Application for participation at the Doctoral Forum

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Description of doctoral research project

Summary

Scientists progress in their careers by gaining their peers' recognition for their contributions to the extension of certified knowledge (Biagioli, 2003; Merton, 1973), and the accrual of such recognition is a key function of scientific authorship (Birnholtz, 2006). However, many factors like multiple authorship, the diversity of epistemic cultures, the lack of globally accepted and applied authorship standards, and the subjectivity of authorship attribution make the assessment of any researcher's contributions based on authorship an extremely complex, if not impossible, task. This is highly problematic since science is based on meritocratic principles and its efficiency depends on the adequate evaluation of researchers and their work.

In disciplines where applied research is done, a research project might lead to both an article and a patent, thus forming a patent-paper pair (PPP). Some factors like the clearer and stricter rules regulating the naming of inventors on a patent, as well as the fact that the potential financial gains are divided between the inventors, tend to limit the number of inventors to only the main contributors. Therefore, PPPs can be a useful tool to shed light on scientific authorship practices by comparing them to inventorship practices.

The purpose of this thesis is to use PPPs to provide a better understanding of authorship practices and of the link between the respective contributions of collaborators to a project and the naming and ordering of authors on the resulting publication(s) in the biomedical and engineering fields. This will be done, firstly, by comparing the authors and inventors of articles and patents forming the PPPs (i.e. the objective result of the authorship and inventorship decisions), and secondly, by interviewing researchers in order to identify the contextual factors (e.g. team size, status of researchers, etc.) influencing those subjective authorship and inventorship decisions.

Research questions

More specifically, the project will provide answers to the following research questions:

RQ1. What is the difference between the number of authors and the number of inventors for the same discovery?

RQ2. What is the relationship between the rank in the authors list and the probability of also being named inventor on the corresponding patent?

RQ3. What are the factors that influence and guide the attribution of authorship and inventorship?

RQ4. What is the link between the individual contribution of team members and the naming and ordering of authors?

RQ5. How do authorship and inventorship practices differ according to the research discipline?

Theoretical background

Scientists and their institutions share the common goal of extending certified knowledge as well as a set of values that constitute the scientific ethos (Merton, 1973). According to Merton (1957, p. 639) "when the institution of science works efficiently […] recognition and esteem accrue to those who have best fulfilled their roles, to those who have made genuinely original contributions to the common stock of knowledge". This necessitates the constant evaluation of researchers and their contributions, which presupposes a link between the work and the individual. This is a crucial function of authorship (Birnholtz, 2006), which is "the undisputed coin of the realm in academia" (Cronin, 2001). In other words, to obtain recognition by the scientific community, which is the sole reward that scientists receive for their work (Biagioli, 2003), researchers must be authors on scientific publications. In order for this meritocratic system to function adequately, we must be able to understand the link between authorship and name ordering and the contribution (i.e. the recognition deserved by each individual). However, a variety of factors make this evaluation of scientists and the recognition they deserve a very complex task.

One of these factors is the growing number of authors on scientific papers (Wuchty, Jones, & Uzzi, 2007), which is commonly attributed to the increasingly multidisciplinary and collaborative nature of research (Katz & Martin, 1997) and the professionalization of science (Beaver & Rosen, 1978). Another explanation is that adding an author does not significantly reduce the amount of credit received by the other authors (Nudelman & Landers, 1972). Accordingly, there is no incentive for researchers to reserve authorship to only the main contributors. As authors lists grow longer, it becomes more and more complex to determine who deserves how much credit (and responsibility) for the work (Rennie, Yank, & Emanuel, 1997), especially for authors who are in the middle of the list (Bennett & Taylor, 2003; Shapiro, Wenger, & Shapiro, 1994).

Another factor is the lack of generalized and enforced authorship norms and the absence of consensus about what defines substantial contribution to warrant authorship (Claxton, 2005), which makes authorship decisions subjective. Existing guidelines are also difficult to enforce (Wager, Fiack, & Graf, 2009), which gives way to cases where the link between contribution and authorship is absent, such as cases of guest or honorary authorship (Epstein, 1993; Flanagin et al., 1998; King Jr, 2000), or ghost authorship (Sismondo, 2009).

In sum, the decision of naming and ordering of authors appears to be highly subjective, determined by individual views and implicit disciplinary norms (Pontille, 2004). This is in line with Bourdieu's (1999) view that researchers use multiple strategies in order to acquire scientific capital (recognition). Those strategies are influenced by the research field and its implicit norms, or what Knorr-Cetina (1991) calls "epistemic culture", as well as the researcher's position within the field's social structure (Bourdieu, 1999). In other words, authorship decisions are the results of strategies aimed at acquiring and sharing recognition.

In some research fields, discoveries frequently lead to patent claims and may thus be both reported in the patent and in a scientific article. Because adding an inventor has a cost for other inventors, and because inventorship is more strictly controlled, the number of inventors on the patent will most likely be lower than the number of authors on the article (Ducor, 2000). Some studies (e.g., Ducor, 2000; Haeussler & Sauermann, 2013) previously used PPPs to investigate authorship and inventorship practices, but used small samples or focused on a precise area of research. Using data on worldwide papers and patents, this thesis will be the first large scale analysis to compare authorship and inventorship practices using PPPs in order to understand scientists' strategies for accruing and sharing recognition.

Planned methodology

The planned methodology is a mixed methods design, combining an initial quantitative analysis of patent paper pairs, followed by a qualitative analysis of data collected by interviewing researchers.

These two stages will follow the essential preliminary matching of patent and papers to form the pairs. The Web of Science (WOS) database and all patents in the United States Patent and Trademark Office (USPTO) database since 1973 will be merged using a semi-automatic matching algorithm.

In the quantitative stage, we will compare the number of authors on the papers with the number of inventors on the patent (RQ1) in order to get a general idea of the proportion of authors who made only minor or technical contributions (i.e. authors that are not inventors). We will also look at the position where names of inventors appear in the author list in order to identify potential patterns (Q2). Ducor (2000) observed that last authors (i.e. lab supervisors) are more often named inventors, followed by first authors and lastly, middle authors. Our research might allow us to confirm and generalize similar trends.

For the qualitative stage, we will conduct semi-structured interviews with authors and inventors chosen from our population of PPPs to determine which different elements of the research context influence the naming and ordering of authors, and how (QR3). Another aim is to obtain information on the nature and extent of the respective contributions of authors (and non-authors) to understand the link between contribution and authorship decisions (QR4). We will form a sample by grouping PPPs by discipline and the authors by status (e.g. PhD student, post-doc and professor). Since the goal is not generalizability but rather the exploration of the complex phenomenon of authorship practices, an equal number of elements will be purposely chosen in each group, aiming for maximum heterogeneity in order to get a high variety of responses. The sample size should be 12 to 15 participants, equally distributed between discipline and status, with more being added if necessary until theoretical saturation is reached.

Current status of the research project

We are currently in the process of completing the literature review and developing the algorithm for the matching of papers and patents.

Motivation for student participation at the Doctoral Forum and the issues you wish to receive feedback on from the senior researchers.

The Doctoral Forum is a great opportunity to exchange with other PhD students and senior researchers and to get an early external feedback on my doctoral research project. I believe that this exchange will be very beneficial to both the quality of my research and my development as a young scientist. I would be happy to receive feedback on any element of my research project, but perhaps more importantly on the methods and challenges of matching the papers and the patents, the adequacy of the chosen methods to answer the research questions.

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