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History Lessons: The Early Development of Intellectual Property Institutions in the United States

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# History Lessons

## The Early Development of Intellectual Property Institutions in the United States

B. Zorina Khan and Kenneth L. Sokoloff

This occasional feature will discuss episodes and events drawn from economic history that have lessons for current topics in policy and research. Responses to this column and suggestions for future columns should be sent to Kenneth Sokoloff, Department of Economics, University of California-Los Angeles, 405 Hilgard Ave., Los Angeles, CA 90095-1477.

### Introduction

Samuel L. Clemens was actively engaged in all dimensions of intellectual property. Though he was the first writer to incorporate and register his pseudonym as a trademark, and copyrights on his best selling books yielded a steady flow of income, his single most profitable property right was to a self-pasting scrapbook he patented in 1873. Some of his greatest disappointments, however, stemmed from troubles with the intellectual property system, including unsuccessful litigation over piracy of his works and investments in patented technologies which turned sour and contributed to his bankruptcy. Despite his decidedly mixed experience, Clemens remained an ardent believer in systems of intellectual property. Speaking through the Connecticut Yankee in King Arthur's Court, Mark Twain (1899, p. 70) declared: "[T]he very first official thing I did, in my administration—and it was on

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the very first day of it too—was to start a patent office; for I knew that a country without a patent office and good patent laws was just a crab, and couldn't travel any way but sideways or backwards."<sup>1</sup>

Clemens was far from alone among nineteenth-century observers in his view that the U.S. patent system was a significant factor behind the rapid technological progress and great prosperity that the nation enjoyed. The United States dazzled the world with its ingenuity at the Crystal Palace exhibition of 1851, held in London for the purpose of displaying the inventions of all countries (Rosenberg, 1969; Hounshell, 1984). The broad spectrum of the U.S. population involved in inventive activity received much comment, as did the wide range of industries to which American inventors had made contributions. Many suggested that America's distinctive patent laws were especially favorable to invention, and it was no coincidence that Britain, after nearly a quarter century of study by a series of parliamentary committees, approved a major overhaul of its patent system in 1852 to make it more like that of its competitor across the Atlantic (Dutton, 1984).

Debate about the design of systems of intellectual property continued, however. Some observers doubted the net benefits, especially to small countries, of awarding property rights in technology at all; indeed, during the so-called patent controversy of the mid-nineteenth century, the Netherlands and Switzerland did away with their patent systems for extended periods (Schiff, 1971; Machlup and Penrose, 1950). Others argued for limiting grants to inventions that were of major consequence or had required extraordinary talents and resources to discover.<sup>2</sup> At a general level, there was much discussion of whether and how systems of intellectual property should vary over time, technology, or stage of development, as well as of the returns to harmonizing them across countries. Although opinion remained divided, most countries—helped along by a series of international conferences that were organized to encourage convergence in the treatment of intellectual property—moved in the same direction by the end of the century.

Then, as now, the United States exercised a major influence on the worldwide evolution of intellectual property—and especially patent—institutions. This country was ironically something of an international plunderer in the realm of copyrighted material for most of the nineteenth century and only agreed to modify its laws to allow foreign residents copyrights in 1891, but was nevertheless widely recognized as the pioneer in offering broad access to strictly enforced patent rights. Moreover, as was suspected then and been established since in work discussed below, U.S. institutions performed well in stimulating inventive activity. Not only did they enhance the material incentives to inventors of even humble devices with

<sup>1</sup> Clemens was not always so admiring of the copyright system: "Only one thing is impossible for God: to find any sense in any copyright law on the planet" (as quoted in Paine, 1935, p. 381).

<sup>2</sup> Similar sentiments were expressed even in the United States, where organized groups representing railway companies and farmers lobbied heavily for changes in the law that would have made it more difficult to enforce patents pertaining to inventions that they deemed straightforward incremental extensions of existing technology or "in the air." In 1878, while Congress was consumed with extended and controversial deliberations about the reforms needed, the Supreme Court took the initiative and narrowed the enforceable breadth of patents (Usselman, 1999).

grants of monopoly privileges for limited duration, but they also encouraged the development of a market for technology and the diffusion of technological knowledge. In relating the early histories of the patent and copyright institutions in the United States, we also highlight how they were not static but instead evolved over time in response to changes in the extent of markets, technology, and other factors.

## **Patent Laws**

The grant of exclusive property rights vested in patents has a long history, tracing back to medieval guild practices in Europe. Monarchs frequently used patents to raise revenue through the sale of, or to reward favorites with, privileges such as monopolies over trade in specified commodities. In Britain, the Statute of Monopolies in 1624 repealed the practice of monopoly grants to all except inventors, but the patent system retained many features that reflected its origins in royal privilege well into the nineteenth century. Patent rights continued to be regarded as something of a favor from the Crown, and applications had to win approval from a number of different officials before the monarch signed off. Other salient features of the British system were the extremely high fees assessed and the restriction of access to the specifications of patents until they expired. Britain, like most other nations in Europe, often awarded patents to residents who were importing technologies discovered elsewhere (Dutton, 1984; Macleod, 1988, 1999), but imposed “working requirements” (that a patent had to be used in production within the country to remain in force).

The framers of the U.S. Constitution and its early laws were familiar with British precedents, and so it might be reasonably inferred that their innovations in design were self-conscious and deliberate. The intellectual property clause providing for the patent and copyright systems appears in the very first Article of the U.S. Constitution, whereby Congress was instructed to “promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries.” From what record of their thinking survives, the framers were intent on crafting a new type of system that would be focused on promoting learning, technology, and commercial development, as well as create a repository of information on prior art. Indeed, it can be argued that the result of their efforts was the world’s first modern patent institution (Bugbee, 1967; Khan and Sokoloff, 1998).

One goal was broad access to property rights in technology, which was achieved through low fees (less than 5 percent of what they were in Britain) and an application process that was impersonal and relied on routine administrative procedures. Incentives for generating new technological knowledge were also fine-tuned by requiring that the patentee be “the first and true inventor” anywhere in the world and that the specifications of the invention be available to the public immediately on the issuance of the patent. This latter condition not only sped the diffusion of technological knowledge, but also—when coupled with strict enforcement of patent rights—aided in the commercialization of the technology.

The legal system reinforced the effectiveness of the patent system (Khan, 1995). Within a few decades the judiciary evolved rules and procedures to enforce the rights of patentees and their assignees. Supreme Court Justice Joseph Story, the acknowledged intellectual property expert of the early courts, made the perspective clear in *Lowell v. Lewis* (15 F. Cas. 1018 [1817]): “[T]he inventor has a property in his invention; a property which is often of very great value, and of which the law intended to give him the absolute enjoyment and possession . . . involving some of the dearest and most valuable rights which society acknowledges, and the constitution itself means to favor.”

Congress was also flexible in adapting the law to improve the system, most notably with the Patent Act of 1836 that introduced the examination system that is still in use today. The previous registration system, modeled on British practices, had left issues of novelty and validity or appropriate scope in patent applications to be resolved through civil actions, which proved to be an inefficient way of resolving competing claims. Beginning on July 4, 1836, each application was scrutinized by technically trained examiners to ensure that the invention conformed to the law, and constituted an original advance in the state of the art.<sup>3</sup> The change led to a substantial increase in the potential returns to inventive activity. Particularly important was that the strengthening of the property right entailed in a patent grant gave impetus to the evolution of organized trade in patented technologies.

## Copyright Laws

Copyright policies, despite their common source in the intellectual property clause of the Constitution, provided a marked contrast to the patent system.<sup>4</sup> The first U.S. copyright statute was approved on May 31, 1790, “for the encouragement of learning, by securing the copies of maps, charts, and books to the authors and proprietors of such copies, during the times therein mentioned.” Authors (broadly defined) were able to obtain copyright protection by registering their works, complying with deposit and notification rules, and paying a nominal fee. Registration initially secured the right to print, publish and sell maps, charts and books for a period of 14 years, with the possibility of an extension for another term. However, the subject matter and scope of copyrights expanded significantly over the course of the nineteenth century to include musical compositions, plays, engravings, sculpture, and photographs. By 1910 the original copyright holder was granted

<sup>3</sup> Between 1790 and 1793, the United States had the first statutory examination system in the world, but it proved unwieldy because the original examiners were the Attorney General, the Secretary of War, and the Secretary of State (Thomas Jefferson). Jefferson, who bore most of the burden, felt that these officials did not have as much time to devote to the examination of the applications as the job deserved.

<sup>4</sup> As noted by the U.S. Supreme Court in *Wheaton v. Peters* (33 U.S. 591, 684 [1834]): “It has been argued at the bar, that as the promotion of the progress of science and the useful arts is here united in the same clause in the constitution, the rights of the authors and inventors were considered as standing on the same footing; but this, I think, is a non sequitur . . . for when congress came to execute this power by legislation, the subjects are kept distinct, and very different provisions are made respecting them.”

derivative rights such as to translations of literary works into other languages; to performances; and the rights to adapt musical works, among others. Congress also lengthened the term of copyright, to a much greater degree than it did with patents, several times (Bugbee, 1967; Khan, 2000).

The United States was long a net importer of literary and artistic works, especially from England, which implied that recognition of foreign copyrights would have led to a net deficit in international royalty payments. Despite the lobbying of numerous authors and celebrities on both sides of the Atlantic, the American copyright statutes did not allow for copyright protection of foreign works for a full century.<sup>5</sup> As a result, the nineteenth century offers a colorful episode in the annals of intellectual property, as American publishers and producers freely pirated foreign literature, art and drama. The publishing industry was further protected by tariffs on books that ranged as high as 25 percent. Other countries retaliated and refused to grant American authors copyright protection.

As a result of lack of legal copyrights in foreign works, publishers raced to be first on the market with the “new” pirated books, and the industry experienced several decades of intense, if not quite “ruinous” competition. By the middle of the nineteenth century, however, the industry achieved relative stability because the dominant firms cooperated in establishing synthetic property rights in foreign-authored books. American publishers made payments (termed “copyrights”) to foreign authors to secure early sheets, and other firms recognized their exclusive property in the “authorized reprint.” These exclusive rights were tradeable, and enforced by threats of predatory pricing and retaliation. Such practices suggest that legally enforceable property rights were of sufficient importance to publishers that, in their absence, the companies attempted to simulate their effects, albeit at higher costs (Khan, 2000).

In the case of patents, the rights of inventors, whether domestic or foreign, were widely viewed as coincident with public welfare. In stark contrast, U.S. policy-makers showed from the very beginning an acute sensitivity to trade-offs between the rights of authors (or publishers) and social welfare (Breyer, 1970; Landes and Posner, 1989; Khan, 2000). The protections provided to authors under copyrights were as a result much more limited than those provided in many European countries with laws based on moral rights. Of relevance here are stipulations in the United States regarding first sale, work for hire, and fair use.

Under a moral rights-based system, an artist or the artist’s heirs can claim remedies if subsequent owners alter or distort the work in a way that allegedly injures the artist’s honor or reputation. According to the first sale doctrine, the copyright holder lost all rights after the work was sold. If the copyright holder’s

<sup>5</sup> John Ruggles was one of the leading authorities in Congress on the patent system and a strong proponent of the 1836 changes in the patent law. He was also a key member of a committee to consider reforming international copyrights, and he argued (as quoted in Barnes (1974, p. 71) that “American ingenuity in the arts and practical sciences would derive at least as much benefit from international patent laws, as that of foreigners. Not so with authorship and book-making. The difference is too obvious to admit of controversy.”

welfare would be enhanced by nonmonetary concerns, these individualized concerns could be addressed and enforced through contract law, rather than through a generic federal statutory clause that would affect all property holders. Similarly, “work for hire” doctrines also repudiated the right of personality, in favor of facilitating market transactions. For example, in 1895 Thomas Donaldson filed a complaint that Carroll D. Wright’s editing of Donaldson’s report for the Census Bureau was “damaging and injurious to the plaintiff, and to his reputation” as a scholar. The court rejected his claim and ruled that as a paid employee he had no rights in the bulletin; to rule otherwise would create problems in situations where employees were hired to prepare data and statistics.

This difficult quest for balance between private and public good is most evident in the copyright doctrine of “fair use” that (unlike with patents) allowed unauthorized access to copyrighted works under certain conditions. Joseph Story ruled in *Folsom v. Marsh* (9 F. Cas. 342 [1841]): “[W]e must often, in deciding questions of this sort, look to the nature and objects of the selections made, the quantity and value of the materials used, and the degree in which the use may prejudice the sale, or diminish the profits, or supersede the objects, of the original work.” One of the striking features of the fair use doctrine is the extent to which property rights were defined in terms of market valuations, or the impact on sales and profits, as opposed to a clear holding of the exclusivity of property. Fair use doctrine thus illustrates the extent to which the early policymakers weighed the costs and benefits of private property rights. If copyrights were as strictly construed as patents, it would serve to reduce scholarship, prohibit public access for noncommercial purposes, increase transactions costs for potential users, and inhibit learning which the statutes were meant to promote.

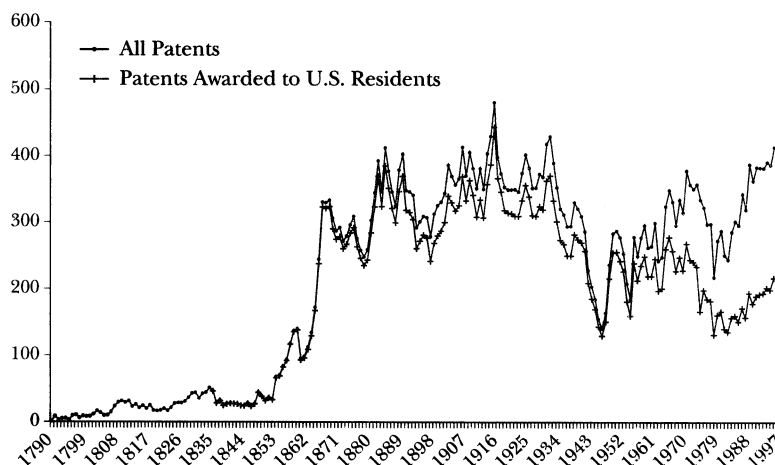
The copyright system evolved throughout the nineteenth century to encompass improvements in technology and changes in the marketplace (Litman, 1989; Khan, 2000). New technologies, such as lithography and photography, stimulated change by creating new subjects for copyright protection, and by lowering the costs of infringement of copyrighted works. In *Edison v. Lubin* (122 F. Cas. 240 [1903]), a lower court rejected Edison’s copyright of moving pictures under the statutory category of photographs. This decision was overturned by the appellate court: “[Congress] must have recognized there would be change and advance in making photographs, just as there has been in making books, printing chromos, and other subjects of copyright protection.” Many uncopyrightable innovations such as stock market quotations and ticker tape news reports were protected through alternative doctrines, such as unfair competition, to further market transactions.

## **The Development of Patenting and Patent Institutions**

Encouraged by the low costs of filing and the relatively rapid development of mechanisms for enforcement, Americans were from the outset enthusiastic about establishing their claims to intellectual property. By 1810 the United States far

Figure 1

## Patents Per Million Residents in the United States, 1790–1998



surpassed Britain in patenting per capita. Patenting exhibited a strongly pro-cyclical pattern throughout the nineteenth century, with the salient exception being the sharp acceleration that occurred during the years just preceding the War of 1812, when the Embargo of 1807 and other barriers dramatically reduced the volume of foreign trade. Such developments would normally be expected to have triggered an economic contraction in the young country which exported agricultural goods and natural resources, but the stimuli to inventive activity provided by the cut-off of supplies of manufactures from abroad and the spread of the population westward, along with the associated investments in manufacturing plant and in the transportation infrastructure, may have been sufficient to offset the effects of an aggregate downturn. Patenting rates stagnated during the War of 1812 and the severe worldwide contraction that followed, but resumed their rapid rise early in the 1820s (Sokoloff, 1988). Except for the sharp drop in the number of patents granted when the examination system replaced the registration system in 1836, and dips during general economic downturns and the Civil War, the trend was steadily upward until peaking in the mid-1880s. The growth in patenting was especially dramatic from the 1840s through the 1870s when the per capita rate increased 15 times. Figure 1 shows the pattern of patents per capita throughout American history.<sup>6</sup>

Scholars have followed the path blazed by Jacob Schmookler (1966) and Zvi Griliches (1990) by employing patent records to study the sources and patterns of inventive activity over this crucial period when the United States emerged as a world leader in technology and an industrial power. One of the principal implications of this work to date has been that inventors were quite sensitive to so-called “demand-

<sup>6</sup> It is interesting that the decline in patenting rates began first, as early as the 1870s, in areas where patenting rates were highest, such as southern New England and big cities in general (Lamoreaux and Sokoloff, 1999b).



side” factors. Researchers have created proxies for market access by exploiting the large differences between the costs of transporting goods by water and by land prior to the railroad and demonstrated that patenting rates varied substantially across geographic areas with access to markets, even after controlling for local industrial composition and degree of urbanization. Moreover, close examination of what happened in the vicinity of discrete transport projects, such as the Erie Canal, whose routes were chosen through processes exogenous to the state of economic development, suggests that rates of patenting rose steeply within a few years of opening (Sokoloff, 1988, 1992; Sokoloff and Khan, 1990). Similar patterns have been noted in early industrial Britain (Macleod, 1988). This close relationship between access to markets and patenting is certainly consistent with the view that inventive activity was responsive to material incentives, as well as to the availability and security of property rights in technology.

Many questions have been raised about whether such evidence is sufficient to sustain the hypotheses that the rate of invention was higher because the expansion of markets had increased the returns to new technologies or because the existence of a well-functioning patent system helped inventors to appropriate some of those returns. Although there remains room for skepticism, these complementary ideas have survived a number of stringent tests of consistency with the record.

For example, critics have argued that patent counts are flawed by the inability to distinguish between important and trivial inventions. To evaluate the relevance of this problem, systematic data on the efforts of 160 early nineteenth-century “great inventors” (whose inventions were presumably more valuable on average than those of all inventors) were collected and analyzed (Khan and Sokoloff, 1993). Virtually all of these great inventors made use of the patent system to appropriate returns to their efforts. Moreover, their patenting exhibited cyclical patterns remarkably similar to those of ordinary patentees, and their activity was even more concentrated in geographic areas with low-cost access to markets. Such locations must have been particularly attractive to technologically creative individuals seeking to extract the returns to their talents, and part of the high patenting by great inventors in these locations was due to in-migration. However, since the great inventors were disproportionately born in the same areas, the extent of markets does seem to have had real independent effects on the rates of inventive activity. Overall, the strong association of patenting with the market in the case of both ordinary patentees and (even more) great inventors supports the notion that potential returns played a major role in the processes generating inventions—big and small.

As the extent of the market for technology expanded over the course of the nineteenth century, creative individuals with a comparative advantage in technology appear to have increasingly specialized in inventive activity (Lamoreaux and Sokoloff, 1996, 1999a). This tendency was likely reinforced by the increasing importance to inventors of specialized technical knowledge as technology became more complex. The dramatic increase in specialization took place at two levels. First, among individuals, there was a substantial rise in the proportion of all patents that were awarded to inventors who were specialized or very productive at invention over their careers. From the first third of the nineteenth century to the last third,

the fraction of cross-sections of patents that went to inventors who received ten or more patents over their career jumped from less than 5 percent to between 25 and 36 percent. These particularly productive inventors were also distinguished by high rates of assignment (selling off) or licensing to firms or other individuals. Among the above-mentioned “great inventors” (whose activity was primarily in the first half of the century), roughly two-thirds extracted some of the return to their inventions through these means. Among a random sample of patentees from the late nineteenth and early twentieth centuries, patentees who received five or fewer patents over their careers assigned away the rights to less than 20 percent of them. In contrast, those who received 20 or more patents over their careers sold off the rights to nearly 60 percent of their patents (Lamoreaux and Sokoloff, 1999a).

The other way in which specialization increased was across organizations. The period of the late nineteenth and early twentieth century has sometimes been referred to as the “golden age of independent inventors” (Hughes, 1989). Although specialization at invention across individuals can occur within a single firm, and indeed is often a celebrated feature of many large firms with research and development laboratories, many major changes in technology during the nineteenth century were realized across enterprises through the operation of a market for technology. Lamoreaux and Sokoloff (1999a) have shown that the highly productive patentees of that era were generally not employees of the firms to which they assigned their patented inventions and that firms relied extensively on procuring technologies generated outside of the firm. The evolution of a market for technology had allowed for a division of labor between individuals or firms who were relatively specialized at invention, and those who focused on commercial development. During the second half of the nineteenth century, these professional inventors exhibited “contractual mobility,” where they assigned different patents to different assignees. A typical example is Richard Gatling, who received many patents for inventions ranging from agricultural machinery (like a rice-sowing machine, a wheat drill, a hemp-breaking machine, and motor-driven plow) to his famous Gatling gun, over a career spanning 60 years. Gatling was highly entrepreneurial, never attached to any single firm for very long, and relied largely on the sale or licensing of his patents to a wide array of different manufacturers to extract the returns to his efforts.

It was only early in the twentieth century that a trend toward long-term attachments between highly productive inventors and particular firms became evident. Even then, these inventors were more likely to have become principals or officers in the firms to which they assigned their patents, rather than employees.

What were the origins of this market for technology? Trade in patented technology appears to have grown rapidly soon after the introduction of the examination system in 1836 strengthened the property right to the technology covered by a patent. This development reduced the transactions costs associated with commerce in technology, and an examination of the registry of the assignment contracts maintained by the Patent Office (where they had to be deposited within three months in order to be legally binding) indicates that already by the 1840s there was a high rate of exchange in patent rights. At first, much of the trade in

patent rights consisted of geographic-specific assignments, such as an inventor in Massachusetts selling off the rights to his patent for the state of Missouri and for the state of Illinois to two different firms in St. Louis and Chicago, respectively. In a context in which high transportation costs meant that output markets were regionally segmented, such geographic assignments were an effective way for an inventor to appropriate more of the return to his investment in inventive activity—for it augmented the return he could realize through direct commercial application in his hometown. But as transportation costs fell and a national market developed, sales of patent rights were carried out for the entire country.

Institutional support for trade in patented technologies came from many sources. Most fundamental was the rapid diffusion of information about inventions by the U.S. Patent Office. Early in the nineteenth century it began to publish regularly descriptions of patents granted and it maintained offices throughout the country where models of recently patented inventions could be displayed and examined. Public knowledge of new patents and developments in technology was further stimulated when growing legions of patent agents or lawyers materialized soon after the 1836 law, especially in major cities and other localities where rates of patenting were high. Although these agents focused initially on helping inventors obtain patents under the new system, they soon assumed a major role in the marketing of patented inventions. By the mid-1840s periodicals (such as *Scientific American*) with the latest news about patents and technology (including extensive sections of classified advertisements encompassing all types of participants in a general market on technology) were introduced by national patent agencies. They attracted large readerships and helped popularize invention as a path for the entrepreneurially minded.

Over time, intermediation in this market for technology grew ever more articulated in a process not unlike the evolution of financial intermediaries. Patent agents and lawyers became increasingly specialized and were drawn into activities such as the provision of advice to inventors about the prospects for various lines of inventive activity, and the matching not only of buyers with sellers of patents but also of inventors with individuals seeking to invest in the development of new technologies (Lamoreaux and Sokoloff, 2000).

Near the end of the nineteenth century, patenting on a per capita basis began a long secular decline, which has only recently shown signs of reversing (see Figure 1). This protracted decrease in patenting rates has attracted much attention from scholars of technology, and undoubtedly had diverse sources (Griliches, 1994). Yet, it is intriguing to consider whether this marked shift in the patenting rate was related to the equally dramatic change in the organization of inventive activity that started to emerge at about the same time. The most productive inventors of the late nineteenth century were quite entrepreneurial and independent of the firms that commercially exploited their discoveries. But early in the 1900s, long-term attachments between inventors and their assignees, as well as the formation of research laboratories within large-scale businesses organizations, became more prevalent (Lamoreaux and Sokoloff, 1999a; Mowery, 1983, 1995).

What factors accounted for the decrease in patenting, especially by independent inventors? One possibility is that the growing complexity and capital intensity of

technology raised the cost of carrying out programs of research and development. In the absence of developed sources of venture capital, these increased costs may have reduced the aggregate amount of inventive activity and led to its concentration in large firms with an advantage in mobilizing capital (Lamoreaux and Sokoloff, 1999a, 2000).<sup>7</sup>

Changes in the law may also have been important, as a series of rulings over the late nineteenth and early twentieth centuries led to a narrowing in the scope of patents and a strengthening of the ability of firms to protect trade secrets, enforce restrictive covenants, and obtain the rights to patents awarded to employees (Usselman, 1999; Fisk, 1998, 2000; Merges, 1999; Lerner, 1995). This evolution of legal thinking about the allocation of intellectual property rights was likely encouraged by a growing appreciation of the amount of investment required to support inventive activity, as well as by the relative political influence of parties with material interests. Whatever the basis for, or significance of, these changes in doctrine, the qualitative impact would have been to diminish the relative importance of patenting as a means of extracting the return to inventive activity. Instead, firms increasingly relied on other means of appropriating returns, such as trade secrecy or accelerated product development (Mowery, 1995; Lerner, 1995; Merges, 1997; Levin, Klevorick, Nelson and Winter, 1987; Cohen, Nelson and Walsh, 2000).

Another important development in the intellectual property rights regime over the late nineteenth century was the movement to attain more uniformity across countries (Penrose, 1951; Kronstein and Till, 1947). Part of the impetus came from the costs of discordant national rules becoming more burdensome as the volume of trade in industrial products grew over time. The first international patent convention was held in Austria in 1873, at the suggestion of the United States, and was followed by other agreements including the International Union for the Protection of Industrial Property in 1884. Because the U.S. patent system was recognized as the most successful, it is not surprising that patent harmonization implied convergence towards that model.

The goal of complete uniformity in patent law was not practicable, given the different objectives, ideologies and economic circumstances of participants. For instance, many countries insisted on retaining working requirements or compulsory licenses, despite fierce U.S. opposition to these constraints on the rights of patentees. Countries such as Germany were initially averse to extending equal protection to foreigners because they feared that their domestic industry would be overwhelmed by American patents. The United States pressed for the adoption of reciprocity (which would ensure that American patentees were treated as favorably abroad as in the United States) but this principle was rejected in favor of “national treatment” (American patentees were to be granted the same rights as nationals of the foreign country). An important aspect of international patent cooperation at the beginning of the twentieth century was the adoption of the right of priority, which meant that a patent

<sup>7</sup> For a discussion of the possibility that the rise of venture capital firms has contributed to the recent increase in patenting evident in Figure 1, and perhaps to the resurgence of firms specialized at invention, see Kortum and Lerner (1998).

grant in one country was recognized in other member countries in which the invention was patentable, and was the first step towards a global patent grant.

In view of the strong protections of inventors under the U.S. patent system, to foreign observers America's copyright policies appeared to be all the more reprehensible (Khan, 2000). The term of copyright grants throughout the history of the system was generally shorter, and rights in general more abridged, than in the rest of the world. Other countries had long recognized the rights of foreign authors in national laws and bilateral treaties. For instance, France allowed copyrights to foreigners conditioned on manufacturing clauses in 1810, granted foreign and domestic authors equal rights in 1852, and led the movement for international harmonization of copyrights. In marked contrast to its leadership in patent conventions, the United States declined an invitation to a pivotal conference in Berne in 1883, and did not sign the 1886 agreement of the Berne Convention that accorded national treatment to copyright holders. It was not until 1891, when the balance of trade in literary and artistic works was swinging in its favor, that the United States reformed its international copyright laws. Even then, concessions to printers' unions (such as requirements that copyrighted books had to be printed in the United States or typeset with U.S. plates) contributed to the U.S. failure to comply with the terms of the Berne Convention until 1988.

### **Does One System Fit All?**

Whether through wisdom, ideology, or good fortune, the framers of the U.S. policies fashioned an intellectual property system that has had a powerful impact on the patterns of inventive activity and generally worked well. According to Abraham Lincoln—himself a patentee of a device to buoy steamboats over sandbars—the patent system “added the fuel of interest to the fire of genius.”<sup>8</sup> Its attention to the provision of broad access to, and strict enforcement of, property rights in new inventions, coupled with the requirement of public disclosure, was extremely effective at stimulating the growth of a market for technology and promoting technical change.

Another reason for its success, however, has been flexibility. Our intellectual property institutions were from the outset in a state of continual evolution, and have undergone a number of fundamental modifications. Much of the change came through the law, inspired by changing circumstances and mediated through formal legislation or judicial initiatives and reinterpretation, but also important were innovations in the structure of the market for patented technologies (and more recently for copyrighted materials) made directly by private agents responding to economic opportunities. That such adjustments so often proved to be constructive owes partly to the virtues of having a market as a central feature of the intellectual property system, and partly to the democratic structure of U.S. institutions.

Some of the changes, such as the introduction of the examination of patent

<sup>8</sup> Lincoln received Patent No. 6469 (May 22, 1849). The quotation is from a lecture, “Discoveries and Inventions,” which he delivered in Jacksonville, Illinois, on February 11, 1859.

applications or the extensions in the subject matter of copyrights, implemented what might be thought of as technical improvements. Others changes, such as the shift of legal thinking (concentrated in the late nineteenth and early twentieth centuries) in favor of the rights of employers to inventions generated by employees, the evolution of the role of intermediaries, or the extension of copyrights to foreign nationals and general strengthening of copyright protection, involved adaptations that seem related to the stage of technological or economic development. The implications of the latter cases raise questions about the desirability of applying the same system to all places at all times despite certain undoubted benefits of international harmonization (Chin and Grossman, 1990; Helpman, 1993; McCalman, 1999; Maskus, 2000). In short, the historical record suggests that appropriate policies towards intellectual property are not independent of the level of economic development and overall institutional environment.

## References

- Barnes, James J.** 1974. *Authors, Publishers and Politicians*. London: Routledge.
- Breyer, Stephen.** 1970. "The Uneasy Case for Copyright: A Study of Copyright in Books, Photocopies and Computer Programs." *Harvard Law Review*. December, 84, pp. 281-351.
- Bugbee, Bruce.** 1967. *The Genesis of American Patent and Copyright Law*. Washington, D.C., Public Affairs Press.
- Chin, Judith C. and Gene M. Grossman.** 1990. "Intellectual Property Rights and North-South Trade," in Ronald W. Jones and Anne O. Krueger, eds., *The Political Economy of International Trade*. Cambridge: Basil Blackwell.
- Cohen, Wesley, Richard R. Nelson and John P. Walsh.** 2000. "Protecting Their Intellectual Assets: Appropriability Conditions and Why U.S. Manufacturing Firms Patent (or Not)." Cambridge, MA: NBER Working Paper 7552.
- Dutton, Harold I.** 1984. *The Patent System and Inventive Activity during the Industrial Revolution, 1750-1852*. Manchester, UK: Manchester University Press.
- Fisk, Catherine L.** 1998. "Removing the 'Fuel of Interest' from the 'Fire of Genius': Law and the Employee-Inventor, 1830-1930." *University of Chicago Law Review*. Fall, 65, pp. 1127-1198.
- Fisk, Catherine L.** 2000. "Working Knowledge: Trade Secrets and Restrictive Covenants in Employment and the Rise of Corporate Intellectual Property, 1810-1920." Loyola Law School: unpublished working paper.
- Griliches, Zvi.** 1990. "Patent Statistics as Economic Indicators: A Survey." *Journal of Economic Literature*. December, 28, pp. 1661-1707.
- Griliches, Zvi.** 1994. "Productivity, R & D, and the Data Constraint." *American Economic Review*. March, 84, pp. 1-23.
- Helpman, Elhanan.** 1993. "Innovation, Imitation, and Intellectual Property Rights." *Econometrica*. November, 61, pp. 1247-1280.
- Hounshell, David.** 1984. *From the American System to Mass Production, 1800-1932*. Baltimore: Johns Hopkins.
- Hughes, Thomas P.** 1989. *American Genesis: A Century of Invention and Technological Enthusiasm*. New York: Viking Penguin.
- Khan, B. Zorina.** 1995. "Property Rights and Patent Litigation in Early Nineteenth-Century America." *Journal of Economic History*. March, 55, pp. 58-97.
- Khan, B. Zorina.** 2000. "The Fuel of Interest": Patents and Copyrights in American Economic Development." Bowdoin College: unpublished book manuscript.
- Khan, B. Zorina and Kenneth L. Sokoloff.** 1993. "Schemes of Practical Utility." *Journal of Economic History*. June, 53, pp. 289-307.
- Khan, B. Zorina and Kenneth L. Sokoloff.** 1998. "Two Paths to Industrial Development and Technological Change," in Maxine Berg and Kristine Bruland, eds. *Technological Revolutions in Europe, 1760-1860*. Cheltenham: Edward Elgar.
- Kortum, Samuel and Josh Lerner.** 1998. "Stronger Protection or Technological Revolution: What is Behind the Recent Surge in Pat-

enting?" *Carnegie-Rochester Conference Series on Public Policy* June, 48, pp. 247-304.

**Kronstein, Heinrich and Irene Till.** 1947. "A Reevaluation of the International Patent Convention." *Law and Contemporary Problems*. 12:4, pp. 765-81.

**Lamoreaux, Naomi R. and Kenneth L. Sokoloff.** 1996. "Long-Term Change in the Organization of Inventive Activity." *Proceedings of the National Academy of Sciences*. November, 93, pp. 12686-12692.

**Lamoreaux, Naomi R. and Kenneth L. Sokoloff.** 1999a. "Inventors, Firms, and the Market for Technology in the Late Nineteenth and Early Twentieth Centuries," in Naomi R. Lamoreaux, Daniel M.G. Raff and Peter Temin, eds. *Learning By Doing in Markets, Firms, and Countries*. Chicago: University of Chicago Press.

**Lamoreaux, Naomi R. and Kenneth L. Sokoloff.** 1999b. "The Geography of the Market for Technology in the Late-Nineteenth and Early-Twentieth Century United States," in Gary D. Libecap, ed. *Advances in the Study of Entrepreneurship, Innovation, and Economic Growth*. Stamford, CT: JAI Press.

**Lamoreaux, Naomi R. and Kenneth L. Sokoloff.** 2000. "Intermediaries in the U.S. Market for Technology, 1870-1920." UC Los Angeles: unpublished working paper.

**Landes, William M. and Richard A. Posner.** 1989. "An Economic Analysis of Copyright Law." *Journal of Legal Studies*. June, 43, pp. 325-63.

**Lerner, Josh.** 1995. "The Importance of Trade Secrecy: Evidence from Civil Litigation," Harvard Business School: Working Paper 95-043.

**Lerner, Josh.** 1999. "150 Years of Patent Protection." Harvard Business School: unpublished working paper.

**Levin, Richard, A. Klevorick, Richard Nelson and Sidney Winter.** 1987. "Appropriating the Returns from Industrial Research and Development." *Brookings Papers on Economic Activity*. 3, pp. 783-820.

**Litman, Jessica.** 1989. "Copyright Legislation and Technological Change." *Oregon Law Review*. 68, pp. 275-361.

**Machlup, Fritz and Edith Penrose.** 1950. "The Patent Controversy in the Nineteenth Century." *Journal of Economic History*. March, 10, pp. 1-29.

**McCalman, Phillip.** 1999. "Reaping What You Sow: An Empirical Analysis of International Patent Harmonization." UC Santa Cruz: unpublished working paper.

**Macleod, Christine.** 1988. *Inventing the Industrial Revolution*. Cambridge: Cambridge University Press.

**Macleod, Christine.** 1999. "Negotiating the Rewards Of Invention: The Shop-Floor Inventor in Victorian Britain." *Business History*. 41:2, pp. 17-36.

**Maskus, Keith E.** 2000. *Intellectual Property*

*Rights in the Global Economy*. Washington, D.C.: Institute for International Economics.

**Merges, Robert P.** 1997. *Patent Law and Policy*. Charlottesville, VA: Michie.

**Merges, Robert P.** 1999. "The Law and Economics of Employee Inventions." *Harvard Journal of Law and Technology*. Fall, 13, pp. 1-54.

**Mowery, David C.** 1983. "The Relationship Between Intrafirm and Contractual Forms of Industrial Research in American Manufacturing, 1900-1940." *Explorations in Economic History*. October, 20, pp. 351-74.

**Mowery, David C.** 1995. "The Boundaries of the U.S. Firm in R & D," in Naomi R. Lamoreaux and Daniel M.G. Raff, eds. *Coordination and Information: Historical Perspectives on the Organization of Enterprise*. Chicago: University of Chicago Press.

**Paine, Albert.** 1935. *Mark Twain's Notebook*. New York: Harper & Row.

**Penrose, Edith Tilton.** 1951. *The Economics of the International Patent System*. Baltimore: Johns Hopkins Press.

**Rosenberg, Nathan, ed.** 1969. *The American System of Manufactures: The Report of the Committee on the Machinery of the United States 1855, and the Special Reports of George Wallis and Joseph Whitworth 1854*. Edinburgh: Edinburgh University Press.

**Schiff, Eric.** 1971. *Industrialization Without National Patents: the Netherlands, 1869-1912; Switzerland, 1850-1907*. Princeton: Princeton University Press.

**Schmookler, Jacob.** 1966. *Invention and Economic Growth*. Cambridge, MA: Harvard University Press.

**Sokoloff, Kenneth L.** 1988. "Inventive Activity in Early Industrial America: Evidence from Patent Records, 1790-1846." *Journal of Economic History*. December, 48, pp. 813-50.

**Sokoloff, Kenneth L.** 1992. "Invention, Innovation, and Manufacturing Productivity Growth in the Antebellum Northeast," in Robert E. Gallman and John Joseph Wallis, eds. *American Economic Growth and Standards of Living before the Civil War*. Chicago: University of Chicago Press.

**Sokoloff, Kenneth L. and B. Zorina Khan.** 1990. "The Democratization of Invention in During Early Industrialization: Evidence from the United States, 1790-1846." *Journal of Economic History*. June, 50, pp. 363-78.

**Twain, Mark.** 1899. *A Connecticut Yankee in King Arthur's Court*. New York: Harper & Row.

**Usselman, Stephen W.** 1999. "Patents, Engineering Professionals, and the Pipelines of Innovation: The Internalization of Technical Discovery by Nineteenth-Century American Railroads," in Naomi R. Lamoreaux, Daniel M.G. Raff and Peter Temin, eds., *Learning By Doing in Markets, Firms, and Countries*. Chicago: University of Chicago Press.