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## Patent Policy Innovations: A Clinical Examination

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# Patent Policy Innovations: A Clinical Examination

*Josh Lerner\**

INTRODUCTION .....	1841
I. THE GLOBAL PATENT POLICY PROJECT .....	1843
II. THREE CLINICAL STUDIES .....	1845
A. <i>The Netherlands in 1869</i> .....	1846
B. <i>Russia in 1896</i> .....	1849
C. <i>The United States in 1980</i> .....	1852
III. KEY LESSONS FROM THE CLINICAL STUDIES .....	1855
A. <i>These Patent Policy Innovations were Difficult to Implement</i> .....	1855
B. <i>The Patent Policy Changes Studied were Implemented on a "Once and for All" Basis</i> .....	1855
C. <i>The Impact of Patent Policy Innovations on the Rate of Patenting was Substantial</i> .....	1856
D. <i>The Impact of Patent Policy Innovations on the Rate of Technological Innovation is Difficult to Assess</i> .....	1856
CONCLUSION .....	1856

## INTRODUCTION

In recent years, many of the policy discussions about the patent system have focused on the harmonization of national systems.

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\* Professor of Business Administration, Harvard University; Research Associate, National Bureau of Economic Research. Harvard Business School's Division of Research provided financial support. I thank Paul Reiner, Scott Wallsten, seminar audiences at Stanford University and Vanderbilt University for helpful comments. All errors remain my own.

On the domestic front, the dispute has centered on the question of whether the United States should honor commitments made in bilateral agreements with Japan to remove idiosyncratic features of its patent system. In particular, legislation to require the publication of pending patent applications and to grant awards to the party that is first to file for an award (as are the practices in most nations) have been fiercely debated in the past few congressional sessions. In the developing nations, the requirements for minimal levels of patent protection in the Uruguay Round of the General Agreement on Tariff and Trade have triggered much controversy.

But a related question has received much less attention: How do patent policy innovations originate? Given the nature of new technologies and changing economic conditions, there may be a need for policy innovations, which might take the form of novel classes of intellectual property protection or adjustments to existing provisions. The sources and nature of these policy innovations, however, have been little discussed by policymakers. This Paper represents an effort to begin to address this gap.

Two considerations may have deterred earlier researchers from seeking to empirically explore patent policy innovations. First, the complexity and opacity of the law precludes the ready identification of policy shifts. Countries have many levers with which to affect the strength of protection, to favor domestic or foreign applicants, and to give discretion to applicants and patent holders. Many apparently innocuous shifts—such as the creation of a centralized appellate court for patent cases in the United States in 1982—have substantial implications. Thus, even if a country undertakes a substantial innovation in its patent policy, it may not be readily identifiable to researchers.

Second, many factors determine the strength and structure of patent protection. As my earlier work has shown, among these factors are shifts in the relative economic standing of the nation, the nature of the political system, and the information problems in the economy. Furthermore, external political pressures may play a significant role in shaping policies. Thus, discerning what patent policy shifts represent policy innovations, rather than responses to internal or external pressures, is not always simple.

In this Paper, I overcome these barriers by examining several patent policy innovations in depth. I focus on three cases that meet a number of criteria, explained in detail below, which are drawn from the sample of sixty countries over 150 years that I have studied as part of an ongoing project on patent policy. (The project is summarized in the next Section of the paper.) The careful screening

of examples and a clinical approach allow me to overcome the barriers discussed above.

In each case, the national government sought to introduce a substantial and novel shift in patent policy with the hope that it would address a perceived national problem. At the same time, the three cases are quite heterogeneous, which gives the clinical analysis a richness it might not otherwise have. The state of national development, the political system, and the legal environment differed substantially. Furthermore, the policy shifts under study were quite distinct. In the first instance, the Netherlands made the decision to abandon the patent system entirely. In the second, the Russian government chose to develop a novel patent system, intentionally disparate from that in other countries, which reflected its status as a less developed country. In the final instance, the government of the United States chose to transfer ownership of patents that it funded to non-profits and small businesses. I review the genesis and impacts of each of these shifts in Section II.

In the final Section of the Paper, I highlight a number of key lessons to emerge from the clinical analyses of these cases. First, the patent innovations studied emerged only after long and contentious debates, often cast in moral, rather than economic, terms. Second, the changes were all done on a permanent basis. Policy-makers made no legislative provisions for the review or evaluation of the changes. Finally, while each of the changes had an apparently substantial impact on patenting activity, the impact on innovation was much less certain. In closing, I also suggest a number of questions for further research.

### I. THE GLOBAL PATENT POLICY PROJECT

Because this Paper draws on earlier work, this Section summarizes the overall research project briefly. In three papers, I examined patent protection in sixty countries over a 150-year period. This project draws on a wealth of historical information on patent policy in the libraries of the Boston Public Library, the Hagley Museum, and Harvard University, particularly information contained in guides prepared for patentees by patent lawyers and agents.

The first of these papers examines the differences in the strength of patent protection.<sup>1</sup> It contrasts three explanations for the differences across nations. First, the extent of patent protection

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1. See generally JOSH LERNER, 150 YEARS OF PATENT PROTECTION (National Bureau of Econ. Research Working Paper No. 7477, 2000), available at <http://www.nber.org/papers/w7477>.

may be determined by the relative economic strength of the nation. Second, the internal political situation—in particular, the degree to which power is centralized among a ruling elite—may play an important role. Finally, the historical origins of the nation's commercial legal system may be a determinant.

The paper finds evidence that is consistent with these views, but also suggests greater complexity. Relatively wealthier nations are more likely to have patent systems, to allow patentees a longer period of time to put their patents into practice, and to ratify treaties assuring equal treatment of patentees from other nations. But they also tend to limit patent protection in some important ways, whether through requirements that protect earlier innovators or through charging higher fees for patent awards. Countries with democratic institutions are consistently more likely to have patent protection and longer awards.

Even after controlling for these differences, however, differences in legal traditions are generally significant and persistent. To cite several examples, French family countries, while early to adopt patent protection, have consistently discriminated against foreign patentees. Civil law countries in general have greater restrictions on the rights of patent holders, including shorter "working periods" (the maximum period before the patent must be employed in practice) and a variety of other curbs, such as the prevalence of compulsory licensing provisions in German and Scandinavian nations. Fees are also significantly higher in these nations (with the exception of the Scandinavian countries) than in common law countries. These differences persist despite considerable changes in the institutional features of the patent system across nations and over time.

The second paper is motivated by the substantial economic literature over the past fifteen years on the relationship between the information environment and government operations.<sup>2</sup> The presence of patent offices for an extended period in a wide variety of countries, as well as the recent theoretical work on patent office practice, suggests that this is an attractive arena in which to empirically examine these issues.

The evidence presented in this paper is broadly consistent with the theoretical suggestions. In nations with more complex economies, where information asymmetries between patent office

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2. See generally JOSH LERNER, 150 YEARS OF PATENT OFFICE PRACTICE (National Bureau of Econ. Research Working Paper No. 7478, 2000), available at <http://www.nber.org/papers/w7478>.

officials and applicants and between policymakers and the patent office were likely to be the most problematic, the workings of the patent system differed substantially. Patentees were more likely to face steeply sloped renewal fee schedules and to pay multiple renewal fees. They were also more often granted the flexibility to delay the examination of patent applications. Meanwhile, patent officials were less likely to be granted discretion to extend and otherwise modify awards in these settings. Responsibility for determining patent validity was increasingly divided between the patent office and the judicial system.

Related research, which I am currently pursuing, examines the impacts of shifts in patent policy on both patenting and innovation. One challenge facing cross-sectional studies of the impact of intellectual property on economic growth is that unobserved factors can affect both, and lead to incorrect inferences. Analyzing the impact of changes in patent policy provides one way to address these concerns. This data set should allow for the examination of a variety of similar policy shifts, in a manner that should complement studies of policy changes in single nations.

## II. THREE CLINICAL STUDIES

In identifying policy innovations for this study, I used four criteria. First, the countries had to have made substantial departures in their patent policies. The change should have been seen as significant not only in retrospect, but should also have attracted attention at the time of the shift. Second, I eliminated cases where the country had undertaken a change that moved in the direction of the median country at the time; put another way, I sought to eliminate cases where the primary motivation was likely to have been harmonizing the nation's patent system with that of other nations. Third, the change had to be documented in sufficient detail to permit an analysis. Among the remaining cases, I then chose three examples whose distribution in time and type roughly reflected that of patent policy innovations more generally.

In this Section, I describe each of the three policy changes. I devote approximately equal space to describing the origin and nature of the policy innovation, and to discussing its impact. In the fourth Section, I suggest that a number of patterns cut across the three case studies.

*A. The Netherlands in 1869*

The Netherlands remains the only industrialized nation to have undertaken the ultimate patent policy innovation: it abolished the patent system entirely.<sup>3</sup> While in many senses an extreme example, this episode provides a number of insights into the origins and nature of patent policy innovations, as well as the difficulty in evaluating them.

The decision of the Dutch government to abandon its patent system must be seen in the context of the international patent controversy of the time. While the concept of patent protection had originated many centuries earlier, it was not until the late eighteenth and early nineteenth centuries that the patent legislation became widely adopted. But by 1850, a backlash against patent protection had already developed.

The anti-patent movement had several origins. First, a series of Parliamentary hearings beginning in 1851 highlighted the poorly functioning British patent system, which was characterized by high fees and long delays. Many inventors testified in these hearings that they would be better served if no patent protection existed at all. In Germany, efforts to encourage a common system of patent protection for all the members of the Zollverein (the loose affiliation of independent German states, such as Bavaria and Saxony, which existed before German unification) spurred opposition. The arguments posited by economists in Germany and elsewhere suggested that the spur to innovation provided by patent protection was modest, while the social loss associated with the exploitation of patent privileges was substantial. One peculiarity of the debate on the Continent during this period was the close link between patent and trade issues. In many pamphlets and discussions of the time, advocates of free trade argued for the abolition of patent privileges as a natural extension of free trade policies. The arguments were resisted—in almost all cases, successfully—by a combination of industrialists, lawyers, and engineers, who frequently argued that these privileges were not only a “natural right,” but also represented an important spur to innovation.

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3. See generally EDITH PENROSE, *THE ECONOMICS OF THE INTERNATIONAL PATENT SYSTEM* (1951); ERIC SCHIFF, *INDUSTRIALIZATION WITHOUT NATIONAL PATENTS: THE NETHERLANDS, 1869-1912, SWITZERLAND, 1850-1907* (1971); G. Doorman, *Patent Law in the Netherlands: Part I*, 30 J. PAT. OFF. SOC'Y 225 (1948); G. Doorman, *Patent Law in the Netherlands: Part II*, 30 J. PAT. OFF. SOC'Y 258 (1948); G. Doorman, *Patent Law in the Netherlands: Part III*, 30 J. PAT. OFF. SOC'Y 347 (1948); Fritz Machlup & Edith Penrose, *The Patent Controversy in the Nineteenth Century*, 10 J. ECON. HIST. 1, 5-6 (1950).

The Dutch anti-patent movement, while somewhat slower in getting started, shared many features with those in other countries. As in Great Britain, frustration with the existing system was a powerful motivation. Two particular and quite idiosyncratic aspects of the Dutch system were singled out for criticism. First, the Dutch system held all patent awards confidential until the expiration of the award, with no provision for publication or examination of the award by outsiders.<sup>4</sup> Second, the law called for rescinding any patent where the patentee subsequently obtained a patent for the same discovery in a foreign country. These two features apparently insured that almost everyone, whether patent advocates or opponents, was unhappy with the system. Moreover, many observers felt that efforts to reform the patent system were likely doomed to fail.

As in Germany, much of the opposition in the Netherlands was led by the economics profession, which was vociferous in arguing (again, on an almost purely philosophical basis, with little effort to marshal empirical support) that patents were detrimental. In particular, the leading economics journal, *De Economist*, argued that abolishing patents would lead to lower costs for consumers. The discussions focused on the diffusion of existing products, particularly those that were developed elsewhere, and on the distortions that the high royalty rates or license fees introduced.

In 1869, the government prepared a detailed memorandum, the "Memorie," to Staten-Generaal (the Dutch Parliament), summarizing the arguments for and against patent protection. The legislative body followed the advice in the memorandum and abolished the patent system later that year. While such legislation failed elsewhere, it may have succeeded in the Netherlands because of the late blooming of Dutch technical education. The first technical schools were introduced in 1861, and remained in an early stage of development. The prominent engineers and industrialists who were the alumni of similar schools played a leading role in opposing reforms in other countries.

The abolition of the patent system appears to have had only a modest impact on the rate of industrialization of the Netherlands. The record regarding overall economic development appears mixed. While the claims by patent opponents that the abolishment of the patent system triggered an acceleration of the manufacturing sector appear overstated, few negative effects can be discerned. For in-

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4. This feature had been relatively common in the very earliest patent systems, where developing a technological innovation was frequently neither a necessary nor sufficient condition for a patent award, but was quite rare by the middle of the nineteenth century.



stance, the percentage of the labor force engaged in non-agricultural industrial activities rose from 34.3% in 1889 to 37.1% in 1910 (the year the patent system was restored). This mirrors the growth in Germany (34.6% in 1890 to 37.4% in 1910), but is slightly below that in the United States (28.3% in 1890 to 32.1% in 1910). In the growth of output per man-hour, the relative Dutch performance was less stellar; during the years 1900 to 1913, the output is estimated to have grown at 1.1% annually, as opposed to Germany's 1.6% and the United States' 2.2%. (The Netherlands continued to lag, however, in the years after the restoration of the patent system.)

The evidence regarding innovative activity is similarly mixed. One source of evidence relates to patenting abroad; Dutch citizens were free to file for patents in other countries during the period when their patent system was inactive. During the period 1900 to 1910, Dutch inventors filed almost two-thirds fewer patent applications on a per capita basis in the major industrialized countries than their Danish counterparts, and even below the rate in Norway, which was much less industrialized.<sup>5</sup> There was little immediate shift in patenting after the restoration of the patent system in 1910, but these observations are compounded by the onset of World War I. In the 1920s, the rate of Dutch patenting abroad was higher than in Norway and almost equal to that in Denmark. These patterns might suggest that less innovative activity was taking place in the Netherlands during the period without patents. Alternatively, the patterns may have resulted from a lower propensity to file patents on inventions when domestic markets could not be protected.<sup>6</sup>

Whatever the impact of the Dutch decision to abolish the patent system, the government came under increasing pressure to undo this step. Much of the public debate in the years leading up to the restoration of the patent system was little changed; economists by and large expressed reservations about patents, while industrialists argued for their restoration. The division was not uniform, however, and was once again characterized more by assertion than

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5. See generally *Historical Patent Statistics: 1791-1961*, 46 J. PAT. OFF. SOC'Y 89 (1964).

6. This might result, for instance, if the domestic market was the most important one for Dutch firms, and the cost of filing subsequent patent applications was lower than the initial one. Further evidence is provided by Schiff's case studies of the pioneering margarine and incandescent lamp firms (forerunners to Unilever and Phillips respectively), which suggest that considerable innovation did occur during this period. Nonetheless, the cases suggest that many of the Dutch innovations were in the nature of incremental advances to technologies developed abroad, rather than fundamental discoveries.

by empirical study. International pressure on the Dutch government to change the system did, however, gradually increase. Much of this was manifested through the International Union for the Protection of Industrial Property, the body created to implement the Paris Convention of 1883. The Netherlands had been a signatory to this agreement because the government had sought to obtain international protection for its firms' trademarks (which the agreement also covered). The language of the Paris Convention was sufficiently flexible that countries without patent protection could join (as long as both domestic and foreign inventions could not be patented). In subsequent debates, however, the Dutch delegation came under increasing pressure to restore its patent system, with the possibility of expulsion from the Union being an implicit threat. In 1910, the Staten-Generaal restored patent protection.

### *B. Russia in 1896*

The adoption of a novel patent system in Russia in 1896 was a less radical innovation than the Dutch example.<sup>7</sup> At the same time, this new patent system, which simultaneously sought to depart from the weak protection offered previously in that nation but not to conform to the norms of the developed countries, was quite interesting. This was one of the first efforts—since emulated by Japan, India, and many others—to restructure a patent system in order to meet the special needs of a developing country.

Over the eighteenth and early nineteenth centuries, the Russian government had undertaken a number of efforts to spur technological innovation. It is not surprising that the need for a patent system was frequently discussed. The decision to adopt such a system in 1812 was triggered by an application by two foreign inventors for exclusive rights to a distilling process. Unlike earlier “manufacturer’s privileges,” through which the czars had granted monopolies over certain industries to favored subjects, the men requested only the exclusive rights to their invention. The request spurred the Russian government to issue an edict that allowed

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7. See generally MANFRED WILHELM BALZ, *INVENTION AND INNOVATION UNDER SOVIET LAW: A COMPARATIVE ANALYSIS* (1975); A. SKORODINSKII, *RUSSIAN PATENT LAW AND PRACTICE* (1910); A. SKORODINSKII, *STUDIEN IN DER PRAXIS DES RUSSISCHEN PATENTGESETZES* (1909) (privately printed); Anneli Aer, *Patents in Imperial Russia: A History of the Russian Institution of Invention Privileges Under the Old Regime*, in 76 *ANNALES ACADEMIAE SCIENTIARUM FENNICAE DISSERTATIONES HUMANARUM LITTERARUM* (1995); Boris V. Anan'ich, *The Economic Policy of the Tsarist Government and Enterprise in Russia from the End of the Nineteenth Through the Beginning of the Twentieth Century*, in *ENTREPRENEURSHIP IN IMPERIAL RUSSIA AND THE SOVIET UNION* 125 (Gregory Guroff & Fred V. Carstensen eds., 1983).

grants of such invention privileges. The grants were limited in nature, however; for instance, applicants for improvements to existing products were typically rejected.

Even these limited grants did not find widespread acceptance. The practice of granting privileges to foreign inventors and to those who did not put their patents into practice in a timely manner generated a great deal of resentment. Many critics believed that these were not in the nation's best interest.

An 1833 policy reform addressed their concerns. Foreign patentees were now to be granted a special class of protection called a patent of importation. These not only had a shorter life (six years instead of ten), but also cost more. A second new class of patents, patents of addition, allowed inventors to patent subsequent inventions. The inventor could exploit only a patent of addition, however, if permission could be obtained from the original patent holder. Finally, to address the problem of under-utilized patents, applicants were given until one quarter of the award period expired (two-and-a-half years for domestic applicants, and one-and-a-half years for foreigners) in which to put awards into practice. If the awardee did not prove that the patent was being utilized (or "worked") in that period, the award would be revoked.

None of the basic elements were unique to the Russian system. But the strictness of the provisions (especially the short "working requirement" for foreign inventors) served to retard the development of the patent system. By way of illustration, a total of nineteen patents had been granted in the four years prior to 1833; in the next four years, the number was seventeen. (In subsequent years, the number would climb somewhat, but did not reach one hundred awards per year until 1875. By this point, patenting in most European nations had grown dramatically; for instance, in 1875, Belgium granted nearly 2500 patents.) While efforts to change the Russian system were proposed—in particular, beginning in the 1860s, the Russian Technical Society sought to spur the adoption of a stronger system—the efforts had little impact until the 1880s.

Gradually, however, a debate about reforming the Russian patent system emerged. A series of reform proposals were circulated in the 1880s and early 1890s. In seeking to modify the Russian patent system, the Technical Society leaders and government officials faced conflicting pressures. On the one hand, they were keenly aware of Russia's reliance on foreign technology. The limited number and training of Russian engineers and plant managers meant that the country would need to attract foreigners willing to

invest in technology and transfer it to the nation. Moreover, the presence of Western competitors would force complacent or entrenched domestic managers to adopt innovations that they might have otherwise ignored. At the same time, there was grave concern about the manner in which the foreign inventors would exploit their discoveries. In particular, government officials worried that foreign patentees would abuse their monopoly power by charging high prices while undertaking the bulk of their manufacturing abroad.

Ultimately, the State Council crafted a compromise that represented one of the first efforts by a less developed nation to rewrite its patent laws in a way that would meet its particular needs. On the one hand, the new laws took numerous steps to make patents more attractive, especially to foreigners. In particular, awards were lengthened to fifteen years duration, and the length of awards to foreigners was set equal to domestic ones. The working requirement was increased to five years for both classes of awardees. Moreover, certain idiosyncratic provisions of the Russian 1833 legislation were removed; for instance, the new laws no longer provided that, when two patent applications for the same invention were received at about the same time, neither would be awarded.

On the other hand, the Russian government resisted pressures to adopt foreign models like those of Germany and France, and it refused to join the Paris Convention. Even though its legislation did not discriminate against foreign patent applicants, the Russian government felt that signing the agreement would have two substantial disadvantages. First, it would limit the state's ability to subsequently impose restrictions on foreign applicants that it found were behaving opportunistically. Second, government officials worried that the reciprocity that the convention offered would make it too easy for Russian inventors to patent overseas. This might lead to a greater emphasis on producing innovations that served foreign rather than domestic markets.

The policy shift, which was adopted by State Council in February 1896 and remained essentially unchanged until Lenin's 1919 statute on inventions outlawing "capitalist monopolies," was a qualified success. Certainly, the percentage impact on patenting activity was dramatic. The number of applications rose from 793 in 1894 to 3287 in 1899. The number of grants over the same period increased almost five-fold. While the state of record keeping was not ideal, it seems clear that the increase was divided roughly proportionately between domestic and foreign applicants.

At the same time, the per capita rate of patenting in Russia remained far lower than elsewhere in Europe for the first two dec-

ades of the twentieth century. This partially reflected the nation's lower level of development, but also appears to have been a consequence of suspicion of the patent system. For example, patent examiners' decisions to award or deny patents remained poorly documented and difficult to appeal. Moreover, Aer's examination of foreign patenting patterns suggests that most of the foreign patent applications were not filed by the technological leaders in their industry segments.<sup>8</sup> He suggests the 1896 reform's goal of facilitating the transfer of foreign technologies went largely unachieved.

### C. *The United States in 1980*<sup>9</sup>

The third innovation that I examine is the 1980 shift in federal policies towards the patenting and commercialization of the innovations whose development it had funded.<sup>10</sup> This represented a dramatic departure from the practice in most countries, where governments typically take title to innovations that they fund. Like the other policy innovations considered, however, this shift was not achieved overnight, and it had ambiguous effects.

While questions concerning the federal government's right to patent the results of the research it funded were the subject of litigation and Congressional debate as early as the 1880s, that controversy assumed much greater visibility with the onset of World War II. The dramatic expansion of federal R&D efforts during the War raised questions about the disposal of the rights to these discoveries. Two reports commissioned by President Roosevelt reached dramatically different conclusions, and they framed the debate that would follow in the succeeding decades.

The first of these reports was authored by the National Patent Planning Commission, an *ad hoc* body established shortly after the Pearl Harbor attack to examine the disposition of the patents

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8. See generally Aer, *supra* note 7.

9. This Section draws on earlier work by the author. See generally Adam B. Jaffe & Josh Lerner, *Reinventing Public R&D: Patent Policy and the Commercialization of National Laboratory Technologies*, 32 RAND J. ECON. (forthcoming 2001), available at <http://www.people.hbs.edu/jlerner/W7064.pdf>.

10. This issue was the topic of an extensive literature, including over forty congressional hearings and reports and four special commissions between 1940 and 1975. See generally U.S. ENERGY RESEARCH AND DEV. ADMINISTRATION, REPORT NO. ERDA-76-16, *THE PATENT POLICIES AFFECTING ERDA ENERGY PROGRAMS* (1976). For a historical overview of the debates, see DAVID M. HART, *FORGED CONSENSUS: SCIENCE, TECHNOLOGY AND ECONOMIC POLICY IN THE UNITED STATES, 1921-1953* (1998); HOWARD I. FORMAN, *PATENTS: THEIR OWNERSHIP AND ADMINISTRATION BY THE UNITED STATES GOVERNMENT* (1957); FREDERIK NEUMEYER & JOHN C. STEDMAN, *THE EMPLOYED INVENTOR IN THE UNITED STATES: R&D POLICIES, LAW, AND PRACTICE* (1971).

developed during the War.<sup>11</sup> In its January 1945 report, the Commission highlighted the tradeoffs associated with the practice of the government taking title to new inventions and issuing royalty-free nonexclusive licenses. (This was the general policy prior to the War in all non-defense agencies.) While this practice assured the rapid diffusion of easily commercialized innovations, the Commission cautioned that

[i]t often happens, . . . particularly in new fields, that what is available for exploitation by everyone is undertaken by no one. There undoubtedly are Government-owned patents which should be made available to the public in commercial form but which, because they call for a substantial capital investment, private manufacturers have been unwilling to commercialize under a nonexclusive license.<sup>12</sup>

Rather than recommending a uniform policy, the Commission urged that the practices be allowed to vary across agencies. It urged the creation of a central body to monitor the patent policies of the various agencies, and to ensure that these policies appropriately reflected national needs.

A second report, completed in 1947 by the Department of Justice, took a very different tack. Indeed, it argued that "innovations financed with public funds should inure to the benefit of the public, and should not become a purely private monopoly under which the public may be charged for, or even denied, the use of technology which it has financed."<sup>13</sup> The report urged the adoption of a uniform policy forbidding the granting of patent rights to contractors and exclusive licenses to federal technology in all but extraordinary circumstances.

Shortly after the report's release, the Justice Department was asked to draft a new policy, which was issued by President Truman in 1950 as Executive Order 10096. This new policy largely reflected the Department's recommendation: it called for a centralized policy across the federal government, to be implemented by a Government Patent Board. While there is little statistical evidence about how the Board implemented its charter, Forman's review of its unpublished decisions indicates that it was far more supportive of awarding and licensing patents to contractors and government employees than might have been anticipated from the circumstances around its creation.<sup>14</sup> Furthermore, some evidence suggests that a

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11. See generally H.R. DOC. NO. 79-22 (1945).

12. *Id.* at 5-6.

13. U.S. DEP'T OF JUSTICE, INVESTIGATION OF GOVERNMENT PATENT PRACTICES AND POLICIES: REPORT AND RECOMMENDATIONS OF THE ATTORNEY GENERAL TO THE PRESIDENT 2 (1947).

14. See generally FORMAN, *supra* note 10.

number of agencies clandestinely persisted in policies that were quite different from those promulgated in the Executive Order.<sup>15</sup> Federal policy shifted again in October 1963, when President Kennedy's "Statement of Government Patent Policy" allowed agencies to adopt different policies, and in some cases to grant "greater rights than a nonexclusive license" to contractors or third parties. Whether this was a shift in practice, however, is less clear.

The true policy innovation took place in 1980. The Stevenson-Wydler Technology Innovation Act of 1980 explicitly made technology transfer a mission of all federal laboratories and created a variety of institutional structures to facilitate the mission.<sup>16</sup> At about the same time, the Bayh-Dole Act (technically the Patent and Trademark Laws Amendment of 1980) allowed academic institutions and non-profit institutions to automatically retain title to patents derived from federally funded R&D.<sup>17</sup> No longer did universities need to seek waivers from the federal government to retain ownership of the patents generated by research at their institution. Moreover, many institutions interpreted the legislation as giving them the flexibility to license patents on an exclusive basis. These two Acts were followed by a series of initiatives that extended and broadened their reach.

The impact of this patent policy innovation has been extensively studied, but remains controversial. Several effects, however, are clear. First, there was a dramatic increase in academic institutions' investments in technology licensing activities. For instance, the number of universities with technology transfer offices increased from twenty-five in 1980 to 200 in 1990.

Second, a surge in patenting by universities occurred around the time of this reform. For instance, the ratio of patenting to inflation-adjusted R&D spending by universities went up by over 500% between 1965 and 1992. This increase, however, appears to have begun well before the passage of the 1980 legislation, raising questions about the causality in the relationship.

Third, Henderson, Jaffe, and Trajtenberg document that the differential between university and industry patents fell over this

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15. See generally NEUMEYER & STEDMAN, *supra* note 10.

16. Stevenson-Wydler Technology Innovation Act of 1980, Pub. L. No. 96-480, 94 Stat. 2311 (1981).

17. Patent and Trademark Laws Amendment of 1980, Pub. L. No. 96-517, 94 Stat. 3015 (1981).

period.<sup>18</sup> In particular, prior to the mid-1980s, university patents were cited much more highly in other patent applications. (Patent citations are often seen as a proxy of economic importance). After this period, the difference largely disappeared. The authors suggest that this change is due in part to a decline in the quality of patents being filed by academic institutions in general, as well as the commencement of patent filing programs by a number of smaller institutions (whose patents were less frequently cited throughout the sample period). Consistent evidence about the declining “yield”—or fraction of licenses that yield positive revenues—was found by Mowery and Ziedonis in a study of two leading research universities.<sup>19</sup>

### III. KEY LESSONS FROM THE CLINICAL STUDIES

The three clinical studies presented here are inevitably greatly condensed, with much interesting detail omitted. Despite the “broad brush” treatment, several themes emerge from these discussions (and the underlying source material from which they were drawn):

#### *A. These Patent Policy Innovations were Difficult to Implement*

Each of the policy shifts discussed above was the result of a long and rancorous discussion. The patent policy questions were frequently considered at the same time as—and often poorly distinguished from—other economic policy questions. In the debates considered, much of the discussion was cast in moral rather than economic terms. Available evidence that might have valuably informed policymakers was apparently not compiled.

#### *B. The Patent Policy Changes Studied were Implemented on a “Once and for All” Basis*

The three policy shifts were permanent ones; these were not “policy experiments.” No provisions were made for temporary changes nor for a formal evaluation procedure (e.g., the creation of

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18. See generally Rebecca Henderson et al., *Universities as a Source of Commercial Technology: A Detailed Analysis of University Patenting, 1965-1988*, 80 REV. ECON. & STAT. 119 (1998).

19. See generally David C. Mowery & Arvids A. Ziedonis, *Numbers, Quality and Entry: How Has the Bayh-Doyle Act Affected U.S. University Patenting and Licensing?*, in INNOVATION POLICY AND THE ECONOMY (Adam Jaffe et al. eds., forthcoming 2000), available at <http://www.nber.org/books/innovation/numbers.pdf>.



a control group of patents or applicants whose policy was not shifted). None of the three legislative efforts apparently had any provision for a formal evaluation of the policy shift's impact. Indeed, each change proved difficult to undo. In the Dutch case, no change was made for more than forty years, and only after extensive international pressure. The Russian policies were only undone after the wrenching changes of the Soviet revolution. The American policy shift remains in force today.

*C. The Impact of Patent Policy Innovations on the Rate of Patenting was Substantial*

In each case, the policy shift appeared to affect patenting sharply. The rise in foreign patent filings after the Dutch restored patent protection, the post-1896 growth in domestic and foreign applications in Russia, and (more ambiguously) the rise of American university patenting after the passage of the Bayh-Dole Act all were consistent with this claim.

*D. The Impact of Patent Policy Innovations on the Rate of Technological Innovation is Difficult to Assess*

The difficulty in assessing these policy innovations appears to reflect the more general difficulty associated with the assessment of patent policy. As Jaffe's literature review highlights, the imprecision of measures of innovation and the apparently weak relationship between patent policy shifts and changes in innovative behavior make these analyses particularly difficult.<sup>20</sup>

CONCLUSION

Taken together, the results suggest a number of questions for further research. What explains the resistance to the patent policy shifts? Why are true patent policy "experiments," as opposed to patent policy innovations, apparently so rare? Can the impact of patent policy shifts on the rate and direction of technological innovation be better assessed by examining a considerable number of policy changes in a large-sample study? These questions deserve further study.

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20. See generally Adam B. Jaffe, *The U.S. Patent System in Transition: Policy Innovation and the Innovation Process*, 29 RES. POL'Y 531 (2000).