

4 Evaluation of Intellectual Property Strategies to Improve International Competitiveness of Japanese Companies

-- Study on Intellectual Property Statistics --

It is important to objectively evaluate intellectual property systems and corporate intellectual property strategies based on statistical data. This study aims to statistically analyze what influence intellectual property strategies receive from the changes in intellectual property systems and the trends in technology markets. The changes in intellectual property systems such as the shortening of the examination request period, changes in fees, and the alterations to the invention compensation system are evaluated by use of econometric techniques. This paper also analyzes how corporate licensing strategies and blocking behavior vary depending on the characteristics of technology markets, and what effects the diversification of patent application fields has on corporate values.

These analyses provide useful information for improving the efficiency of corporate intellectual property activities in response to the changing patent system and technology market.

I Introduction

In order to evaluate intellectual property policies, one has to analyze statistical data objectively. Similarly, it is important for all companies to objectively evaluate their intellectual property strategies in order to improve them and strengthen competitiveness. Understanding such importance, the JPO (Japan Patent Office) publicized the Intellectual Property Strategy Indexes (revised version) (tentative translation) in December 2000 in an effort to prompt companies to improve their intellectual property strategies. In recent years, the Japanese intellectual property systems have undergone various reviews and changes including a reform of the employee invention system and shortening of the period in which examination may be requested ("examination request period"). Such evolution of the Japanese intellectual property systems must have caused corporate managers to reconsider how to evaluate their intellectual property strategies and what intellectual property strategies to adopt. This suggests that it is

time to review the Intellectual Property Strategy Indexes (revised version) (tentative translation).

In order to establish the new Intellectual Property Strategy Indexes, the first purpose of this study is to empirically analyze, based on statistical data, how companies' intellectual property strategies are influenced by the changing intellectual property systems and environment that they face. In particular, this paper conducts empirical analyses on the intellectual property strategies of Japanese companies from various perspectives, with focus on their patent portfolio strategies, covering such procedural phases as patent application, examination request, and registration. This paper also analyzes how companies exploit their intellectual property rights through licensing for example. The second purpose of this paper is to study the intellectual property indexes currently used in other countries in order to obtain information useful for the establishment of the Japanese Intellectual Property Strategy Indexes.

The third purpose of this paper is to review and change the questions asked in

the questionnaire for the "Intellectual Property Activity Survey," which is conducted by the JPO with the aim of grasping corporate intellectual property activities, in such a way that the survey results would help devise the quantitative Intellectual Property Strategy Indexes.

The outlines of this study will be separately presented in this paper. I would like to end this section by briefly describing the insights gained from the analyses conducted in Section II.

In Section II of this paper, empirical analyses are conducted to identify the factors affecting corporate intellectual property strategies and the effects of system changes. Those analyses are conducted based on the results of the "Intellectual Property Activity Survey" and the IIP Patent Database by use of econometric techniques. While some analyses fail to produce definite results at this stage due to data limitation, all of the analyses are useful for those who are trying to make corporate intellectual property activities more efficient in response to the changing patent system and intellectual property environment or trying to pursue an ideal patent system itself.

(Sadao Nagaoka)

II Analysis of the Intellectual Property Strategies of Japanese Companies

1 Analysis of the filing of examination requests by Japanese companies

The following are the findings of an analysis of the company-specific or technical-field-specific panel data on the filing of examination requests by Japanese companies:

(1) The primary cause of a long-term increase in the rate of examination requests filed by Japanese companies is considered to be a rise in the average number of patent claims. Both cross-section analysis and/or chronological analysis show that companies that filed a large number of claims or increased the number of their claims have a

higher rate of examination requests. In Japan, the companies subject to the analysis have only seen a slight increase in the numbers of their patent applications. The average number of applications increased from 260 to 305 from 1986 to 2002. In contrast, the number of inventions included in one patent application jumped fivefold. This increased the value of each patent and gradually and greatly boosted the rate of examination requests over a long time;

(2) The legal change to shorten the examination request period is applicable to any application filed in and after October 2001. This change resulted in a sharp rise in the examination request rate. The change had an especially significant effect on the companies characterized as follows: (a) any company that used to file examination requests for its patent applications in the seventh year, (b) any company that has a low research-and-development-intensive ratio and owns relatively low-quality patents. An industry-specific analysis reveals that the examination request rate showed almost no increase in the pharmaceutical industry, which may be characterized by a high degree of uncertainty in patent value. The main reason for this little increase in the examination request rate among pharmaceutical companies is considered to lie in the fact that the patents of pharmaceutical products remain uncertain for a long period of time (excluding any company that is faced with a high degree of uncertainty in patent value that cannot be reduced in the third year while the degree of uncertainty will be substantially reduced in the medium run); and

(3) The alterations made to the fee system in 2004 (an increase in the examination request fee and a decrease in the annual fee) put some downward pressure on the number of examination requests submitted in 2005 for patent applications previously filed. In fact, the examination request rate decreased by about 2.5% over the first 18 months. According to the preliminary results of a cross section analysis across technical fields, about 1.2% of the 2.5% decrease is estimated

to be attributable to the revision of the system of examination request fee. The simultaneous reduction of the patent fee had an effect of raising the examination request rate. However, we were unable to evaluate the effect by cross-section analysis across technical fields.

The shortening of the examination request period is expected to prevent companies from leaving patent applications unexamined. Those companies used to maintain those applications with little patentability just for the sake of showing their technical advantage to other companies. As shown by the empirical analysis conducted in this chapter about the filing of examination requests by companies, the shortening of the examination request period has the effect of prompting companies to file examination requests for relatively low-quality inventions, which has the effect of increasing the examination request rate. The theoretical analysis explains why it always brings about such an effect. Therefore, the shortening of the examination request period could increase the risk of raising the number of patents and the ratio of low-quality patents. On the other hand, a higher examination request fee (compensated by a lower annual fee) would enhance the quality of examination requests, setting off the above-mentioned negative economic effects caused by the shortening of the examination request period. These two important system reforms complement each other.

(Sadao Nagaoka, Yoichiro Nishimura, Isamu Yamauchi, Koichiro Onishi)

2 Analysis of the filing of examination requests for biotechnology-related patent applications

In this chapter, an analysis has been conducted on the biotechnology-related patent applications for which priority claims may be made in Japan during the period from 1991 to 2002. The purpose of this analysis is to identify the deciding factor in the filing of an examination request. More specifically, we estimated a hazard model by

using the length of the period from the application date to the examination request day as an induced variable and obtained the following results. First, we confirmed that a foreign application for the same invention had the effect of shortening the examination request period for the corresponding patent application filed in Japan. While we expected that the number of claims and the scope of patented technology would reflect the subjective value of the applicant, our attempt to correlate those factors with the length of period preceding the request for examination failed to identify any clear correlation between the two. However, the (objective) value index created based on the number of forward citations had a meaningful correlation with the length of period preceding the request for examination. These findings have led to the conclusion that the higher the patent value as well as the degree of certainty of the patent value, the earlier an examination request tends to be filed. Furthermore, we estimated the influence of the type of applicant on the length of the period preceding the request for examination and found that, before the shortening of the examination request period, the period preceding the request for examination tended to be longer if the applicant is a private company, while such correlation seems to have disappeared since the revision of the system. Although having tried to find a correlation between recent pro-patent policies and the filing of examination requests in the public sector, to which universities and public research institutions belong, we were unable to find any meaningful correlation. Another finding is that the period preceding the request for examination tends to be longer in the case of a listed company or an applicant who files a large number of applications. The reason for this tendency is that the richer a company is in its supplementary assets, the more likely the company can generate profits by commercializing a patented invention even if the invention is low in quality. As a result, such a company has an incentive to patent an invention even if its economic value is

highly uncertain. This indicates that applicants who fall under those categories use the patent examination period as a period to optimize their patent portfolios.

(Kenta Nakamura, Hiroyuki Odagiri)

3 Comparative analysis of the ownership and exploitation of Japanese patents and non-Japanese patents by Japanese companies

The number of Japanese patents owned by Japanese companies is extremely large in comparison with that of their non-Japanese patents. The reasons for this disparity are analyzed in this chapter with focus on the importance of overseas business development, the quality of inventions, and the patterns of patent exploitation. The analysis reveals that the exploitation patterns of the Japanese patents owned by Japanese companies are extremely similar to those of their non-Japanese patents. This similarity is considered to be attributable, in large part, to the slow progress of Japanese companies in their efforts for globalization. The details are explained below.

First, pharmaceutical companies own more non-Japanese patents than Japanese patents. In fact, the number of patent applications they file with the USPTO is larger than that they file with the JPO. The pharmaceutical industry is followed by the telecommunications, electronic, electric measuring instrument industries, food manufacturing industry, transport equipment industry excluding the car industry, and precision instrument industry in terms of the number of non-Japanese patents. These industries share the characteristic that they operate globally. Companies that engage in highly-sophisticated research and development activities tend to have a high overseas patent application rate.

Second, a company-to-company comparison within industry reveals that a company that has a higher export rate and concentration rate of research and development activities or a company that licenses its patents overseas tends to have a

significantly higher rate of ownership of non-Japanese patents relative to Japanese patents.

Third, the exploitation patterns of Japanese patents are extremely similar to those of non-Japanese patents, although the degree of similarity differs from one industry to another and from one company to another. More specifically, the similarity lies in the rate of exploitation by the patentee, the rate of exploitation by any other party, and the ratio of blocking patents. The similarity exists despite the fundamental differences that affect the exploitation patterns of Japanese patents and non-Japanese patents such as the differences between the Japanese patent system and the U.S. patent system and the differences between domestic supplementary assets and overseas supplementary assets of companies.

(Sadao Nagaoka, Yoichiro Nishimura)

4 Research and development strategies and corporate financial structures

This chapter analyzes the correlation between the debt ratio of a company and its strategic investment such as research and development costs as well as the results of intellectual property activities.

It is difficult for any person outside a company to grasp its research and development activities since those activities are internal activities of the company. This causes information asymmetry in the fundraising activities of the company. In most cases, the asymmetry has a negative effect on the debt ratio. However, information concerning the ownership of patents, which are the outcomes of research and development investments, is available to the public. If the outcomes of research and development activities of a company and the corporate activities that make use of the outcomes contribute to the enhancement of the technical reputation of the company, a company that has many important patents and actively engages in the formation of corporate alliances by use of patents could reduce the degree of information asymmetry. In other words, patents could have a positive

effect on the debt ratio.

This analysis was conducted based on the research and development cost data and the patent-related intellectual property data presented in a report entitled “Intellectual Property Activity Survey” conducted by the JPO and based on corporate financial data presented in the annual security reports. The following are the findings of the estimation conducted by a least-squares-analysis method and panel analysis method based on data of about 269 companies used as samples:

- The ratio of the gross assets to the tangible fixed assets was significant and positive to the debt ratio;
- The ratio of the research and development costs to sales was insignificant and negative to the debt ratio;
- The number of patents owned by each researcher tended to be significant and positive to the debt ratio;
- The number of patents licensed to other companies per number of owned patents was insignificant but positive to the debt ratio; and

While investment in tangible fixed assets noticeable to the public had a significant and positive effect on the debt ratio, the index that represents the amount of investment in research and development activities that the public had almost no information to evaluate had a negative and insignificant effect on the debt ratio. The fact that the number of patents owned by each researcher has a significant and positive effect on the debt ratio supports the hypothesis that “acquisition of a patent, which is a tangible outcome of research and development activities, helps the company to raise funds.” We also found that, if the number of patents licensed to other companies per number of owned patents has a positive effect on the leverage, it would mean that the company not only obtains a patent but also makes use of it by subjecting the patent to technology transactions such as licensing. As a result, the research and development activities of the company would become more transparent to the public,

which would further facilitate the company to raise funds. These are new estimations that have not been made in the preceding studies. These findings suggest that, since the intellectual property strategies of a company influence the debt structure of the company, we need to take corporate financial structures into consideration in one way or another when creating Intellectual Property Strategy Indexes.

(Fumihiko Koyata, Fumio Funaoka, Joji Tokui)

5 Quantitative analysis of patent portfolio management of companies

This chapter analyzes corporate intellectual property strategies from the perspective of patent portfolio management by dividing the patent portfolio management of a company into two phases for the convenience of analysis. The decision that has to be made in the first phase is whether the company should exploit a patented invention or keep the patented invention without exploiting it. The decision that has to be made in the second phase is whether the company itself should exploit the patented invention or license it to a third party. In this chapter, a quantitative analysis is conducted to identify the factors affecting the above-mentioned decisions based on statistical data from in the “Intellectual Property Activity Survey (JPO)” and the IIP Patent Database.

Having analyzed the relation between a variable concerning the size of a company including the amount of supplementary assets that the company owns and a variable concerning the degree of congestion and concentration of patents in a technology market, we found that the ownership of unexploited patents had a correlation with the state of a technology market. More specifically, the rate of unexploited patents tended to be high in the case of a company that had a high concentration rate and belonged to a technical field where the number of claims was high as a technical field. With regard to a decision as to whether a company should exploit its patent itself or

license the patent, we hypothesized that the larger the supplementary assets of the company, the more likely the company exploits the patent itself. Our hypothesis was proven to be correct. In the meantime, regarding a technology market, our analysis results are consistent with those of Rent Dissipation Hypothesis, that a company that belongs to a technology market characterized by a high concentration rate is likely to exploit its patents itself.

(Kazuyuki Motohashi)

6 Influence of the diversification of patent acquisition fields on corporate value

This chapter conducts an empirical analysis on the influence of diversification of patent acquisition fields on corporate value. Several preceding studies show that a company that has diversified its research and development activities tends to increase its efficiency thanks to the economies of scope. In this chapter, based on the understanding that a patent is an output of diversified research and development activities, an empirical analysis is conducted on the correlation between patents and corporate value (Tobin's q theory).

Few studies have been conducted on the influence of the diversification of patent acquisition fields on corporate value based on the understanding that a patent is an outcome of research and development activities. The purpose of this chapter is to identify, through an empirical analysis, the effect of the diversification of patent acquisition fields on corporate value.

Our analysis has revealed that the more diversified the fields in which patents have been acquired are, the higher the corporate value. We also analyzed the effect of the diseconomies of scope resulting from the inefficiency caused by the diversification of patent acquisition fields, which inevitably raises costs for patent management and maintenance. The analysis results showed no statistical significance but it was indicated.

(Akira Yorisue, Hiroyuki Odagiri)

7 Analysis of an invention compensation system, litigation risk, and corporate strategies

Sadao Nagaoka and Yoichiro Nishimura ("Shokumu hatsume ni yoru hosho seido no jissho bunseki (Empirical Analysis of a Compensation System for Employee Inventions)," *Tokkyo tokei no riyō sokushin ni kansuru chosa kenkyū hokokusho* (Study Report on the Promotion of the Use of Patent Statistics), Institute of Intellectual Property, 2005, pp.26-40) conducted an empirical analysis and proved that, in some cases, the main reason for a company to introduce a compensation system is to comply with Section 35 of the Patent Act and not so much to give more incentive to researchers. If Article 35 invariably prompts companies to establish a compensation system, any company that exploits a patent should be paying compensation. However, many companies do not pay compensation in reality. For example, a survey conducted by the Institute of Intellectual Property in 2003 reveals that 26% of large companies and as much as 80% of small and midsize companies do not pay compensation for the patents that those companies exploit.

This chapter empirically analyzes whether a company that is eager to reduce litigation risk is more likely to introduce an invention compensation system. The analysis reveals that the more risk-averse a company is, the more compensation the company pays. The analysis also shows that companies that tend to employ diverse types of researchers, gain a large profit from patents, or disagree with inventors on the amount of compensation due to information asymmetry are more likely to pay a large amount of compensation. The analysis confirms that patents exploited in other countries have little effect on the amount of compensation because it has been uncertain whether Article 35 applies to those patents. This reflects that a compensation system is not used as a system of incentive agreement. These analysis results are so stable that it would not change even if the number of applications or the number of exploited

patents was controlled. The above-mentioned findings strongly indicate that many companies operate compensation systems as a means of reducing the risk of litigation initiated by their employees to seek compensation, and that little attention has been paid to the importance of giving an incentive to researchers.

(Koichiro Onishi, Akiya Nagata)

III Revision of the questionnaire for the “Intellectual Property Activity Survey”

The “Intellectual Property Activity Survey” is an annual questionnaire survey that has been conducted by the JPO since fiscal year 2002 for the purpose of grasping the reality of intellectual property activities of Japanese companies in order to collect basic data useful for the establishment of the Japanese intellectual property policies. The survey provides researchers with a lot of extremely useful information such as the license balance and the exploitation patterns of industrial property rights of each of the responding companies. Researchers could not obtain such information without actually asking questions to those who are in charge of intellectual property management in those companies. The “Intellectual Property Activity Survey” will be conducted in 2007 for the sixth time. In the past six years, the JPO and the research committee under a commission from the JPO have been reviewing the questionnaire, estimation method, etc., in an effort to make the survey even more useful.

Taking into consideration the fact that the “Intellectual Property Activity Survey” for fiscal year 2007 will be a large-scale survey (complete enumeration and sampling survey), which is conducted every three years, this section discusses how to further improve the questionnaire to enhance the accuracy of analysis. Based on the discussion, this section proposes improvements to raise the response rate, amendments to make the survey more useful for researchers, and

addition of new questions to the questionnaire.

IV Creation and use of the intellectual property indexes in other countries

Patent statistics, which have been rapidly increasing in amount in recent years, provide basic and useful information for those who are in a position to create indexes designed to facilitate the formation of innovation policies, to evaluate cooperate intellectual property strategies, and to identify technical trends. In view of the importance of patent statistics, the European Patent Office (EPO) and the Organization for Economic Co-operation and Development (OECD) have held joint workshops on patent statistics.

This section focuses on research on patent indexes that are a part of the research presented in the workshop, “Patent Statistics for Policymaking,” that was held in autumn 2006. This section describes and introduces such research to find out what kinds of intellectual property indexes have been created and used in other countries and to gain information useful for the establishment of the Intellectual Property Strategy Indexes.

The data attracting special attention from those in charge of creating indexes are citation data and patent family data. An increase in the amount of those statistical data would enable us to create more accurate indexes that indicate patent value and technical trends in each country. It will enhance the reliability of the data based on which a nation or company decides whether to file an application or exploit a patent and identifies the innovation trends. Accurate and high-quality empirical analyses are expected to be conducted in the future. The results of those analyses will help us to create intellectual property strategy indexes.

(Isamu Yamauchi, Sadao Nagaoka, Kazuyuki Motohashi)

V Creation of the Intellectual Property Strategy Indexes based on the results of the analyses conducted in this study

In order to establish new Intellectual Property Strategy Indexes, Chapters 1 through 7 of Section II of this paper have empirically analyzed the effects of the intellectual property systems and environment faced by companies on corporate intellectual property strategies. Section IV has introduced efforts to establish and use patent indexes in other countries.

Section V has analyzed how to take advantage of these empirical analyses and overseas efforts to establish patent indexes in order to establish Intellectual Property Strategy Indexes with focus on the patent applications, examination requests, registration and exploitation of patents by companies.

The analysis has provided useful information as to what factors should be taken into consideration when we evaluate patent acquisition efforts, licensing activities, internationalization, and the financial structure of a company from the perspective of intellectual property strategy.

(Secretariat)