fields that lacked human agency or were vertically hierarchical, structurally fixed, or taxonomic (like classics, botany, zoology, astronomy, anthropology, philosophy, or theology) were likely to decline, whereas the ones that exploit human actorness and knowledge capabilities and/or were dynamic and horizontally structured (such as history, geography, sociology, economics, biology, chemistry, physics, and mathematics) were more likely to expand.

Frank and Gabler's research period ends in the mid-1990s, just at the time that the instrumental and functional pressures on the university begin to ramp up (cf. Maassen & Olsen, 2007); as we move into the twenty-first century, the trends they identified have intensified. With the advent of the internet and social media, networked interconnections have become more central. Their words ring even more true today than when they were written: "the natural fit of reality was seen to consist of team-like interconnections rather than top-down subordinations, and the natural order of reality was seen to consist of elastic *co-minglings* rather than rigid separations" (Frank & Gabler, 2006, p.28 emphasis added). We would therefore expect to see an increase in the academic core of programs that link across (disciplinary) borders and are horizontally (anti-hierarchically) assembled. Further, we argue that these changes provide a mechanism for resilience, that is, for countering pressures against the humanities in particular but also fields in other branches that have become devalued in the globally institutionalized frameworks of knowledge.

Methodology

Case selection

To analyze whether the academic core is exhibiting resilience in the twenty-first century, we selected two large, comprehensive research-based flagship universities from the Nordics: the University of Oslo (UiO) and the University of Copenhagen (UoC) and studied the nature and evolution of their academic cores for the period 2003–2019. These are least-likely cases in most-likely national contexts. Below, we discuss the national context and the pressures which could threaten the university's academic core; but within that context, these comprehensive, old, and prestigious universities are the ones least susceptible (on paper) to external pressures. If we find significant effects on the academic core in these universities, that would suggest that other universities with less academic capital would not be able to buffer or shield themselves either (Young et al., 2017).

The case universities are broadly similar, both as institutions and in terms of the governmental and societal context in which they operate, which exhibits strong pressures of the sort discussed in the introduction. UiO is Norway's oldest, and until recently largest and most traditional university, founded in 1811 and comprised of 8 faculties: Medicine, Dentistry, Law, Theology, Humanities, Mathematics and Natural Sciences, Social Sciences, and Education Sciences. As of 2019, it had a student enrollment of 27,000 (a 5% decrease

from 2003) and an academic staff of 3661 (a 40% increase from 2003). The University of Copenhagen (UoC) is Denmark's oldest, largest, and most prestigious university. Founded in 1479, in 2019, it enrolled 37,500 students (an increase of 16% from 2003) and employed 4712 academic staff (a 128% increase from 2003) across its six faculties: Humanities, Natural Sciences, Social Sciences, Medicine, Law, and Theology. Both universities expressed a commitment to the comprehensiveness and breadth of academic subjects in their strategic plans over the period of study.

Analyzing the academic core

The academic core was studied in accordance with a slightly modified version of the methodology used by Frank and Gabler (2006), the starting point and inspiration for this study. First, a complete list of all the Bachelor (BA) and Master (MA)-level degree programs offered by each faculty was created for three points in time (2003, 2009, 2019), following longitudinal design methodologies (Stritch, 2017). The 2019 data was collected directly from the universities' websites, while the two earlier periods used the "wayback machine" internet archive¹ to collect relevant public data that had been archived. Second, the programs were sorted by branch as humanities, social sciences, or natural sciences according to the faculty in which they were offered and double-checked for fit (see Frank & Gabler, 2006, pp. 49–51). Third, the programs in each branch were sub-categorized as either branch-bounded or interbranch, to represent whether the fields of the program remained all in the same branch or whether they crossed branches (e.g., programs such as "Natural resources and development" or "Communication and IT"). It should be noted that while these interbranch programs are also interdisciplinary, we use the term "interbranch" to distinguish these programs from interdisciplinary programs that fall within a single branch (i.e., "Chemistry and biochemistry," or "Molecular biology and biological chemistry"). For this, it was often necessary to look into the internal structure and content of the programs in question. All three authors independently reviewed and reached a consensus on all the categorizations. The interbranch programs were then assigned to a branch according to the faculty that was administratively responsible. This allowed us to locate the interbranch programs primarily within one of the (3) branches of knowledge. Fourth, the resulting categorizations were quantified so as to examine the trajectories of each branch and type of program over time (see the next section). Finally, to assess whether the changes were simply programmatic or if they also reflect deeper shifts in the university, we looked at faculty numbers (full-time equivalent (FTE) basis) and student enrollments in the three branches over the time period as a way to triangulate with the program data. Faculty composition, as Frank and Gabler explain, is a "gauge of priorities in the body of university knowledge as a whole" (2006, p.64). Data for this was taken from university reports showing the breakdown of faculty members by faculties (i.e., law, natural science), which were compiled together under the appropriate branch. Student numbers provide a proxy for the perceived value of the knowledge provided by the programs and aggregating them by branch avoids biases that might occur when focusing only on specific programs. It also provides, like the faculty data, a way to check that program fluctuations are not simply cosmetic changes in names and program titles that do not actually alter the balance of resources and demand for a particular branch.

¹ <https://archive.org/web/>

Frank and Gabler's work has shown the strong path dependencies that provide continuity in the programs that make up the academic core, but also the incremental shifts that allow the core to change in ways that reflect the changes in the overall state of global knowledge. Changes in the academic core can be said to occur through the mechanisms of displacement, layering, drift, and conversion (Mahoney & Thelen, 2010). Displacement occurs when existing programs are removed and replaced with new ones; layering occurs when new programs are added alongside existing ones. Programs that drift reorient themselves as a result of contextual pressures, becoming essentially new programs with a veneer of continuity, while programs that undergo conversion intentionally and strategically change their character, but not their name.

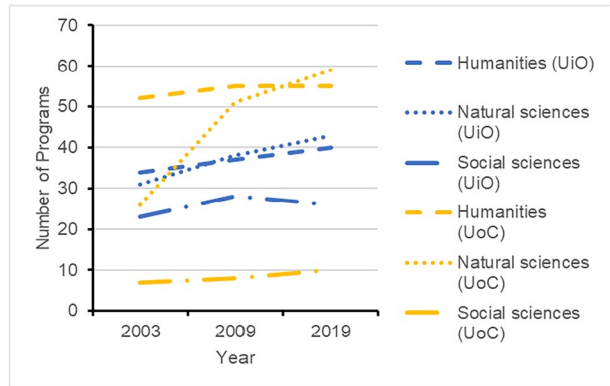
In the empirical section below, three specific aspects of the academic core were investigated to better understand whether it displayed signs of resilience. First, we looked at *trends in the absolute number of programs* during the first two decades of the twenty-first century in terms of the (overall university) academic core and in the expansion or contraction of the three branches, triangulating with the number of programs, faculty members, and students. A decrease in the overall number of programs could be a sign of weakened resilience, as it would show that there was less diversity in the academic core overall. Diversity has been shown to be an essential element in the resilience of biological systems (Elmqvist et al., 2003) and more recent work shows that it can also build resilience in organizations (Duchek et al., 2019) As a baseline, therefore, we assume that a resilient core will not be shrinking.

Furthermore, we wanted to illuminate whether the balance between the branches was changing. Frank and Gabler had found a general decline within the humanities, a sharp increase in the social sciences, and relative stability across the natural sciences. As they put it: "In the twentieth century program growth was 'monopolized by the social sciences' (p.52) and the 'humanities is assumed to be at or near crisis'" (p.53). We wanted to inquire whether such trends had already played themselves out, or if they would continue in the twenty-first century. Academic debates show that the humanities are under increasing threat in the twenty-first century (cf. Zakaria, 2015). As the pressures for societal relevancy increase, there is a preference for disciplinary fields (e.g., socio-sciences like medicine and engineering) that offer concrete solutions to specific social problems at the expense of fields associated with abstract human goods like the humanities (Frank & Meyer, 2020, p. 124). Given this, we expected to find a continued decline in the number of programs across the humanities at the beginning of the twenty-first century. If we did not find a decline, we would interpret that as a display of resilience and investigate the mechanisms by which the humanities were able to accomplish this.

Second, we investigated patterns of *stability and change within the branches*, seeking to understand whether the growth or decline in program numbers reflected a dynamic of incremental layering and/or cancellation, or whether there was a more significant level of upheaval in the form of displacement and/or conversion. In order to consider the branches resilient, we would expect the latter to be occurring. Small adjustments on the margins would not constitute a mechanism for resilience; rather, we looked for adaptive changes that would establish requisite diversity on the level of the branch as a whole. The resilience of the academic core is not constituted by the continuity of individual programs themselves, but rather, by the relative balance among all three branches of knowledge.

Finally, we investigated the interrelations between the branches, distinguishing between programs that were confined within a single branch ("branch-bounded") and those that crossed branches ("interbranch"). Identifying programs that crossed branches would provide an example of the sort of horizontal assembly structures, the "elastic co-minglings"

Fig. 1 Number of Programs at UiO and UoC per Branch (2003, 2009, and 2019)



that Frank and Gabler pointed to in their work from the last century, and we expected it was likely that this trend would also continue in the early twenty-first century. These inter-branch programs, we hypothesized, could be a key mechanism for nurturing academic core resilience as they have the potential to foster adaptability (e.g., by creating hybrids) while, at the same time, allowing programs to retain a disciplinary ethos or identity.

Empirical findings

Trends in the number of programs

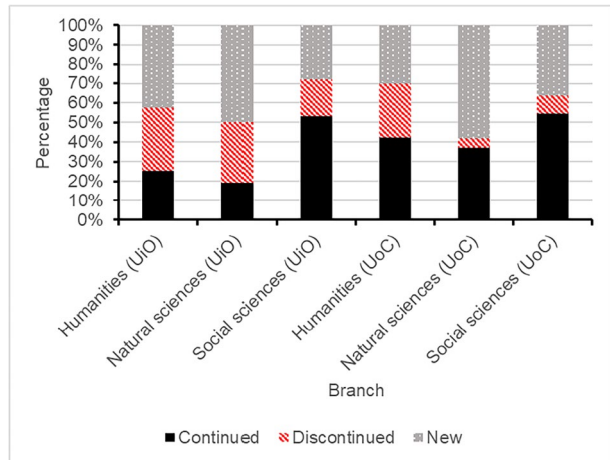
Overall, we find that in both universities there was growth in the number of programmatic offerings during the period under analysis (2003–2019). At UiO, the total number of degree programs (bachelor and master levels) increased by 24%, from 88 in 2003 to 109 in 2019. At UoC, the data show an increase of 44% in the total number of programs offered by the university (from 86 in 2003 to 124 in 2019).

When breaking these down by branch of study in line with the categories developed by Frank and Gabler (see Fig. 1), we found that, at both universities, the greatest increases occurred in the natural sciences while the humanities and the social sciences maintained relatively stable numbers. At UiO, the humanities increased by 18%; the social sciences increased by 13%; the natural sciences increased by 39%. At UoC, we found that the humanities programs remained mostly stable during the observed period, increasing slightly by 3%; the natural sciences increased by 127% (partially as a result of mergers in 2007; see the analysis section below); the social sciences rose by 43%.

Triangulating the program data with student and faculty numbers shows similar trends to the program numbers. The overall number of students at UiO decreased by 5% and at UoC increased by 16%. The overall picture is more nuanced when it comes to the three branches. At UiO and UoC, student enrollments in the humanities decreased by 21% and 27%, respectively, while the number of students in the natural sciences increased at both institutions by 23% and 80%, respectively. In the social sciences, the number of students at UiO declined by 6%, while the opposite occurred at UoC, where there was an increase of 55%.

In terms of academic staff FTEs, the number increased at both institutions across all three branches. The total number of academic staff at UiO increased by 40% between 2003

Fig. 2 Stability and Change Within Branches at UiO and UoC (2003–2019)



and 2019, while at UoC, the numbers more than doubled (an increase of 123%). Looking into the branches, academic staff in the humanities increased at UiO and UoC by 10% and 17%, respectively; in the social sciences, the increases were 50% and 23%; and in the natural sciences, the numbers rose by 52% and 200%.

Stability and change within branches

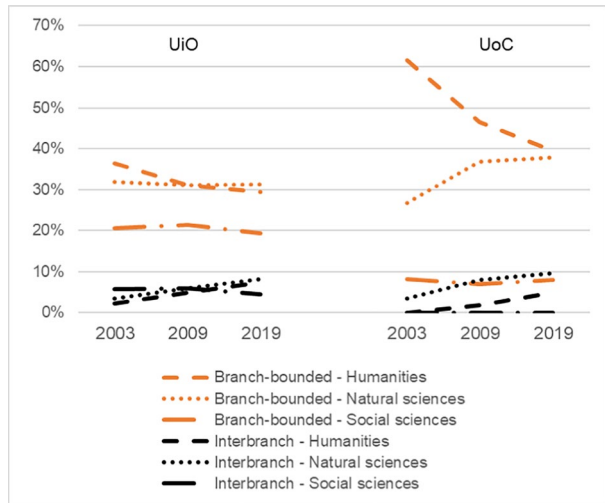
The overall trends in the previous section appear as rather smooth lines that increase or decrease gradually; however, this picture of subtle movement is misleading. In fact, when we look into the stability and change within the branches, we find that there is a significant churn in programmatic offerings. Figure 2 shows the breakdown of continued, discontinued, and new programs. At UiO, the humanities witnessed the introduction of 25 new programs while 19 programs were discontinued; 15 existing programs from 2003 remained unchanged in 2019. The natural sciences saw an even bigger introduction of new programs (31 in total) while 19 programs were discontinued, and 12 remained unchanged throughout the period. Finally, the smallest introduction of new programs was in the social sciences — only 9 new programs were established, with 6 discontinued and 17 remaining unchanged.

At UoC, the picture is rather similar. In the humanities, 23 new programs were introduced, and 21 were discontinued, with 32 programs unchanged. The natural sciences introduced 36 new programs, discontinued 3, and left 23 unchanged. In the social sciences, only 1 program was discontinued, while 4 were introduced, and 6 remained unchanged.

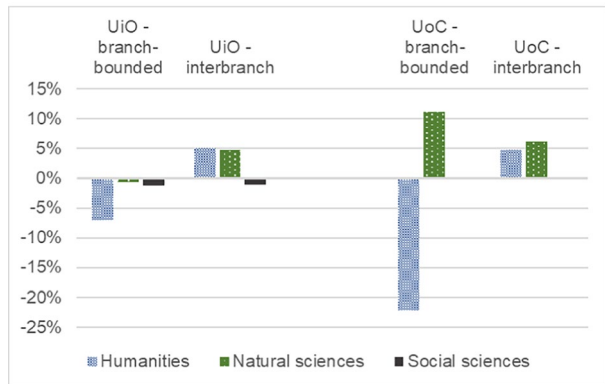
Type of programs

Our examination of the two types of programs: “interbranch” and “branch-bounded” reveals that interbranch programs increased at a more rapid rate than other types of programs in their respective branches, and that their share of the overall number of programs has grown. At UiO, interbranch programs increased by 120% (more than doubling from 10 to 22), while branch-bounded programs grew by 12% (from 78 to 87). Overall, the interbranch programs comprised over 20% of all university programs in 2019, up from about

Fig. 3 a Composition of the Academic Core by Program Type Over Time at UiO and UoC (2003–2019). **b** Change by Program Type at UiO and UoC (2003–2019)



a



b

11% in 2003. At UoC, interbranch programs increased by 500% (from 3 to 18), while branch-bounded programs grew by 28% (from 83 to 106). Overall, the interbranch programs at UoC comprised nearly 15% of all university programs in 2019, up from about 3% in 2003.

Looking into the hosting of interbranch programs by the administrating faculty, we find (see Fig. 3a) that at UiO, interbranch programs increased in the humanities (from 2 to 5) and the natural sciences (from 3 to 9), while those belonging to the social sciences remained unchanged (5). Programs belonging to the branch-bounded category increased in the natural sciences (from 28 to 34) and the social sciences (from 18 to 21) while remaining stable in the humanities (32). At UoC, interbranch programs increased in both the humanities (from 0 to 6) and the natural sciences (from 3 to 12) but did not in the social sciences. In fact, we could not find any interbranch programs hosted by the social sciences. This does not mean that the branch was not part of interbranch offerings but that these were being hosted by either the humanities or the natural sciences faculties. Branch-bounded programs at UoC increased in both the natural sciences (from 23 to 47) and the social

sciences (from 7 to 10) and slightly declined in the humanities (from 53 to 49). Figure 3b shows more clearly the differences in growth/contraction of the branch-bounded versus the interbranch programs over the study period (2003–2019).

Analysis and discussion

The data unequivocally show that a reduction in the number of programs across the three branches did *not* occur; rather, there were increases of 24% at UiO and 44% at UoC, which suggests that the academic core as a whole exhibits resilience in the face of societal pressures for efficiency and streamlining. The resilience in this case is characterized not by simple stability but is rather an “adaptive” type of resilience (Frigotto et al., 2022, p. 15–28), in which the academic core shows medium to high levels of change while remaining within a threshold that maintains a continuity of essence — in this context, the distinctive character of each branch of learning.

One possible explanation for the observed changed patterns, as hypothesized at the onset, pertains to the increasingly dynamic and competitive environment facing (Nordic) universities and the need for diversification (new programs) ensuring a continuous flow of students as well as a means of retaining (and in the case of the natural sciences, expanding) the number of academic staff members. At both case universities, as shown in the data on stability and change, the overall growth in programs does not follow so much a traditional layering process (Mahoney & Thelen, 2010) where old and new programs coexist, but instead, one of displacement with significant churn, that is, large numbers of existing programs being discontinued as new ones are rapidly added. These findings demonstrate the theoretical cornerstones of resilience presented earlier: a dual dynamic of change and stability, as well as novelty in response to adversity. The observed historical trends seem aligned with the strategic imperative to retain academic breadth, and studies in the Nordic region show that many academic communities, most notably outside the natural sciences, have become increasingly skeptical towards modernization agendas centered on rationalization and performance management (Pinheiro et al., 2019). The considerable growth in programs at UoC may partly be explained by the fact that mergers further strengthened UoC’s historically strong position in terms of the size and breadth of its academic core. The large jump in growth in the natural sciences at UoC in 2007 results from a merger with two “mono-faculty” universities, the Danish University of Pharmaceutical Sciences and the Royal Veterinary and Agricultural University.

Frank and Gabbler neither expected nor did they find the natural sciences to be rapidly growing in the twentieth century, but our analysis shows that in the first decades of the twenty-first century, they exhibit higher growth rates than the other two branches. Among the factors influencing this are the policy emphasis given to STEM-related fields in the last two decades (Freeman et al., 2014), and possibly also the importance attributed to economies of scale and scope in the context of global competitiveness in the research realm. This latter factor is much more salient for the natural sciences, which is a team- and infrastructure-laden enterprise, when compared to the social sciences that have traditionally relied on individual scholars and smaller teams that, for the most part, do not require large infrastructure investments.

The most dynamic branches were the natural sciences and the humanities, which at both universities showed over 50% change (and around 80% at UiO). These were the two branches where most experimentation (new program creation) and discontinuation

occurred during the period covered, though in the natural sciences at UoC, there were fewer discontinued programs, and the process might be better characterized as layering than churn (Mahoney & Thelen, 2010). The social sciences branch exhibited greater stability in terms of continued programs at both universities, which is likely a result of its development (exponential growth and evolution) in the twentieth century (Frank & Gabler, 2006) having brought it to a point of requisite diversity. There were also observable differences between the universities, as the evolutionary process at UiO was more intense than at UoC. Overall, with the exception of the natural sciences at UoC, the data show a correlation between program cessation and program creation, implying that more experimental branches (many in the form of interbranch initiatives) are involved in the process of churn of their old or existing programs.

The social sciences were found to be the least dynamic branch, showing lower levels of creative destruction of existing programmatic structures. One possible explanation for this pertains to documented resistance towards NPM-inspired reforms among social scientists across the Nordics when compared to the natural sciences, which seem to have adopted a more performance-oriented ethos (Pinheiro et al., 2019). Another explanation, following Frank and Gabler (2006, pp.68–69), pertains to the notion that given the changing political and societal environment (focus on STEM and societal grand challenges), both the humanities and the natural sciences have become more applied in nature by, among other aspects, branching out to other fields. In contrast, the social sciences have traditionally been both more applied (focused on societal structures and institutions) as well as interdisciplinary (in a branch-bounded manner) in nature (Levitt et al., 2011).

Looking specifically at UoC, we find that there were only very minor changes in the social sciences faculty: splitting political science and sociology into independent programs and the addition of two master's degrees. The biggest increases were found in the natural sciences faculty, where programs mixing natural and social sciences such as "Agricultural Economics," "Natural Resources and Development," and "Nature Management," were established in significant numbers. These are examples of elastic co-minglings, and the most active fields in creating them are economics/management and fields that fall under health sciences and ecological sciences. Similar types of interbranch courses are found also in the humanities such as "Cognition and Communication" and "Advanced Migration Studies". In the humanities, there was also a trend towards converting language programs into language-and-culture programs that contain courses in the social sciences, particularly politics and sociology, and in a number of cases grouping them together into "area studies." There is potentially an argument for reclassifying these "Area Studies" as social sciences, as Frank and Gabler's do, which would even further accentuate the shifts we have found; however, as the courses are still predominantly linguistic and cultural in orientation, we have left them under the humanities. These changes are an example of drift as a mechanism for fostering resilience; horizontal assemblages of fields allow the programs to reorient themselves in order to maintain a position in the academic core and better reflect the current state of reality.

Contrary to expectations, the data show that the humanities were able to retain their share of the academic core at both case universities, being stable at UoC and slightly increased (18%) at UiO. As discussed in more detail below, this program stability has been driven by the increase in interbranch programs. When it comes to students, their numbers have, as predicted, declined over the period (across both BA and MA programs) at both case universities (by 21% at UiO and 27% at UoC). However, this student decline did not result in a reduction in the number of academic staff in the humanities.

Theology provides a useful example as regards resilience in the humanities. Despite Frank and Gabler's expectations and the increasing secularization of society in the Nordics, Theology has been able to retain its position as a dedicated faculty at both universities despite very low enrollments and large contextual shifts in its societal relevance and positioning. At UoC, enrollments shrunk from 905 students in 2003 to 575 in 2019; at UiO, they decreased slightly, from 445 students in 2010 to 375 in 2019. Despite their small size (making up less than 1.5% of the overall student body), there does not appear to be an attempt to shut down the Theology faculties. The two universities, however, displayed quite different approaches to the programs in the faculty: UoC had fewer but more stable programs (none were discontinued), whereas UiO was more experimental in attempting to establish co-minglings with other disciplines and no single program was detected unaltered across the entire study period. Programs that attempted to cross boundaries to other disciplines, primarily within the humanities (like culture, gender, idea studies), came and went. Developments at UiO show clear signs of displacement whereas dynamics at UoC denote the importance of drift, with layering playing a role in both faculties. Drift can be seen in the shift, already identified by Frank and Gabler, from theology as a basic science (i.e., "the study of God and religious thought" (p.106)) to one that is applied (i.e., which focuses on the ways in which religion relates to society). At UiO, these latter types of programs "Religion & Society" (BA/MA) and "Christian Studies" (MA) have endured. UiO's programs mostly targeted a domestic audience, whereas non-pure-theology courses at UoC diversified by appealing to international students and, for example with the program "African Studies," expanded to those interested in Africa where religion still plays a key role in society. In short, in theology, inter-branch co-minglings as a mechanism for fostering resilience have been attempted, showing their perceived usefulness as a resilience mechanism, but have thus far proven unstable.

Looking at the humanities programs at UoC, we found the creation of 23 new programs and the cancellation of 25. Not all of the cancelled programs disappeared altogether, as many were merged or conglomerated into the new programs, especially in the area of languages, which saw a mixture of mergers and cancellations. Many of these conglomerations are examples of conversion in which external pressures have resulted in a reconfiguration of programs from the inside. Much of this occurred after the Danish government announced, in 2015, cuts in the university budget and a program resizing initiative which led to significant decreases across the academic core; hardest hit by these were small programs in the humanities. Yet, as a whole, the humanities have exhibited resilience to this external shock by, as we have seen, adjusting and reconfiguring themselves to remain viable.

In contrast to the gloomy predictions by Frank and Gabler (2006), but also many others like Zakaria (2015), as regards the future of the humanities, our Nordic cases reveal the branch to be highly resilient in the face of challenging internal and external circumstances. Recent studies on societal valorization reveal that, as a branch of learning, and despite being different from other branches, the knowledge generated by the humanities is not less useful to society per se (Olmos-Peñuela et al., 2015). In reaching out to other branches, not only have the humanities responded to, and tapped into, new student and societal demands and opportunities, but also, equally importantly, they have developed the applied or useful nature of their programmatic offerings, an element seen as key to matching social reality (Frank & Gabler, 2006) and leveraging the branch's legitimacy, adaptability, and overall resilience to changing circumstances.

Conclusion

Universities have long been understood to be resilient, even when the actual concept has not been invoked. This article explicitly brings the concept into the HE discourse by applying it to the academic core of universities and the three branches of knowledge that compose it. We proposed that resilience is fostered by replicating the complex, creative-destruction aspect of evolutionary dynamics within each of the academic branches, rather than being a simple reflection of the number or exact character of individual programs, which often fluctuate and adapt over time. This corresponds to what we found in our study of two flagship Nordic universities: for the most part, there was not layered growth within the branches, but rather a much more chaotic dynamic of creation and destruction. That said, this was not a radical transformation, but rather a process denoted by resilience since it allowed for the continuity of essence, both in terms of function (teaching or knowledge transmission) and (disciplinary) identity.

University resilience, we argue, is fostered at the level of the branches of knowledge, rather than the level of programs or disciplinary fields. Programs adapt and change; new, emerging programs replace old ones in an ongoing process by which the branches are revitalized but remain recognizable. These changes occur in an evolutionary manner. The biological understanding of fitness (i.e., “survival of the fittest”) has to do with attunement to the local context or niche, and in a university context, fitness is determined by an ability to reflect true, i.e., universally credible, knowledge about the world outside ourselves. This dynamic of “mapping reality” also demands “requisite variety” in order for the academic core to cover the expansive range of fields of knowledge that comprise the globally legitimated understanding of reality.

Within the academic discourse on universities, the branches of knowledge are generally understudied. As an intermediate level between the broad research on structures and strategies and the more micro-level studies on programs, research groups, and individual academic actorness, the branches as an object of study tend to be passed over. While the branches do often get taken as a starting point to frame an argument, for example in bibliometric studies and criticisms to say that the Social Sciences and Humanities (SSH) are disadvantaged, they are otherwise often left as a black box. In this paper, we have sought to open up that black box, but future research is needed, both quantitatively and qualitatively, to understand these dynamics more intricately. We venture to suggest that the dynamic process has a core and periphery: that is a stable core of disciplines and programs, which are long-standing and deeply rooted in the university as a global institution, and alongside those programs is a churning periphery in search of new fields and combinations of fields that can explain the world around us. This exploratory process of program creation, as the data in this study have shown, results in a significant percentage of interbranch programs.

As far as theoretical implications are concerned, we argue that this cross-branch variant of interdisciplinarity is critical for resilience in the academic core of the twenty-first century. Adaptation occurs as pressures on the academic core activate resilience mechanisms by which the core attempts to stabilize the balance between the branches; rather than pursuing a monopolistic drive, in which branches attempt to destroy each other, they co-mingle and establish horizontal assemblages between fields in the form of interbranch programs. While at a university level and within university politics we can certainly find examples of winner-take-all attempts of some fields and branches to usurp the bulk of the funding, it appears that within the core, there is a greater prominence of interaction and cooperation.

Drawing on complex adaptive systems theory (Pineiro & Young, 2017), we can identify a co-evolutionary process at work between the branches, and the resulting interbranch programs can be understood as boundary objects or structural couplings. Further studies are needed to better understand how (under what conditions) these boundary objects come into being and affect the internal dynamics of the branches themselves and the academic core as a whole, and to what extent that process is either strategic or emergent.

How political and societal forces interact and co-determine each other in ways that potentially undermine the resilience of the academic core needs to be investigated in further detail, across and beyond the Nordic countries; for now, this initial study provides fresh evidence and a novel framework for examining resilience in the academic core.

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