



Academic patent licenses: Roadblocks or signposts for nonlicensee cumulative innovation?



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ABSTRACT

Academic inventions are key drivers of technical progress in modern economies, and exclusive licensing has become the dominant means of transfer to the private sector. However, the strong licensee incentives generated by exclusive academic licensing are generally assumed to come at the expense of discouragement or diversion of research by nonlicensees. Using data from university campuses and national research laboratories we find that, after exclusive licensing, forward citations by private sector nonlicensees actually increase. An unanticipated exclusive license appears to be a signpost pointing to commercially relevant innovation pathways that nonlicensees follow with successful patented research. Tests using multiple pre-license information disclosures support this signaling hypothesis.

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1. Introduction

Academic inventions are a key source of technical progress (Jaffe, 1989; Adams, 1990; Berman, 2011). Since they tend to be embryonic, in need of further research and development,¹ transfer of technology to the private sector is an essential step in a successful academic innovation program. But how is this transfer best achieved? In the fourth decade after the passage of the Bayh-Dole Act, the global increase in academic patents, and exclusive licensing of those patents, remain controversial (Mowery and Sampat, 2005; Schacht, 2012; and Boldrin and Levine, 2013). There is concern that the incentivization of development by the licensee comes at the cost of reduction of positive externalities for nonlicensee innovators.

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¹ Schacht, 2012 p. 4. In a survey by Jensen and Thursby (2001 Table 1 p. 243) university technology transfer managers reported that 48% of inventions are "proof of concepts but no prototype" and 29% had only a laboratory-scale prototype.

In this paper we empirically address the effects of exclusive licensing of university inventions on subsequent patented innovation by nonlicensees. The general topic of sequential innovation has received much academic attention since the pioneering model of [Green and Scotchmer \(1995\)](#), yet there is little systematic evidence on the effect of university patenting and licensing on the rate and direction of further innovation beyond academia, apart from analyses of citations in academic publications, with conflicting conclusions ([Murray and Stern, 2007](#); [Sampat, 2004](#); [Fehder et al., 2014](#); [Thompson et al., 2017](#)).

In the absence of adequate evidence, there are strong a priori arguments supporting the consensus that academic patent licensing, predominantly exclusive,² blocks, diminishes or diverts research by nonlicensees. Grant of an exclusive license implies a credible commitment to enforce the patent monopoly rights against others conducting research on innovations that might be infringing, or already practicing an infringing invention ([Nelson, 2004](#); [Cohen, 2005](#)). In a classic paper [Kitch \(1977\)](#) makes the analogy to a mining claim. On the other hand some nonlicensees might divert their efforts to finding inventions in the same field that are valuable only as non-infringing substitutes for the licensed patent, implying wasteful duplication that reduces the overall productivity of the innovation sequence.

The above arguments assume that all information relevant to follow-on researchers (other than whether and how it will be licensed) is common knowledge after the patent (or its application) is published. This assumption is unlikely to hold in practice. Indeed in a recent survey of scientists [Jensen and Webster \(2014\)](#) find that licenses to patented research might include restrictions on licensee publication of information relevant to the patented and licensed invention.

On the other hand, it is plausible that news of licensing might be a positive signal to nonlicensees about the prospects for, or feasibility of, useful follow-on innovation in relevant fields. Such a signal might encourage nonlicensees to explore ways to make use of the licensed patent or information revealed therein, leading to socially useful follow-on development or utilization of the invention. However, there is no empirical evidence in the literature regarding any positive informational effect of patent licensing on nonlicensee researchers.

For academic inventions, an informational effect of licensing might seem particularly dubious a priori. Information about the licensed invention is typically disclosed much earlier in conference presentations, working papers, or academic publications. Nevertheless, academics know well that publication of a paper does not mean all researchers in the field are instantaneously aware of the implications of its findings for downstream research. Further, a patent may reveal key technical details for understanding or reproducing the invention, not included in related scientific papers.³ Although university patents or patent applications offer critical technical information about the invention, that information is costly to acquire. Indeed, even patent examiners who are experts in their fields may find locating relevant prior patents and papers to be a substantial and perhaps overwhelming challenge ([Lemley and Sampat, 2013](#); [Lei and Brian, 2017](#)). Furthermore, researchers may be reluctant to search more diligently for prior patents in the United States because they are wary of charges of willful infringement based on that prior knowledge.⁴

Thus, news of a license might draw attention to a patent not previously identified as important by downstream innovators. Furthermore, a license reveals commercially relevant information not found in the patent or related publications. It affirms that an inventor other than the patentee found the invention to be sufficiently valuable to justify the substantial costs of negotiation and the financial obligations specified in the license (often including an upfront payment to reimburse the cost of patent prosecution by the academic licensor).⁵ Relative to an academic patent, a license is much more credible evidence of “commercial opportunity.” In the classic survey by [Jaffe and Trajtenberg](#), a majority of citing patentees identify awareness of such opportunity as a significant influence on the development of the relevant cited invention; far fewer mention information in patents or technical literature ([Jaffe and Trajtenberg, 2002](#)). Thus the net effects of exclusive academic licensing on further research by nonlicensees, and on the field and focus of that research, are empirical issues that have yet to be resolved.

The evidence we bring to these questions includes files on patented invention disclosures at three renowned National Research Laboratories, Los Alamos, Lawrence Livermore, and Lawrence Berkeley Laboratories, and nine University of California (UC) campuses, as recorded by the UC Office of Technology Transfer (hereafter OTT).⁶ This confidential dataset is unique in that it contains licensing information and other confidential contractual information, and its size is large enough to permit econometric analysis. We use forward patent citations to a patent from these UC campuses or National Labs (“UC/NL” patent)

² See for example [Henry et al. \(2003\)](#) and [Pressman et al. \(2006\)](#).

³ A recent survey of nanotechnology researchers revealed that 64% of those who had looked to patents to gain scientific knowledge found useful information. One industrial participant noted: “Usually the way a new technology is described is much more reliable and reproducible in a patent than in a scientific paper. Unfortunately many academic researchers purposely remove essential steps for reproducing data, for fear other researchers will catch up with them and publish first.” (See [Ouellette, 2012](#); footnote 145 p. 560, and p. 561).

⁴ [Cohen et al. \(2002\)](#) find that researchers in Japan, a less litigious society, report a greater tendency to read patent documents to obtain useful information.

⁵ If instead the required payment were structured entirely as a running royalty, the announcement of an exclusive license would not necessarily imply any commitment by the licensee to a significant minimum evaluation of the patent. See [Gallini and Wright \(1990\)](#) for more on the informational implications of different contractual forms for an exclusive license.

⁶ The OTT has recently been restructured into two departmental units, Innovation Alliances Services and Research Policy & Coordination Unit and, within the UC Office of President (<http://www.ucop.edu/ott/about.html>). However, consistent with usage during the period the sample was generated, here we still refer to the office in charge of technology transfer activities as the OTT.

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