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# Social capital in academia: Measuring researchers' collaboration habits versus preferences

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## Abstract

Many studies concerning social capital in academia have used social network theory and social network analysis as an approach. Social network analysis focuses on a boundary set of actors in a network and what it reveals as an outcome of social capital. However, social capital is also a precursor or catalyst for cooperative work. Here, we investigate researchers' perceptions of social capital based on the hypothesis that what academics do when they collaborate (as a habit), may not relate to what they actually prefer. We have piloted a questionnaire-survey to test this, focusing on the goal-seeking behavior of publishing new research. Data were collected from 1,092 academics, across 6 faculties at the University of Copenhagen: Health and Medical Science, Science, Social Sciences, Humanities, Law, and Theology. The survey of collaboration habits first revealed significant differences at the level of gender, academic position, years active in publishing, and faculty. Collaboration preferences, interpreted from social capital theory, were also measured according to three interrelated dimensions—i.e. *cognitive, relational*, and *structural*. Survey respondents tended to prefer the *cognitive-relational* aspects of collaboration (i.e. *reciprocity and obligation*; *shared understandings*), over certain *structural* determinants (i.e. *linking to networks*). Few habits and preferences correlated and did not correlate strongly. Amongst the researchers who indicated a preference for *bridging networks* (i.e. working with people who have different types of expertise), few confirmed this as a collaboration habit, particularly with experts from organizations outside academia (i.e. the business/public sector).

**Keywords:** social capital; scientific research collaboration; research policy.

## 1. Introduction

*Can we measure social capital*? Ask any scholar from a field of social science and there is rarely a definitive answer. For instance, Tzanakis (2013) claims that 'research is plagued by unresolved measurement issues, which do not help to clarify the nature of the concept' (p. 2). In the work of Engbers, Thompson and Slaper (2017) social capital is said to be 'a concept that is notoriously difficult for measurement' (p. 537), and as Claridge (2017) suggests, it is difficult because the demand for relevant empirical measures has continued to outstrip supply. Yet, many empirical measures have been developed, often based on social network theory and social network analysis as an approach (e.g. Barbieri 2003; Díez-Vial and Montoro-Sánchez 2014; Lin 1999; Sabatini 2009).

According to Bourdieu (1986), social capital incorporates both the social process and status procured through the intricate structures of an individual's social network. Social connections are a resource, and, as with many resource-based advantages, with whom we connect and when can make it easier to procure further advantages. This is true also for academic researchers, but in this realm there is what Merton (1968) calls a 'Matthew effect'. Even though social patterns are 'functional for social systems', they can 'sometimes also be dysfunctional for certain individuals within that system' (p. 59). Social capital is therefore a '"credential" that can perpetuate social inequity by providing differential entitlements to credit' (Bourdieu 1986: 248–9). In this regard, many researchers understand, without necessarily even mentioning it, that 'social capital' is a significant precursor to initial and continued academic success (Abbasi, Hossain and Wigand 2011). Success can mean many things, for example, fundraising, achieving satisfaction from scientific puzzle solving, and/or advancing a university's mission (Iorio, Labory and Rentocchini 2017). At the very least it could be as simple as 'becoming familiar with alternative ways of thinking and behaving' and being 'at a higher risk of having good ideas' (Burt 2004: 349).

The purpose of this study is to measure social capital in academia, at an interpersonal level, and with a population of academics at one university: The University of Copenhagen We align ourselves with a class of research, which Carpenter et al. (2012) refer to as 'social capital research'. We accept '[social] networks and their features as a given', chosing to investigate 'the underlying mechanisms' of interpersonal networks, rather than the networks themselves (p. 1329–30) We do not examine bonds or bridges within a pre-determine actor-network. Instead, we test a measurement approach designed to elucidate academics' perceptions of social capital, specifically as collaborators on research publications.

We therefore distinguish between what an individual's *habits* are versus their *preferences*, and this is based on the hypothesis that what an academic does and what they might prefer to do may differ. For instance, many researchers might *prefer* to collaborate with colleagues from universities/institutions abroad, but have yet to find the opportunity to do so, or find it difficult to develop international connections. Our research question is as follows: *What do academics from various disciplines do when collaborating on research leading to publication, and how do their habits compare with what they actually prefer?*

## 2. Background literature

### 2.1 Theories, dimensions, and structures of social capital

Social capital is almost uniformly conceptualized in terms of social resources, although a host of theories have been put forward over the years. Siisiäinen (2000) offers a systematic and philosophical comparison between the early writings of Bourdieu (circa 1970s and 1980s), and later concepts shared by Putnam in the 1990s. Pierre Bourdieu (1972, 1986) was a French sociologist and public intellectual who viewed social capital in terms of class, conflicts, power functions, and the individual's ability to advance self interests in the midst of social struggle. Putnam (1999, 2000), on the other hand, was more concerned with norms, mutual reciprocity, and trust in social capital. In the beginning, it was the socio-political or socio-economical constructs of social capital that were prevalent. Eventually, more attention was given to structural dimensions. In this vein, Newman (2001) claimed that 'one could in principle, construct the social network' resulting from social capital (p. 404).

For Newman (2001), a social network was simply 'a collection of people, each of whom is acquainted with some subset of the others. Such a network [could therefore] be represented as a set of points (or vertices) denoting people, joined in pairs by lines (or edges) denoting acquaintances' (p. 404). By adding structure (i.e. *a structural dimension*) to social capital, researchers have the opportunity to view network ties, bonds, and bridge configurations between people. Between these ties, one can further explicate shared understandings (i.e. a *cognitive dimension*) and shared expectations, obligations, identities, and trust (i.e. a *relational dimension*) (Nahapiet and Ghoshal 1998). The *cognitive dimension* refers more specifically to an individual's subjective interpretation of shared understandings and goals, whereas the *relational dimension* generally places emphasis on feelings between actors.

### 2.2 Measuring social capital

Stanley Milgram (1967) is said to have conducted one of the earliest measures of social capital. In this study, random test subjects were asked to get a letter to one of Milgram's friends in another part of the United States, by passing it from person to person. But, when doing so, they should choose someone known on a first-name basis. The average number of persons was six and this gave evidence to what Milgram called his 'small-world' hypothesis (Milgram 1967; Newman 2001). Newman (2001) notes that this research was revealing in many ways, though his main critique was that better data were needed to learn about the type of exchanges among social contacts. Improved and more varied datasets gradually enabled researchers to identify two primary, yet conceptually distinct, types of social capital: *bonding* and *bridging*.

Bonds between persons in a network denote similarity, and commonalities within a social group, whereas 'bridging social capital is *between* social groups, social class, race, religion or other important sociodemographic or socioeconomic characteristics' (Claridge 2018). Putnam (2015) originally explained how trust builds from bonds (e.g. bonds between members with shared interests in a church or club). However, it was the social network theorists (i.e. Granovetter 1973; Burt 1987; Coleman 1988) who developed some of the empirical 'bridging' measures used today. For instance, statistics pertaining to indirect ties, brokering roles, the bridging of

structural holes, and the identification of what Granovetter (1973) calls the 'strength of weak ties'. Geys and Murdoch (2008) later challenged this distinction by suggesting that *bonding* and *bridging* actually co-exist. In this way, persons within a group (i.e. those coming together on a voluntary or involuntary basis) can experience *within*-group connections, which they call *internal* bridging, or links *between* different groups, which they call *external* bridging.

### 2.3 Social capital antecedents versus outcomes

Social capital theory and social network theory are often referenced together, given that the two constructs intersect. Social capital is the 'lubricant' or 'catalyst of co-operative relations' (Adam and Roncevic 2003). It is concerned with how actors act or behave, and what their expectations are surrounding social contacts. Social network theory, on the other hand, focuses on a boundary set of actors, and what the network reveals as an outcome or consequence of social capital. Brass et al. (2004) provide a thorough overview of causal concepts like actor similarity, culture socialization, homophily, and personality, as well as outcome related concepts, such as gaining power, getting a job, or improving one's performance. Within this literature Carpenter et al. (2012) found that 'researchers' theoretical models' and the constructs that they use in studies of social capital 'can focus on different directions of causality, that is, whether or not networks serve as predictors (causes) or predicted effects (consequences)' (see also Borgatti and Foster 2003).

Payne et al. (2011) critique the levels at which social capital theory has been applied. Although many scholars 'continue to maintain separate micro and macro streams of research' the story is a bit more complex (p. 493). Individual actors might rely on internal resources to gain social capital, just as they might exploit external resources. An organization, group or team, can in principal do the same. Social capital can have alternative meanings, antecedents, and consequences at different levels. It is also highly context dependent, and overwhelmingly it has been utilized as an independent variable (p. 492; see also Adler and Kwon 2002). The future of social capital research, lies with what Payne et al. (2011) call a 'cross-level' approach or 'Frog-pond' model. With this model, an actor's standing in a network highlights the relative effect of an entity's standing within a higher level entity. In other words, a same-sized frog might be considered large or small, depending on the size of the pond.

### 2.4 Social capital and the academy

At universities, institutes, and between worldwide research centers, social bonds and bridges are established every day. Much of the social capital research carried out in the academy has focused on students (Levin, Walter and Murnighan 2011; Brouwer et al. 2016), contracts established between industry and universities (Doz, Olk and Ring 2000; Steinmo and Rasmussen 2018; Al-Tabbaa and Ankra 2019) and collaboration networks based on co-authorship patterns (Abbasi, Altmann and Hossain 2011; Li, Liao and Yen 2013; Gonzalez-Brambila 2014).

#### 2.4.1 Students and study programmes

When students start their first years at university, many find it difficult to adapt to what constitutes a new social situation. Research by Brouwer et al. (2016) shows that smaller class sizes, as well as peer and faculty capital contribute to study

success. The earlier that peer social capital is developed, the better it is for the student longterm. In addition, friendships developed among 'high achievers' tended to contribute more to study success than friendships among 'low achievers' (Brouwer et al. 2016).

In terms of networking practices, Villar and Albertín (2010) found that students employed either a *socio-affective* approach, a *pragmatic approach*, or a *context-contingent* approach. Those who were pro-active at building *socio-affective* friendships at university, did this because it was part of their personality, and/or because it came naturally to them. Students who were more *pragmatic* about friendships tended to be more concerned about survival in a competitive world. Here, social networking was used to help acquire products, like the possession of information, a stronger professional orientation, and/or new professional contacts. Further research by Levin et al. (2011) shows that when students, specifically MBA students, re-connect with old or 'dormant' professional contacts, this can also be a valuable source of knowledge and social capital.

Social capital and university students' use of social media has also been investigated, and although Facebook was found to be 'positively related to time spent participating in co-curricular activities' there was a 'significant negative relationship between frequency of engaging in Facebook chat and time spent preparing for class' (Junco 2012: 168). Students do not necessarily acquire more cognitive social capital via social media, but amongst regular Twitter users, measures in self-esteem were higher, which was in turn said to be a significant predictor of 'perceived maintained social capital' (Petersen and Johnston 2015: 24).

### 2.4.2 Industry-university connections

In industry and businesses, it is well-known that external sources of knowledge often complement internal sources of knowledge (e.g. Chesbrough 2003; Chesbrough, Vanhaverbeke and West 2006). For this reason, 'collaborations between industry and universities have increased dramatically over the last two decades' (Al-Tabbaa and Ankra 2019). However, there can be challenges associated with this kind of collaboration; most notably the two-world paradox, where incentives for rewarding the production of information normally differ (Hall 2003). There can also be differences in how such collaborations are formed.

Some collaborations are pre-conceived according to complementary needs, whilst others are engineered via a third party (Doz, Olk and Ring 2000; Al-Tabbaa and Ankra 2019). Most engineered connections rely on social capital to facilitate technology translation, as well as technology transfer (Bozeman, Rimes and Youtie 2015). Technology translation is defined by Al-Tabbaa and Ankra (2019) as 'the collective sensing of opportunity and technology adaptation that would be necessary for companies to utilize and commercialize the imported technology' (p. 559). One of the benefits of this translation phase is that if there are any strong language barriers and/or communication issues between academia and industry, they can more easily be overcome, before technology transfer.

Differences in collaborative connections also occur if the specific firm/organisation involved lacks prior experience with industry-university collaboration. Prior experience of collaboration for innovation can also increase the likelihood of subsequent collaboration. Dundas-Hewitt, Gkypali and Roper (2019) call this the 'learning effect'. Steinmo and

Rasmussen (2018) found that cognitive social capital was the significant precursor to a collaboration if a firm had more experience; whereas 'less experienced firms initially base[d] their university collaborations on relational social capital' (p. 1964). For the less experienced firms, the cognitive dimension was normally established after, and reinforced 'over time' (p. 1964).

### 2.4.3 Researchers, collaboration, and co-authorship

Bibliometric data are often used in studies pertaining to co-authorship (Kumar 2015). These data are not only convenient to measure, but useful as a proxy for measuring collaborative work. It is a widely accepted research practice, though some scholars recognize that it is 'at best only a partial indicator' of collaboration (i.e. Katz and Martin 1997; Bozeman and Boardman 2014: 2).

Co-authorship data have now become useful for creating and examining social networks. According to Takeda, Truex and Cuellar (2010) co-authoring is 'another way to build academic [or social] influence' (p. 1). With Social Network Analysis (SNA) as an approach, it is possible to examine the nature, strength and statistical properties of co-authoring networks (Newman 2004; Takeda, Truex and Cuellar 2010). Abbasi et al.'s (2011) use of SNA, for instance, has shown that 'scholars with strong ties (i.e. repeated co-authorships) show a better research performance than those with weak ties (e.g. single co-authorships with many co-authors)' (p. 605). Petersen's (2015) work points to a similar finding. Here, strong ties between authors, or 'super ties' as he calls them 'contribute to above-average productivity and a 17% citation increase per publication' (p. 4671).

Li, Liao and Yen's work (2013) emphasises academic *centrality*, or the author-as-actor's prominence in a collaboration network relative to other authors. Centrality as a structural factor means that an author has achieved either a high degree centrality, betweenness centrality, or closeness centrality within a collaboration network. All three relate either directly or indirectly to increases in document citation counts. More explicitly, authors who positioned themselves as brokers (i.e. betweenness centrality), or were instrumental in developing bridges ('weak ties') between different research groups, tended to benefit most in terms of citations.

Gonzalez-Brambila's (2014) research, utilizing all characteristics of social network-based capital, confirms that research productivity is most positively affected by 'number of ties, the positional dimension [of the researcher in a network], and publishing with people from different areas of knowledge' (p. 1616). The main conclusion here is that dense networks can be detrimental to the creation of new knowledge, and that interdisciplinary research amongst diverse individuals tends to be a more critical way of taking advantage of social capital.

SNA research shows, overall, that if a researcher holds a favorable position in a collaborative network, this can become a resource leading to further gains. But, the downside is that for every network structure or cluster that exemplifies well-positioned collaborating authors, there can be structural evidence of exclusion (Walker and Boamah 2019). The presence of invisible structures in academia therefore promotes uneven privileges. SNA, as a research approach, is also problematic because it fails to attend to the 'qualitative and behavioural dimensions of social capital' (Martín-Alcázar, Ruiz-Martínez and Sánchez-Gardey 2019). This in turn

makes it difficult to 'fully understand relational dynamics within research teams' (p. 917).

When social network analysis is used to study social capital, attention is typically given to *roles* and/or *outcomes* (e.g. social capital's effect on citation performance) rather than *antecedents* (i.e. the processes for its creation), particularly at an individual level. As Petersen (2015), explains: 'the choice to start or terminate a collaboration can be an important strategic consideration with long-term implications' (p. 4671). More research is therefore needed to explicate what academics think about as they try to build social capital.

In this vein, investigations have been carried out concerning motives for collaboration (Latour and Woolgar 1986; Whitley 2000), proclivities in collaboration (e.g. Iglič et al. 2017; Holman and Morandin 2019), collaborator roles (e.g. Bozeman, Fay and Slade 2013), and the conditions that affect collaborative choices (e.g. Birnholtz 2007; Van Rijnsoever and Hessels 2011). For instance, Whitley (2000) claims that recognition and the attainment of credibility is generally a strong motivating factor to collaborate. But, academics are often motivated to collaborate with persons from other disciplines. This can be for strategic purposes or because it is a good way to advance one's career (Van Rijnsoever and Hessels 2011). Trier and Molka-Danielsen's (2013) work with researchers in Information Systems links individual preferences for collaboration to evolving network structures. Here, four main strategic motivations were uncovered (cognitive, structural, structural-broker focused, serendipity-focused) as well as one sympathetic driver—i.e. to reinforce existing relationships.

Iglič et al. (2017) refer to Bozeman, Dietz and Gaughans (2001); Bozeman and Boardman (2014) Scientific and Technical Human Capital Theory, which assumes that 'researchers engage in collaboration to enhance their human capital' (p. 155). Choices in this regard can differ at the level of academic rank (e.g. Abramo, D'Angelo and Murgia 2014), or they may be gender specific, or nationalistic in nature. For example, researchers from the life sciences prefer to collaborate with persons of the same gender (Holman and Morandin 2019). Women have also been found to collaborate less often with international colleagues than men (Abramo, Ciriaco and Murgia 2013); an issue that may be attributed to women's underrepresentation in upper ranks (Uhly, Visser and Zippel 2017). Melkers and Kiopa's (2010) work shows that non-US researchers are more likely to have close international collaborators, whilst US researchers mobilize international versus domestic human capital, for a range of reasons. And, when it comes to academic collaboration at an interdisciplinary level, motivations tend to be 'strongly shaped by funders' (Harris et al. 2009: 379). Academics tend to find interdisciplinary collaboration difficult when each person involved wants to 'follow different perspectives and priorities' (p. 376). For the approach to work, Harris et al. (2009) explain that collaborators need 'time to develop relationships, build up trust, and identify good working practices' (p. 383).

## 3. Research motivation and framework

Our motivation is to add to this intersecting literature—i.e. social capital research and research on collaboration– from a specific point of view. First we want to improve upon the methods for measuring social capital in academia. Again, the literature points to many network analysis studies based on selected actors and outcomes, rather than perceptions or preconceived requirements. Second, we have chosen to pilot test a new survey questionnaire. Third, with scientific collaboration as our focal point, we want to ascertain what researchers habitually do in research leading to a publication, and compare this to three dimensions of social capital (cognitive, relational, and structural), which they may prefer.

We use the definition of social capital put forth by Portes and Sensenbrenner (1993)—i.e. *social capital is the expectations for action within a collectivity that affect the goal-seeking behaviour of its members*. Although this definition was originally used to investigate determinants of economic action, it is useful for studying collaboration preferences in academia. It not only explains what social capital *is* but also what it can be used to achieve (see Robison, Schmid, and Siles 2002: 2). Thus, social capital is part of a researcher's expectations within a collaborative action, where goal-seeking is focused on publishing new research.

We also employ the theoretical framework of Nahapiet and Ghoshal (1998), which explains what *cognitive*, *relational*, and *structural* social capital can mean. Whilst these three dimensions may be separated for analytical purposes, Nahapiet and Ghoshal (1998) maintain that they are closely related. Their underlying features are also highly interrelated. As shown in Figure 1, shared narratives and shared codes and languages are features of the *cognitive* dimension. A shared understanding of norms, feelings of interpersonal trust, feelings of mutual obligation, and a shared form of identification are all features of the *relational* dimension. *Structural* social capital, which is the third dimension, reflects ties to an appropriable organization (e.g. a university department/research field), ties (bonds/bridges) to others in a network, and the overall network configuration (see Figure 1).

Our method of investigation, i.e. a questionnaire-survey, follows what has been done previously by Trier and Molka-Danielsen (2013), and Martín-Alcázar, Ruiz-Martínez and Sánchez-Gardey (2019). The difference with this study is that we have recruited academics from multiple research disciplines (i.e. not just Information Science as in Trier and Molka-Danielsen 2013), and focus on the thoughts and preferences
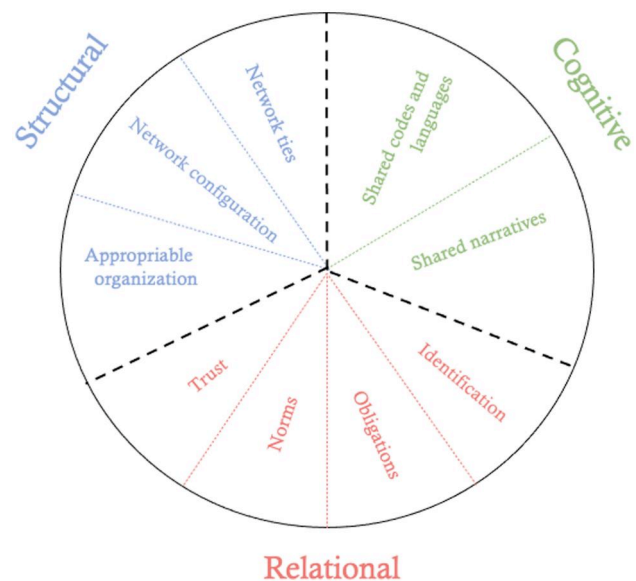


**Figure 1.** Features and dimensions of social capital (adapted from Nahapiet and Ghoshal 1998).

of individuals as opposed to research teams (as seen in Martín-Alcázar, Ruiz-Martínez and Sánchez-Gardey 2019).

## 4. Method

### 4.1 Pilot questionnaire development

A tool called SurveyXact, created by the Rambøll group (i.e. an engineering, architecture and consultancy company in Copenhagen, Denmark) was used for the development of our survey-questionnaire, because it is available to researchers at the University of Copenhagen as a digital resource. It is relatively easy to master, enables the 'secure handling of data' and 'complies with the EU's personal data regulations (GDPR) by ensuring anonyminity' (Rambøll 2021).

The survey began with a short introduction to the aim of the study, how long the questionnaire would take to complete ($\sim$8 min), and a confirmation to all participants that their responses would be kept anonymous (see Supplementary Appendix B). If and when an academic agreed to participate, they could click on a 'next' button, and this would lead to the first set of four demographic questions (i.e. What is your: *gender, faculty affiliation, academic position, years active as a publishing researcher?*), each considered to be of interest, based on previous research on collaboration (i.e. Harris et al. 2009; Abramo, Ciriaco and Murgia 2013; Abramo, D'Angelo and Murgia 2014; Holman and Morandin 2019).

The second part of the survey was comprised of seven questions about collaboration *habits*. These were developed to reflect different forms of interaction, from none at all to those that might take place at an increased geographical distance. Each item was worded as a statement and required respondents to indicate a frequency level on a 5-point rating scale (1. *Never*, 2. *Rarely*, 3. *Sometimes*, 4. *Often*, and 5. *Always*). The questions were as follows:

1) *I work and publish research alone/on my own*
2) *I collaborate and publish research with people from the same department*
3) *I collaborate and publish research with people from different faculties at UCPH*
4) *I collaborate and publish research with people from other Danish academic institutions*
5) *I collaborate and publish research with people from non-academic organisations*
6) *I collaborate and publish research with people from universities/institutions abroad*
7) *I think about the person(s) with whom I want to collaborate and publish*

The third part focused on *preferences* with regard to collaboration (see Table 1). Twenty-seven new statements were prepared, all beginning with: '*I prefer to collaborate and publish with people …*.' Here, respondents were asked to indicate their level of agreement on a 7-point Likert scale (1. *Strongly disagree*, 2. *Disagree*, 3. *Somewhat disagree*, 4. *Neutral*, 5. *Somewhat agree*, 6. *Agree*, and 7. *Strongly agree*).

In Table 1, each 'preference' question was ordered initially to reflect the three dimensions of social capital—*cognitive*, *relational*, and *structural* (Nahapiet and Ghoshal 1998). All were coded in brief terms according to an underlying features, also explained in Nahapiet and Ghoshal (1998), but only for analytic purposes (see text used to describe Figure 1). At the time that the survey was piloted, the 27 questions were

presented in random order so that respondents were not aware of our thematic schema.

We wrote the questions to be generic enough so that any researcher could provide an answer, regardless of field and level of agreement. For example, all researchers can, to a greater or lesser extent, relate to questions about the 'trusted competencies' of a collaborator (Q17), productivity 'deadlines' (Q18), as well as 'feedback' on their work (Q15) and 'citations' received after the work is published (Q24). We acknowledge that collaboration can lead to many types of outcomes; however, in keeping with our study's objective, we consistently reminded respondents to think about collaboration as it leads to publishing new research. If one or more academics selected the following response to years active in publishing: '*I am not and have not been a publishing researcher*', the survey was designed to end automatically.

Respondents' navigational progress was shown by a percentage complete bar at the bottom of each survey page. They were not able to continue forward unless every question was completed. If a question was forgotten they received an error alert—i.e. '*must be completed*'. If the respondent wanted to change an answer to a question, they could click on a 'previous' button, allowing them to navigate backwards. If they decided that they no longer wished to participate, they could freely exit the survey at any time.

At an early stage of development, a preliminary test of the survey was carried out with four researchers at the Department of Communication, University of Copenhagen (15 March 2021). The purpose was to ensure that the instrument was free of technical errors, and that the questions were easy to read and understand. The feedback from the four researchers led to a few adjustments in wording prior to its launch.

### 4.2 Recruitment of participants

Our recruitment of survey participants began with a manual search for employed academics at each of the University of Copenhagen department websites. An ethics clearance for this task and for the research was confirmed by our university department. We restricted our study to one university population so that we could keep a wide array of additional variables at a constant. The manual search was carried out by two Master's degree students in March 2021, and was limited to the following types of academics: *PhD students, Postdocs, Assistant, Associate*, and *Full Professors*, including *Visiting Scholars*. This resulted in a total of n $=$ 7,453 names, which we recorded in an Excel file along with individual email addresses. The file was then stored on a secure server drive at the university, where we also kept responses to the questionnaire.

On the sixth of April, 2021, an email message with a link to the online questionnaire was sent to the 7,453 individuals. The email included a brief explanation of the study, the researchers involved, and a note concerning the respondents' right to anonymity (see Supplementary Appendix A). An email with a reminder to complete the survey was sent on the 14th of April 2021. The survey was closed for submissions on the 26th of April 2021.

A total of 1,635 respondents entered the survey, but only 1,094 completed all questions. Two responses were deemed ineligible and removed from the dataset. This resulted in a final response rate of 15% at n $=$ 1,092. For an online survey, 15% is considered an acceptable rate. To achieve a 95% confidence rate and 5% margin of error, we would have needed at least 366 responses (i.e. 366 from the initial 7,453 identified academics). Thus having achieved a sample size of n $=$ 1,092 means that our margin of error was at 3%. At 3%

**Table 1.** Preference items ordered by dimension and underlying features of social capital

| Cognitive: *I prefer to collaborate and publish with people* | Underlying features |
|---|---|
| Q01 … with whom I can exchange and share knowledge | Shared language and codes/reciprocity |
| Q02 … who share the same attitudes and beliefs about research | Shared narratives: values, attitudes, beliefs |
| Q03 … where we can take advantage of our different expertises | Shared language and codes |
| Q04 … who share my expectations of work productivity | Shared attitude |
| Q05 …who agree with me on the paradigm for the given research project | Shared narratives: values, attitudes, beliefs |
| Q06 … who prioritize the process of working and interacting together | Shared language and codes/reciprocity |
| Q07 … who are in regular contact with me about our research project | Shared language and codes/reciprocity |
| Q08 … who produce a good final result, therefore it is less important how they work | Shared goals and purpose |
| Q09 … who I can work closely with on joint tasks | Shared language and codes/reciprocity |
| Q10 … who challenge my understandings and beliefs | Shared narratives: values, attitudes, belief |

| Relational: *I prefer to collaborate and publish with people* | Underlying features |
|---|---|
| Q11 … who have the same perspective on conducting research as me | Norms |
| Q12 … who share my ambitions for the research project | Identification |
| Q13 … whom I know well | Trust and trustworthiness |
| Q14 … who take a different approach to research than me | Norms |
| Q15 … who are available to provide/receive feedback | Obligation |
| Q16 … who I know are effective and will get the work done | Obligation |
| Q17 … whose competences I trust will make the research easier | Trust and trustworthiness |
| Q18 … who I know will comply with our deadlines | Obligation |
| Q19 … with whom I have previously worked | Trust and trustworthiness |
| Q20 … who share the same vision as me | Identification |

| Structural: *I prefer to collaborate and publish with people* | Underlying features |
|---|---|
| Q21 … who bring resources from a research community different from mine | Bridging/network ties |
| Q22 … who are top researchers in their field | Linking/network configuration |
| Q23 … who are similar to me and my research | Bonding/network ties |
| Q24 … who will increase my citation rate and have a positive effect on my h-index | Linking/appropriable organization |
| Q25 … who have had more experience with research than me | Linking/network configuration |
| Q26 … who come from a different academic background than me | Bridging/network ties |
| Q27 … who allow me to be part of a networked community of researchers | Bonding/network ties |

**Table 2.** Survey response rates and percentages per University of Copenhagen faculty

| Faculty | Faculty population | Survey response rate per faculty | Percentage of faculty population |
|---|---|---|---|
| Health & Medical Sciences | 2,993 | 383 | 13 |
| Science | 2,747 | 449 | 16 |
| Social Sciences | 514 | 65 | 13 |
| Humanities | 881 | 142 | 16 |
| Law | 199 | 32 | 16 |
| Theology | 119 | 21 | 18 |
| Total | 7,453 | 1,092 | 15 |

we can be relatively confident that the views of our respondents reflected those of the academic population.

## 5. Survey results and analyses

### 5.1 Response rates and demographics
Results are shown in Table 2 and Table 3.

### 5.2 Questionnaire validity and reliability
To examine the structural dimensions of the questionnaire, an exploratory factor analysis was carried out using oblique

**Table 3.** Independent variables and response rates based on total questionnaire responses

| Independent variables | Respondents (n = 1,092) | Percentage of the total sample |
|---|---|---|
| Gender | | |
| Woman | 434 | 40 |
| Man | 642 | 59 |
| Non-binary | 6 | 0.5 |
| Do not want to disclose | 10 | 1 |
| | 1,092 | 100 |
| Academic position | | |
| Full professor | 162 | 15 |
| Professor MSO | 18 | 2 |
| Associate professor | 285 | 26 |
| Assistant professor | 88 | 8 |
| Emeritus/emerita | 55 | 5 |
| Postdoctoral fellow | 195 | 18 |
| PhD student | 219 | 20 |
| Visiting researcher | 14 | 1 |
| Other | 56 | 5 |
| | 1,092 | 100 |
| Years active in publishing | | |
| 0–5 | 328 | 30 |
| 6–10 | 176 | 16 |
| 11–15 | 134 | 12 |
| 16–20 | 110 | 10 |
| 21–25 | 106 | 10 |
| 26–30+ | 238 | 22 |
| | 1,092 | 100 |

rotation and Kaiser normalization (see Carpenter 2018). This was completed after receiving the 1,092 questionnaire responses, followed by a Cronbach's alpha test of the questionnaire's reliability. The extraction and retention of factors was based a visual examination of a scree plot. Figure 2 shows the scree plot and point of inflection at the fifth component. Table 4 shows the factor loadings for the 27 questionnaire items. The Kaiser-Meyer-Olkin (KMO) measure verified sampling adequacy (KMO = 0.881). Bartlett's test of sphericity, $X^2(351) = 7,774.863$, P < 0.001, indicates that correlations between the items were sufficiently large for a factor analysis.

Table 4, below, supports Nahapiet and Ghoshal's (1998) tenet that the three primary dimensions of social capital are not mutually exclusive and that there are complex interactions among them. Our factor analysis yielded the following five factors, which show how the primary dimensions interrelate: (1) *Reciprocity & Obligation*, (2) *Bridging Networks*, (3) *Links to a Network*, (4) *Trust & Familiarity*, and (5) *Shared Understandings*.

A Cronbach's alpha test for the preference items scaled according to Nahapiet and Ghoshal's (1998) dimensions resulted in a range of acceptable to uncertain values. The scale for the *cognitive* dimension consisted of 10 items ($\alpha = 0.712$), the second scale for the *relational* dimension consisted of 10 items ($\alpha = 0.696$), and the third scale for the *structural* dimension consisted of 7 items ($\alpha = 0.638$). Results indicated that slight improvements to these alpha values would be obtained by removing question 8 from the *cognitive* scale (improved $\alpha = 0.757$), question 14 from the *relational* scale (improved $\alpha = 0.730$), and questions 21 and 23 from the *structural* scale (improved $\alpha = 0.645$ and 0.647 respectively).

A second Chronbach's alpha test based on the 5 factors shown in Table 4, resulted again, in a range of acceptable to uncertain values. The first subscale *reciprocity & obligation* consisted of 10 items ($\alpha = 0.821$), the second subscale *bridging networks* consisted of 6 items ($\alpha = 0.629$), the third subscale *links to a network* consisted of 3 items ($\alpha = 0.597$), the fourth subscale *trust & familiarity* consisted of 3 items ($\alpha = 0.611$), and the fifth subscale *shared-understandings* consisted of 5 items ($\alpha = 0.743$) Similar to the first test, the alpha value for '*bridging networks*' would be improved to an $\alpha = 0.707$ by removing question 8, and the alpha value for the subscale *trust & familiarity* would be improved to $\alpha = 0.637$ by removing question 23. Together, both tests show that: (1) two of the questions (i.e. Q8 and Q23) were not internally consistent to our measure of social capital, and (2) two additional questions (i.e. Q14 and 21) were not suited to the scales (dimensions) to which they were assigned.

## 5.3 Collaboration habits

Figure 3 shows the extent to which collaboration habits are similar or different across the six University of Copenhagen faculties.

Our analyses show that academics in **Theology** have a frequent tendency to '*publish research alone*' (62% responded '*often*' and 10% responded '*always*').

Academics from the **Health and Medical Sciences** as well as the **Sciences** confirmed that they are just as likely to collaborate '*often*' (54% and 53% respectively) with people from '*other universities/institutions abroad*' as they do with '*people from the same department*' (52% and 49% respectively).

Both the **Humanists** and **Social Scientists** indicated the lowest frequency of collaboration with '*people from different faculties*' at the university (47% and 52% respectively stated '*never*'). And, at the **Law** faculty, 63% '*always*' think about with whom they want to collaborate; whilst 41% of respondents (same faculty) said that they '*never*' collaborate with people '*from other Danish academic institutions*'.
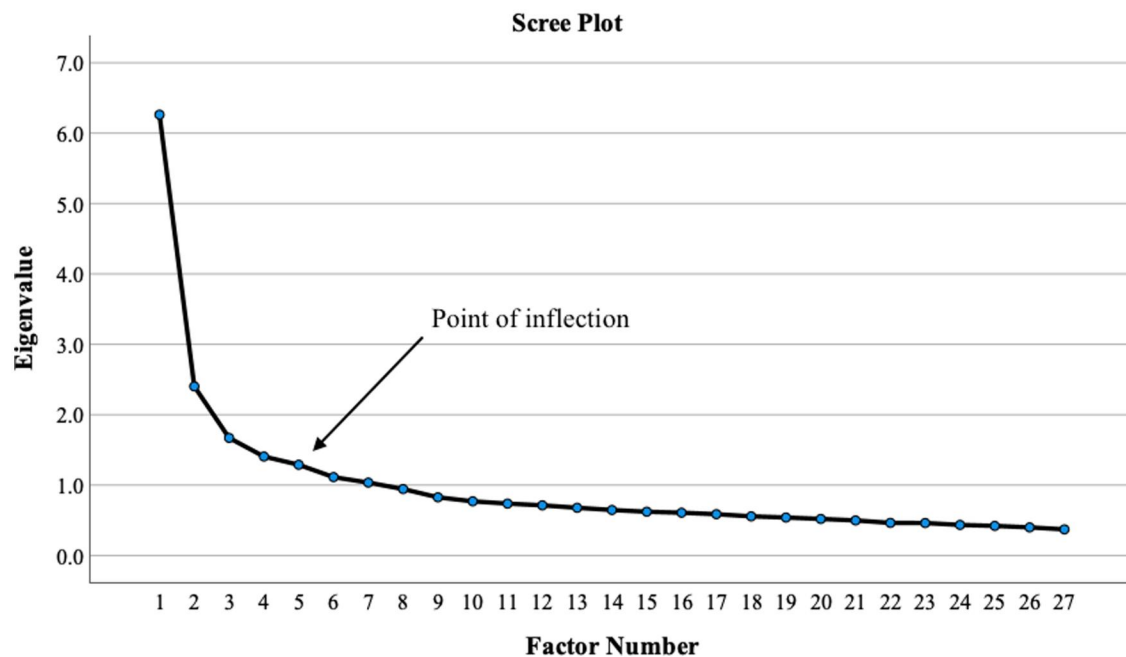


**Figure 2.** Scree plot.

**Table 4.** Factor loadings for 27 questionnaire items and % of variance explained with oblique rotation

| Questionnaire item | Factor | | | | |
| --- | --- | --- | --- | --- | --- |
| | Reciprocity and obligation | Bridging networks | Links to a network | Trust and familiarity | Shared understandings |
| Q15 …who are available to provide/receive feedback | **0.654** | 0.316 | | | 0.336 |
| Q06 …who prioritize the process of interacting and working together | **0.63** | 0.338 | | | 0.336 |
| Q16 …who I know are effective and will get the work done | **0.623** | | 0.403 | | 0.370 |
| Q18 …who I know will comply with our deadlines | **0.620** | | 0.358 | | |
| Q07 …who are in regular contact with me about the research project | **0.619** | | | 0.304 | |
| Q09 …who can work closely with me on joint tasks | **0.556** | | | 0.449 | |
| Q04 …who share my expectations of work productivity | **0.534** | | 0.36 | | 0.482 |
| Q27 …who allow me to be part of a networked community of researchers | **0.489** | 0.348 | 0.373 | | |
| Q17 …whose competencies I trust will make the research easier | **0.404** | | 0.328 | | |
| Q01 …with whom I can exchange and share knowledge | **0.386** | 0.379 | | | 0.362 |
| Q21 …who bring resources from a research community that is different from me | | **0.597** | | | |
| Q03 …where we can take advantage of our different expertises | 0.333 | **0.595** | | | |
| Q26 …who come from a different academic background than me | | **0.586** | | | |
| Q10 …who challenge my understandings and beliefs | 0.431 | **0.562** | | | |
| Q14 …who take a different approach to research than me | | **0.549** | | | |
| Q24 …who will have a positive effect on my h-index/increase my citation rate | | | **0.603** | | |
| Q22 …who are top researchers in their field | | | **0.593** | | |
| Q25 …who have more experience with research than me | | | **0.513** | | |
| Q08 …who produce a good final result, thus I find it less important than how they work | | *(0.124)* | | | |
| Q19 …with whom I have previously worked | | | | **0.594** | |
| Q13 …whom I know well | | | | **0.555** | 0.309 |
| Q23 …who are similar to me and my research | | | 0.317 | **0.470** | 0.326 |
| Q02 …who share the same attitudes and beliefs about research | 0.301 | | | | **0.699** |
| Q11 …who have the same perspective on conduction research as me | | | | | **0.667** |
| Q12 …who share my ambition for the research project | 0.456 | | | | **0.589** |
| Q05 …who agree with me on the paradigm for the research project | 0.390 | | | | **0.487** |
| Q20 …who have the same vision as me | 0.329 | | | 0.427 | **0.464** |
| Eigenvalues | 5.65 | 1.779 | 1.035 | 0.797 | 0.701 |
| Total variance explained (%) | 20.953 | 6.588 | 3.832 | 2.952 | 2.617 |
| Cumulative variance explained (%) | 20.953 | 27.541 | 31.373 | 34.326 | 36.943 |

Values with highest loading are written in bold font. Loadings below 0.3 are not shown, with the exception of item Q08, written in italics (0.124).

Another clear finding was that the majority of both the **Social Scientists** and **Humanists** '*never*' collaborated with *non-academic organizations* (54% and 56% respectively), whereas in **Law,** the **Health and Medical Sciences,** and **Sciences,** academics confirmed that this '*sometimes*' occurs (31%, 25%, and 24% respectively). Note that for **Social Scientists** and **Humanists,** previous research has shown that if they do collaborate with non-academic organizations and communities, this may occur as 'consultancy or contract research', which may also depend on the individual's academic status (Olmos-Peñuela, Castro-Martínez and D'Este 2014: 696).

At Figure 4, we see that academics with **~16 to 20 years** and also **26 to 30 + years** of publishing experience, tend to collaborate '*often*' with '*people from the same department*'. However, individuals who reported having the fewest years of experience in publishing (i.e. **0–5 years**) not only said that they did so '*often*' (38%) but some said '*always*' (25%). When an academic is new at the publishing 'game' and needs to learn more through collaborative work, they are most

likely to be with people from the same department—i.e. a senior research supervisor. This same category of respondents (i.e. with **0–5 years**) also overwhelmingly reported (62%) that they have '*never*' published research '*with non-academic organizations (business/public sector)*'. However, there were some respondents from this category who said that they collaborate '*with people from other universities/institutions abroad*' (i.e. 32% and 34% of respectively said '*sometimes*' and '*often*'). This could be because they had been assigned to a senior academic's international project and thus learned to collaborate with members of an international team.

As an academic acquires more and more years of publishing experience, there is a growing tendency to '*always*' think about '*the person(s) with whom they want to collaborate*'. This is a habit that seems to begin after 11 years of experience or more, where 57% of academics said that this was '*always*' true (i.e. at the **11–15 year** category), and then again, at a peak rate of 71% '*always*' for academics with **16–20 years** of publishing experience.
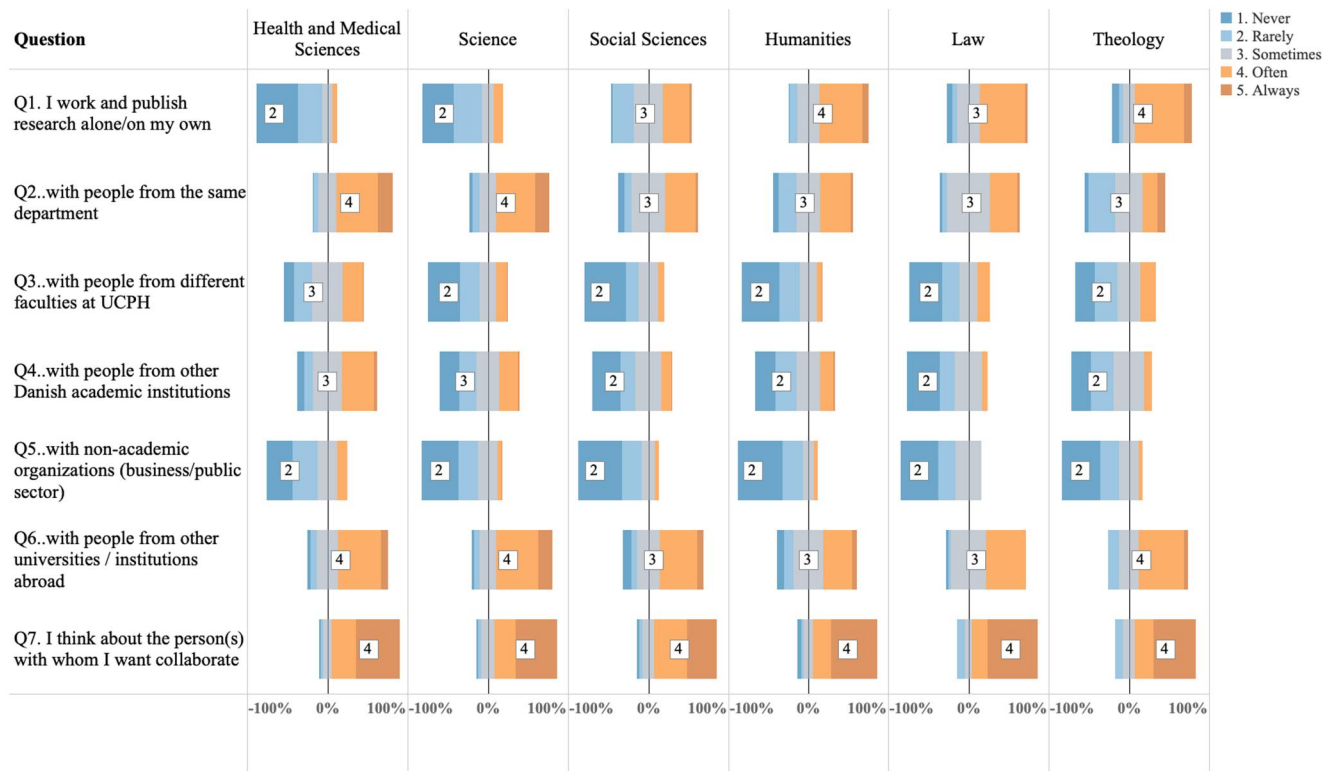
**Figure 3.** Collaboration habits and mean responses across six UCPH faculties: **Health and Medical Sciences**, **Science**, **Social Sciences**, **Humanities**, **Law** and **Theology**. Distributions are rescaled to Gantt percentages, showing the proportion of low-collaboration frequency responses '*Never*' and '*Rarely*' (left of the vertical line corresponding to '*Sometimes*'), and the high-collaboration frequency responses '*Often*' and '*Always*' to the right of the vertical line.
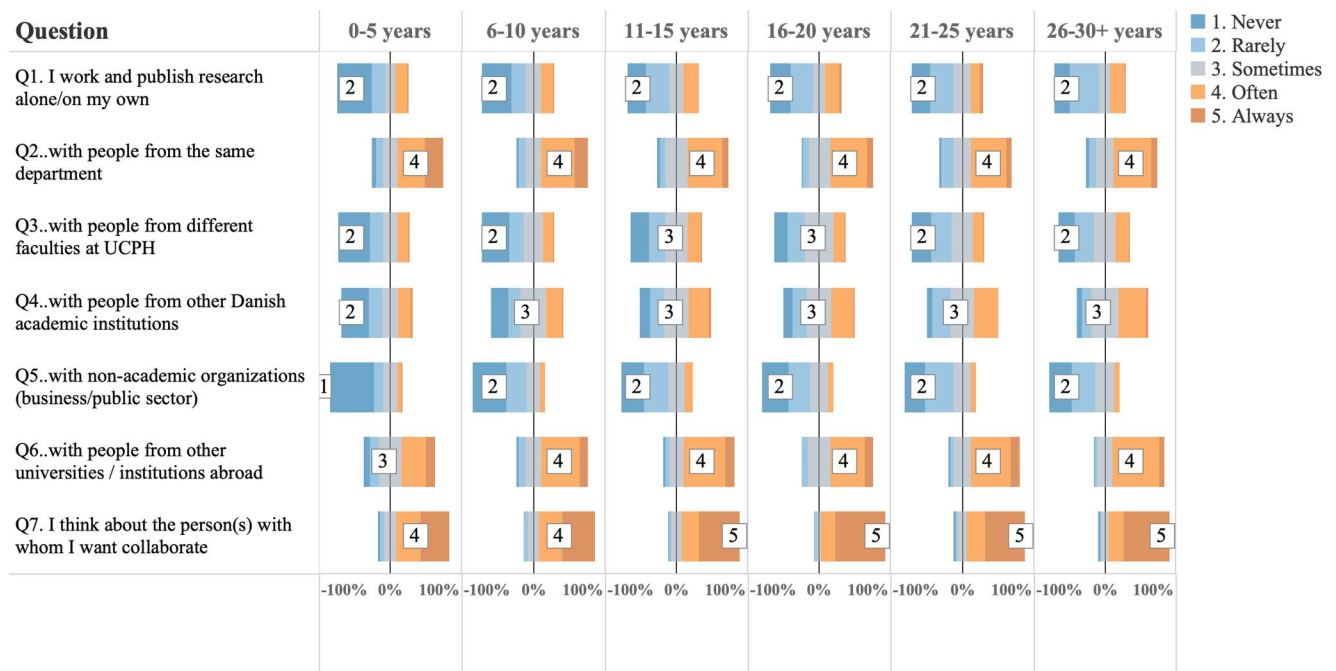


**Figure 4.** Collaboration habits and mean responses across six categories pertaining to years active in publishing research: **0–5, 6–10, 11–15, 16–20**, and **26–30** years. Distributions are rescaled to Gantt percentages, showing the proportion of low-collaboration frequency responses '*Never*' and '*Rarely*' (left of the vertical line corresponding to '*Sometimes*'), and the high-collaboration frequency responses '*Often*' and '*Always*' to the right of the vertical line.

For the four independent variables in this study—i.e. gender, academic position, faculty affiliation, and number of years active, *Kruskal-Wallis tests* were computed to determine if there were statistically significant differences between one or more groups. Table 5 shows the results of these tests. In terms of the respondents' academic position, and years active in publishing, the *Kruskal-Wallis tests* indicated significant differences across all habits.

Across the different university faculties, six of the primary habits confirmed a hypothesis of significant differences with the exception of habit #7. This means that the academics vary considerably in their collaboration habits, even though a significant percentage responded similarly to '*thinking about the person(s) with whom they might collaborate*'.

There was a significant effect related to gender at the sixth habit—i.e. *working and publishing with people from universities/institutions abroad* [H(3) = 19.05, P = 0.001]. This result, in particular, confirms what has been shown in previous research (e.g. Abramo, Ciriaco and Murgia 2013).

At Figure 5, more than half of the respondents who identified as men stated that they collaborate '*often*' (56%) or '*always*' (11%) with *people from universities/institutions abroad*. Here the distribution is positively skewed, with only 3% to 6% respectively, stating '*rarely*' or '*never*'. The responses to the same question given by women were less skewed. Whilst 43% indicated '*often*' and 12% '*always*' in response to collaborating with *people from universities/institutions abroad*, a slightly higher percentage of women, compared to men, responded that they '*rarely*' (11%) or '*never*' (6%) do.

## 5.4 Social capital preferences

Figure 6 shows the results for the 27 survey items concerning social capital.

Since the results in Figure 6 appear to be similar across the six faculties, we computed a nonparametric *Kruskal-Wallis test* to determine if there were any statistically significant differences between the four independent variables. Table 6 shows the results of these tests. The significant response differences at the level of the individual's faculty affiliation are written in bold font (n = 12), and listed in descending order from significant to non-significant values. These 12 questions

are used later in Section 5.4 for a comparison with collaboration habits.

The University of Copenhagen academics, at the level of **gender, academic position, years active in publishing,** and **faculty affiliate** show significantly different preferences when it comes to *collaborating with persons that they know well* (Q13). Evidence also points to significant differences in terms of what the academics prefer (at all levels), when collaborating with persons who *comply with deadlines* (Q18). In this case, preferences do not necessarily always match with reality. Sometimes research deadlines are extended; therefore, one must have a reasonable expectation/preference in this regard.

At the level of **academic position**, seven of the statistically significant differences in social capital preferences were associated with the '*relational*' dimension (i.e. 7 of 10 questions; 70%), two were associated with the '*cognitive*' dimension (3 of 10 questions; 30%), and three with the '*structural*' dimension (3 of 7 questions; 43%). An individual's **academic position**, for instance, makes a significant difference in the degree to which there is a preference for having a collaborator/collaborators *available to provide/receive feedback* (Q15). In other words, feedback may be more requested and have more significance to the work of a Postdoctoral Fellow or tenure track Assistant Professor, than a Full Professor.

At the level of **gender**, four of the statistically significant differences in social capital preferences were associated with the '*structural*' dimension (i.e. 4 of 7 questions; 57%), four were associated with the '*relational*' dimension (4 of 10 questions; 40%), and three were associated with the '*cognitive*' dimension (3 of 10 questions; 30%). The key differences were aligned with choosing collaborators that are *similar to them and their research* (Q23), and *with whom they have previously worked* (Q19).

When it comes to **years active in publishing**, the academics differed significantly in their preferences for collaborating with people *who have had more experience with research* (Q25). At this level, four of the statistically significant differences in social capital preferences were associated with the '*cognitive*' dimension (4 of 10 questions; 40%), four were associated with the '*relational*' dimension (4 of 10 questions;

**Table 5.** Kruskal–Wallis test for K-dependent samples

| Collaboration habit | Gender | Academic position | Years active in publishing | Faculty affiliation |
|---|---|---|---|---|
| *1. I work and publish alone* | H(3) = 4.85, P = 0.184 | H(9) = 39.14, P < 0.001* | H(5) = 25.07, P < 0.001* | H(5) = 359.27, P = 0.000* |
| *2. … with people from the same department* | H(3) = 1.65, P = 0.648 | H(9) = 21.26, P = 0.012* | H(5) = 15.82, P = 0.007* | H(5) = 85.22, P < 0.001* |
| *3. … with people from different facilities at UCPH* | H(3) = 4.94, P = 0.177 | H(9) = 29.24, P < 0.001* | H(5) = 26.76, P < 0.001* | H(5) = 122.55, P = 0.000* |
| *4 … with people from other Danish academic institutions* | H(3) = 4.88, P = 0.181 | H(9) = 100.82, P = 0.000* | H(5) = 93.06, P = 0.000* | H(5) = 106.26, P = 0.000* |
| *5 … with people from non-academic organizations (business/public sector)* | H(3) = 4.96, P = 0.175 | H(9) = 63.53, P < 0.001* | H(5) = 48.95, P < 0.001* | H(5) = 37.15, P ≤ 0.001* |
| *6 … with people from universities/institutions abroad* | H(3) = 19.05, P < 0.001* | H(9) = 58.83, P < 0.001* | H(5) = 41.08, P < 0.001* | H(5) = 47.28, P ≤ 0.001* |
| *7. I think about the persons with whom I want to collaborate* | H(3) = 5.29, P = 0.152 | H(9) = 48.82, P < 0.001* | H(5) = 49.78, P < 0.001* | H(5) = 8.36, P = 0.138 |

Asymptotic significances (two-sided tests).
Collaboration habits related to gender, academic position, years active in publishing, and University of Copenhagen faculty affiliation.
*   Significance level is 0.050.
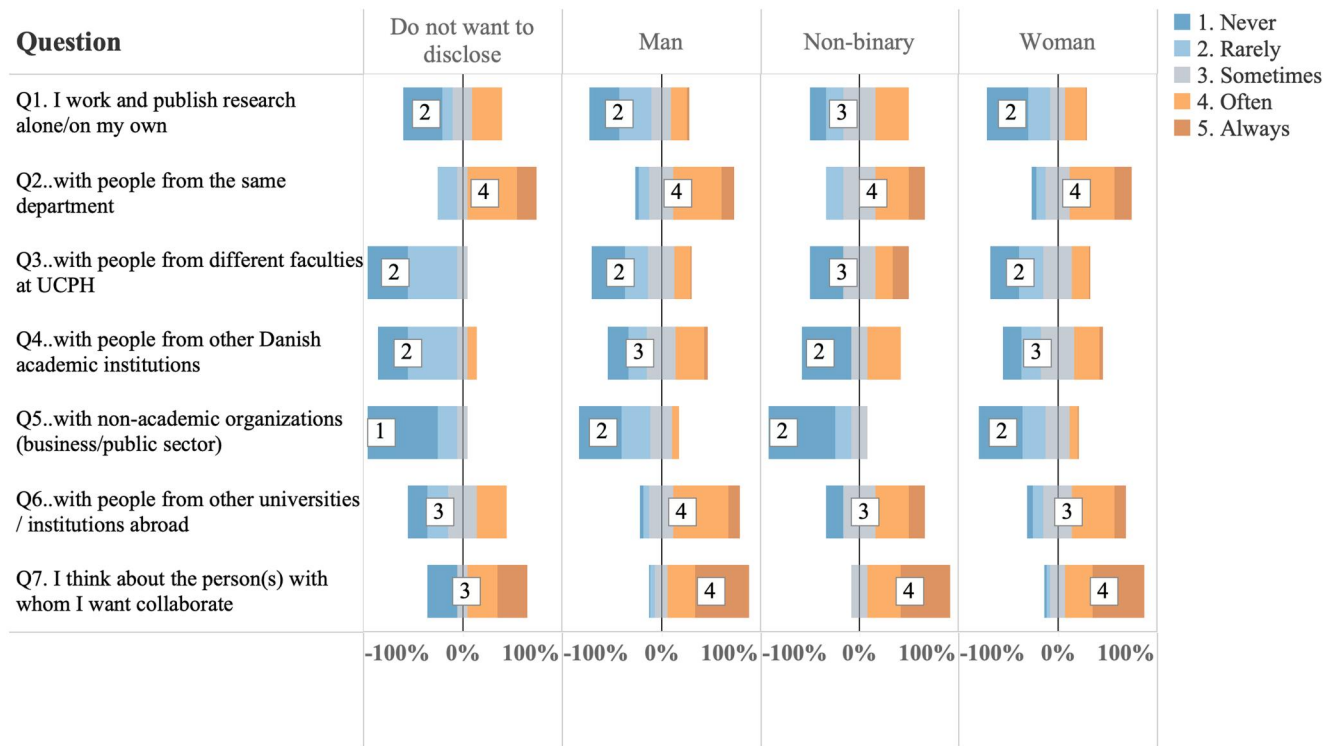
**Figure 5.** Collaboration habits and mean responses across four categories pertaining to gender: **Do not want to disclose**, **Man**, **Non-binary**, and **Woman**. Distributions are rescaled to Gantt percentages, showing the proportion of low-collaboration frequency responses '*Never*' and '*Rarely*' (left of the vertical line corresponding to '*Sometimes*'), and the high-collaboration frequency responses '*Often*' and '*Always*' to the right of the vertical line.
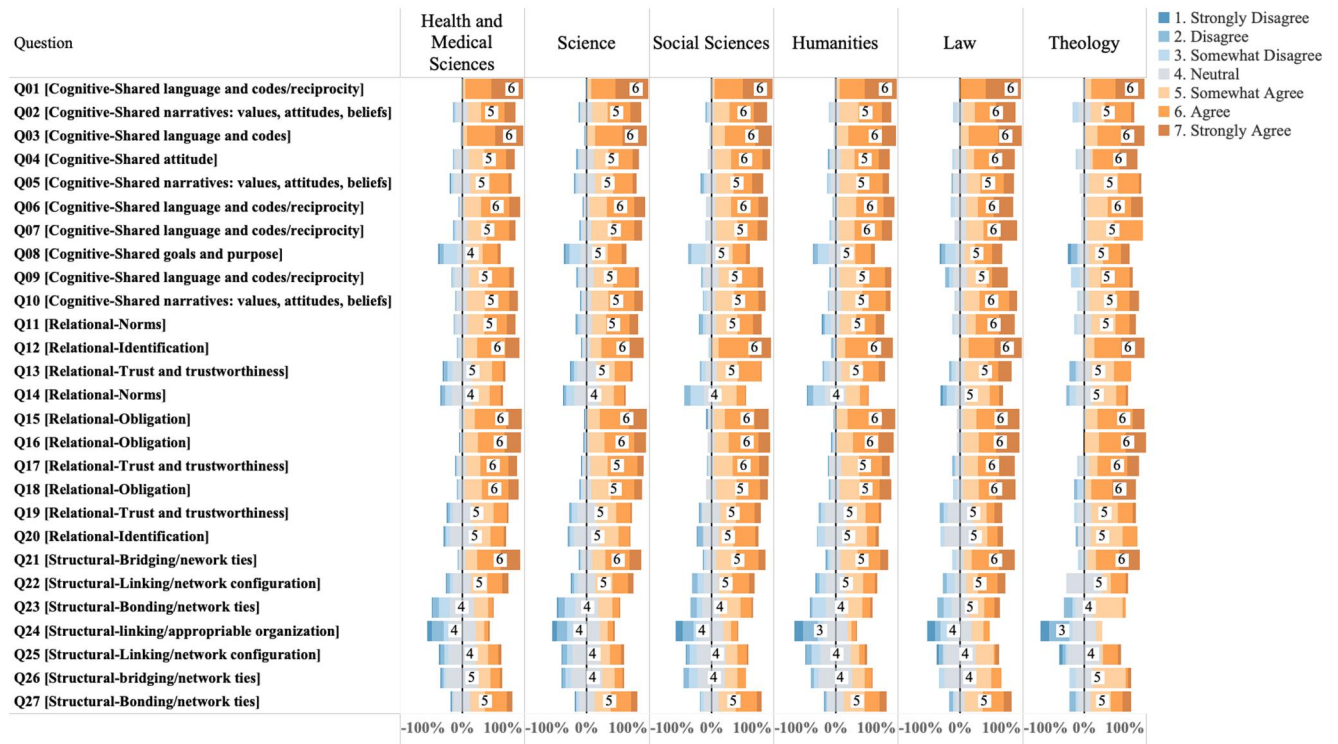


**Figure 6.** Collaboration preferences and mean responses across across six UCPH faculties: **Health and Medical Sciences, Science, Social Sciences, Humanities, Law** and **Theology**. Distributions are rescaled to Gantt percentages, showing the proportion of low-preference responses '*Strongly Disagree*', '*Disagree*', and '*Somewhat Disagree*' (left of the vertical response line corresponding to '*Neutral*'), and the high-preference responses '*Somewhat Agree*', '*Agree*', and '*Strongly Agree*' to the right of the vertical line.

**Table 6.** Kruskal-Wallis test for collaboration preferences across gender, academic position, years active in publishing, and faculty affiliation

| Q# | Question | Social capital dimension | Gender | Academic position | Years active in publishing | Faculty affiliation |
|---|---|---|---|---|---|---|
| | | | | | Sig.[a,*] | |
| Q12 | … who share my ambitions for the research project | Relational | 0.346 | 0.016* | 0.147 | **<0.001***  |
| Q21 | … who bring resources from a research community different from mine | Structural | 0.002* | 0.552 | 0.904 | **<0.001***  |
| Q13 | … whom I know well | Relational | <0.001* | <0.001* | <0.001* | **<0.001***  |
| Q03 | … where we can take advantage of our different expertises | Cognitive | 0.053 | 0.409 | 0.614 | **<0.001***  |
| Q23 | … who are similar to me and my research | Structural | 0.007* | 0.350 | <0.001* | **0.003*** |
| Q04 | … who share my expectations of work productivity | Cognitive | 0.057 | 0.240 | 0.961 | **0.004*** |
| Q05 | … who agree with me on the paradigm for the given research project | Cognitive | 0.176 | 0.040* | 0.041* | **0.008*** |
| Q18 | … who I know will comply with our deadlines | Relational | 0.039* | <0.001* | 0.007* | **0.008*** |
| Q14 | … who take a different approach to research than me | Relational | 0.150 | 0.620 | 0.640 | **0.014*** |
| Q07 | … who are in regular contact with me about our research project | Cognitive | 0.126 | 0.051 | 0.044* | **0.028*** |
| Q24 | … who will increase my citation rate and have a positive effect on my h-index | Structural | 0.339 | 0.120 | 0.004* | **0.031*** |
| Q26 | … who come from a different academic background than me | Structural | 0.080 | 0.534 | 0.957 | **0.039*** |
| Q25 | … who have had more experience with research than me | Structural | 0.002* | 0.000* | 0.000* | 0.064 |
| Q20 | … who share the same vision as me | Relational | 0.430 | 0.017* | 0.637 | 0.086 |
| Q16 | … who I know are effective and will get the work done | Relational | 0.023* | 0.159 | 0.516 | 0.204 |
| Q11 | … who have the same perspective on conducting research as me | Relational | 0.629 | 0.619 | 0.052 | 0.212 |
| Q19 | … with whom I have previously worked | Relational | <0.001* | 0.015* | <0.001* | 0.212 |
| Q22 | … who are top researchers in their field | Structural | 0.379 | 0.009* | 0.025 | 0.272 |
| Q02 | … who share the same attitudes and beliefs about research | Cognitive | 0.760 | 0.487 | 0.645 | 0.287 |
| Q10 | … who challenge my understandings and beliefs | Cognitive | 0.122 | 0.310 | 0.025* | 0.381 |
| Q09 | … who I can work closely with on joint tasks | Relational | 0.374 | <0.001* | <0.001* | 0.464 |
| Q17 | … whose competences I trust will make the research easier | Relational | 0.132 | 0.660 | 0.614 | 0.495 |
| Q08 | … who produce a good final result, therefore it is less important how they work | Cognitive | <0.001* | 0.009* | <0.001* | 0.540 |
| Q15 | … who are available to provide/receive feedback | Relational | 0.052 | 0.044* | 0.191 | 0.873 |
| Q01 | … with whom I can exchange and share knowledge | Cognitive | 0.011* | 0.254 | 0.320 | 0.927 |
| Q27 | … who allow me to be part of a networked community of researchers | Structural | 0.009* | 0.010* | 0.006* | 0.929 |
| Q06 | … who prioritize the process of working and interacting together | Cognitive | 0.010* | 0.005* | 0.062 | 0.970 |

Questions listed in descending order of significance (bold font) according to faculty affiliation.

\* Significance level is 0.050.

a Asymptotic significance is displayed.

40%), and four with the '*structural*' dimension (4 of 7; 57%).

Figure 7 presents the 12 significant preferential differences across **faculty affiliation**. Here we see where some of the main disciplinary inclinations lie. For instance, the **Health and Medical Scientists** tended to '*agree*' (46%) and '*strongly agree*' (44%) with collaborations that would allow them to '*take advantage of different expertises*'. The **Humanists,** in particular, also showed a preference for this same dimension of social capital (54% '*agree*' and 22% '*strongly agree*').

**Health and Medical Scientists** and **Scientists** indicated a preference for collaborators that would be as '*ambitious as they are about a research project*' (45% '*agreed*' and 22% '*strongly agreed*', and 45% '*agreed*' and 23% '*strongly agreed*' respectively); however, it was the **Social Scientists**

that seemed to care about '*ambition*' the most (i.e. 51% stated that they '*agree*' and 34% '*strongly agreed*'). The **Social Scientists** also confirmed (51% responding to '*agree*' and 12% responding to '*strongly agree*') that it was preferential to have collaborators that '*shared their expectations of work productivity*', whilst 29% '*somewhat agreed*' to a preference of collaborating with colleagues '*who take a different approach to research than themselves*'. This stands in sharp contrast to the **Health and Medical Scientists** and **Scientists** who were not sure if they preferred a different approach or not, and thus gave a *neutral* response (33% and 41% respectively).

At the **Humanities** faculty, 40% considered it preferable to collaborate with persons who share the same ideas/views on the chosen '*paradigm for a given research project*' (i.e. 40%
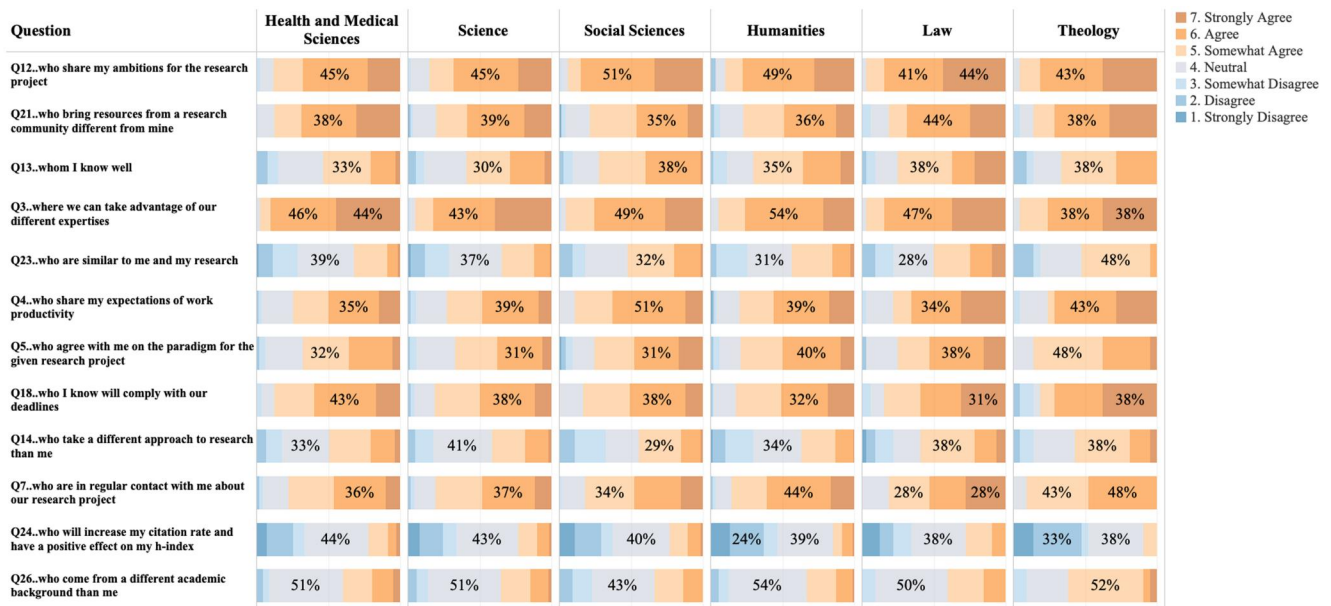
**Figure 7.** Responses as percentages (ie maximum rates) per UCPH faculty (**Health and Medical Sciences**, **Science**, **Social Sciences**, **Humanities**, **Law** and **Theology**) and social capital preferences at Q12, Q21, Q13, Q3, Q23, Q4, Q5, Q18, Q14, Q7, Q24, and Q26.

*'agreed'*). Both the **Humanists** and the **Theologians** also indicated disagreement (24% and 33% respectively) with choosing collaborators who would *'increase their citation rate and have a positive effect on their h-index'*. The **Health and Medical Scientists** and **Scientists** on the other hand, tended to be *'neutral'* about this issue (44% and 43% respectively).

Note also that academics from **Law** indicated a strong preference for collaborators that were *'in regular contact throughout a research project'* (28% *'strongly agreed'*). In contrast, 0% of the academics at **Theology** *'strongly agreed'* to this item, but 48% responded with *'agree'*.

### 5.5 Social capital preferences for collaboration versus collaboration habits

Our final analysis compares what the University of Copenhagen academics prefer as collaborators with what they do. Table 7 presents the Spearman's rank correlation values computed across the top 12 significant findings for social capital preference at the faculty level (as listed in Table 6) with the 7 collaboration habits.

Note that almost all correlation values in Table 7 are weak. Some make sense, as in the first example, whilst other values indicate that preferences resonated with the academics somewhat distinctly from their actual habits. For example, the significant negative correlation between a preference for *'taking advantage of different expertises'* and a habit of *'working alone'* (rho = −0.132**) indicates that some academics are more likely to work alone if they have indicated a lower preference for collaborators with different expertises.

Moreover, when academics have a habit of *'thinking about with whom to collaborate'* this corresponds to a significant, though weak preference for *'sharing expectations about work productivity'* (rho = 0.154**). Academics are thus thoughtful about their selection processes if it means taking on more work than a chosen collaborator. But, not as thoughtful as we might assume, due to the fact that one never knows beforehand what a collaboration will be like, if the individual has no experience of working with a certain person.

A significant, though weak correlation was found between a preference for *'resources from a research community that is different'* and a collaboration habit of working with *'people from different faculties at the university'* (rho = 0.175**).

It is also of interest to see that the corresponding Spearman's rho values are not as strong as one might expect, concerning a preference for *'taking advantage of different expertises'* and a collaboration habit involving: (1) *'people from different faculties at the university'* (rho = 0.129**), (2) *'people from other Danish academic institutions'* (rho = 0.126**) and (3) *'people from non-academic organization (business/public sector)'* (rho = 0.057).

A preference for *taking advantage of different expertises* corresponds slightly with responses to collaborations involving *'people from universities/institutions abroad'* (rho = 0.163**), and slightly more with the academics' habit of *think[ing] about with whom they want to collaborate* (rho = 0.209**).

## 6. Discussion

### 6.1 Framing the measurement approach

*Can we measure social capital in academia?* In the introduction to this study, social capital is described as being difficult to measure. Not only is it notoriously difficult, but validated measures of this concept are in short supply. Often a social network/structural approach is used. We have therefore challenged this approach by introducing a measurement tool designed to capture how social capital as a precursor, or catalyst is perceived.

From the field of scientific collaboration studies, it has long been known that an academic's choice of collaborator depends on multiple factors, such as: (1) the degree to which the research is focused on practical applications, (2) a need to strengthen long-term cooperation between public or business spheres, or (3) a need to apply for public funds to support basic research (see Sonnenwald 2007; Iglič et al. 2017). These factors are influential, but what they highlight are *external* determinants, which are often used to motivate collaborations.

**Table 7.** Spearman's rho rank correlations between 12 statistically significant social capital preferences (faculty level) and 7 collaboration habits

| Social capital preferences | | Collaboration habits | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | I work and publish alone/on my own | …with people from the same department | …with people from different faculties at the UCPH | …with people from other Danish academic institutions | …with people from non-academic organizations (business/public sector) | …with people from universities/institutions abroad | I think about the persons(s) with whom I want to collaborate |
| Q12: Relational-Identification | …who share my ambitions for the research project | 0.078** | -0.115** | -0.02 | 0.008 | -0.054 | 0.01 | 0.135** |
| Q21: Structural-Bridging/network ties | …who bring resources from a research community different from mine | -0.109** | 0.060* | 0.175** | 0.146** | 0.102** | 0.120** | 0.125** |
| Q13: Relational-Trust & trustworthiness | …whom I know well | 0.127** | -0.046 | -0.076* | -0.011 | -0.057 | -0.014 | 0.075* |
| Q03: Cognitive-Shared language and codes | …where we can take advantage of our different expertise | -0.132** | 0.023 | 0.129** | 0.126** | 0.057 | 0.163** | 0.209** |
| Q23: Structural-Bonding/network ties | …who are similar to me and my research | 0.083** | -0.016 | -0.121** | -0.081** | -0.124** | -0.060* | -0.034 |
| Q04: Cognitive-Shared attitudes | …who share my expectations of work productivity | 0.057 | -0.023 | 0.004 | 0.009 | -0.014 | 0.036 | 0.154** |
| Q05: Cognitive-Shared narratives | …who agree with me on the paradigm for the given research project | 0.071* | -0.01 | -0.055 | -0.039 | -0.063* | -0.015 | 0.115** |
| Q18: Relational-Obligation | …who I know will comply with our deadlines | -0.003 | 0.029 | -0.024 | 0.042 | -0.031 | -0.028 | 0.115** |
| Q14: Relational-Norms | …who take a different approach to research than me | -0.076* | 0.021 | 0.154** | 0.133** | 0.118** | 0.062* | 0.066* |
| Q07: Cognitive-Shared language & codes/reciprocity | …who are in regular contact with me about our research project | 0.063* | -0.054 | -0.057 | -0.058 | -0.086** | 0.018 | 0.052 |
| Q24: Structural-Linking/appropriable organization | …who will increase my citation rate and have a positive effect on my h-index | -0.080** | 0.068* | 0.041 | 0.022 | -0.071* | 0.068* | 0.04 |
| Q26: Structural-Bridging/network ties | …who come from a different academic background than me | -0.004 | -0.009 | 0.181** | 0.102** | 0.119** | 0.045 | 0.053 |

Correlations with the highest significance, shown in bold font.
**   Correlation is significant at the 0.01 level (two-tailed);
*   Correlation is significant at the 0.05 level (two-tailed).

It is also known that funding agencies now stipulate the involvement of inter-organizational or international collaborators. Despite this, collaborations among colleagues within a department are still prevalent (note: we also see this at the University of Copenhagen). Van Rijnsoever and Hessels (2011) suggest that this occurs in order to 'support an internal departmental strategy' or to 'cope with change in the discipline' (p. 468). Again, these factors, which can and do inspire collaboration, are *external* motivators.

To measure social capital in academia, it is therefore essential to focus on a relevant outcome. In this regard, we refer to our chosen definition (i.e. Portes and Sensenbrenner (1993)—*social capital is the expectations for action within a collectivity that affect the goal-seeking behaviour of its members*), and re-confirm that, in this case, the outcome was research collaboration with the aim of publishing.

We then translate a theory of social capital into a measurement tool based on the *cognitive, relational*, and *structural* preferences, or expectations that might inspire, or affect this outcome. By doing so, this study presents a timely contribution to the investigation of interpersonal academic connections involving sympathy—i.e. common understandings and shared feelings (see Robison, Schmid, and Siles 2002). We succeed, albeit with limitations, to illuminate more of what multi-disciplinary academics think *internally* and in a shared capacity with other colleagues.

## 6.2 Study limitations

Our focus on one study population is a key limitation, as it does not permit a high degree of generalizability beyond the chosen university and its employed academics. Another limitation pertains to the reliability test, which confirms a need to refine the survey instrument and implement it with more respondents from other universities in Denmark, as well as other countries.

A third limitation is that we cannot control for the many external factors in academia that typically coincide with *internal* factors. In other words, it is not feasible to separate all external motivations for developing collaborative ventures from internal ones. The *structural dimension* of social capital accounts, in part, for some external influences. For instance, a preference for increasing one's citation rate/h-index would not be part of an academic's mindset, if it were not for external uses of impact indicators and research evaluation procedures.

At the time this research was carried out, the University of Copenhagen was, like other universities/academic institutions worldwide, closed due to the Covid pandemic. Research and teaching was transferred to an online environment. This did not affect the implementation of our online survey, though it may have affected the academics' responses. There is no clarity in this respect, since identifying pandemic-specific influences was not part of the scope of this investigation. We can only refer to other reports and studies worldwide, which showed a rise in international collaborations concerning Covid (Maher and Van Noorden 2021), yet, at the same time a predilection for more national (i.e. intra- and extramural) collaborations concerning other scientific topics (see Abramo, D'Angelo and Di Costa 2022).

## 7. Conclusion

Here we summarize three key findings from our piloted questionnaire-survey, and reflect on what they mean for the academics now and for the future.

At the University of Copenhagen, academics from the six faculties (Health and Medical Sciences, Science, Social Sciences, Humanities, Law and Theology) confirmed that they are less concerned with the *structural* aspects of social capital, in favor of internal *cognitive* and *relational* ones. In other words, they showed a stronger preference for social capital determinants like *reciprocity and obligation*, *trust and trustworthiness*, and *shared understandings*, as opposed to other determinants, like *linking to appropriable networks* or *brokering ties to other networks*.

This could be a sign that they are cautious; relying primarily on familiar, if not comfortable contacts rather than those that might 'push boundaries' or create potential for innovation. Another interpretation is that the academics are not structural 'visionaries', and do not think too much about what their collaboration networks will eventually look like or what role they would like to play (e.g. as nodes on a bird's eye view of a network). Some might achieve outcomes as network brokers or bridge builders, but on a daily level, they seem to be focused on what their university administration demands of them, or what they perceive to be useful and/or works for their career at the time.

Another key finding was that collaboration habits '*with people from non-academic organizations (business/public sector)*' was not a prevalent response choice. This is difficult to interpret, given that many of the University of Copenhagen academics selected '*agree*' or '*strongly agree*' when asked if they preferred collaborations that would allow them to '*take advantage of different expertises*'. Our respondents' seemed to value the idea of consulting/working with external experts, but rarely achieved this in practice, as a matter of habit. It could be that collaborations of this type are best suited to an 'engineered' approach (see Doz, Olk and Ring 2000; Al-Tabbaa and Ankra 2019). It might also be that external motivators, such as funding, are better at motivating the consulting of and blending of expertise than internal ones (see Harris, Lyon and Clarke 2009).

Finally, the weak correlations between preferences and habits suggest that only a few elite or 'star' academics at the university have been able to manifest social capital preferences to achieve desired collaboration outcomes. This suggests that we might investigate also the degree to which financial support was involved, and if it is the consolidation of both funding (which 'stars' usually have) and social capital that makes a difference.

Every university is situated in a different socio-political-economic context. Like most academics worldwide, researchers at the University of Copenhagen value academic freedom. With whom they choose to collaborate and why is a significant part of this, and it is fundamental to goal-seeking behaviour. Here, we have focused on publishing as an end goal, but different forms of academic goal-seeking can involve different dimensions of and approaches to building social capital. This deserves attention in future research. Although social capital may at times be fostered externally (i.e., via fundig instruments and other 'engineered' approaches), our work suggests that, overall, it is still a significant part of how researchers' view themselves and articulate their academic freedom – i.e., the freedom to identify new collaborators, discover new and alternative ways of thinking, create positive outcomes, and achieve a sense of career satisfaction.

## Supplementary data

Supplementary data are available at *Research Evaluation Journal* online.

*Conflict of interest statement.* None declared.

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