

Ivory Tower and Industrial Innovation: University-Industry Technology Transfer Before and After the Bayh-Dole Act. By David C. Mowery, Richard R. Nelson, Bhaven N. Sampat, and Arvids A. Ziedonis. Palo Alto: Stanford Business Books, 2004. xiv + 242 pp. Index, notes, references, figures. Cloth, \$39.95. ISBN: 0-804-74920-5.

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Patent policy has long been a controversial area of public policy in the United States. Are patents the fair and necessary reward of risk-taking for inventors, or are they the means by which rich and powerful organizations concentrate their power and wealth, to the detriment of society as a whole? Patenting and licensing in the twentieth century, which has seen the emergence of large research-performing companies and the expansion of the federal government's role in the funding of big science, has been a hard area for historians to penetrate, let alone understand. The authors of *Ivory Tower and Industrial Innovation* have spent more than a decade studying the role of patents in the U.S. innovation system. In this book, a well-integrated collection of chapters based on both qualitative and quantitative research, they not only perform the service of locating the Bayh-Dole Act of 1980 in its historical context; they also provide a model for how to translate more specialized academic research into what social scientists Charles E. Lindblom and David K. Cohen once termed "usable knowledge" (*Usable Knowledge: Social Science and Social Problem Solving*, 1979).

The Bayh-Dole Act of 1980 was intended by the United States Congress to improve the yield of publicly funded university research by encouraging universities to patent and license the inventions produced by those in their employ. The act simplified and regularized the process of granting rights to patent federally funded research, formerly a hodge-podge of different agency policies that were permissive in some cases, restrictive in others. Another aim of the legislation, not stressed in this book, was to spread the benefits of federal funding by increasing the pool of research universities that could gain rewards from their research through licensing. Unfortunately, Bayh-Dole was based on the now thoroughly discredited premise that innovation typically occurs in a linear fashion, beginning with fundamental research and ending with commercialization,

rather than in the messier iterative fashion that most often characterizes university-industry interaction. In addition, the promoters of Bayh-Dole assumed that patents were the most important channel of commercialization, rather than one of many avenues for the exchange of knowledge between universities and industry. Promoters of the legislation paid scant attention to the reasons for prior university practices of patenting and licensing. The authors maintain that for a proper assessment of the outcomes of Bayh-Dole, and as a prerequisite of the enactment of similar legislation in other countries, this broader context needs examination.

Until the 1970s, research universities were careful to keep most patenting activities at arm's length, especially in areas of social sensitivity, like medicine and public health. They remembered the public outcry between the two world wars over the concentration of technological control in a few large companies, which collaborated only with a select group of university scientists. In that era, universities generally left patenting activities to their researchers, or outsourced their patenting, including the all-important maintenance of their patent portfolios, to the Research Corporation, a nonprofit organization whose function was to channel royalties back into research. Aware of the problems that fragmentation of scientific domains could pose for scientific research and technological progress, university leaders tried to keep fundamental research in the public domain, especially in medical schools and in health-related research domains.

Critics of Bayh-Dole have charged that giving universities blanket rights to patent and to license in whatever manner they choose—exclusive or not—has had the effect of skewing university research programs toward less fundamental, more applied, research. Mowery et al. dispute this conclusion. The history, they show, is far more complicated. Bayh-Dole, crucially in convergence with certain shifts in interpretation by the courts, has encouraged and enabled universities to take out patents on discoveries in widening areas of fundamental science, and has enabled them to maximize royalty income at the expense of public access to knowledge. In effect, especially in the more lucrative areas for patenting—certain areas of biomedical research—universities have entered into direct competition with research-performing companies. This has not only driven up the cost and slowed the pace of research in universities and companies alike; it has also

endangered universities' exemption from payment of royalties to patent holders before they can conduct research in certain fields.

In fact, especially in the area of biomedical science, which accounts for the largest share of university patents, the outcome of Bayh-Dole is a classic example of the triumph of unintended consequences. The legislation passed early in the life cycle of a powerful emerging technology, molecular biology, and was approved at the same time as a decision by the courts to allow patenting of life forms. It also coincided with the courts' shift toward granting broader patent claims for potential, rather than for demonstrated, usefulness. For these reasons, returns to patents in the biomedical area—particularly when they seem to open up opportunities for blockbuster developments in pharmaceuticals or medical devices—have been especially lucrative. These developments paved the way for universities to enter into the kind of unfortunate competition that characterized the early days of radio, when companies like General Electric and American Telephone and Telegraph could block each other's ability to turn new technologies to commercial advantage until their hugely expensive patent disputes were sorted out.

Ironically, the authors show that if the desired effect of Bayh-Dole was to speed up and increase the flow of knowledge with commercial potential out of the existing pool of research-performing universities, the legislation was unnecessary. The trends in that direction were already established, mainly because leading research universities were changing their policies in the 1970s. The book's history of the Research Corporation highlights the inherent conflicts of interest in patenting and licensing for university research that eventually prompted research universities to take direct control of their own patenting activities, despite fear of public criticism. On the other hand, the evidence does not support the contention of some critics that the increasing engagement of more universities in patenting reduced the overall quality of patents coming out of universities. Mowery et al. suggest that after a four- or five-year learning period in the early 1980s, more universities, including new entrants, began producing commercially feasible inventions of a higher quality than those emerging from company research. While the authors address this point obliquely, they make it clear that the aim of the Bayh-Dole Act to expand the economic benefits of federally funded research in order to favor a broader

spectrum of universities, and in that way to stimulate economic activity in wider regions of the country, may well have been achieved.

It is left to the reader to decide whether the benefits of Bayh-Dole have outweighed the costs. In calculating what the total costs might be, this book raises, or at least implies, more questions than it answers, and they are good questions. The authors of *Ivory Tower and Industrial Research* conclude that other countries contemplating similar legislation should proceed at a slower pace than that followed by the proponents of the U.S. version of the legislation, taking the time to understand the particular nature of their own innovation systems, particularly the prior organization of universities and their historic relations with industry, before embarking on a similar campaign to stimulate university-industry innovation.

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