

FUNDING AND OWNERSHIP OF ACADEMIC INVENTIONS: EVIDENCE FROM A PATENT-LEVEL SURVEY

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EXTENDED ABSTRACT

How to bring academic inventions to market? The question has been haunting university administrators and policy makers for more than two decades now. One important step to ‘turn science into business’, it has been frequently argued, is the institutionalization and professionalization of technology transfer activities at academic institutions (OECD 2003). Following the example set by the United States, with the approval of the Bayh-Dole Act in 1980, many countries have also pushed their academic institutions to retain title of their faculty’s inventions, whenever obtained as a result of public funded research (Mowery and Sampat 2005).

In some European countries, such as Austria, Finland, Germany and Denmark, this move required the abolition of the so-called professors’ privilege (von Proff *et al* 2012; Lissoni *et al.* 2009). Even in countries with no such norm, universities lacked the legal and financial means both to make sure that the faculty would disclose their inventions and to manage actively the related patents. As a result, in most research contracts or collaboration agreements with business partners, some of which were signed in order to develop research results from public funded research, the IP ended up being assigned to industrial partners. Overall, this implies that, historically, the vast majority of patents filed over academic inventions in most European countries belonged to business companies. Methodologically, such patents can be associated to universities only by identifying their inventors as academic researchers (Lissoni 2012).

Spain, which is the focus of the present study, is no exception (Garcia and Sanz-Menendez 2003). Despite the fact that most Spanish academics are civil servants, recent efforts to reclassify patents according to the institutional affiliation of their inventors have confirmed that a large share of all patents invented by

Spanish academic inventors is in fact owned by industry, where the term academic comprises both universities and public research centers (Maraut and Martinez 2014).

Quite recently, a number of studies have started to look at the issue of ownership and patent importance using novel data on academic patents from different European countries which allow for industry ownership, and, for importance, citation-based measures.¹ The growing, albeit scattered evidence suggests that academic patents owned by academic institutions are less cited on average than academic patents owned by industry, which may imply a lower commercial value of the former. However, the difference seems to disappear over time, which indicates that university-owned academic patents are more fundamental by nature. A common limitation of most of the European studies available is that they solely rely on publicly available information about patents, and they lack information on the underlying details of the funding and patent filing process. Exceptions such as Gulbrandsen *et al* (2006) and Baldini *et al* (2007) concentrate on incentives to patent and patenting obstacles in academic contexts. The PatVal survey is also addressed to inventors (Giuri *et al* 2007), but its focus is on the value of business patents.

The present paper draws from the results of a patent-level survey of Spanish academic inventors, carried out by the authors in 2014. Data on funding sources, ownership, commercialization and inventors' personal characteristics have been collected for almost 600 academic patents. The target population of the survey consisted on the 3,142 academic inventors (with about 2 patents each, but a few having more than 100) who had been previously identified by matching academic authors of scientific papers from Spain (as listed on 2003-2008 Scopus publications) to inventors from Spain (as listed on EPO patent applications filed in 1978-2009), following the methodology described in Maraut and Martinez (2014). An invitation to fill out a web based questionnaire was sent to those inventors for whom a valid email address was available, a total of 2,511. Amongst the recipients of the questionnaire, 472 responded about one or more patents, which represent a valid response rate of almost 19% of our population. Questions at the patent level were divided into eight different themes: i) types of funding; ii) timing of the decision to patent; iii) timing of the decision about patent ownership; iv) commercialization; v) role of the university administration at the research funding phase; vi) role of the university administration at the patenting phase; vii) publication of related results; and viii) occupation of co-inventors at the time of patenting. Each inventor responded to patent-specific questions only for a maximum of three patents², in addition to some academic career and personal questions.

Our analysis of the unique and novel information provided by the survey is done in two stages. First, we build a typology of the 514 academic patents for which we have valid information from the survey, based on the characteristics of their inventing and patenting process (in particular, as regards funding, ownership and involvement of technology transfer offices), using cluster analysis. Second, we assess, by means of an econometric model, which types are more likely to be considered commercially valuable and technologically important. Information on commercial values comes both from our own survey and from public available

¹ See <http://www.esf-ape-inv.eu/> for literature review and recent initiatives.

² We imposed a maximum of three patents for each inventor's questionnaire (the most cited and most recent ones), so that the most prolific inventors were not discouraged.

information (e.g. change of ownership, granted or not, patent family, renewal status, as from PatStat). Information on technological importance is based on public information on citation patterns (also derived from PatStat), in accordance with the existing literature (survey by: Van Zeebroeck 2011).

Results of the cluster analysis reveal three distinct groups of patents of similar size. The first group, with 32% of the patents, corresponds to the ‘public and nationally funded patents’. These are the academic patents which originate from public-funded projects at the national level and are characterized by a strong involvement of the technology transfer office. Here the decision to patent and the allocation of ownership rights come relatively late in the project’s timeline. The second group, with 27% of the patents, corresponds to the ‘public and internationally funded patents’. Funding for these is also mainly public and national, although combined with international sources, and the technology transfer office is barely involved in the patenting and commercialization process, which is possibly due to consortia or foreign partners. The third and final group, with the remaining 40% of the patents, corresponds to the ‘industry funded patents’. It mostly includes patents over research projects and contracts that are fully or partly funded by industry. Here the role of the technology transfer office is minimal or non-existent, and the allocation of IP rights occurs early on in the process.

Preliminary results from exploratory statistical analysis shows differences across clusters with respect to ownership (the first group tends to be mostly academic-owned, the third one industry-owned) and technical field composition (the first two groups tend to have more biotechnology patents than the third one). We also find differences in commercialisation models and technological importance (as reflected in citations). The second group, which includes public and internationally funded patents, has the largest share of patents jointly owned with industry and tends to have the highest proportion of non-used patents (neither licensed, nor used internally), and is also the group receiving a lower number of citations from other patents. We argue that transaction costs associated to multiple funders and owners might be behind these findings, and explore this and other issues more generally in econometric analysis about the relation between patent types, commercialization and technological importance.

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