

# Commercializing the laboratory: Faculty patenting and the open science environment

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## Abstract

This paper investigates the relationship between patenting and publication of research results by university faculty members. Our study adds to the limited evidence on this topic with an empirical investigation based on a panel data set for a broad sample of university researchers. Results suggest that publication and patenting are complementary, not substitute, activities for faculty members. This is not consistent with recent concerns regarding deleterious effects of patenting on the research output of faculty members. Average citations to publications, however, appear to decline for repeat patenters, suggesting either a decrease in quality or restrictions on use associated in patent protection.

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## 1. Introduction

University research has traditionally been associated with norms of rapid disclosure of research results and an environment of knowledge sharing, co-authorship, and joint projects that contribute to cumulative learning and innovation (Dasgupta and David, 1994). The reward system for faculty provides incentives for being first to discover and disclose new research results, and valuable reputations are built on diffusion of these results among the scientific community. Faculty members therefore have the incentive to pursue impactful research prob-

lems and disclose research results openly and quickly (David, 1998; David et al., 1992). These activities stimulate the cumulative research process by facilitating the generating of fundamental discoveries and the transfer of knowledge among researchers. These norms and incentives are being challenged by the increasing patenting of university research results. In this study, we examine the relationship between a faculty member's involvement in patenting research results and the quantity and quality of publications generated. Our goal is to evaluate the recent concerns that patenting negatively affects the generation and publication of academic research.

This is an important question because academic research results contribute substantially to the industrial R&D process (Mansfield, 1991, 1995, 1998; Narin et al., 1997). To varying degrees, respondents in all industries report that a significant percentage of their product

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and process innovations could not have been developed without academic research, or would have been substantially delayed. University research was reported as an important source of new projects for 31% of respondents and an important source of information for 36% of respondents (Cohen et al., 2002). In their survey of R&D managers across many industries, Cohen et al. (2002) find that the most important channel for knowledge transfer from universities or government labs is publication of the research, followed by informal exchange, public meetings or conferences, and consulting. Patents were ranked as one of the least important transfer channels.<sup>1</sup> Therefore, it is important both that academics continue to pursue fundamental research question and that they continue to publish their research findings.

There is reason to believe that the influence of patenting and commercialization activity on university researchers has grown in recent years. Since the late 1970s, the university research environment has changed dramatically. Policy changes, such as the Bayh-Dole Act of 1980,<sup>2</sup> encouraged commercialization of university research results by standardizing policies granting intellectual property rights to university researchers for outcomes of federally under research.<sup>3</sup> At the time, federally funded research made up approximately 70% of university research.<sup>4</sup> In addition, sources of academic research funding shifted substantially from the 1970s to the 1980s to include more industry funding and less government funding (Mansfield, 1995).<sup>5</sup> Universities underwent organizational changes to attempt to better promote the commercialization of university research

<sup>1</sup> The pharmaceutical industry stands in contrast to these generalizations, with more knowledge transfer through the information disclosed in patents.

<sup>2</sup> Patent and Trademark Act Amendments (P.L. 96-517).

<sup>3</sup> See Jaffe (2000) and Mowery and Ziedonis (2001) for a more extensive history of the policy changes.

<sup>4</sup> University faculty members do hold patents from prior to the passage of the Bayh-Dole Act. Some of these inventions were not patented through the university (i.e. they were patented by firms with which the faculty member worked or they were patented by the faculty person individually and not assigned to the university). However, even before the Bayh-Dole Act, universities could and did patent some inventions from faculty research. For example, the famous Cohen and Boyer patent on recombinant DNA technology was applied for in 1979 and is assigned to Stanford University. The importance of the Bayh-Dole Act is that it streamlined and standardized the rights of universities with respect to intellectual property stemming from federally funded research.

<sup>5</sup> Industry funding of university research increased from \$630 million to \$1.896 billion between 1985 and 1998, university-industry joint R&D centers grew 60% during the 1980s, and the number of university offices of technology transfer increased more than 800% between 1980 and 1995 (Cohen et al., 2002).

results (Argyres and Leibeskind, 1998). In response to these policy, institutional, and market changes, patenting by university researchers increased dramatically in the last two decades (Henderson et al., 1998a,b). This increase in patent volume was accompanied by a significant increase in the number of universities that were patenting innovations Henderson et al. (1998a).<sup>6</sup> Providing researchers with the incentive to patent their findings may encourage commercialization of research findings, as intended by the Bayh-Dole Act. However, the increased focus on patenting may also lead to increased secrecy, delayed publication, and a shift in faculty research effort and time away from scientific research and toward commercialization activities, thereby decreasing the production and/or quality of scientific publications.

The existing empirical studies that attempt to uncover the relationship between academic patenting and publishing activities have presented contradictory pictures. Several surveys of academic researchers have documented the secrecy, delay of publication, and re-focusing of research activities that accompany involvement in patenting and commercialization activities (Blumenthal et al., 1996a,b; Campbell et al., 2002). However, the few existing studies of individual research publishing and patenting activities have failed to find such a negative impact. Agrawal and Henderson (2002) examine the patenting and publishing of faculty members in two departments at MIT (Mechanical and Electrical Engineering), and find no relationship between patenting and the generation of publications, but do find that the number of citations to publications is positively related to the level of patenting, which they interpret as evidence that patenting is positively correlated with the impact of research. Azoulay et al. (2004) examine the publication activity of faculty members in the life sciences field and find a positive relationship between patenting and the generation of publication, but do not examine citations to the publications. Positive correlations between publishing and patenting can be found in recent empirical investigations of non-U.S. context (Breschi et al., 2005; Buenstorf, 2006; Looy et al., 2005). Interestingly, Buenstorf's investigation of publishing behavior of Max Planck Institutes' Directors show that the positive correlation

<sup>6</sup> Mowery and Ziedonis (2001) find that of the 224 universities with patents issued after 1980, 51 universities had 10 or more issued patents applied for between 1970 and 1980, 92 universities had fewer than 10 issued patents during 1970–1980, and 81 universities has no patents issued during 1970–1980. This indicates the significant entry of inexperienced and less experienced universities into the pool of patenting universities.

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