

# Do formal intellectual property rights hinder the free flow of scientific knowledge? An empirical test of the anti-commons hypothesis

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## Abstract

Although many scholars suggest that IPR has a positive effect on cumulative innovation, a growing “anti-commons” perspective highlights the negative role of IPR over scientific knowledge. At its core, this debate is centered on how intellectual property rights over a given piece of knowledge affect the propensity of future researchers to build upon that knowledge in their own scientific research activities. This article frames this issue around the concept of dual knowledge, in which a single discovery may contribute to both scientific research and useful commercial applications, and finds evidence for a modest anti-commons effect. A key implication of dual knowledge is that it may be simultaneously instantiated as a scientific research article and as a patent. Such patent-paper pairs are at the heart of our empirical strategy. We exploit the fact that patents are granted with a substantial lag, often many years after the knowledge is initially disclosed through paper publication. The knowledge associated with a patent-paper pair therefore diffuses within two distinct intellectual property environments, one associated with the pre-grant period and another after formal IP rights are granted. Relative to the expected citation pattern for publications with a given quality level, the anti-commons perspective suggests that the citation rate for a scientific publication should fall after formal IP rights associated with that publication are granted. Employing a differences-in-differences estimator for 169 patent-paper pairs (and including a control group of other publications from the same journal for which no patent is granted), we find evidence for a modest anti-commons effect (the citation rate after the patent grant declines by approximately 10 to 20 percent). This decline becomes more pronounced with the number of years elapsed since the date of the patent grant and is particularly salient for articles authored by researchers with public sector affiliations. © 2007 Elsevier B.V. All rights reserved.

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## 1. Introduction

In the early 1980s, Professor Philip Leder, recently recruited to head the new Genetics department at the Harvard Medical School, developed the first genetically engineered mouse with cancer, dubbed the Oncomouse. Leder and his post-doc Tim Stewart had used novel transgenic techniques to insert an oncogene into a mouse embryo; the result was a mouse that was highly susceptible to cancer. In his pursuit of a deeper understanding of cancer, Leder came to recognize that “it could serve a variety of different purposes, some purely scientific others highly practical” (Kelves, 2002, p. 83). This research was published in *Cell* in 1984, and in 1988 a broad patent for the Oncomouse was granted by the US Patent Office (USPTO). The Oncomouse patent was more controversial than most; not only was the Oncomouse the first living mammal to be patented, but Du Pont, as the patent’s exclusive licensee, aggressively enforced the property rights. Du Pont’s strategy included demands for “reach-through” rights and review of publications that used the Oncomouse in further scientific research (Murray, 2006). Ideas that are simultaneously of value as a scientific discovery and inventive construct, such as the Oncomouse, are frequently generated in the disciplines that underpin modern biotechnology (Stokes, 1997).

Dual-purpose ideas provide their originators with multiple disclosure choices, including an option to publish research in the scientific literature *and* obtain intellectual property rights (IPR) over that knowledge. In academia, an increasing number of scientists have chosen this path of dual knowledge disclosure, which we describe as patent-paper pairs (Murray, 2002; Ducor, 2000). Patent-paper pairs are scientific articles and individual patents that disclose (and serve as a property right over) the same underlying “piece” of knowledge. Patent-paper pairs are thus more than simply a reflection of the rise in patenting by academics of knowledge unrelated (or only tangentially related) to their scientific research. Rather, by embedding the same piece of knowledge in two distinct institutional regimes, patent-paper pairs instantiate the expansion of formal intellectual property rights over knowledge that was traditionally disseminated solely through the norms of scientific publication.

The increased use of intellectual property rights (IPR) in scientific research has sparked a vigorous academic and policy debate. On the one hand, a significant amount of research has highlighted the benefits of IPR (Kitch, 1977; Arora et al., 2001). Recent empirical research on commercial discoveries suggests that IPR may facilitate the creation of a market for ideas, encourage further investment in ideas with commercial potential, and mitigate disincentives to disclose and exchange knowledge which might otherwise remain secret (Merges and Nelson, 1990, 1994; Arora et al., 2001; Gans and Stern, 2000). Indeed, within the context of university research (particularly publicly funded university research), it has been suggested that IPR offers important incentives to move nascent discoveries out of the “ivory tower” and into commercial practice. In other words, IPR may enhance the ability of society to realize the commercial and social benefits of a given discovery (Kitch, 1977; Hellman, 2007). However, a more recent “anti-commons” perspective argues that the expansion of IPR (in the form of patents and/or copyrights) is “privatizing” the scientific commons and limiting scientific progress (Heller and Eisenberg, 1998; Argyres and Liebskind, 1998; David, 2001b). Specifically, the anti-commons hypothesis states that IPR may inhibit the free flow and diffusion of scientific knowledge and the ability of researchers to build cumulatively on each other’s discoveries (Heller and Eisenberg, 1998; David, 2003, 2000; Lessig, 2002; Etzkowitz, 1998; Krinsky, 2003). Taken together, the impact of IPR on future progress in the broader scientific community remains open to debate.

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