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THE UNIFORM PATENT ACT AND INDUSTRIAL SUPPORT OF UNIVERSITY RESEARCH

Prepared for
THE NATIONAL SCIENCE BOARD
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Issue

Has the Uniform Patent Act of 1980 (PL 96-517) had a positive effect on industrial support of university research? Has it had other effects on university research and the practices of university research scientists?

Results

The Uniform Patent Act replaced 26 separate Federal agency patent policies. It enables universities to retain title to inventions that arise from Federally sponsored research.

This Act has facilitated a continuation of increased industrial support of university research that began in the early 1970's. It has simplified negotiations between universities and industrial firms for patent rights and exclusive licenses, reduced the university administrative costs of filing patent applications, and increased the interest of major research universities in acquiring patents on Federally sponsored research in order to license these patents to industrial users. The percentage of patent applications covering inventions produced under Federal sponsorship at nine major research universities during 1981-1984 was equal to the percentage of university research funds obtained from Federal sponsors, despite the greater emphasis on basic research among Federally sponsored projects.

The Act has had a small positive direct influence in increasing university scientists' interest in conducting applied research and (consequently) in increasing industrial support of university research over the last four years. Simultaneously, it has had a small positive influence in strengthening the preferences of a minority of university scientists for obtaining Federal sponsorship of their research because of the improved potential for earning royalty income, and may have contributed to the increasing rate of faculty-founded small-firm spinoffs from universities (partly because it also covers small firms). Finally, the Act may have contributed to delays in publishing because of increased university proprietary interest in some areas.

APPROACH

This issue paper is based on a study conducted by Abt Associates for PRA ("An Assessment of the Effects of the Uniform Patent Act Upon Sponsorship of University Research by Private Industry", February 12, 1985). This study surveyed representatives of 9 major research universities and 9 industrial firms active in supporting university research. At each university three departments (electrical engineering, biology, and materials sciences) were selected on the basis of the importance of patent protection for commercial products developed from research origins. For each of the three fields of science and engineering, three industrial firms were selected on the basis of their active involvement in supporting university research in that field. Single respondents were identified to represent each university's patent administration (a patent officer), each department's research interests (a scientist) and each firm's interest in supporting university research (a research manager), and separate survey instruments were developed for each class of respondent.

The survey was designed to elicit informed opinions rather than hard evidence. It is too early to seek stronger evidence because of the large volume of confounding changes that have occurred in the research environment during the 1980's. The Economic Recovery Tax Act of 1981 has stimulated industry support of university research through enhanced tax savings for equipment donations and through the R&D tax credit. State and local governments and Federal agencies have promoted industry-university cooperation through a growing number of direct mechanisms and programs. And industrial support of university research has expanded of its own accord in response to growing links between research and development in a variety of high technology industries, particularly genetic engineering, microelectronics, and materials research.

The research questions investigated were formed by reference to prior published analyses of industry-university relationships and the role of Federal patent policy in stimulating those relationships. Particularly influential were: University-Industry Research Relationships, Selected Studies (Washington, DC: National Science Foundation, 1982), and Arthur Gerstenfeld (editor), Science Policy Perspectives: USA-Japan, Part V: Patent Policies for Government Supported Research (New York: Academic Press, 1982).

ANALYSIS

Reasons for a Uniform Patent Act

The impetus for a uniform Federal patent policy stemmed largely from the increasing commercial relevance of university research and the growing awareness that the rate of patenting and patent usage was low under the flexible (agency-level) patent policies of the 1960's and 1970's.

Beginning approximately in 1970, Federal support of university research increasingly emphasized applied research, which rose from 17 percent of total Federal support to 27 percent in 1980. University research supported by

nonprofit organizations, by universities themselves, and by state and local governments also became increasingly applied. Applied research accounted for 24 percent of funds from these sources in 1970, 32 percent in 1975, and 38 percent in 1984. Finally, industrial grants and contracts for university research grew at an annual rate of 15 percent during 1970-1984, rising from 2.5 percent to nearly 5 percent of university research expenditures. In the aggregate, approximately 20 percent of university research in 1970 was applied research or problem-focused basic research, whereas at least 35 percent was of these types in 1984.

In 1971, Federal patent policy, which had evolved on an agency-by-agency basis, was officially designated as "flexible" in a Presidential Memorandum. There were 26 separate agency patent policies, ranging from "title" policies (the agency retains title and provides nonexclusive, royalty-free licenses to the public) to "license" policies (the R&D performer is permitted to retain title, but must reserve a royalty-free license to the government).

Starting in 1968, studies began to show that most of the patents covering inventions produced under government sponsorship were not being licensed and, of those licensed, only a few were being used. The argument was made that concern about "giving away" government-funded inventions was misplaced because the private costs of developing commercial products from a typical invention were much higher than the level of Federal support for that invention, requiring guarantees of exclusivity before a private firm would willingly incur these development costs.

Key Features of the Uniform Patent Act

The Patent and Trademark Amendments Act (PL 96-517) was signed into law in late 1980 with an effective date of July 1, 1981. This Act, also known as the Uniform Patent Act (UPA), applied to nonprofit organizations (most notably universities) and small business firms conducting research under Federal sponsorship.

Under the UPA, universities are allowed to retain title to inventions arising from Federally sponsored research with the purpose of improving the rate of commercialization of these inventions and increasing industry-university collaboration in research. Universities are allowed to give exclusive licenses to private firms to use these inventions. But the UPA imposed a restriction on the period of exclusive license to large firms of five years from the first commercial use or sale, or eight years from the date of the license (plus the time needed to obtain clearance from regulatory agencies, if applicable), whichever is over earlier. The UPA also required universities to share licensing royalties with inventors (i.e., university-employed researchers) and use the remaining royalty income (net of expenses) to support scientific research or education. The immediate effect of the UPA was to facilitate the acquisition by universities of patents arising from Federally sponsored research, and to clarify the terms under which universities could sell exclusive licenses to private firms to promote commercialization of university-owned inventions.

The NSF Assessment of the Effects of the UPA

Effect on Patent Policies, Procedures, and Activities. In a 1981 NSF study, it was found that 20 of 38 research universities surveyed were making revisions in their patent policies and only six of them had policies more than five years old. The passage of the UPA was identified as only one impetus for these revisions. Other important motives mentioned were university interest in increasing their rate of invention (by increasing the rewards to faculty inventors), a desire to attract more industrial sponsorship, and a wish to generate an increased flow of their own research funds.

Seven of the nine universities surveyed in the current study were among the 38 surveyed in the 1981 study. Six of these seven revised their policies and procedures in 1980 or 1981. However, only one of the nine university patent officers surveyed in the current study stated they had revised their policy in response to the UPA.

Five of the nine university patent officers indicated that the number of university patent applications had increased in certain fields since 1981, although these respondents stated that increased applications should not be causally attributed to the UPA alone. A higher fraction of university scientists believed that the number of patent applications in their fields had increased since passage of the UPA (15 out of 22). Seven of the 15 scientists answering "yes" also believed the increase was attributable to the UPA. Scientists' answers to this question varied considerably across the three fields surveyed. The biologists were most affirmative (corroborating the perceptions of the patent officers); all of them (9) answered "yes" and four thought the UPA was partly responsible. Four of six materials scientists believed the volume of applications had risen since passage of the UPA and three considered the UPA to be a causal factor. On the other hand, only two of seven responding electrical engineers answered "yes" to this question and neither believed the UPA was instrumental.

The UPA has heightened the interest of university administrators in obtaining patents on Federally sponsored research products. Three patent officers noted the greater ease of acquiring patents (because they no longer have to negotiate with agencies not previously employing Institutional Patent Agreements) and the reduction in associated paperwork and administrative costs. Three patent officers also claimed the UPA had resulted in increased interest in the patent system as a vehicle for improving technology transfer. One respondent reported there has been a large increase in the membership of the Society of University Patent Administrators since passage of the UPA. All of the universities surveyed were actively seeking potential licensees for their patents through a variety a means. In three cases, these efforts went beyond marketing patents and extended to attracting industrial sponsors for related research. Also, in three cases (all public universities) the university used a separate organization to prepare its patent applications and to market patent licenses. (In two cases, this separate organization was affiliated with the university).

On average, 62 percent of the patent applications filed by the surveyed universities during 1981-1984 were filed under the UPA (i.e., represented inventions produced under government sponsorship). The range was 40 to 87 percent. The average figure is close to the percentage of research funds

obtained from Federal agencies by these universities. It might be expected that the percentage filed under the UPA would be lower than the percentage of research funds obtained from Federal sources because Federal sponsorship is more heavily weighted towards basic research. The equivalency of these percentages may be accidental, it may reflect the growing volume of focused basic research performed under Federal sponsorship, or it may represent an active effort by universities to respond favorably to the UPA.

Industrial Sponsorship of University Research. All three types of respondents were asked if the UPA had resulted in an increase in industrial sponsorship of university research. Six of the patent officers answered "yes" and two of these indicated that the increase had been very large. The other three were not certain. Considering that NSF data indicate that two-thirds of the sampled universities had experienced a faster rate of growth in industrial research support during 1976-1983 than in all other types of support (in two cases--much faster growth), it is possible that the six respondents answering "yes" chose to associate the UPA with continued increases in industry's share of their research budgets.

Most of the industrial respondents reported an increase in industry sponsorship of university research. The UPA was acknowledged as facilitative in a variety of respects. University administrators were seen as more aware of the financial rewards to be derived from industry sponsorship that produces patents from which the university derives royalty income. Both industry and university representatives were found to have become "more relaxed" about mingling Federal and industrial funds in a given area of research. And the industrial respondents believed that patent rights were much easier to negotiate after the UPA became effective.

However, when asked if they thought there would be major increases in their firm's support of university research over the next few years as a consequence of the UPA, only one industrial research manager said "yes." Six others said "no." The negative respondents believed that the changes in patent law were already digested at the time of the survey.

The scientists were asked two related questions. First they were asked if the UPA had increased the percentage of applied research conducted in their academic department. The total group of scientists surveyed were evenly split; one-half (10) said "yes" and one-half (10) said "no." However, six of those answering "yes" also indicated that this increase could not be attributed to the UPA and three other respondents (answering neither yes nor no) claimed any such increases could not be causally attributed to the UPA. The materials scientists were more definite that an increase in applied research had taken place (none of them dissented). The biologists were at the other extreme--two-thirds said there had not been an increase in applied research attributable to the UPA. It is possible that the already close linkages between basic research and commercial activities in bioengineering dominated the biologists' perceptions of any further shifts towards applied research after 1981.

The second question was intended for those scientists who had detected an increase in the emphasis on applied research in their department, but it was answered by 15 respondents--50 percent more than answered "yes" to the first question. All 15 answered "yes" to the question: "If there has been an

increase in emphasis on applied research in your department, has industrial funding (of your department's research) also increased?" Eleven of these respondents indicated that the increased industrial funding could not be attributed to the UPA. Nearly all of the materials scientists and biologists believed the increased industrial funding could not be attributed to the UPA, while the electrical engineers were evenly split about the UPA's influence. Given the large Department of Defense (DOD) programs in microelectronics, it is possible that industrial sponsors had been more concerned about prior or concurrent DOD patent claims arising from its sponsorship of university research prior to the UPA.

Other Effects of the UPA. One of the provisions of the UPA was a requirement that universities share royalty income derived from licensing with faculty inventors. The formulas for royalty sharing at the nine surveyed universities varied considerably. There were fixed rate and variable (descending) rate formulas, some based on gross patent income and others based on patent income net of administrative expenses. Fixed-gross income sharing ranged from 15 to 20 percent. Fixed-net income sharing ranged from 33 to 50 percent. The least generous variable-net income sharing formula specified the inventor would receive 50 percent of the first $10,000, 35 percent of the next $40,000, 25 percent of the next $50,000, and 15 percent of any additional net income. The most generous formula paid the inventor 75 percent of the first $10,000, 40 percent of the next $40,000, and 25 percent of any additional net income. The single variable-gross income formula specified the inventor would receive 50 percent of the first $50,000 and 25 percent of any additional gross income (considerably more generous than the fixed-gross income formulas). With generally improved prospects for royalty income, the hypothesis that some faculty inventors might have a strengthened preference for seeking Federal research sponsorship was examined.

It should be noted that all but one of the surveyed universities had an internal policy of requiring university ownership of all patents derived from university research regardless of sponsor. (The single exception allowed inventors to retain title under industrial sponsorship). Consequently, a strengthened faculty preference for Federal sponsorship would not derive from possible industrial sponsors' requirements that resulting patents be assigned to them. Rather, it would derive from tougher industrial negotiations regarding the payment of royalties in exchange for exclusive licenses when the research was industrially sponsored (as compared to Federal sponsorship) or it would derive from improved prospects for royalty income arising from Federally sponsored research.

Faculty scientists were asked if the UPA had increase their interest (or their departmental colleagues' interest) in seeking Federal sponsorship. Nineteen respondents answered "no" while five answered "yes."

The percentage answering "yes" was small in each of the three fields surveyed, although somewhat higher in electrical engineering and materials science than in biology, probably because the major sponsors of biological science (NSF and HHS) had established IPA's long before the UPA. The percentage answering "yes" (20 percent) should be considered significant in light of the many reasons given by the respondents answering "no." For example, some scientists stated that the major incentive for faculty choices about research (career advancement) ensures that most faculty will attempt to stay at the forefront

of their field in order to publish, and that the choice of sponsor is determined by this objective. In a number of academic departments, there are built-in incentives for acquiring Federal research funds, and the growing competition for Federal sponsorship tends to dominate patent-related preferences. Biological scientists in particular stressed the much higher income that could be realized through industrial consulting or employment (in comparison to royalty income) by scientists who are strongly motivated by the income potential of their research. Finally, some respondents doubted their colleagues were adequately informed about the implications of the UPA.

A hypothesis related to the idea that the UPA may have induced a stronger preference for Federal funding by university scientists is the possibility that the UPA has induced a higher rate of faculty spinoffs from universities in the form of new small firms. For university scientists that are able to successfully compete for Federal research support, the applicability of the UPA to small firms may represent an extra incentive to engage in this form of entrepreneurial research activity. To investigate this hypothesis, both patent administrators and university scientists were asked if the rate of small-firms spinoffs had increased since passage of the UPA.

Five patent administrators answered "no," but two of them added that there was a high probability increases would occur in future years. A sixth was not certain whether the UPA had increased the spinoff rate, while the remaining three reported increases (in two instances linking these increases with the UPA). Of the 24 faculty scientists responding to this question, only five answered "no." Six others indicate the UPA was largely unrelated to the spinoff rate from their universities because other factors (e.g., a penchant for entrepreneurism) were much more important. The remaining 13 respondents answered "yes," but only three of them considered the increased rate to have been positively influenced by the UPA (two biologists and one materials scientist). Based on these responses, it appears that the UPA has had at most a modest influence on the rate of faculty small-firm spinoffs.

The final effect investigated in this study was the possibility of publication delays necessitated by the patent application process. Both industrial research managers and university scientists were asked if there were increasing instances of publication delays since passage of the UPA because of proprietary interest by scientists or universities in acquiring patents. The majority of respondents from both groups stated there had not been an increase in publications delays beyond the normal 30-day period needed to scrutinize research findings for possible patentable results (six out of seven industrial respondents and 17 out of 22 scientists). These respondents indicated that in rare circumstances delays of 60 or 90 days might occur. The single dissenting industrial respondent stated that there had been a rise in publication delays but that the length of delay was typically minimal.

The five scientists who identified publication delays with the UPA were surprisingly definite about their perceptions (in light of the fact that 17 others had not perceived such delays). The single biologist identifying growing publication delays cited a major professional meeting at which "critical" findings were not presented, which he attributed to "the highly competitive climate of the times" and the possibility of "financial reward to the winner." One of two materials scientists identifying publications delays stated that he and his colleagues do not publish findings until their patent

applications are on file to protect foreign patentability, and also claimed there were delays or efforts to "sanitize" publications of research findings arising from projects undertaken by research consortia. One of the two electrical engineers who thought publications delays were growing offered a similar statement. The other stated there was a growing backlog of invention disclosures not yet acted upon by his university's patent administration, with the result that he and his staff had become "more deliberate" about publishing.

The 17 scientists who believed publication delays were not growing typically made reference to the importance of publishing in first-rate journals for career advancement. Some implied that even small delays might jeopardize the publication of findings in the most suitable journal and doubted delays would become a cause for concern for this reason.

APPROVALS

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Table 1. Industrial Support of Research and University Performers

	Percent of University Research Supported by Private Industry		Universities Share of Private Industry Funds for Research		Industry Financed Research as a Percentage of Industry Financed R&D	
	Basic	Applied	Basic	Applied	Basic	Applied
1984	4.4	5.5	11.5	1.6	4.6	23
1980	3.3	4.7	10.6	1.19	4.1	21
1975	3.0	4.0	10.1	.97	4.5	22
1970	2.2	3.7	7.5	.66	5.0	23
1965	2.3	4.7	5.7	.78	7.0	25
1960	5.5	7.3	7.1	1.06	7.6	27

Source: Calculated from National Patterns of Science and Technology Resources 1984, NSF, Division of Science Resources Studies, NSF 84-311, Tables 1-3.

Table 2. Federal Support of Research and University Performers

	Percent of University Research Supported by the Federal Government		Universities Share of Federal Research Funds		Federally Financed Research as a Percentage of Federal R&D	
	Basic	Applied	Basic	Applied	Basic	Applied
1984	69	53	52	14	17.6	19
1980	71	61	51	16	18.7	22
1975	70	61	54	13	17.3	22
1970	72	63	52	9	16.7	21
1965	77	56	49	6	13.9	19
1960	69	49	47	5	8.2	19

Source: Same as Table 1

Table 3. Sources of National Funds for Basic Research and Applied Research by Sector: 1960-1984

	Basic Research						Applied Research					
	Industry		Federal		Other		Industry		Federal		Other	
	$	%	$	%	$	%	$	%	$	%	$	%
1984	2,270	19	7,775	66	1,805	15	11,830	55	8,380	39	1,190	6
1980	1,265	16	5,559	69	1,265	16	6,695	48	6,599	47	766	5
1975	705	15	3,139	68	764	17	3,517	45	3,940	50	406	5
1970	528	15	2,489	70	532	15	2,427	42	3,080	54	213	4
1965	461	18	1,809	71	285	11	1,654	38	2,524	58	161	4
1960	342	29	715	60	140	12	1,226	41	1,688	56	106	4

Source: Same as as Table 1

Table 4. Sources of Funds Used by Universities for Basic and Applied Research

	Basic Research			Applied Research		
	Industry	Fed.Gov't	Other	Industry	Fed. Gov't	Other
1984	260	4,030	1,560	125	1,210	945
1980	135	2,851	1,040	80	1,035	576
1975	72	1,694	644	34	516	301
1970	40	1,296	460	16	268	143
1965	26	879	233	13	157	109
1960	24	299	110	13	88	78

Source: Same as Table 1.