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Japan's Patent System and Business Innovation: Reassessing Pro-patent Policies

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Japan's Patent System and Business Innovation: Reassessing Pro-patent Policies

by

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Abstract

Since current Japanese patent law was enacted in 1959, it has been revised several times, mainly for the purpose of international harmonization. Recently the Japanese government stresses the importance of pro-patent policies, i.e., strengthening intellectual property right in order to stimulate business innovation and to regain international competitiveness. This paper assesses the impact of series of revisions of Japanese patent system on firm's innovation activities, by using statistical data, firm level survey data and information from interviews for IP managers in IT and pharmaceutical firms.

It is found that increases in patent application in the late 1990's are attributed to a surge of IT patents, as well as pharmaceutical ones. For IT and pharmaceuticals, technology fields covered by patent protection have been gradually expanded, such as in areas of software and biotechnology. This policy change may contribute to increase in patent application. However, it is difficult to separate this system factor from other factors such as expansion of technological opportunity.

Although the impact of recent pro-patent policies on firm's innovation is not so clear, it is clear that IP section inside firm becomes to play more active role in firm's innovation strategy formulation, particularly in pharmaceutical firms. Tremendous technology opportunities in IT and biotech push a firm to rely on external knowledge pools by licensing activities, and it becomes important to coordinate in-house R&D with licensing activities to tap on external technology sources. In this context, IP section involves heavily in R&D and product development process inside firm. In addition, it is found that large firms in IT and pharmaceutical industry, focuses on US patent system, which moves relatively quickly for new technology field patenting, and pay less attention to Japanese one.

Keywords: Pro-patent policies, innovation, biotechnology, information technology

JEL code: O31, O34

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1. Introduction

The Japanese government published the Strategic Framework for Intellectual Property Policy in June 2003. The purpose of this Strategic Framework is to enhance Japan's industrial competitiveness by promoting the creation, strengthening the protection, and promoting the utilization of intellectual property. In addition, the Basic Law on Intellectual Property was established in November 2003, and led to action plans to promote the creation, dissemination, and effective exploitation of IP to contribute to the development of new industries. Implementation of this action plan involves various related ministries, and is coordinated by the Intellectual Property Policy Headquarters, headed by the Prime Minister.

Since the beginning of the 1990s Japan's economy has been mired in long period of stagnation. Stimulation of business innovation is vital to breaking out of this confining situation. The Strategic Framework for Intellectual Property aims to encourage innovation through proactive actions plans for stimulating effective use of intellectual property. This Strategic Framework covers a wide range of topics, including promotion of patenting by universities and public research institutions, revision of regulations on staff inventions within businesses, and revision of the Unfair Competition Prevention Law to prevent technology drain to overseas. Key elements of the Strategic Framework include so-called pro-patent policies, which include speeding up patent examination procedures, revision of the tort system, and protecting IP in new fields such as biotechnology and information technology (IT).

Against this background, one frequently encounters the argument that the pro-patent policies adopted by the U.S., which had been mired in decreasing competitiveness in the 1980s, provided the driving force behind today's rebirth of American competitiveness. Representative examples of pro-patent policies advanced in the U.S. in the 1980s include the establishment of the Court of Appeals for the Federal Circuit (CAFC) to specialize in appeals concerning patent infringement, and the extension of patent protections in the biotechnology and software fields. Such extension and strengthening of patent rights is argued to have stimulated business innovation, leading to enhancing US competitiveness. In addition, in the U.S., the amount of damage compensation in connection with patent disputes has recently soared. This increase may contribute to the trend toward strengthening of patent rights as well.

However, even in the U.S. opinions are divided as to whether pro-patent policies to expand and strengthen patent protections have had any visible effects on business innovation. A wide range of factors influence incentives for research and development (R&D) investment and new product development by businesses. These factors include the economic conditions of the

businesses as well as expanding technological opportunities and policy factors not related to the IP system (for example, pharmaceuticals safety regulations). Results of most analyses, primarily of U.S. cases, indicate that pro-patent policies have only marginal effects on business innovation (Kortum and Lerner (1999), Hall and Ziedonis (2001), Lerner (2002)) In addition, one criticism of pro-patent policies lies in the "anti-commons" problem. Taking the pharmaceuticals field as an example, the anti-commons argument states that successive application of patent protections to genetic innovations results in decreased R&D efficiency by increasing the number of patent licenses required in order to conduct such R&D (Eisenberg and Heller (1998)). Another vital issue concerns the goal of IP right policies to promote the circulation of technology by providing incentives for business innovation and clarifying rights to established technologies. Granting excessive exclusive rights to specific technologies may impede such circulation of technology.

This paper empirically analyzes the effects on business innovation of changes in Japan's patent system. Although the pro-patent approaches of Japan and the U.S. differ, until now most research on the subject has concerned the United States. Indeed, empirical research on the relationship between Japan's patent system and innovation is virtually nonexistent[1]. In addition, strategies for securing exclusive rights to technology, including patents, are understood to differ between Japanese and American firms (Cohen et al. (2003)). For these reasons, analysis of the effects of the Japanese system on business innovation is important to draw proper policy implications for patent system in Japan. In this paper, we will first examine changes to Japan's patent system and trends in innovation, including patent application and R&D investment. Next, we will analyze the effects of patent system changes as viewed by businesses, using results from a survey conducted by the Institute of Intellectual Property. We will then employ an analysis based on interviews with businesses to gather qualitative information unobtainable through the survey. These interviews focused on the biotechnology and IT fields, which have experienced notable recent technological progress. Finally, we will address the policy conclusions that may be drawn from this research.

2. Business innovation and changes to Japan's patent system

The history of Japan's patent system goes back to the Statute of Monopoly Patent, established in 1885. Patent law at that time, modeled after French and American law, applied the "first-to-invent rule." The law underwent numerous subsequent revisions, and from 1921 the patent law applied the "first-to-file rule." The current postwar Patent Law was established in 1959 and

[1] An exception is Branstetter and Sakakibara (2001), which examined the effects of the revised system

went into effect in April 1960. In addition to clarifying the requirements for an invention through provisions such as "inventive step" rules, the law also fulfilled the requirements of modern patent law; for example, by adopting an international rule concerning the loss of novelty occurring when an invention enters the public domain through publication[2]. We shall now review changes in the postwar patent system based on this new Patent Law and examine the accompanying trends in patent applications and in R&D. [3]

Table 2-1 lists major revisions to the patent system under the new Patent Law. These fall into the following four categories: extension of patent protection to new spheres, such as the introduction of microbiology patents; extension of patent protection across technology fields, such as the revised system of multiple claims; strengthening of patent rights, such as increases in damage claim amounts; and modification of the way the patent system operates, such as introducing electronic patent application submission system.

Table 2-1: Major changes in Japan's patent system

	New technolgy patent	Wider range patent	Stronger patent	User friendly patent
1970s	microbe (1979)	chemical compound (1976)		Application laying open system(1971) Request for examination system
1980s	animals (1988)	multi claim (1988) extension of patent period for drugs (1988)		
1990s	Definition of software patent (1993) e-money (1995) software media(1997) ↕ (gene related patent) (business model	doctrine of equivalance (Ball Spline case・	Post grant opposition system (1996) Raising penalty to patent infringement (1999) Review of panal provisions (1999)	Erectronic application(1990) Application in English (1995) Application fee reduction(1998)* Application fee reduction(1999)*
2000年代	software (2000) ↕		Expansion of remedies against infringements (2000)	Shortening time limit for request for examination (7 yrs→3 yrs, 2001)

*: Until 1998, application and registration fees had been raised occasionally, which is not described in this table

of multiple claims adopted in 1988 on business R&D and patent applications.

[2] These historical references to Japan's Patent Law are based mostly on Kadota and Tatsumi (2000).

[3] In Japan the Utility Model Law covers small-scale inventions not subject to patent law. Although the utility model system, along with the patent system, has made major contributions to Japan's economic development, since the late 1980s the number of applications under the Utility Model Law has declined dramatically. Under revisions made in 1994 the utility model system shifted to a registration system without examination, but applications and registrations continued to decline. In 2001, while approximately 440,000 patent applications were submitted, only 9,000 utility model applications were submitted.

The major areas subject to the extension of patent protection to new spheres are software and biotechnology. In 1985 copyright law was revised to provide clear protection for software as copyrighted material. However, since copyright law ultimately protects expression, not ideas, protection of software under patent law also came under consideration. In the consideration of patent protection for software, issues arose concerning whether software qualifies under the patent law requirement that an invention include technological ideas along the line of natural science theory. Through the early 1990s, software itself, which consisted simply of calculation methods, was not considered subject to patent protection. However, software enabling the functioning of hardware, such as the Japanese language input system used in word processors, was allowed patent protection together with such hardware. In line with the increase in packaged software not embedded in hardware, in 1997 patent protection was allowed for software recorded on media such as floppy disks. In 2000, software was made eligible for patent protection as software itself, and in 2002 this protection was extended to software that circulates on computer networks.

In connection with software patent protection, recently patent protection has been extended to business models, such as e-commerce auctions and settlement systems. Even Japan, which has lagged behind the U.S. in implementing such patent protection, has seen approval of a number of such business model patents. Currently, inventive step examination is becoming stricter, as patent cases are accumulated. With regard to standards for such patent protection, in Japan as in Europe business model patents are approved only for business models that have technological aspects. For this reason, pure business methods unrelated to software are not granted patent protection. On this point, Japan's standards are stricter than those of the U.S., where a wide range of business models may be patented if they have utility, regardless of technological aspects. However, the results of research comparing standards for software-related business model patents in Japan, the United States, and Europe, conducted by the patent offices in those regions, show no major differences between the three markets (Japan Patent Office (2000)) [45].

In the field of biotechnology, beginning with the introduction of microbiology patents in 1979, the range of inventions subject to patent protection has expanded in line with technological developments in the field. In the 1980s genetically engineered pharmaceuticals and plants and animals became subject to patent protection. Since the 1990s, patents have been available for

[4] Among the three regions, examination standards are particularly strict in Europe, where business models are specifically excluded from patent protection. However, business model patents are most common in the software field, and such patents are awarded if they meet the technological requirements

genetic functional analysis and research tools. With regard to gene fragment patents, in 1999 Japan, the U.S., and Europe agreed not to extend patent protection to gene fragments unless they have specific functions or special utility; however, it has been pointed out that each patent office has its own methods of determining whether a gene fragment has such functions or special utility. In Japan, patent requirements are clearly defined under the standards for genetic patent examination established in 1999. These examination standards have since been updated; for example, with the addition of screening method precedents in 2000.

The extension of the scope of patent protection is not limited to new spheres such as IT and biotechnology. Also vital are measures for extension of patent protection across technology fields, such as the introduction of chemical compound patents (in 1976), the system of multiple claims (in 1988), and the system for extension of the patent term for pharmaceuticals (in 1988). Until the introduction of chemical compound patents, only methods of production could be patented for a drug with new chemical entity. However, since 1976 such entities themselves have been subject to patent protection. Before, it was impossible to stop another firm from circumventing patent protection through the use of different production methods. Such circumstances inhibited incentives for the development of new medicines. Protection of pharmaceuticals based on new compounds through the adoption of substance patents may be said to have had a major effect on pharmaceuticals R&D. In addition, the revised system of multiple claims adopted since 1988 allows a single patent application to cover multiple inventions. Japan's patent system used to operate on the one-patent, one-claim principle, requiring numerous individual patent applications for multiple related inventions. By enabling collection of such inventions under a single patent application, a wider range of inventions may be subject to wider patent protection. Along with the revised system of multiple claims, special measures were adopted to extend patent terms for inventions such as pharmaceuticals and agricultural chemicals, which require long periods for government approval before they may go to market. The ordinary term of a patent is twenty years, but under these measures this term may be extended by up to five years. Furthermore, the doctrine of equivalents was adopted for interpretation of the breadth of claims protected by patents. This doctrine states that even if insubstantial elements of a patented claim are replaced with different elements, activities that have operational results identical to those of the original patent will still qualify as infringements of the original patent. In the Ball Spline Case in 1998, Japan's courts affirmed the doctrine of equivalents. General adoption of the doctrine of equivalents with regard to patent disputes could result in a broadening of the scope of claims protected by patent rights.

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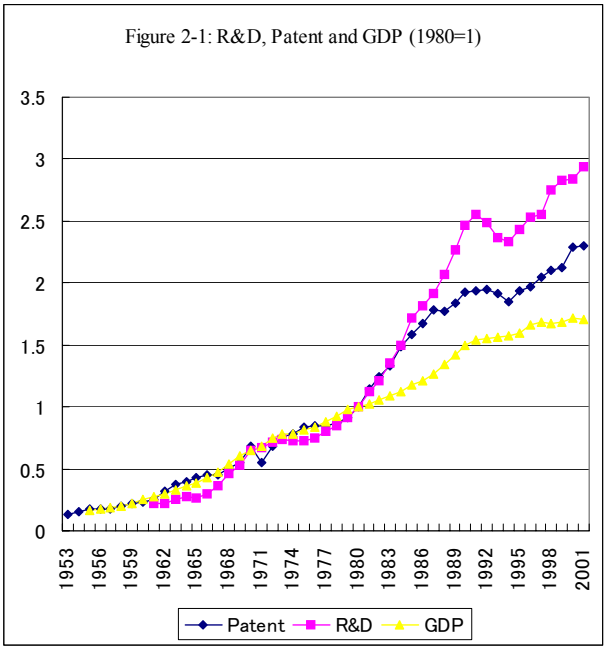
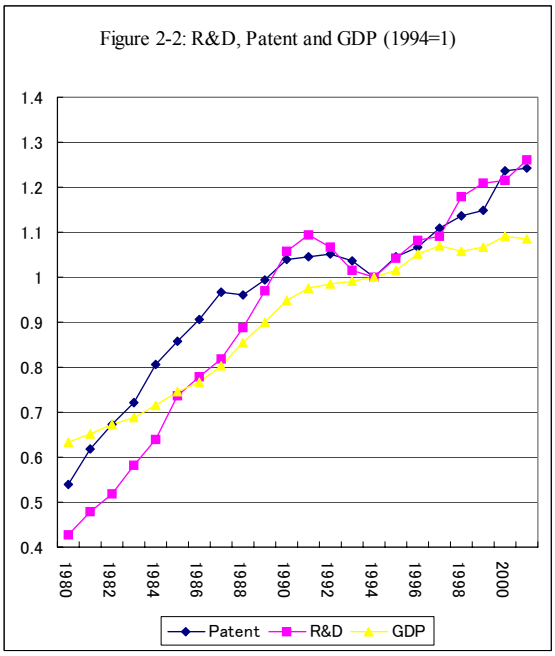
of software. (Aida, Hirashima, and Sumikura (2001))

In addition, recently implemented revisions have tended to strengthen patent rights. Major examples include increased damage claim amounts for patent infringements (implemented in 1999 and 2000), the revision of the patent dispute processing system, and the revision of legal judgment procedures. Since the late 1990s, the Japan Patent Office has worked to strengthen the protection of patent rights using these sorts of pro-patent policies. In this context, it is recognized that revisions to the patent system itself are strongly linked to the strengthening of patent protection. Many of these measures have been specifically aimed at speeding up patent examinations. For example, in 1996 the allowable period for lodging objections to the granting of a patent was extended beyond the grant of the patent in an effort to shorten the time required for obtaining a patent. In addition, although fees for patent applications, requests for substantive examination, and registration had steadily increased through the early 1990s, in both 1998 and 1999 these fees decreased. These measures are intended to encourage protection of the results of technological and other kinds of development through patents. In fact, the 2001 reduction in the required period between patent application and a request for examination (from seven to three years) is expected to result in a large number of requests for substantive examination in the short term. In response, fees for requests for examination increased from the beginning of 2003.

Japan's patent system has thus undergone numerous revisions. We shall now examine the relationship between these revisions and innovation in business, including patents and R&D activities. Figure 2-1 shows long-term trends in the number of patent applications, R&D expenses, and GDP. Figure 2-2 shows in greater detail trends in these figures since 1980. Until about 1980, these three indicators largely moved parallel to each other. However, since 1980 growth in the number of patent applications and R&D expenses has exceeded that of GDP. Japan in the 1980s saw high economic growth-- 4% or more per year on average. This strong economy can be seen to have stimulated business R&D and encouraged applications for patent. The beginning of the 1990s then saw the collapse of the so-called bubble economy, leading to a decrease in economic growth, to around 1% per year on average. Initially at this time, R&D expenses and the number of patent applications fell. Thus, we may consider trends in R&D expenses and the number of patent applications generally to reflect the economic conditions of the time.





If we look at trends in the late 1990s, however, we see a different tendency: significant increases in patents and R&D despite unremarkable economic growth rates. With regard to patent application data in particular, if we take into account the fact that the adoption of the revised system of multiple claims in 1988 increased the number of claims that could be covered under a single patent, we realize that the increase in the volume of claims exceeded even the growth in patent applications.[5] As Table 2-1 shows, since the late 1990s various patent system revisions have taken place, such as the introduction of patents in new areas, the strengthening of patent protection, and revision of the patent system overall. However, it is difficult to determine using macroeconomic data whether or not this increase in applications is an effect of these changes to the patent system.

Figure 2-3 shows shares of the increase in patent applications (55,898 applications) by technological field from 1995 through 2000. Using the three-digit International Patent Classification (IPC) industry classifications, five of 120 technological fields accounted for 65% of the total increase. Most of these were IT-related fields. (Biotechnology fields related to pharmaceuticals were also represented.) The share of the classification that includes software (G06: Computing; Calculating; Counting) was particularly large. The G06 classification accounted for approximately 34,000 patent applications in 2000, of which approximately 20,000 were software-related (G06F). We can see that the trend toward extension of patent protection to software, as well as to business method, has had a significant effect on recent growth in the number of patent applications.

Figure 2-3: Increase in patent application from 1995 to 2000

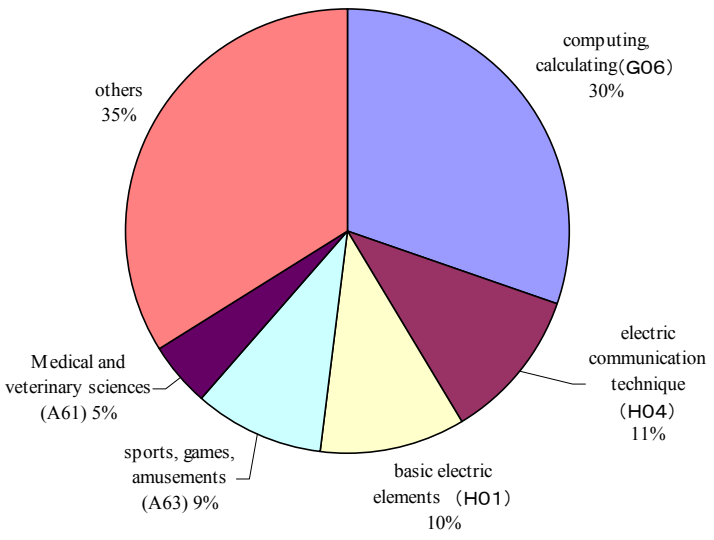
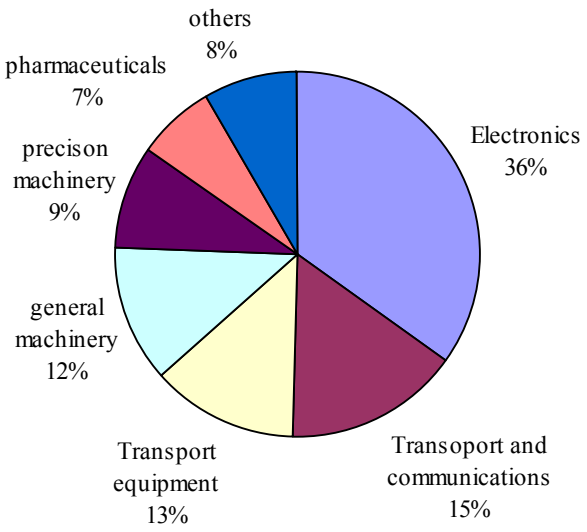


Figure 2-4 shows the increase in R&D expenses (JPY 1.46 trillion) over the period from 1995-2000, divided by industry. Increases in R&D expenses in IT-related fields (such as telecommunications, measurement instruments, transportation, and communications) represented a significant portion of this amount. In addition, since firms in machinery-based industries (involving transportation machinery, general machinery, and precision machinery, for example) are likely to conduct IT-related research, to some degree these industries have also contributed to the increase in investment in IT R&D and patent applications.

[5] The average number of claims per patent has increased from 2.8 in 1989 to 7.6 in 2001.

Figure 2-4: Incremental ammount of R&D from 1995-2000



Thus, growth in certain primarily IT-related technological fields had a major impact on increasing growth in R&D investment and patent applications in the late 1990s, despite low levels of economic growth. With regard to changes to the patent system, the extension of the scope of patent protection to include new spheres such as software seems to have had a stronger effect than pro-patent policies across fields such as revisions to patent dispute procedures and increased damage claim amounts. We will examine this point in more detail in the following sections.

3. Assessment analysis of pro-patent policies: survey data analysis

As we have seen, the current Patent Law has undergone various changes since its establishment in 1959. These changes largely stem from international requirements, such as harmonization with international agreements such as the Paris Convention and the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) of the World Trade Organization (WTO), in addition to measures adopted since the late 1980s based on the Japan-US Structural Impediments Initiative. Since the late 1990s, the importance of strengthening of the protection of patent rights through pro-patent policies has become clear, and steady efforts have been made to protect inventions in new fields in line with advances in IT and biotechnology. The previous section summarized these changes to the patent system and looked at their relationship to business innovation, as seen in macroeconomic and industry-specific trends in patents and R&D. In this section, we will analyze these matters in more detail, using the results of survey data by the Institute of Intellectual Property.

Under Japan's patent system, patent rights have been both extended and strengthened. Extension of patent protections to new technological fields and extension of the scope of patent protections (the breadth of claims) have resulted in covering more broad range of technology. In addition, patent protections have been strengthened, as evidenced by increases in damage claim amounts. What effects have these policies had on innovative business activities, such as R&D? [6]

By securing a fixed period of exclusive rights for inventions that have economic uses, patent rights provide economic incentives for R&D. In this context, pro-patent policies promote business innovation. However, when we consider the innovative efficiency of society as a whole, we must not neglect the point of view of the user side of technology. Typically, R&D builds cumulatively on past scientific knowledge (the "standing on shoulders" principle). For this reason, if from the user's point of view beneficial knowledge is excessively protected by patent rights, this cumulative innovation will be impeded. Recently, genetic patents and patents for research tools have increased in the biotechnology field. These patents may have a negative effect on downstream R&D in pharmaceuticals development. In addition, in the software field, multiple patents are sometimes combined into a single complete technology, in which case using such patents requires negotiations with multiple patent holders, resulting in increased transaction costs. Thus, when considering the relationship between the patent system and innovation, we must take note not only of the incentives to inventors but also of the mutual relationship between innovations and their users. In order to examine this relationship between pro-patent policies and technological spillover, it is useful to examine trends in licensing, which serve as an indicator of the state of the technology market.

Another essential purpose of the patent system is to encourage technological spillover by means other than licensing, including through publication of technological information. Related benefits of publication of patent information for developed technologies include the stimulation of new ideas and reduced redundancy in R&D investment by other firms. Japan's patent system places emphasis on such publication of technological information and its related spillover effects, as with the establishment of a system for publication of patent applications in 1970.[7]

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[6] Concerning the relationship between pro-patent policies and innovation in the U.S., Jaffe (2000) conducted a wide-ranging survey including both theoretical and empirical research. In addition, the survey by Nakayama (2002) focuses on anticommons issues resulting from pro-patent policies.

[7] In the U.S., a system of publishing applications was established in 1999 as a result of the international harmonization of patent systems. However, this publication of technology has come under intense criticism for handicapping small and medium-sized enterprises by weakening their negotiating power. (Gallini (2002))

The Institute of Intellectual Property conducted a survey at the end of 2001 to determine the actual relationships between pro-patent polices and business innovation and licensing trends. Although this was a small-scale survey of 1,398 firms (valid responses were received from 373 firms, for a response rate of 26.7%), it provides useful information because it examined in detail both matters related to inventors, such as patent applications and R&D, and matters related to users, such as third-party licensing of corporate patents (Institute of Intellectual Property (2002)). This survey classified pro-patent policies into the following three types and investigated the effects of each type on business innovation:

(1) Broad protection: extension of protection to new spheres (e.g., patents relating to microbiology, gene fragments, software, and business models)

(2) Broad protection: extension of the coverage of an individual patent (e.g., application of the revised system of multiple claims and the doctrine of equivalents)

(3) Strong protection: increasing amounts of damage claims and speeding up the dispute process and other policies

Table 3-1 shows percentages of firms by sector reporting increases in R&D expenses, increases in patent applications, or negative effects as a result of the three polices above. The data is classified to allow comparisons between trends among large firms in R&D-intensive industries such as the pharmaceuticals and electrical machinery industries and those of R&D-intensive small and medium-sized enterprises (high-tech startups), as well as the overall average. The most distinguishing characteristic of Table 3-1 is the high percentage of firms in the pharmaceuticals industry that reported some kind of effect. The pharmaceuticals industry is one in which patents are especially effective as means of protecting exclusive rights to technology. It is natural that this industry would experience major effects from changes to the patent system.[8] In particular, policies to broaden patent protection by extension to new spheres appear to have had significant effects: close to half of the pharmaceuticals industry firms responding have increased patent applications, and approximately one in three firms have increased R&D expenses. At the same time, the percentage of pharmaceuticals industry firms reporting negative effects is greater than in other industries, indicating that while a firm's exclusive rights to its own technology may have increased, the same may be said for other firms as well.

[8] The Yale Survey is a famous survey concerning technological exclusivity. The National Institute of Science and Technology Policy conducted a survey of Japanese firms using a similar questionnaire. Thus this characteristic of the pharmaceuticals industry has been confirmed in surveys conducted in both Japan and the United States. (National Institute of Science and Technology Policy (1997))

Table 3-1: Effect of pro-patent policy on firm's innovation activities

		all	drugs	electronics	SMEs
Wide patent (new technology)	Increase R&D	8.0%	34.6%	22.0%	15.8%
	Increase patent application	24.1%	46.2%	26.1%	11.8%
	Harmful effects	6.2%	23.1%	4.3%	3.9%
Wide patent (not technology specific)	Increase R&D	5.9%	19.2%	0.0%	11.8%
	Increase patent application	11.3%	23.1%	8.7%	10.5%
	Harmful effects	11.5%	23.1%	6.5%	3.9%
Strong patent	Increase R&D incentives	27.3%	30.8%	30.4%	19.7%
	Increase patent application	14.7%	19.2%	17.4%	9.2%
	More use of patent	17.4%	11.5%	23.9%	11.8%
	Harmful effects	7.5%	11.5%	4.3%	1.3%

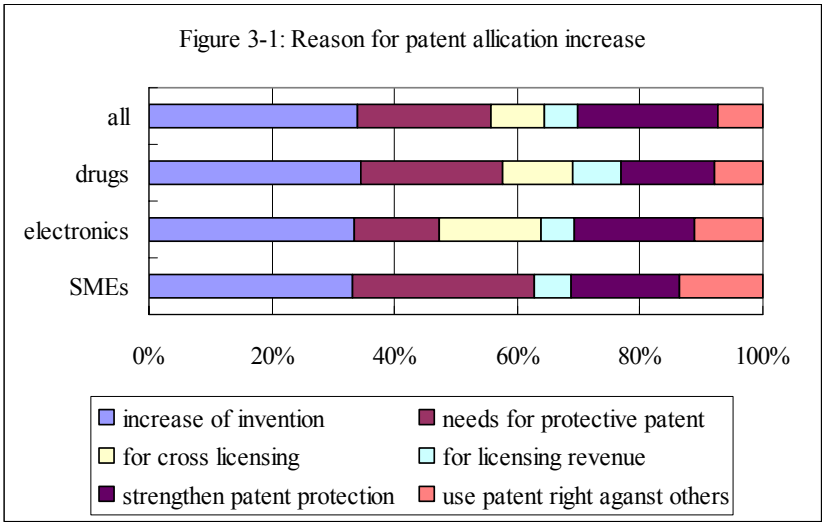
When compared with the pharmaceuticals industry, the electrical machinery industry has not felt such strong effects of pro-patent policies. The effect on R&D expenses of policies to broaden patent protection by extension to new spheres is slightly higher than the average for all industries, but this is likely the result of the extension of patent protection to software. In addition, the effect on the number of patent applications is even lower than the average for all industries. With regard to the strengthening of patent protections, the large number of firms responding that they are actively exercising patent rights is of great interest. It appears that some firms are adopting measures such as active licensing of existing patents to other firms in response to the strengthening of patent rights resulting from measures such as increased damage claim amounts.

Finally, small and medium-sized venture businesses do not seem to have felt the effects of changes to the patent system as strongly as large firms. Although the number of such firms reporting increased R&D expenses as a result of policies for broadening patent protection by extension to new spheres is larger than the average for all industries, the survey sample is composed of R&D-intensive small and medium-sized enterprises. Such firms may exhibit tendencies toward higher R&D investment regardless of pro-patent policies.

Figure 3-1 shows in greater detail trends in patent applications by businesses and factors affecting movements in such figures, including pro-patent polices. Of the 373 firms responding to the survey, 264 reported increased the number of patent applications in 2000 relative to the prior three years. However, the most common reason cited for such increases was an increase in the number of inventions, representing approximately one out of three responses. The percentage of firms in the pharmaceuticals industry citing strengthening of patent rights, considered an effect of pro-patent policies, was small. As we saw in Table 3-1, this Figure indicates that although IP rights policies have had an effect, in comparison with other factors (such as increased inventions and efforts to prevent patenting by other firms) the relative effect of such policies is weak. In the electrical machinery industry, cross-licensing

was cited by a relatively large number of firms as the reason for the increase in patent applications. Despite the trends seen in Table 3-1 concerning the active use of existing patents, increasing negotiating power by cross-licensing appears to be more important to respondents than the increase in income accompanying patent licensing.

Figure 3-1: Reason for patent allication increase



The survey by the Institute of Intellectual Property investigates the effects of pro-patent polices on the licensing activities of businesses. Pro-patent policies intended to strengthen patent protection through increased damage claim amounts, speeding up the processing of disputes, and other measures increase the negotiating power of licensors, who license their own patent rights to licensees. In addition, the trend toward broader patent protection may also work to the advantage of the patent holder in a dispute over the breadth of a patent claim. In such cases the effects of these policies may tend to increase licensing fees.

Table 3-2 summarizes survey results concerning the effects of pro-patent policies on licensing. Overall, total licensing fees seem to be increasing for both licensee and licensor activities. In addition, responses from both the pharmaceuticals and electrical machinery industries in particular point to increases in the licensing fees paid to license patents. On the other hand, this effect of increased licensing fees is barely acknowledged by small and medium-sized venture businesses.

Table 3-2: Effect of pro-patent policy on firm's licensing activities

		all	drugs	electronics	SMEs
Incease licensing fees	Licensing out	14.7%	15.4%	19.6%	2.6%
	Licensing in	15.0%	26.9%	28.3%	1.3%
Increase of licensing out		51.5%	46.2%	69.6%	39.5%
Reason	Increase licensing needs	18.7%	30.0%	6.1%	37.0%
(increase firm only)	Seek for licensing revenue	57.8%	45.0%	61.2%	54.3%
	Necessity of cross licensing	23.6%	25.0%	32.7%	8.7%
Increase of licensing in		24.7%	42.3%	13.0%	11.8%
Reason	Increase licensing needs	13.3%	31.0%	6.0%	11.8%
(increase firm only)	R&D outsourcing	15.7%	17.2%	12.1%	26.3%
	Entry into new business	50.5%	44.8%	42.4%	47.1%
	Necessity of cross licensing	20.4%	6.9%	39.5%	14.7%

More firms expect future increases in total licensing fees for both licensees and licensors. However, outlooks in this area differ between the pharmaceuticals and electrical machinery industries. In the pharmaceuticals industry, more firms expect to increase licensee activity in the future, while in the electrical machinery industry the reverse is true: more firms expect to increase licensor activities. High percentages of pharmaceuticals industry respondents gave development of new businesses and increasing licensing needs as reasons for increased licensee activities. This is an indication of pharmaceuticals firms' needs to cooperate with other parties in response to new technology, as R&D in the pharmaceuticals industry expands to new areas such as use of genetic information and bioinformatics. In the electrical machinery industry, high percentages of respondents gave the desire for licensing income and the necessity of cross-licensing as reasons for increased licensor activities. These results indicate that, in response to the extension of the scope of patent protection, electrical machinery firms may have turned to a strategy of strengthening leverage through cross-licensing while more actively making use of existing patents, in order to gain a competitive edge over other firms attempting the same thing. More small and medium-sized start-up businesses expect their licensor activities with electrical machinery manufacturers to increase to a greater extent than their licensee activities with such manufacturers. In most cases, start-ups that do not have their own manufacturing processes and distribution channels thus may be adopting a strategy of actively gaining profit from their own technology.

In this way, the effects of pro-patent policies on licensing differ according to the type of industry and the nature of the firm. In the pharmaceuticals industry, firms tend to increase licensee activities due to the necessity of development in technological fields that are new to them. The increase in licensing fees accompanying this process is likely a result of weakened licensee leverage due to the necessity of obtaining licenses in new areas of R&D. In terms of the relationship with the patent system, although the extension of patents into new areas such as genetic functions and screening technology is relevant, the expansion of technological

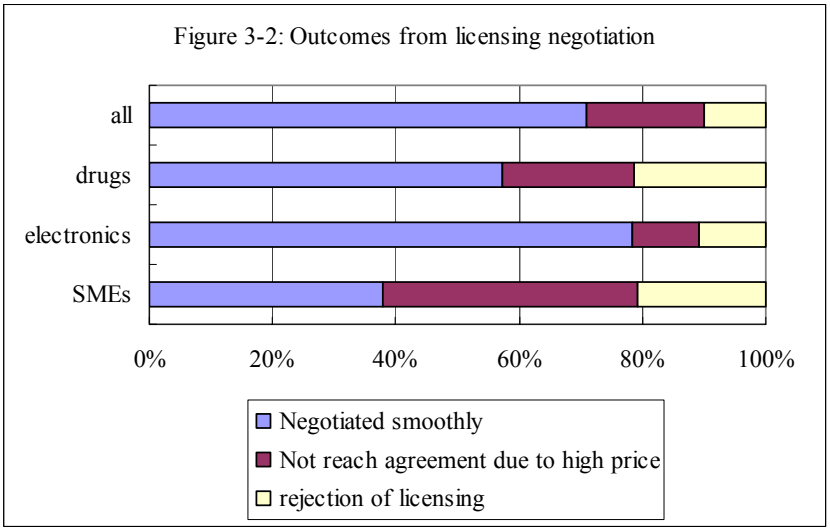
opportunities (such as the use of genome information in the creation of pharmaceuticals) is of greater significance. On the other hand, in the electrical machinery industry, active attempts to put patents to use can be seen to accompany the strengthening of patent protection. Software-related patents, for which the number of applications has recently risen dramatically, have a special characteristic: multiple patents are required in the development of a single product. Accordingly, the key to competitiveness in software product development is a firm's ability to conclude licensing agreements with other firms. In other words, since a firm's technology is likely to be useful to other firms, many firms adopt cross-licensing as a working strategy[9].

Firms appear to be actively patenting their own technological successes in preparation for cross-licensing with other firms. For small and medium-sized start-up businesses, many of which are specialists in their own technologies, patents by other firms resulting from pro-patent policies are unlikely to have negative effects on technological development. In fact, the strengthening of patent protections under pro-patent policies may have the benefit of allowing R&D-intensive venture businesses to place a higher priority on licensing strategies as a result of the simplification of the protection of their own rights.

Finally, since the late 1990s patent licensing fees are said to have increased (Nagaoka (2002)). We will examine the actual circumstances to determine whether this jump in licensing fees has had negative effects on the circulation of technology. Figure 3-2 summarizes the results of licensing negotiations overall. For the entire sample, negotiations seemed to be going well. One of the benefits of the patent system is the spillover effect caused by the circulation of technology protected by patents. At present, the jump in licensing fees has had no apparent negative effect on the technology market. Among small and medium-sized start-up businesses, there were many cases of failure to reach an agreement on licensing prices. However, this reflects the significantly restricted funding of such firms. Since, as seen in Table 3-2, few small and medium-sized start-up businesses noted increases in total licensing fees due to pro-patent policies, these cases may indicate merely a shortage of funds among small and medium-sized businesses in general and may not have a strong relationship with the patent system.

[9] Patent pools are sometimes used when selling products that use various patents held by numerous firms. See Nagaoka (2002) for an economic analysis of patent pools.

Figure 3-2: Outcomes from licensing negotiation



4. IPR and innovation in the IT and biotechnology fields: firm interview approach

As seen in the previous section, pro-patent policies have a relatively greater effect on innovation in R&D-intensive industries such as IT and biotechnology. In addition, these industries show major increases in investment in R&D and in the number of patent applications since the late 1990s. Although we cannot deny that pro-patent policies are a factor in such trends (particularly the extension of patent protections to new spheres), we have seen that additional factors such as increased numbers of inventions due to the extension of technological opportunities and to the strengthening of licensing strategies have also had major effects. Since pro-patent policies include the extension of the scope of patent protection to new areas (such as the genetic and software fields) and patent revisions in response to technological advances, it is difficult to distinguish between the effects of such policies and the additional factors mentioned above. However, in order to assess the value of pro-patent policies within the overall patent system, we must answer the following: What would have been the extent of innovation if patent protection were not available for these new fields? If R&D in IT and biotechnology would have been stimulated independent of the patent system, we would need to reconsider the trend toward the strengthening of patent protections currently under discussion. We will now attempt an examination of this issue, focusing on the fields of IT and biopharmaceuticals based on information from interview surveys[10].

(1) Information technology

The followings are results of interview surveys for IP manager in 4 large electronics

[10] The survey was conducted with division-manager level personnel of the IP sections at major electrical machinery manufacturers (representing the IT field) and five major pharmaceuticals manufacturers

manufacturers.

1. *Effects of pro-patent policies on patent activities (e.g., application, registration, licensing)*

- In terms of the relationship with business innovation, only expanding technology fields for patent protection, such as business model patent, has a significant effects. Other policies play a minor role. Revision of software patent guideline can be appreciated, but an efficient patent attorney can write effective patent application even without it.
- Multiple claim system is important in a sense that one technology can be protected from various kinds of aspects in one patent. This contributes to clearer boundary of technology covered by patent protection.
- Improvement of dispute settlement system is also important. Quick decision is needed in fast moving technology area.

2. *Effects of pro-patent policies on R&D and licensing*

- The role of IP section becomes important in firm wide innovation strategy. However, the impact of IP policy is not so strong as to change R&D strategy and resource allocation.
- Licensing decision is made by product development group. IP section provides information on IPs in licensing candidates.
- IT products combine a lot of technology, so that cross licensing and strategic alliance are common. Therefore, IP strategy should be in line with advantageous positioning in future negotiation for cross licensing.
- For fab-less companies without manufacturing facilities, cross licensing strategy is useless. However, these firms' patents are rarely broking R&D.

3. *International patent strategies*

- US Patent Office moves relatively quickly in terms of new technology field patent. We are paying close attention to this move and international patenting.
- US patent office allows relatively broader area for patent protection, and an actual boundary of right may be determined in patent lawsuits. In this sense, it is necessary to make patent application by US standard for international patent.

4. *Trends in and background of R&D and patent applications in the late 1990s*

- In many IT firms, the number of patent application decreased after 1990's. Each firm makes more efforts in selecting inventions to be patented, as its financial condition becomes bad. In addition, increasing number of international patenting pushes down domestic patent application further.
- However, there are some firms which increased patent application after 1990's. In this sense, the number of patent application does not reflect firm's innovation output directly, but is susceptible for its strategic decision.
- The number of cross licensing and patent infringement is increasing. Patent application is based on clear objective from viewpoint of technology strategy and patent portfolio.
- For R&D management, it is important to catch next dominant technology area quickly. For example, new PDA and contents in broadband era and IC technology in cellular phone are

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(representing the biotechnology field).

important. Pro-patent policies are not related to this kind of forward looking R&D strategy. It is found that new technology patent, in area of software and business model, has some impact on firm's patenting activities, but other pro-patent policies such as improvement of patent dispute settlement system have only marginal effects. Moreover, as is found in the case of business model patent, US Patent Office moves quickly to patent protection of new technology, so that Japanese electronics firms are paying attention to US patent system more closely.

As for the impact on firm's R&D activities, since strategic alliance and licensing activities become more and more important, electronics firms are using patent information intensively. However, there are no firms saying that R&D is stimulated by pro-patent policies in interview survey. IP section plays an important role to distribute technology information to R&D section, but its role in firm's innovation strategy is not proactive, but only passive one.

Figure 4-1 and 4-2 is the number of patent application by 9 large IT firms for all technology areas and for software related patent (G06F), respectively. In many firms, large volumes of applications were submitted during the period from the late 1980s through the early 1990s, and that the number of applications has decreased markedly since then. The trend in the 1990s differs by firm, with some firms (such as Matsushita and Mitsubishi) submitting a greater number of applications since the late 1990s and others (such as Hitachi and Toshiba) submitting fewer applications over the same period. Although recent trends in the total numbers of patent applications vary by firm, all firms have increased the number of applications for software patents (classification G06F). A factor behind this trend may be the revision of guidelines concerning software patents, which expanded the scope of software subject to patent protection.

There are some points to be discussed. The first point is about a role of fab-less firms in IT industry. In the United States, it is observed that pro-patent policies in 1980's facilitated entry by semiconductor specialized design firms. (Hall and Ziedonis (2001)) Strong IP protection is important for these fab-less firms, but since they do not own their fabrication facility, cross licensing are cannot work with them. In biopharmaceutical area, it is argued that IPs on fundamental technology or research tools hampers innovation in downstream R&D, i.e., new drug development, but what happens in IT? From this interview survey, we cannot find a big concern about breakdown of successive R&D. If technology market in licensing works well, stronger patent is effective from viewpoint of technology spillover.

The second point is differences of patent system between Japan and the United States. In

interview, IP managers stressed US Patent Office's quick move toward new technology protection and relatively broader coverage of patent claim. As a result, globally operated firms set IP strategy along US standards, and pay little attention to Japanese system. This may lead to disadvantage for Japanese firms in global market. However, this difference is deeply rooted in the juridical system in both countries, and there is no simple solution.

Figure 4-1: Number of Patent Application (all category)

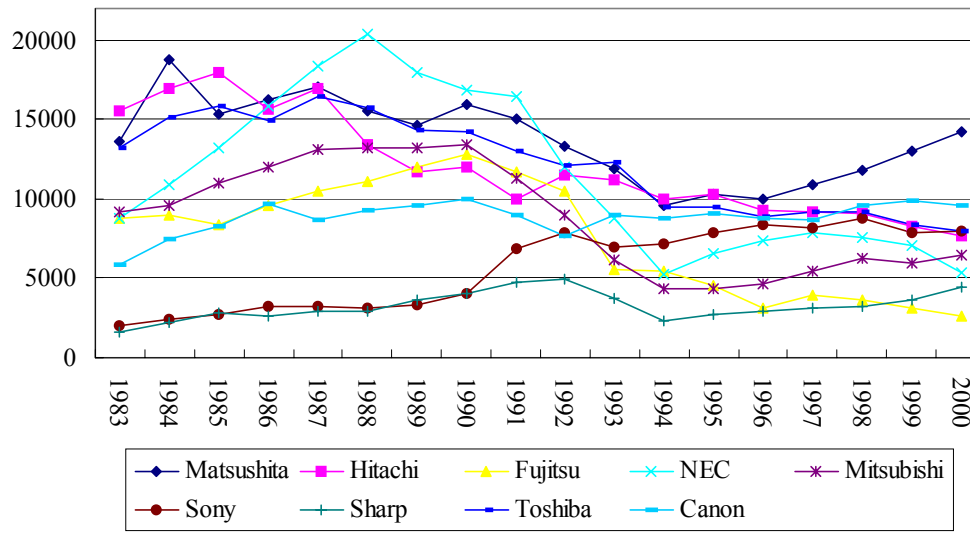
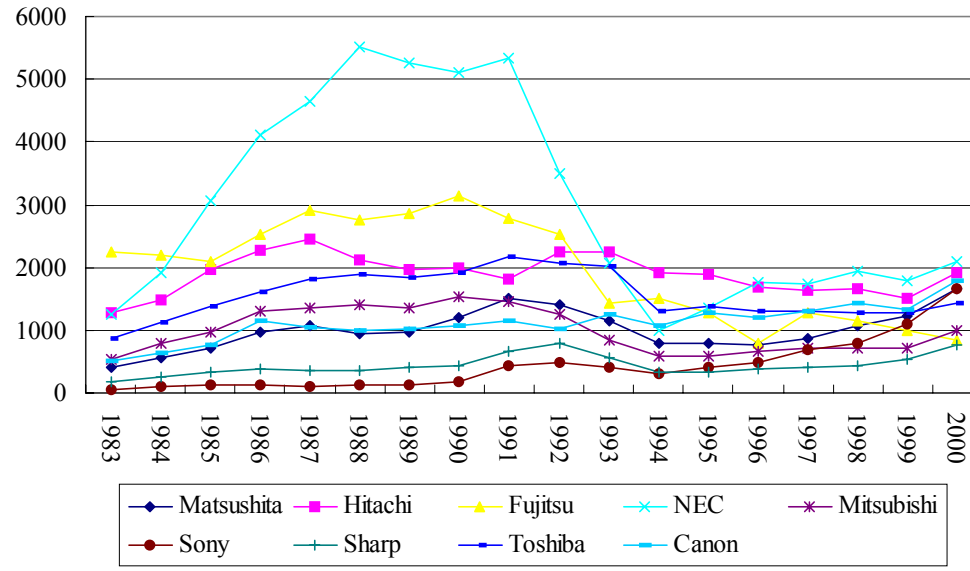


Figure 4-2: Number of Patent Application (IPC=G06F)



(2) Biopharmaceuticals

Concerning biotechnology, we conducted interviews with five major pharmaceuticals firms. The results of these interviews are as follows[11].

1. Effects of pro-patent policies on patent activities (e.g., application, registration, licensing)

- The changes to the patent system that had the most significant effects were the introduction of chemical compound patent in 1975 and the term extensions for pharmaceuticals patent in 1987.
- In particular, chemical compound patent is essential to maintaining incentives for R&D in the creation of new pharmaceuticals. In addition, since R&D for pharmaceuticals takes place over long periods of time (typically ten to fifteen years), pharmaceuticals that use compounds patented in the initial R&D stage may in some cases not go to market until several years after awarding of the patent. Measures to extend the terms of pharmaceuticals patents are extremely important in this context.
- Although the period between submission of an application and request for examination was shortened from seven to three years, this in fact has had a negative effect, forcing more firms to determine whether to request an examination before knowing whether an invention is likely to lead to a new pharmaceutical product.
- Other measures seem to have had no particularly strong effects. The revised system of multiple claims and the speeding up of substantive examinations have not had particularly strong effects. Increased damage claim amounts have also not had a strong effect. Since numerous costs arise in the event of a dispute, the amount of damage claim is marginal to the total cost.
- With regard to the extension of patent protection to new fields--to include genetic patents, for example--it is important to note that pharmaceutical products are aimed at a global market. Since the U.S. implemented such extensions earlier than either Japan or Europe, patent application in such fields tends to take place in line with U.S patent standards. Changes to Japan's patent system have not had major effects.

2. Effects of pro-patent policies on R&D and licensing

- In the development of a new pharmaceutical product, the IP section cooperates closely with the R&D section beginning in the early R&D stages. For this reason, an extension of the areas covered by patent protection should have an effect on R&D. However, this effect is not large enough to change the total amount of R&D costs.
- Until now we have focused on compound patents, which are relatively simple. However, with the extension of patent protections to new technologies and frequent changes to patent office policies, the patent system itself has become unstable. Formulation of R&D strategies has become more complicated, leading to increased costs. In addition, in the U.S. in some cases patents have been granted for purposes of pharmaceutical products, without limitations on compound structure. This has led some to warn that the scope of protection of rights has become too broad.
- Since patents are increasing for upstream components of the process of creating

[11] The Institute of Intellectual Property has conducted interviews separately to investigate the status of licensing at pharmaceuticals firms. Information from this survey was also used here, with respect to licensing-related topics. (Institute of Intellectual Property (2003))

pharmaceuticals (i.e., in the development of new pharmaceuticals based on genetic information and screening), licensing costs incurred in R&D are also increasing.

- Although licensing costs are growing, this has not led to changes in R&D strategy. Firms have simply licensed the technology they require to pursue their existing R&D strategies.
- Licensing between pharmaceuticals firms and universities or venture businesses is also increasing. Overall, these consist mostly of licensee activities, with almost no pharmaceuticals firms acting as technology licensors.

3. International patent strategies

- As growth in the domestic pharmaceuticals market stalls, major pharmaceuticals manufacturers are creating products with global markets in mind. For this reason, patent strategies themselves are also based on international patents. The Patent Cooperation Treaty (PCT) system has been revised, so that in principle international applications are now conducted using a PCT system. However, some firms submit international applications selectively, depending on the type of invention.

4. Trends in and background of R&D and patent applications in the late 1990s

- Many firms are increasing R&D expenses in connection with the creation of pharmaceuticals using genetic information. However, since some firms have decreased spending in other fields, whether total R&D expenses have increased varies by firm. In addition, although overall more firms have increased the number of patent applications than have not, some firms have become more selective in patent application. Patent strategies thus vary among firms.
- Increased R&D expenses and the number of patent applications are driven not by the effects of the patent system but by the effects of the extension of R&D to new fields and by increased diversity among the subjects of patent protection. Firms apply for patents for their own use, more than for purposes of future licensor activities.

5. Other matters

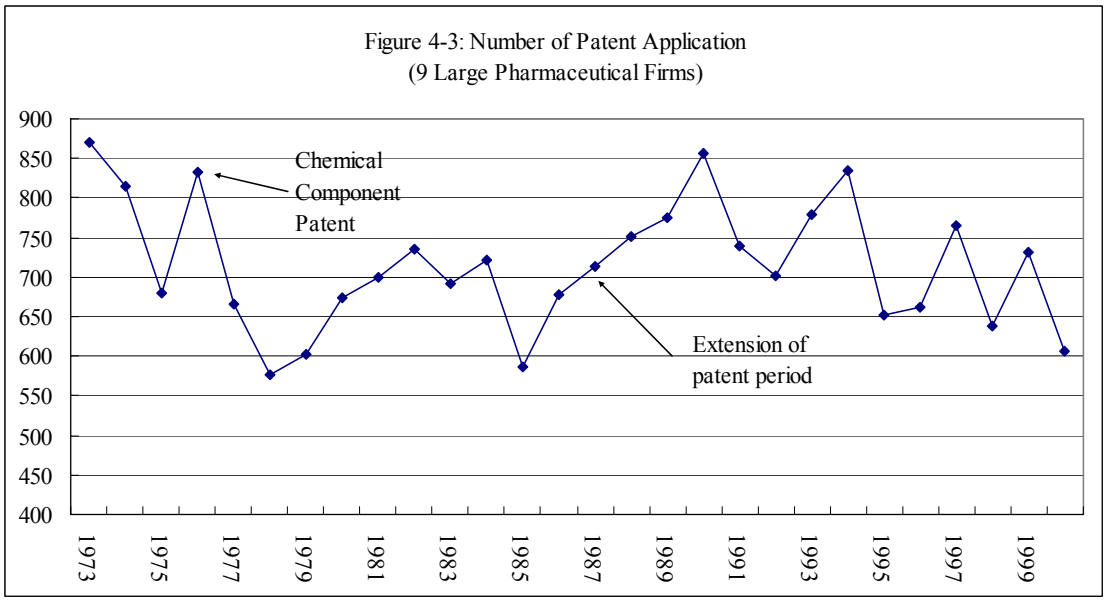
- In the pharmaceuticals industry, R&D and IP sections cooperate more closely than they do in other industries. Recently this tendency has strengthened.
- Reductions in patent fees have not had major effects, as patent applications were previously relatively few in number. Firms select technologies that they will use themselves for patent application, resulting in low patent-related expenses as a proportion of R&D expenses.

Of the changes to the patent system implemented since 1970, those commonly reported in the interviews to have had major effects on innovation are the adoption of chemical compound patents in 1975 and the extension of patent terms for pharmaceuticals, adopted in 1988. Interviewees did not consider other measures to have had major effects. Although in the survey discussed in the previous section more than thirty percent of firms in the pharmaceuticals industry reported that pro-patent policies had contributed to increases in R&D and patent applications, not one of the firms interviewed reported any such effects.

Figure 4-1 shows a graph of trends in the number of patent applications among the top nine

pharmaceuticals firms in terms of sales[12]. From this graph, it is hard to draw the conclusion that any change in application patterns has resulted from the adoption of chemical compound patents and special patent terms. Furthermore, although an increase in the number of claims per single patent is visible after the revised system of multiple claims was adopted in 1988, no effect can be seen on R&D expenses in large firms, including those in industries other than pharmaceuticals. (Branstetter and Sakakibara (2001))

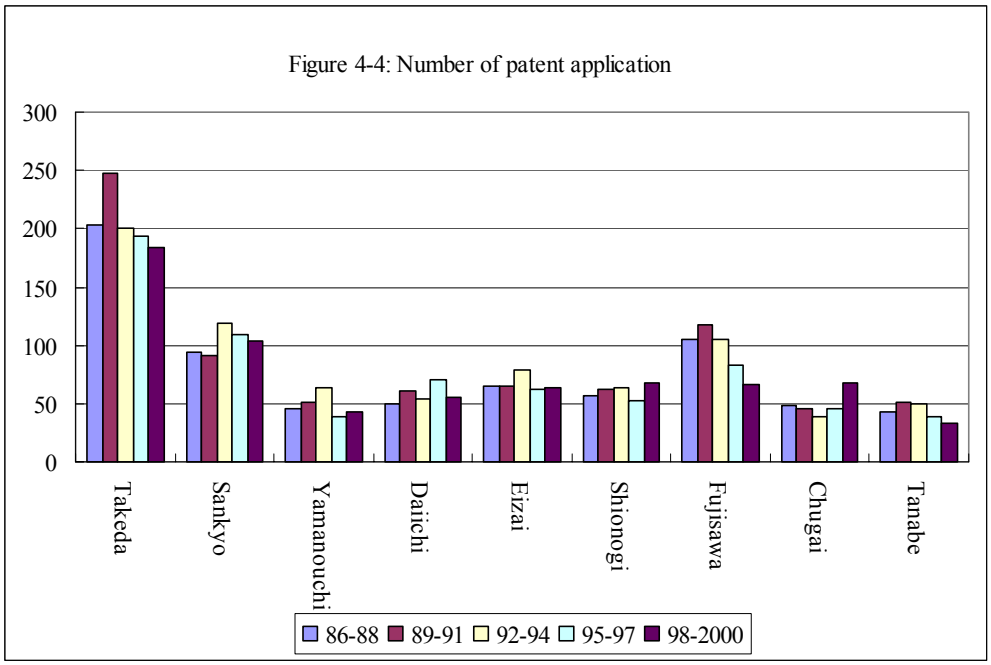
Figure 4-3: Number of Patent Application
(9 Large Pharmaceutical Firms)

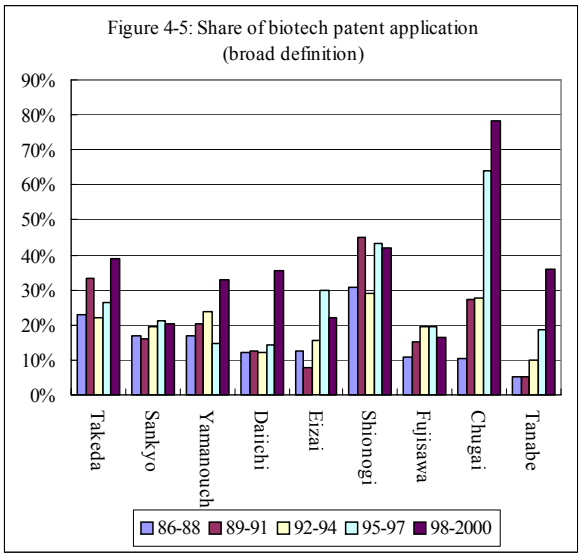


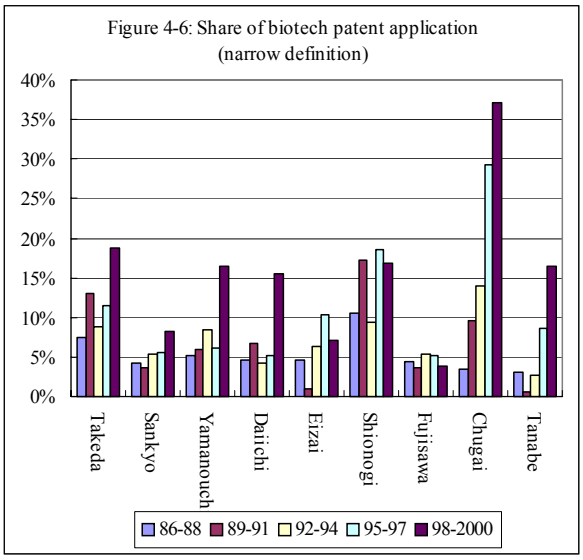
In order to illustrate the role of biotechnology in pharmaceutical patent applications since 1990s, Figures 4-2 through 4-4 show trends in the number of patent applications by industry. Figure 4-2 shows trends in the number of patent applications for each of the nine firms. Figures 4-3 and 4-4 show trends in proportionate shares of patent applications by IPC classification for biotechnology in the OECD-defined broad and narrow senses, respectively[13].

[12] Nine firms (Takeda Chemical Industries, Ltd., Sankyo Co., Yamanouchi Pharmaceutical Co., Daiichi Pharmaceutical Co., Eisai Co., Shionogi & Co., Fujisawa Pharmaceutical Co., Chugai Pharmaceutical Co., and Tanabe Seiyaku Co.)

[13] Definition of "broad sense": A01H1/06 + A61K48/ + C12N1/ + C12N7/ + C12N9/ + C12N9/ + C12N15/ + C12P21/ + C12Q1/68 + G01N33/50-98; definition of "narrow sense": C12N15/ (OECD (2002))







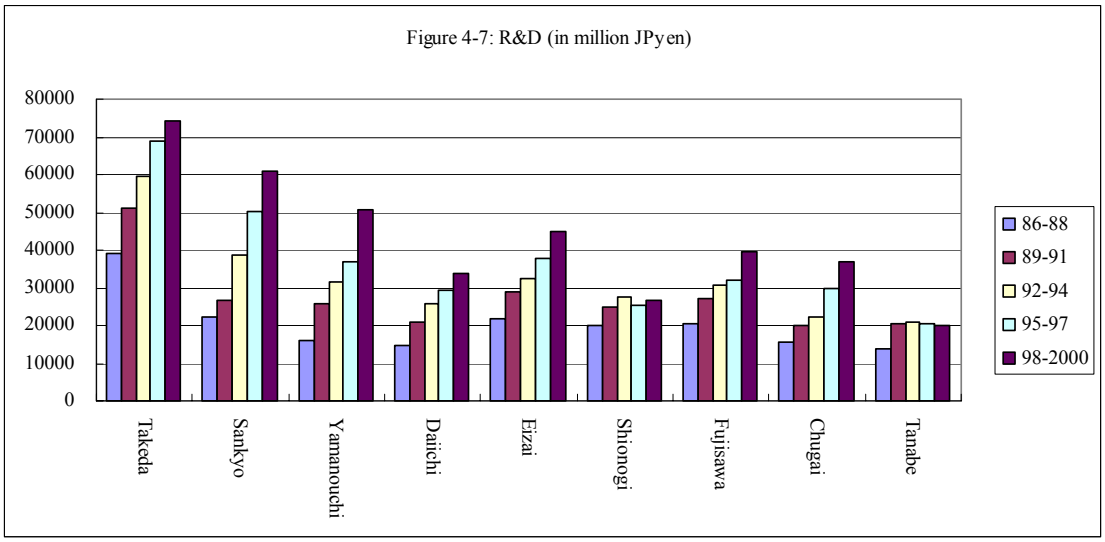
As Figure 4-4 shows, the number of patent applications has recently declined, and for many firms, the number of patent applications peaked from 1989-1991. This may reflect the effects of slow growth in the pharmaceuticals market in the 1990s[14]. Even if the extension of the patent term for pharmaceuticals, enacted in 1988, did have an effect, this would not explain the drop in applications since 1992. In this manner, although the number of patent applications has not increased overall, many firms showed an increase in biotechnology-related patent

[14] With regard to the scale of the pharmaceuticals market, measures to cut pharmaceuticals prices have been implemented as part of social security system reforms. For this reason the total amount has not grown since the early 1990s.

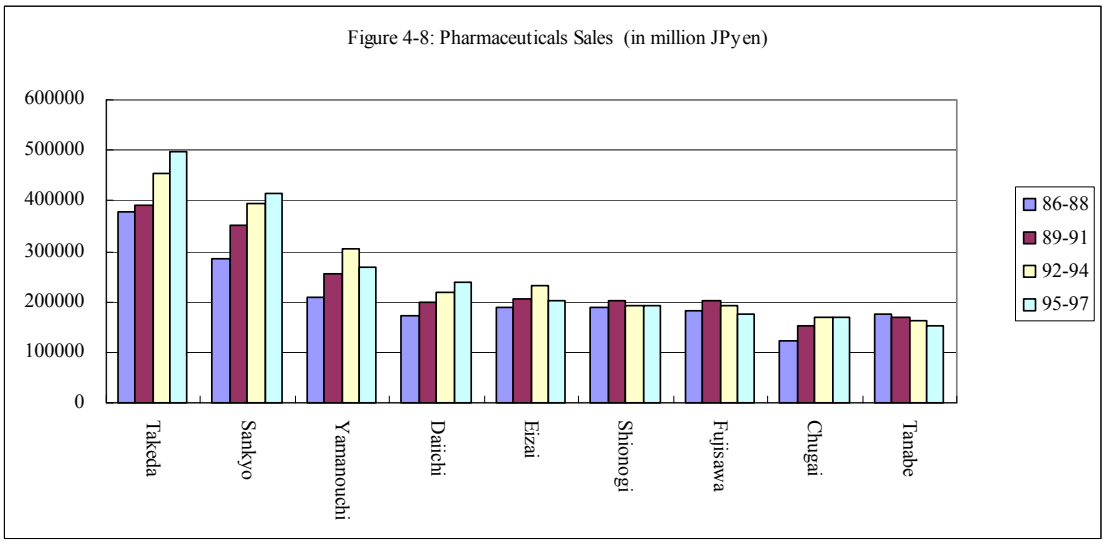
applications in the late 1990s. Pharmaceuticals manufacturers overall are being more selective in patent applications, focusing on biotechnology-related patents. Although this is a result of many pharmaceuticals manufacturers enhancing their R&D efforts in the biopharmaceuticals field, some firms pointed out that the extension of areas subject to patent protection has also had an effect on some types of patents, such as genetic patents.

Figures 4-7 and 4-8 show graphs of trends in R&D expenses and sales of pharmaceutical products for the same firms. These Figures show two extremes: firms with high sales of pharmaceutical products and those with low sales. These Figures also show the ways in which firms such as Shionogi and Tanabe limited R&D expenses in the 1990s. In addition, a comparison of Figures 4-4 demonstrates that approaches to patent applications differ markedly among firms. For example, Takeda spent roughly 1.5 times the amount spent by Yamanouchi on R&D, yet submitted more than four times as many patent applications. If we view the number of patent applications as the output of innovation, Takeda demonstrates extremely high innovation efficiency. However, it would be more fitting to view this discrepancy as a difference in patent strategies.[15] Whether a firm applies for more patents or applies for patents more selectively due to pro-patent policies depends on the particular circumstances of the firm. In addition, the results of the interviews show that even within the same firm the status of the IP section and patent strategies may change over time.

Figure 4-7: R&D (in million JPyen)



[15] Limitations inherent in using patent data as an indicator of innovation have been noted; for one thing, not all innovations are patented, and for another, the quality of patents varies. The latter is often regulated in the U.S. using patent citation data (Hall, Jaffe and Trajtenberg (2001)). Since no database has been developed in Japan similar to that in the U.S., analysis using patent data is difficult.



Thus, it is difficult to discern the effects of pro-patent policies by examining patent application trends. However, generally speaking, pharmaceuticals manufacturers have recently focused their efforts on R&D relating to biopharmaceuticals, resulting in an increased number of patent applications. Although this may also be affected by the extension of patent protection to new fields (permitting patents on organisms and genetic patents, for example), the effects of the U.S. patent system are particularly significant. This is because pharmaceuticals manufacturers conduct R&D tailored to the international marketplace, and therefore focus their patent applications on the U.S. patent structure, which features the most lenient patent standards in the world.

At least among major pharmaceuticals manufacturers, we were unable to find evidence that Japan's pro-patent policies have promoted innovation in business. On the other hand, many firms reported their concerns about the “anti-commons problem" resulting from the gene patents and patents on research tools seen primarily in the United States.

In the pharmaceuticals industry, R&D tends to take place in close cooperation with IP sections, and recently this relationship has been intensifying. While patents in the past mostly consisted of substance patents, and past fields subject to patent protection were clearly defined, the increase in patent protection for upstream aspects of the pharmaceuticals creation process has made IP strategies a vital part of the early stages of R&D.

At the same time, progress in patenting new pharmaceuticals created using new genetic technologies has led to increased licensee activities and continuing increases in licensing fees. In theory, even if patent protections are strengthened, this should cause no problems as long as licensing negotiations take place before the licensee makes sunk cost investments such as

R&D (Green and Scotchmer (1995)).

In the case of pharmaceutical products, since IP sections take part from the early stages of R&D and research advances in line with patent mapping, the situation in the industry is close to the theoretical ideal. However, due to successive changes to patent examination standards in new areas and vague rules (such as those for determining whether a screening tool patent will result in a final product), we cannot discount the possibility that strengthening of patent protection for upstream technologies will have a negative effect on downstream innovation.

Although cancellations of R&D projects due to licensing refusals are rare, in not a few cases such a situation has been avoided only through the payment of high licensing fees. Licensors in such cases are in many cases overseas start-up businesses--American firms in particular. For this reason, while the Japan's patent system has its own effects, in fact the influence of the U.S. patent system on the R&D framework is greater. Interviewees pointed to recent cases in which the U.S. has granted patents covering a wide range of final pharmaceutical products aimed at genetic and protein functions (i.e., functional patents for medical use). Given the foregoing, progress in encouraging strict global implementation of the patent system through clarification of worldwide patent standards is thus vital; for example, by holding conferences between patent offices in Japan, the U.S., and Europe.

5. Conclusions

We have examined changes in Japan's postwar patent system and trends in business innovation. The current Patent Law, implemented in 1960, has undergone numerous changes as a result of trends toward international harmonization of IP systems and pro-patent policies. Extension of patent protections to new spheres in the IT and biotechnology fields, substance patents, extension of patent terms, increases damage claims related to patent disputes, revisions to procedures for processing patents, and other changes have led to the establishment of broader and stronger patent rights. These sorts of revisions were conducted in order to provide incentives for business innovation. In addition, Japan's patent system has developed not only to provide incentives to inventors but also to provide benefits to technology users, as seen in moves such as the adoption of a patent application publication system at an early stage.

Concerning the relationship between the patent system and business innovation, we were unable to discern a link between changes in the patent system and changes in business R&D expenses and the number of patent applications. Since changes to the patent system are continuous and reflect the situation at a given time, it is difficult to discern the results of each individual change. However, it seems appropriate to consider the patent system as just one of

many factors affecting investment in R&D, which is also affected by long-term demand for target products, moves by competitors, expansion of technological opportunities, and other factors. The quantitative analysis conducted by Branstetter and Sakakibara (2001) of firm level data concerning the effects of the 1987 patent system revisions, which included the revised system of multiple claims and extension of the patent term for pharmaceuticals, also failed to find effects of such revisions on R&D. In addition, although their study concerned the U.S. rather than Japan, when Kortum and Lerner (1998) analyzed the causes of the recent dramatic increase in patent applications in the U.S., they concluded that it resulted more from the expansion of technological opportunities in the IT and biotechnology fields more than from the structure of the patent system.

We have seen that in Japan the number of patent applications in the IT and biotechnology fields has increased tremendously since the late 1990s. Closer examination of the technological fields in which these increases took place shows that the growth has occurred in areas recently made subject to patent protection, such as the software field. Although when we look at the economy as a whole the patent system's effects on innovation are limited, in the IT and biotechnology fields these effects seem relatively strong. According to the results of a survey of businesses conducted by the Institute of Intellectual Property, large proportions of firms in the electrical machinery and pharmaceuticals industries have acknowledged the effects of recent pro-patent policies. However, it is important to note the differences between the pro-patent policies that have affected each of these two industries. Firms in the electrical machinery industry are more affected by revisions that strengthen the patent system, since these firms are looking for ways to put the patents they hold to use, through cross-licensing and other methods. Firms in the pharmaceuticals industry, on the other hand, are more sensitive to the extension of patent protections to new fields, such as genetics, because such firms are becoming more active in licensee activities in the biopharmaceuticals field.

In this paper, we examined the incentive structure for business innovation at a micro level through interviews with firms in the electrical machinery and pharmaceuticals industries. In the electrical machinery field, major manufacturers attempt to utilize their own patent assets strategically. Although recent trends varied by firm, with some using more selectivity in applying for patents, all firms reported increasing numbers of applications for software patents. This is likely a result of the expansion of the types of software subject to patent protection. However, we have seen that the effects of pro-patent policies are limited to patent tactics and do not extend to R&D activities.

On the other hand, in the pharmaceuticals industry protection of rights via patents is extremely

important, since R&D for pharmaceutical products can take more than ten years. However, we could not discern any apparent effects of pro-patent policies on business innovation, including R&D and patent applications. We must note that, with regard to R&D in the creation of pharmaceuticals utilizing genetic engineering and genetic information, the growth of technology has stimulated patent application in a number of related new fields. In addition, Japan's pharmaceuticals manufacturers are becoming more active in licensing patents from overseas venture businesses.

It may be true that were rights not subject to protection by patents, information on new technologies held by universities and venture businesses would not be released, reducing the speed of R&D for pharmaceuticals. However, in some cases a flood of patents has had negative effects on R&D. In particular, the U.S. patent system employs the first-to-invent rule, sometimes resulting in sudden demands for licensing fees as a result of so-called “submarine patents.” In such cases, there are no benefits to the patent user. In addition, due to increases in licensing fees and more frequent patent disputes, uncertainty with regard to R&D may increase, restricting investment. This issue concerns the U.S. patent system, and not Japan’s patent system, the main topic of this paper. This uncertainty is an issue, however, especially in the pharmaceuticals industry.

The Framework for Intellectual Property Strategy completed in June of last year emphasizes strengthening the IP rights system through patents and other means, under the “IP Revolution” theme. At the forefront of the specific action plans is strengthening protection of IP through strong patent policies, such as speeding up the patent examination process, creating a “patent court” function, and strengthening the damage claims system. However, we have seen from the analysis in this paper that strong patent policies, such as those improving the patent dispute processing system and increasing damage claim amounts, have only marginal effects. More important is rationalization of the patent protection system with regard to high-technology fields such as IT and biotechnology. Vital to such efforts are balanced policies that take into consideration the spread of technology, rather than simply encouraging the expansion of the protection of rights.

The details of this rationalization process will vary among individual industries. For example, in fields such as biopharmaceuticals, in which businesses and universities in the U.S. and Europe have already taken out many basic patents, strengthening protection of patent-holders’ rights is likely to impede innovation among Japan’s pharmaceuticals manufacturers. On the other hand, application of scientific knowledge is vital to R&D in the field of pharmaceuticals, and a major role of the patent system is to encourage the appropriate dissemination of the

results of research conducted at universities and public research institutes. For these reasons, it may be appropriate to strengthen the protection of rights through patents while simultaneously implementing special measures governing the use of patents in R&D.

With regard to the extension of patent protection to new areas—through patents for business models and genetics, for example—the patent offices of Japan and Europe conduct relatively strict examinations, while in many cases the system in the U.S. is more lenient. Although examination rules are being reconciled as the three regions' patent offices conduct comparative research based on precedents, strengthening of such activities is critical.

As the globalization of business advances, internationalization of patent systems is becoming even more important. Although patent systems are undergoing revisions in many countries in response to the WTO TRIPS agreement, there is a major gap in awareness between developed nations and developing nations regarding IP systems. As for harmonization of the patent system with regard to high-technology fields, more focused discussions are required at the OECD, with the support of the patent offices of Japan, the U.S., and Europe.

Finally, although our results show that improvements in the system for processing patent disputes have not yet had major effects on innovation in business, patent disputes have recently become more frequent, indicating that the importance of such measures will increase in the future. Establishment of a patent court modeled on the Federal Circuit Court of Appeals in the U.S. would be an important step. However, it is necessary to note that even in cases that could result in patent disputes, such disputes are often avoided through payment of high licensing fees. One solution may be to consider the adoption of an alternative dispute resolution (ADR) system to arrange licensing before disputes arise.

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