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# **Innovation Policy and the Economy 8**

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**edited by**

**Adam B. Jaffe, Josh Lerner, and Scott Stern**

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## Introduction

This volume is the eighth annual volume of the National Bureau of Economic Research (NBER) Innovation Policy and the Economy (IPE) group. The appreciation of the importance of innovation to the economy has increased over the past decade. There is an active debate regarding the implications of rapid technological change for economic policy, and the appropriate policies and programs regarding research, innovation, and the commercialization of new technology. This debate has only intensified as policymakers focus on innovation and new technologies in seeking to address recent economic and security challenges.

The IPE group seeks to provide an accessible forum to bring the work of leading academic researchers to an audience of policymakers and those interested in the interaction between public policy and innovation. The following are our goals:

- To provide an ongoing forum for the presentation of research on the impact of public policy on the innovative process
- To stimulate such research by exposing potentially interested researchers to the issues that policymakers consider important
- To increase the awareness of policymakers (and the public policy community more generally) concerning contemporary research in economics and the other social sciences that usefully informs the evaluation of current or prospective proposals relating to innovation policy

This volume contains the papers presented in the group's meeting in Washington, DC, in April 2007.

The first two papers offer complementary perspectives on the impact of policy and institutions at the university-industry interface. Over the last several years, a vigorous policy debate has emerged about the appropriate relationship between academic and commercial research. In

the first paper, Wesley M. Cohen and John P. Walsh focus on one of the most contentious areas of debate: the role of formal intellectual property (such as patents) in publicly funded university research. Several analysts have suggested that academic research, particularly in the life sciences, has suffered an “anticommons” effect, whereby the proliferation and fragmentation of intellectual property rights has limited the ability to follow-on researchers to effectively build on prior scientific discoveries. Cohen and Walsh reorient this debate toward a focus on “real” impediments to academic research. They argue that, from a practical perspective, patents likely play only a minor role in shaping exchanges of materials, data, or tools among scientific researchers. Instead, researchers are able to limit access by follow-on researchers through secrecy or not sharing research materials. Moreover, the choice of whether to share research materials is grounded in both scientific and commercial incentives. Drawing on both qualitative evidence as well as their own detailed survey data, Cohen and Walsh provide evidence that the *practical* limits on sharing may be much more important than the limits imposed by formal intellectual property rights. Thus, to promote a high level of scientific research productivity and cumulative discovery, policymakers may need to establish institutions and incentives that encourage sharing, even for discoveries that are, at least in principle, in the “public domain.”

In the second essay, Robert E. Litan, Lesa Mitchell, and E. J. Reedy address the potential for experimentation and for competition among institutions at the University-industry interface. By and large, efforts to commercialize academic discoveries are organized around university-run technology transfer offices (TTOs), which serve as the only “authorized” licensing channel for inventions developed by university researchers. While universities acknowledge that the objectives of the TTO are multi-dimensional, an emerging body of empirical evidence suggests that (1) TTO officers are provided incentives slanted heavily toward the maximization of licensing revenue and (2) most TTOs realize only a very small level of licensing revenue. Much of a TTO’s time is devoted to technologies that are expected to produce significant short-term revenue, as opposed to technologies that have a longer road to commercialization or those that may benefit society but offer little in terms of licensing fees. To maximize the social benefits from university inventions, Litan, Mitchell, and Reedy suggest that university licensing efforts should be tilted toward enhancing the volume of innovations brought to the marketplace (i.e., focusing on the total flow of deals at the expense of the guaranteed revenue associated with each deal). The essay argues for significant in-

stitutional experimentation in the licensing process and the potential for competition between alternative technology transfer channels. In particular, the authors evaluate the potential benefits (and potential risks) associated with alternative institutions, including a “free agent” model (where external agents could serve as technology brokers), the development of regional alliances among universities, the use of Internet-based brokerage systems, and directly removing barriers for direct commercialization by faculty (and relying on faculty loyalty to earn a financial return). By promoting competition and experimentation in the technology transfer process, these authors emphasize the potential for policy to shape the social benefits from public investments in academic research.

In “Economic Experiments and Neutrality in Internet Access,” Shane Greenstein focuses attention on the crucial role of market experience and learning in evolving high-technology markets. Economic experiments consist of the introduction of new products or business models in actual markets that result in significant learning for market participants. These experiments involve more than just technical invention; they also lead to changes in business operations and organizational procedures that translate technology into economic value. Because economic experiments cannot take place in a laboratory, managers must move beyond building prototypes or conducting highly stylized focus groups and instead subject new technology to real-world markets, learning about market demand, the nature of how alternative characteristics (and even pricing models) are valued, and what forms of potential competition are particularly important. While theoretical understanding of economic experiments is at an early stage, Greenstein draws out several broad insights: for example, outside of a few important exceptions, industry-wide returns from economic experimentation exceed the private returns. More importantly, the historical record illustrates that economic experimentation was extremely important for value creation in the development of Internet access markets. These insights motivate an inquiry into the potential role of regulation in the process of economic experimentation, with a particular focus on the contemporary debate over “net neutrality.” Under the economic experiments approach, optimal policy would grant considerable discretion to broadband carriers if they act only as carriers, such as allowing retail and wholesale price discrimination (within some binding limits applying to the latter). However, when carriers have economic interests in content markets, a three-part test is proposed, limiting carrier discretion within specific bounds. More generally, the policy analysis is premised on nurturing incentives for invest-

ing in economic experiments from both carriers and content providers, considerations that have often been overlooked within the policy debate over net neutrality.

The last two papers focus on the challenges posed by the shifts in the patent system and the appropriate legal and institutional responses. The past two decades have seen an explosion of patent awards across a wide variety of technologies and a dramatic increase in the volume of patent litigation between rivals. Numerous commentators have suggested that the proliferation of these awards has socially detrimental consequences: overlapping intellectual property rights make it expensive for firms to commercialize innovative products and difficult for inventors to move the technological frontier.

“Patent Reform: Aligning Reward and Contribution” by Carl Shapiro begins with the widely accepted observation that innovators must be able to receive as profits a reasonable portion of the social benefits of their innovations if innovation is to be suitably rewarded and encouraged. In many cases, Shapiro argues, the current U.S. patent system allows patent holders to obtain private rewards that *exceed* their social contributions. Such excessive patentee rewards are socially costly as they discourage innovation by others. Shapiro argues that it is critical that the rewards provided to patent holders be related to their actual social benefit. Thus, reducing excessive rewards to patent holders may boost social welfare. In particular, Shapiro highlights two reform proposals (expanding the independent invention defense and the use of reexaminations), which would have highly targeted effects on specific types of patent holders, while not causing an across-the-board reduction in the rewards to patent holders in general. In this respect, these reforms are quite different from the classic instrument of patent policy traditionally studied by economists, namely patent length. Further, because determining the optimal patent length requires an understanding of the relationship between the rewards provided to patent holders and the extent of inventive activity, which is enormously difficult, the proper patent length can be very difficult to compute; the proposed reforms circumvent this problem. After considering these reforms and their beneficial effects, Shapiro turns to three additional proposed changes relating to patent litigation: limiting the use of injunctions, clarifying the way in which “reasonable royalties” are calculated, and narrowing the definition of “willful infringement.”

*Patent pools*, which can be defined as formal or informal organizations where owners of intellectual property share patent rights with each

other and with third parties, are the focus of the paper by Josh Lerner and Jean Tirole, “Public Policy toward Patent Pools.” These pools have been proposed by many parties as a way in which firms can address this patent-thicket problem. Indeed, patent pools are already an economically significant institution and have also been increasingly seen as a potential solution for prevalent patent licensing issues in biotechnology-related fields. This paper aims at pointing out what we know and don’t know about patent pools, their general desirability, and the types of covenants that should or should not be included into their charters. It first presents the basic trade-off—that patent pools can be used to solve “stacking” problems that deter the adoption of innovative technologies, but can also be used by firms to suppress competition and maintain higher prices. After examining the extreme cases where patents of rival firms are perfect complements and perfect substitutes of each other, it turns to the more realistic but complex case where the patents are somewhere between these two extremes. In this middle ground, the authors highlight the importance of regulators’ stances toward independent licensing (the individual patent holder’s ability to license his or her property independently of the pool), grant-back policies (a requirement by the pool that members turn their future intellectual property to the pool if the latter is deemed essential to a proper working of the technology covered by the pool), and royalty control: appropriately designed policies can go a long way toward addressing the regulators’ concerns that the pool may be designed to suppress competition. The paper also considers the empirical evidence about these patent pools.

While the issues involved are undoubtedly difficult, these essays highlight the role that economic theory and empirical analysis can nonetheless play in evaluating key policies impacting innovation. They suggest that contemporary research in economics can usefully inform the evaluation of current and prospective innovation policy alternatives.

Adam B. Jaffe, Josh Lerner, and Scott Stern