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# Patent Policy Reform and Its Implications

Josh Lerner\*

Economists have long viewed the patent system as a crucial lever with which policymakers can affect the speed and nature of innovation in the economy. It is not surprising, then, that the profound changes that have roiled the U.S. patent system over the past two decades — the strengthening of patent rights by the specialized court that hears patent appeals and the reduced resources available to assess patent applications — are attracting increasing attention from the economics profession.

Here I briefly review some of the key changes that have taken place in the U.S. patent system, as well as a selection of studies that examine their short- and long-run implications. While this abbreviated treatment will not do justice to the complex issues involved, the interested reader will be directed to a variety of more detailed readings.<sup>1</sup>

## The Backdrop

The ferment in the U.S. patent system had its origin in two shifts. Neither was thoroughly discussed at the time, nor did policymakers appear to appreciate the *interaction* between these two changes.<sup>2</sup>

The first was a seemingly technical shift in the appellate process. Since the birth of the republic, almost all formal disputes involving patents have been tried in the federal judicial system. The initial litigation must occur in a district court. Before 1982, appeals of patent cases were heard in the appellate courts of the various circuits. These circuits differed considerably in their interpretation of patent law, with some of them more than twice as likely to uphold patent claims than others.

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These differences persisted because the Supreme Court rarely heard patent-related cases.

The result was widespread “forum shopping” in patent cases. Patent applicants would crowd the hallway in the office where the list of awards was distributed at noon on each Tuesday. Upon discovering that their patent had issued, they would rush to the pay phones to instruct their lawyers to file a patent-infringement lawsuit against competitors in a patent-friendly district court. Meanwhile, representatives of firms who might infringe the issued patent would race to the phones as well. They would order their lawyers to file a lawsuit seeking to have the new patent declared invalid in a “skeptical” district. Often the fate of the case — and many million dollars in damages — would hinge on which lawyer got his suit time-stamped first. (Judges would often combine such dueling lawsuits into a single action, heard in the district court where the initial action was filed.)

In 1982, the U.S. Congress decided to tackle this situation. It established a centralized appellate court for patent cases: the Court of Appeals for the Federal Circuit (CAFC). In the congressional hearings that preceded the decision, lawmakers reassured constituents that the change would bring much-needed consistency to the volatile world of patent litigation. But even from the inception of the legislative push, informed insiders suspected that the new court would substantially boost patent-holders’ rights.

And that is precisely what happened. The CAFC was staffed mostly with judges in the federal system who had experience as patent attorneys. Not surprisingly, many had an outlook that was sympathetic to the patent system. Over the next decade, in case after case, the court significantly broadened patent-holders’ rights. A comparison of the CAFC’s rulings

with those of the previous courts illustrates the magnitude of the change. Whereas the circuit courts had affirmed 62 percent of district-court findings of patent infringement in the three decades before the creation of the CAFC, the CAFC in its first eight years affirmed 90 percent of such decisions.<sup>3</sup> The court expanded patent-holders’ rights along a number of other dimensions as well.

The impact of the strengthening of patent rights alone would be difficult to predict: after all, a voluminous theoretical literature has debated the virtues of strong and weak patent protection. Yet these changes to the judicial system did not happen alone — simultaneously, the U.S. Patent and Trademark Office (PTO) itself was also changing. In 1999, Congress converted the PTO from a tax-revenue-funded agency that collected nominal fees for patent applications into one funded solely by fees. Indeed, the PTO has become a “profit center” for the government, collecting more in application fees than it costs to run the agency. Meanwhile, levels of compensation of patent examiners fell well below comparable positions in the private sector. Simultaneously, and perhaps not coincidentally, the PTO increasingly defined its mission as serving patent applicants. Many critics have suggested that these pressures have led to a lowering of the standards for examining of patent awards.

## The Nature of the Changes

What are the consequences of these changes? How have these shifts affected the way in which firms apply for patents, and use their patents once they are awarded?

Economists have explored these questions primarily through industry studies.<sup>4</sup> One effort examined the

biotechnology industry, which has been the site of some of the most intensive patent litigation.<sup>5</sup> I examined the propensity of firms to patent in sub-classes of rival firms that had already received awards. My analysis showed that firms with high litigation costs were less likely to patent in more “crowded” subclasses with many other awards, particularly those of firms with low litigation costs. This pattern was consistent with the literature on costly litigation, which suggests that firms with high litigation costs will take greater precautions to avoid litigation, and raises questions as to whether the strengthening of patent protection was affecting the direction of technological innovation.

Bronwyn Hall and Rosemarie Ziedonis, meanwhile, analyze in detail the behavior of semi-conductor firms.<sup>6</sup> Combining empirical analyses with interviews of lawyers and managers at semi-conductor firms, they document the critical role of patent strategy. The complex nature of semi-conductor technology implies that firms must use rivals’ technologies, so cross-licensing agreements are an economic necessity. Furthermore, the capital intensity of the industry implies that the costs of an injunction would be punishing. As a result, firms build large portfolios of patents, which they then cross-license with rivals.

Hall and Ziedonis suggest that the strengthening of patent protection has led to an increased emphasis on seeking patent protection, even if the pace of innovation at large firms has not increased. At the same time, they acknowledge that recent years have seen much entry of “fabless” manufacturers, who design chips but leave the manufacturing to others. Without strong patent protection, it is unclear whether such vertical disintegration could have occurred.

My recent study of securing patents on financial formulas and methods highlights various concerns about patent quality.<sup>7</sup> Awards in this category have exploded, particularly after a 1998 decision by the CAFC unambiguously established the patentability of such innovations. Analyses of the awards and surveys of patent lawyers suggest that academic research is germane to

many of the patents being awarded (and indeed, that much of academic finance research could be patented). Despite this seeming overlap, very few of the finance patents awarded today cite academic research as “relevant previous discoveries.” In fact, there are numerous examples of academic papers anticipating the patented discovery by many years, which should have made it impossible to patent the “discovery.” Comparisons of finance patents with awards in other academic-related fields suggest that the seemingly poor quality of financial patents is attributable to the lack of experience of the examiners reviewing the applications: these examiners are far less likely to have a doctorate in a relevant field or to have examined a significant number of patents in this area.

## The Impact on Innovation

What impact have these changes had on the rate of innovation? To what extent do these changes really affect the pace of innovation in a given industry?

Initially this literature tended to examine a single policy change in depth. Of the works along these lines, Lee Branstetter and Mariko Sakakibara’s examination of the increase in the scope of Japanese patent protection stands out.<sup>8</sup> Prior to 1988, the Japanese patent system essentially allowed only one claim per patent, which led to very narrow awards. In that year, Japan converted to a system much like the U.S. system, in which a single patent can have multiple claims. The authors examine the impact of this change on innovation by studying the shifts in research spending in Japan around this time, as well as the change in filings in the United States (whose patent system did not change in this time). Their study shows that neither of these changes occurred. The certainty with which the authors can conclude that the shift in patent protection did not affect innovation, however, is tempered by the fact that the effect of the policy shift may have been relatively minor, and there was the possibility of economy-wide shocks

during the same period.

My recent work generalizes this approach by examining the impact of major patent policy shifts in 60 nations over the past 150 years that enhanced or reduced the amount of patent protection provided (but not the scope of awards).<sup>9</sup> I examine the changes in patent applications by residents of the nation undertaking the policy change. I tabulate the filings that the residents made domestically, although confounding factors may influence this measure. Thus, I focus on filings made by residents of the nation undertaking the policy change *in a nation with a relatively constant patent policy*, Great Britain. The basic patterns are striking. Once overall trends in patenting are adjusted for, the changes in patenting by residents of the country undertaking the policy change are weak, and indeed negative, both in Great Britain and in the country itself. Cross-sectional analyses suggest that the impact of patent protection-enhancing shifts was greater in nations with weaker initial protection and greater economic development, consistent with economic theory. My interpretation of the results must be cautious, because the measure of innovative output is a crude one and other forms of technology policy are not considered. But, subject to the caveats, this evidence suggests that these policy changes have a limited effect on domestic innovation.

## Institutional Responses to the Patent Policy Changes

One emerging research area examines the mechanisms through which firms can address problems of overlapping patents. A number of legal scholars, including Robert Merges, have argued that collective rights organizations (such as patent pools) should be encouraged, in order to address the coordination and hold-up problems that such patents introduce. These arguments were placed into an economic framework in an important paper by Carl Shapiro.<sup>10</sup> He argued that cross-licenses and patent pools are natural responses by firms to address the problems posed by overlapping patent

holdings. Despite the desirability of this solution, antitrust law historically has viewed these mechanisms with suspicion. Using a simple Cournot model, Shapiro demonstrates that a few relatively simple principles — such as insuring that patents licensed together are complements, not substitutes — can help assure policymakers that these mechanisms are socially beneficial.

This work in turn has stimulated other research, examining the normative and positive features of these mechanisms. In a series of empirical and theoretical papers, Jean Tirole and I examine a variety of mechanisms by which firms share their intellectual property holdings: open source projects,<sup>11</sup> patent pools,<sup>12</sup> and (in ongoing work) standard setting organizations, for example. In a similar vein, Jeffrey Furman and Scott Stern examine tissue type collections, through which the fruits of academic research are shared.<sup>13</sup> Given the ubiquity of challenges associated with overlapping patent holdings, and the slow pace of policy reform in this arena, it is likely that these institutions will play an even more important role in the years to come, and that further research into their workings will be valuable.

In short, the shifts in patent policy and practice over the past two decades appear to be having a substantial impact on the American economy. While economists to date have had relatively little impact on the patent policy process, the growth of research into critical questions is encouraging.

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<sup>1</sup> Two recent review articles are good starting places: N. T. Gallini, "The Economics of Patents: Lessons from Recent U.S. Patent Reform," *Journal of Economic Perspectives*, 16 (Spring 2002), pp. 131-54; and A. B. Jaffe, "The U.S. Patent

*System in Transition: Policy Innovation and the Innovation Process*," NBER Working Paper No. 7280, August 1999, and in *Research Policy*, 29 (2000), pp. 531-57.

<sup>2</sup> This section is based on A. B. Jaffe and J. Lerner, *Into the Patent Thicket*, Princeton, NJ: Princeton University Press, 2004. It should also be noted that there were important changes around this time in policies concerning the commercialization of patented academic research and in the harmonization of the global patent system, neither of which will be discussed here.

<sup>3</sup> These statistics are gleaned from G. K. Koenig, *Patent Invalidation: A Statistical and Substantive Analysis*, New York: Clark Boardman, 1980; and R. L. Harmon, *Patents and the Federal Circuit*, Washington: Bureau of National Affairs, 1991.

<sup>4</sup> Some exceptions, with an explicitly cross-industry perspective, exist as well. Examples include W. M. Cohen, R. R. Nelson, and J. P. Walsh, "Protecting Their Intellectual Assets: Appropriability Conditions and Why Firms Patent and Why They Do Not in the American Manufacturing Sector," NBER Working Paper No. 7552, February 2000; and S. Kortum and J. Lerner, "Stronger Protection or Technological Revolution: What Is Behind the Recent Surge in Patenting?" NBER Working Paper No. 6204, September 1997, and in *Carnegie-Rochester Series on Public Policy*, 48 (1998), pp. 247-304. An alternative approach has been to look at specific policy shifts: examples include D. K. N. Johnson and D. Popp, "Forced Out of the Closet: The Impact of the American Inventors Protection Act on the Timing of Patent Disclosure," NBER Working Paper No. 8374, July 2001, and in *RAND Journal of Economics*, 34 (2003), forthcoming; and J. O. Lanjouw and J. Lerner, "Tilting the Table? The Use of Preliminary Injunctions," *Journal of Law and Economics*, 44 (2001), pp. 573-603.

<sup>5</sup> J. Lerner, "Patenting in the Shadow of

Competitors," *Journal of Law and Economics*, 38 (1995), pp. 563-95.

<sup>6</sup> B. H. Hall and R. H. Ziedonis, "The Patent Paradox Revisited: An Empirical Study of Patenting in the U.S. Semiconductor Industry, 1979-1995," NBER Working Paper No. 7062, March 1999, and in *Rand Journal of Economics*, 32 (2001), pp. 101-28.

<sup>7</sup> J. Lerner, "Where Does State Street Lead? A First Look at Finance Patents, 1971-2000," NBER Working Paper No. 7918, September 2000, and in *Journal of Finance*, 57 (2002), pp. 901-30.

<sup>8</sup> M. Sakakibara and L. Branstetter, "Do Stronger Patents Induce More Innovation? Evidence from the 1988 Japanese Patent Law Reforms," NBER Working Paper No. 7066, and in *Rand Journal of Economics*, 32 (2001), pp. 77-100.

<sup>9</sup> J. Lerner, "Patent Policy and Innovation Over 150 Years," NBER Working Paper No. 8977, June 2002.

<sup>10</sup> C. Shapiro, "Navigating the Patent Thicket: Cross Licenses, Patent Pools, and Standard Setting," *Innovation Policy and the Economy*, 1 (2000), pp. 119-50.

<sup>11</sup> J. Lerner and J. Tirole, "Some Simple Economics of Open Source," *Journal of Industrial Economics*, 52 (2002), pp. 197-234; "The Scope of Open Source Licensing," NBER Working Paper No. 9363, December 2002.

<sup>12</sup> J. Lerner and J. Tirole, "Efficient Patent Pools," NBER Working Paper No. 9175, September 2002; J. Lerner, M. Strojwas, and J. Tirole, "The Structure and Performance of Patent Pools: Empirical Evidence," unpublished working paper, Harvard University and University of Toulouse, 2002.

<sup>13</sup> J. L. Furman and S. Stern, "Climbing Atop the Shoulders of Giants: The Impact of Institutions on Cumulative Research," unpublished working paper, Boston University and Northwestern University, 2002.