

6 Analysis of Various Issues Concerning the “Tragedy of the Anticommons”

Many patents relate to the research, development, production, and sales of one product. This situation, a so-called “patent thicket,” has given rise to concerns that such a thicket will cause various problems for corporate activities. The most worrisome of those problems is the “tragedy of the anticommons,” in which the use of a patented technology is made impossible by another patent.

In this study, we conducted a positive analysis through a macro-economic approach on the results of the “Survey of Intellectual Property-Related Activities” conducted by the Patent Office. In addition, we held interviews with companies that represent each business field to obtain their views on the current situation regarding “patent thickets” and also on their respective stances.

The results of this study indicate that, in most cases, companies have taken measures including such management strategies as patent and license exchanges in order to prevent “patent thickets” from causing damage to their business. However, this does not deny the possibility of existence of the “tragedy of the anticommons.”

I Introduction

This report presents the results of an empirical study on issues that could be caused by “patent thickets.” This study was conducted based mainly on the “Survey of Intellectual Property-Related Activities.” The term “patent thicket” can be defined as a situation where a company needs to use a collection of many patents owned by other companies for the production, sales, or research of its products. The company needs those patents to complement its own patents. There are two major reasons for the formation of a “patent thicket,” which are that (1) Products and the production processes (or research processes) thereof are so complex that the use of many complementary technologies is necessary and (2) Many companies are involved in research. Even if the number of necessary patents is large, the issue of “patent thickets” does not arise as long as many substitute technologies exist or as long as a certain company owns a set of complementary patents.

It is feared that a “patent thicket” might prevent companies from using available technologies in an efficient combination. This is since the necessary patents are owned by so many companies that it is difficult to negotiate effectively with all the patent holders. For this reason, the use of patented technologies is prevented. This situation is called the “tragedy of the anticommons.” The occurrence of the “tragedy of the anticommons” could cause intellectual property rights to decrease the appropriability of the results of research and

development despite the common understanding that the most basic function of intellectual property rights is to actually increase the appropriability of the results of research and development.

A “patent thicket” does not necessarily cause the “tragedy of the anticommons” because it could be prevented through an explicit or implicit agreement between companies. However, if such an agreement is ineffective, this will barely be able to stop a patented technology from being stored away forever and will not be able to prevent a decrease in the profitability of the results of research and development. Therefore, in order to examine the degree of seriousness of the “tragedy of the anticommons” in reality, we need to conduct a positive analysis as to whether companies are suffering such problems.

We studied this issue by reviewing the results of the Survey of Intellectual Property-Related Activities and conducting interviews with companies. We will outline the study in Chapter II and Chapter III below and present our conclusion at the end of this report.

At this stage, if someone asks us whether a “patent thicket” causes the “tragedy of the anticommons,” our answer will be as follows. A “patent thicket” tends to encourage companies to submit patent applications and also to increase their legal expenses incurred in negotiations with other companies for matters such as the conclusion of license agreements and the settlement of legal proceedings in order to prevent the formation of a “patent thicket” in the fields where measures against “patent thickets”

are important. However, we have found no evidence that suggests that a “patent thicket” has contributed to decreasing the profitability of research and development or of patent acquisition in the industries facing a serious problem of “patent thickets.” The results of our interviews with companies indicate that, in most cases, companies have taken measures including an appropriate management strategy in order to prevent latent problems related to “patent thickets” from becoming serious.

However, it would be wrong to assume that the “tragedy of the anticommons” does not exist. To prevent the tragedy from causing substantial damage, we consider it important for the following steps to be made:

- (1) Intellectual property rights should be granted only for such inventions and creations that meet very stringent requirements. For instance, a patent should be given only for such an invention as one that involves a significant inventive step. Such a policy is likely to alleviate the problem of “patent thickets” and also increase the profits to be gained by rights holders because their inventions tend to be more innovative under this policy;
- (2) In order to prevent a “patent thicket” from causing problems, companies should be encouraged to exchange patents and licenses for technologies more frequently by such means as patent pools and cross licenses. It is important to promote the smooth use of complementary technologies. At the same time, it is also important, from the perspective of competition policy, to take measures to stop cooperation among rival companies from having an anti-competitive effect on the product market or technology market; and
- (3) Standardization organizations should enhance their intellectual property policies (such as the clarification of a basic policy about rational and indiscriminate licensing and the clarification of the duty of disclosure) in such a way that promotes cooperation between companies that own patents essential for standardization and prevents hold-up problems.

(Sadao NAGAOKA)

II Analysis of Various Issues Related to the “Tragedy of the Anticommons”

1 The effects of a “patent thicket” on profitability and compensatory cost of patent use, research, and development

There has been a concern that a “patent thicket” could prevent companies from using technologies in an efficient combination, which would cause the “tragedy of the anticommons.” However, a “patent thicket” does not necessarily cause the “tragedy of the anticommons” if companies take such preventive measures as cross licensing and using NAP clauses (Non-Assertion of Patents). In this study, we used the frequency of cross licensing as an index for the formation of a “patent thicket” in each industry in order to empirically identify the effect of a “patent thicket” on the acquisition and use of a patent, the profitability of research and development, and the payment of compensation for an employee invention.

The major findings of the analysis are as follows:

- (1) The propensity to patent is high among industries where cross licensing is common and also among companies whose use of cross licensing is relatively common regardless of industry;
- (2) The ratio of patent use is high among the companies and industries where cross licensing is common. In the calculation of this ratio, the licenses granted by other companies are included. Cross licensing does not have significant effects on the use of their own patents regardless of the level of use (regarding coefficients, the variable for the company level is negative, whereas the one for the industry level is positive.);
- (3) The ratio of defensive patents is low in the industries where cross licensing is common;
- (4) There is no trend whereby the effect of a company’s investment in research and development or acquisition of a patent on the corporate profits is relatively small in the industries where cross licensing is common; and
- (5) Advocates of the incentive theory believe that a compensation system for inventions (in particular, compensation linked to the profitability of an invention) is ineffective in industries where tactful navigation through a “patent thicket” is the key to success (=

industries where cross licensing is common) and therefore that the compensation for an invention will decrease. Such a trend, however, has not been observed.

The results described in (1) through (4) above indicate the absence of evidence that suggests that a “patent thicket” has adverse effects on companies in terms of the profitability of patent use and of research and development. This does not necessarily deny the existence of the “tragedy of the anticommons.” In order to avoid this problem, it is important for companies to conclude an effective agreement for the use of each invention jointly made by companies (or by a company and an individual inventor). Such an agreement could take a form of advance license agreement. The result described in (5) above seems to indicate that the compensation for an invention is paid in compliance with relevant rules rather than based on its effectiveness.

(Sadao NAGAOKA, Yoichiro NISHIMURA)

2 Relationship between a “patent thicket” and the effectiveness and results of research and development activities

[Part I] Does the tragedy of a “patent thicket” exist?

A “patent thicket” can be defined as a situation where multiple patentees have overlapping patent rights to a technology necessary for the commercialization of a certain product. In this sense, our study revealed that a “patent thicket” contributes to reducing the number of onerous contracts concluded for the exchange of technologies and also to raising the license fees, causing an increase in the transaction costs of technology exchanges. As a result, a “patent thicket” influences the research and development activities of companies, exerting downward pressure on the profitability of research and development. A rise in transaction costs caused by a “patent thicket” is attributable in part to business practices and also to the technical strategies of companies such as the direction of technical development and the diversification of technology.

Although a “patent thicket” could make research and development less effective in the short run, a “patent thicket” might be necessary in some cases because it allows many researchers and engineers who take slightly different approaches to develop new technologies by trial and error. This way of research and development

is especially useful at the stage where the direction of technological development has not yet been established. Therefore, we should not try to eliminate “patent thickets” by establishing patent policies to regulate the scope of a patent and the effectiveness of patent rights. Rather, we should enhance the market for technology exchanges in order to reduce transaction costs that have risen due to “patent thickets.”

[Part II] The efficiency of research and development activities and “patent thickets”

We studied the effects of a “patent thicket” on the efficiency of the research and development activities of companies and discovered that a “patent thicket” functions as a disincentive to corporate research and development. However, we also found that companies facing this situation take steps to prevent the formation of a “patent thicket” by sharing intellectual property with other companies. Such sharing is realized by various means including cross licensing. Moreover, we analyzed the influence of the effectiveness of research and development on the frequency of cross licensing and the use of owned patents and discovered a proportional and significant relationship between the efficiency of research and development and the frequency of cross licensing. In this analysis, we used the DEA (Data Envelopment Analysis) method, taking into account the cost of research and development and the number of employees engaged in research and development as an input and estimating the efficiency of research and development based on an index created by regarding the number of patents as an output. We also considered the use of cross licenses and owned patents as a surrogate variable for a “patent thicket.” On the assumption that the thickness of a “patent thicket” is reflected in the number of cross licenses, we should be able to evaluate the efficiency of research and development by the number of patents acquired. According to this evaluation, companies’ efforts to deal with a “patent thicket” have contributed to enhancing the effectiveness.

(Fumio FUNAOKA, Joji TOKUI, Fumihiko KOYATA)

3 Study on the effects of “patent thickets” on corporate intellectual property strategies

In this chapter, we present the results of an analysis of the relationship between a “patent thicket” and corporate intellectual property

strategies. The analysis was conducted by using the “Survey of Intellectual Property-Related Activities” and the “IIP Patent Database.” Regarding a “patent thicket,” we defined this as a technical field in which a large number of patent applications is submitted for one IPC (International Patent Classification) group. According to the results of the analysis, the IPCs where “patent thickets” exist (“patent thicket IPCs”) belong mainly to the IT sector including the software and telecommunications industries and also to the biotechnology sector including the pharmaceutical and genetic engineering industries. We noticed that the intellectual property strategies of companies facing “patent thickets” (companies submitting many patent applications in “patent thicket IPCs”) differ depending on the industry. For example, companies in the chemical sector have a relatively high ratio of unused patents to owned patents and also hold many patents for the purpose of defense. The pharmaceutical sector also has a high ratio of unused patents, while the ratio of patents that pharmaceutical companies are willing to license is relatively high. This suggests that their intellectual property strategies are more open. On the other hand, the electronics industry has a lower ratio of unused patents, while the ratio of cross licenses is high. Our regression analysis revealed that their intellectual property strategies differ depending on whether the technologies necessary to produce a product are complementary or substitutional.

(Kazuyuki MOTOHASHI)

4 Creation of indexes for “patent thickets” and analysis of each industry

A “patent thicket” is caused by multiple factors such as the need for the use of many patents in the production of certain products and the availability of complementary patents owned by other companies. Therefore, in order to structurally understand the current situation regarding “patent thickets” in consideration of those factors, we need to create an index for each factor. In this chapter, we designed such indexes based on the data obtained from the “Survey of Intellectual Property-Related Activities” and calculated the index for each industry. The calculated indexes were used to outline the differences between industries from the viewpoint of the “possibility of the formation of a patent thicket” and the “possibility of the removal

of a patent thicket.” We studied the trend of each index over the period from 2002 through 2004 and discovered that the number of patents used for a single product has been on the rise whereas the availability of patents owned by other companies has been on the decline. This trend indicates that the problem of “patent thickets” has gradually been spreading. As a result, the risk of getting involved in a lawsuit has risen. Furthermore, we discovered that the spread of a “patent thicket” was caused by one of the two reasons depending on the industry in question: an increase in the number of necessary patents or a decrease in the availability of other companies’ patents. We presented our view that the first case would be attributable to the increasing complexity of products and production processes whereas the second case would be attributable to the intensifying competition among companies for technological development. The analysis conducted in this chapter should be further deepened in order to follow the new developments in “patent thickets” from a political standpoint.

(Akiya NAGATA, Satoko IDA)

5 Analysis of the trends in patent infringement lawsuits, licensing, and intellectual property costs in relation to “patent thickets”

In this paper, we conducted a study on companies and outlined the trends in patent infringement lawsuits, licensing, and intellectual property costs, which have a close relationship with “patent thickets.”

Our industry-level analysis did not provide evidence that the number of lawsuits is extremely high in the electronics industry, which seems to face a serious problem of “patent thickets,” in comparison with other industries. The analysis, however, did reveal that the cost of negotiations among companies such as the conclusion of license agreements and the settlement of lawsuits is relatively high in the electronics industry and the precision machinery industry. These analysis results indicate that domestic companies in such industries manage to prevent the problem of “patent thickets” by concluding license agreements. For this reason, they seem to incur higher transaction costs in comparison with companies in other industries.

(Yosuke OKADA, Koichiro ONISHI)

6 Study of the corporate behavior of licensing -- Positive analysis of a bargaining model

The purpose of this study is to clarify the factors determining a patent license price and thereby to check the validity of concerns that research and development companies contribute to worsening the “tragedy of the anticommons.” We conducted a positive analysis and found that the higher development cost and appropriability of a patent exert upward pressure on the average license price. On the other hand, the size of complementary property has a negative effect on the license price. These findings suggest that large companies that own a lot of complementary property tend to have low-quality patents on average and to refrain from licensing important inventions for fear of licensees becoming their rivals in the future. Although we predicted that research and development companies might naturally possess higher negotiation skills because they, as research and development companies, specialize in supplying new technologies, we did not obtain any results that verify our prediction. On the contrary, we discovered that research and development companies tend to agree to low license prices due to their lack of complementary property and difficulty in exploiting patented inventions.

(Kenta NAKAMURA, Hiroyuki ODAGIRI)

7 Patents, standards, and innovation

The patent system has played an important role in promoting innovation.

However, some problems in the system have been pointed out in recent years. For instance, in some industries including the electronics industry, in the case where many patents are involved in a single product, if the technical standards for the product have already been established, the inability to use a patent related to the standards will prevent the standards from serving their proper roles, impeding the use of technologies and the development of the product. Some people are concerned that the mutual use of technologies will be hindered if an increasing number of non-manufacturers such as venture companies and universities, which engage only in technical development, start owning patents in these industries in addition to manufacturers, which engage in production as well as in technical development.

In this chapter, we conducted a preliminary study on issues concerning technical standards,

patents, and innovation. First, in order to clarify the relationship between technical standards and innovation, in other words, in order to identify the effects of standard-setting on the development of technology, we studied the case of VTRs where a de facto standard had become the official standard as well as the case of fax machines where a de jure standard had become the official standard. Second, we used a theoretical model to predict the effects of the introduction of a new system on industrial innovation. The new system is designed to force venture companies to share technologies if they belong to the industries where the elemental technologies necessary for the production of products are owned individually by venture companies that engage only in research and development and not in production, as well as by manufacturers that internally conduct research, development, and production in a vertical and integrated manner. We concluded that the introduction of such a system will promote the development of technology under certain conditions.

(Akira GOTO, Yoshihito YAZAKI)

III Interviews with Companies -- Various Issues Concerning the “Tragedy of the Anticommons” from the perspective of companies

We conducted interviews with two companies each in the electronics industry, the automobile industry, and the pharmaceutical industry respectively. In each of these industries, many patents have been issued for inventions that overlap in terms of technical areas. None of the companies said they would suspend their research projects or business plans for fear of being caught in “patent thickets.” This indicates that they take necessary measures to avoid “patent thickets” as technology exchanges and cooperation in standard-setting.

However, we should not deny the possibility of the “tragedy of the anticommons” worsening in the future. We need to keep in mind that these findings were made from the interviews conducted with companies skilled in intellectual property management and also that the findings were made in Japan, where we have not seen the emergence of outsiders who cause hold-up problems.

Therefore, we consider it necessary to monitor future developments with special attention paid to the following points:

- (1) Any unused and reserved rights could create a “patent thicket” that causes the “tragedy of the anticommons” to occur in the future;
- (2) We should not deny the possibility of a “patent thicket” made of defensive patents causing the “tragedy of the anticommons” to individuals and small companies that do not have the system or means to prevent the formation of a “patent thicket”;
- (3) The risk of the “tragedy of the anticommons” is considered likely to increase when an agreement or a transaction has to be canceled for some reason or when a “patent thicket” emerges; and
- (4) It is feared that any problems in a part of a “patent thicket” could influence the entire thicket because the thicket is formed based on overlapping multiple layers of collaborative relationships among relevant parties.

(Secretariat)

IV Issues Regarding the “Survey of Intellectual Property-Related Activities” Conducted by the Patent Office and Remedial Measures

In this study, an analysis was conducted based mainly on the data obtained through the “Survey of Intellectual Property-Related Activities” conducted by the Patent Office. For further study, we need to seek more accurate analysis results. To discuss the issues concerning this study and remedial measures, each member of the Study Committee identified issues relating to his or her area and exchanged views with other members in order to devise countermeasures as follows:

- (1) One of the issues is that the number of samples is insufficient. We need to increase our effort to solicit responses from survey participants and, at the same time, to identify the reasons for non-response and take measures to raise the response rate;
- (2) We should carry out a theoretical check. If any irregularity is detected, we should check that case in question separately;
- (3) An appropriate method to supplement blank answers should be adopted at the stage of statistics calculation; and
- (4) Prior to a survey, we should raise awareness in order to prevent errors. We also need to review the sample design if outliers are detected.

(Senior Researcher :Takashi HORINAKA)

