

Role of Japan's Intellectual Property System in its Economy (*)

Attempts are being made in various countries to empirically analyze the impact of intellectual property systems on the intellectual property and innovation activities of companies, etc. In particular, in recent years, demand for evidence-based policy-making has been growing worldwide, so intellectual property offices in the U.S.A. and Europe have responded by establishing chief economist positions and promoting scientific research into intellectual property systems. Amid this situation, in this study, we conducted six empirical analyses to examine the relationship of company performance to the contribution of intellectual property rights and licensing, the impact of changes in intellectual property policy on companies in the life sciences sector, the concordance between IPC and industrial classifications, the impact of intellectual property systems on the economy, and studies using data from surveys of intellectual property activities. In doing so, we made full use of such databases as the Patent Database, the Ministry of Economy, Trade and Industry Basic Survey of Japanese Business Structure and Activities, the Japan Patent Office Survey on Intellectual Property-Related Activities, and the Ministry of Internal Affairs and Communications Survey of Research and Development. Furthermore, we examined the organization of survey items in the Survey on Intellectual Property-Related Activities, which is the basis for empirical research.

I Introduction

This report features an empirical economic analysis of the role that the intellectual property (IP) system plays in the economy. The key feature of the studies carried out during the current fiscal year is that they have used fundamental statistics in the form of the Basic Survey of Japanese Business Structure and Activities published by the Ministry of Economy, Trade and Industry (METI) and the Survey of Research and Development published by the Ministry of Internal Affairs and Communications (MIC), and have combined these with the Survey on Intellectual Property-Related Activities published by the Japan Patent Office (JPO) to carry out a much more in-depth analysis of the economic role of IP. Using such external statistics facilitates the construction of a large panel data set that also includes companies that do not hold patents, as well as providing a more comprehensive understanding of innovation activities by companies. In addition, we have built an international patent family of patents protecting pharmaceuticals on the Japanese market and are using it to analyze such matters as trends in the international protection of substance patents, etc.

Our research consists of the following studies concerning the role that the IP system plays in the economy: (1) Effects of Intellectual Property Rights on Companies' Financial performance; (2) Research on the Relationship between Corporate Performance and Licensing; (3) Survey on the Effects of Change in Intellectual Property Policy on Companies in the Life Sciences Field; (4) A Study of Concordance between the IPC and Industrial

Classification; (5) A Survey of Trends in Studies of the Impact of IP Systems on the Economy; and (6) Study using data from Survey of Intellectual Property-Related Activities. Furthermore, it includes an Examination of the

Organization of Survey Items in the Survey on Intellectual Property-Related Activities.

(Sadao NAGAOKA)

II Studies of the Role of the Intellectual Property System in the Economy

1 Effects of Intellectual Property Rights on Companies' Financial Performance

This chapter analyzed the impact that obtaining patent rights has on a company's performance. In analyzing this topic, we used the IIP Patent Database to compile panel data concerning the number of patents held per company and linked this to the Basic Survey of Japanese Business Structure and Activities, thereby building a large new data set that also included companies that do not hold patents.

When analyzing the relationship between the acquisition of patents and performance, we attempted to resolve the challenge of controlling for endogeneity, which had been an issue in many previous studies, by using as instrumental variables such exogenous variables as examination request and patent fee reduction/exemption systems for small and medium-sized enterprises (SMEs), and distance to the nearest patent attorney office. At the same time, we revealed that reduction/exemption systems and ease of access to patent attorneys helps to promote the acquisition of patents.

As a result of our analysis, we discovered that the number of patents held increases value-added productivity, even after using these instrumental variables to control for endogeneity. Similarly, the results demonstrated that added value and net sales grow as a result of the acquisition of

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patents and the achievement of this at an earlier stage, even after controlling for endogeneity in the acquisition of patents by start-up companies. These results suggest that the existence of a patent system helps to promote innovation by expanding research and development and accelerating corporate growth.

Furthermore, we ascertained that examination request and patent fee reduction/exemption systems increase the number of patents held by SMEs and the probability that they will begin to hold patents. In addition, it emerged that being located closer to a patent attorney encourages SMEs to obtain patents. In other words, there is a possibility that policies such as reduction/exemption systems and easier access to patent attorneys would promote patent acquisition by SMEs, thereby helping to encourage innovation.

(Isamu YAMAUCHI, Sadao NAGAOKA, Koichiro Onishi)

2 Research on the Relationship between Corporate Performance and Licensing

In this chapter, we used the JPO's Survey on Intellectual Property-Related Activities and METI's Basic Survey of Japanese Business Structure and Activities to ascertain the licensing situation in Japan and investigate its impact on company performance (profits, net sales, salary levels, research and development expenditure, etc.) The main results are as follows.

When we looked at the impact of license-related inventions on the performance of the applicant, an analysis on a numerical basis demonstrated that licensing out has both positive and negative effects on profits, net sales, market share, and salary levels, and that these effects cancel each other out. Licensing in and inventions deemed to be company secrets did not have any kind of effect on company performance. It would appear that this is because the effect of saving on company research and development expenditure by licensing in is canceled out by the research and development promotion effect resulting from the introduction of complementary technology.

Due to the constraints of both time and the database, this study was not able to adequately address such problems as endogeneity in relation to simultaneity and the like, so some reservations must be expressed in regard to the conclusion.

(Yoichiro NISHIMURA)

3 Survey on the Effects of Change in Intellectual Property Policy on Companies in the Life Sciences Field

We built an international family from the approximately 1,200 patents protecting pharmaceuticals on the market in Japan (with a priority claim date in 1969 or later) and then analyzed how these patents are protected internationally and how this protection has changed as a result of the strengthening of patent

protection in each country. Furthermore, we analyzed the impact that substance patents in a broad sense (substance patents and crystal patents), which are the fundamental basis of patent protection for pharmaceuticals, have on a company's profitability rate and licensing income. Around 40% of the aforementioned patents are substance or crystal patents, and a quarter are held by Japan's top ten pharmaceutical manufacturers.

The strengthening of patent protection in developing countries led to a substantial rise in the number of patents obtained in those countries over the course of the 1990s. For example, China's introduction of substance patents in 1993 resulted in a doubling of the propensity to file a patent application in China, from 40% to 80%. The propensity to file a patent application also rose in regard to method-of-use patents and process patents. Moreover, in the Philippines, the propensity to obtain a patent rose by approximately 20% from the early to the late 1990s, due to such factors as the introduction of a substance patent system in order to implement the TRIPS Agreement (as a result of the TRIPS Agreement, the Philippines became obliged to begin accepting substance patent applications from 1995). An analysis of the policy effects in countries other than China and the Philippines was not possible, due to a lack of past gazette and registration data, among other issues.

While almost all substance patents were also protected in major developing countries, including India and Mexico, by the early 2000s, the number of crystal patents and method-of-use patents obtained remained low. There could be differences in such areas as criteria for determining an inventive step, so more thorough examination would be preferable in future.

The number of substance patents in a broad sense held by a company had a significantly large impact on disparities and fluctuations in the profitability rate (equivalent to the price-cost margin) of drug discovery companies. This shows that patent protection has a substantial impact on the appropriability of research and development investment for Japanese drug discovery companies. The number of substance patents held by Japanese drug discovery companies has a significant impact on licensing income from the U.S.A., but there is no significant correlation with licensing income from developing countries. One of the key factors contributing to this is believed to be the fact that Japanese drug discovery companies frequently grant global development rights to major foreign companies.

(Yoshimi OKADA, Sadao NAGAOKA,
Naotoshi TSUKADA)

4 A Study of Concordance between the IPC and Industrial Classification

This chapter investigated what kind of concordance tables have been compiled to correlate each country and

region's industrial classifications to the International Patent Classification (IPC), and examined approaches to concordance in Japan.

There are two methods of linking industrial classifications to patents: (i) patents can be allocated to the industrial sector of origin (to the main economic sector of the inventing/applicant company); or (ii) they can be allocated to the sector of use (to the main industry to which the product incorporating the invention belongs). In Japan, precise information about the inventing companies can be obtained by using METI's Basic Survey of Japanese Business Structure and Activities. Accordingly, for this survey, we adopted method (i). To address the issue of how to assign industrial classifications to diversified companies, we used four approaches to create concordances and carried out a comparative examination of the results. Based on these results, from the perspective of the coverage, stability, and ease of preparation of the concordance, we proposed an approach based on tallying the number of patent applications by industry and IPC, taking the biggest industrial sector in the net sales composition of each company to be the industrial classification of the company in question.

In the latter half of this chapter, we prepared a concordance between the major field of business of each company and the various technical fields, and identified the relationship between patent trends and the economic status of each industry. According to this, the relationship between trends in patent applications and trends in net sales differs considerably from one industry to another. For example, some industries demonstrate an upward trend in both indicators, such as the transportation equipment manufacturing industry, while in others, such as the pharmaceutical manufacturing industry, chemical industry, and steel and non-ferrous metal manufacturing industry, net sales are growing, but the number of patent applications is on the decline.

Moreover, looking at changes in the distribution of applications by technical field in each industry, the share of applications in Section G (physics) and Section H (electricity) is growing in the transportation equipment manufacturing industry, the chemical industry, and the pharmaceutical manufacturing industry, even though these are not the fields attracting the largest number of applications. This suggested that technologies relating to telecommunications, artificial intelligence, and big data analysis, among others, could be growing in importance in response to the rise of the IoT (Internet of Things).

(Kenta NAKAMURA, Isamu YAMAUCHI)

5 A Survey of Trends in Studies of the Impact of IP Systems on the Economy

Examples of Analysis at the IP Statistics for Decision Makers Conference

Each country's patent office employs a chief economist and advisors on the economics of intellectual property (IP), who study the impact of IP systems on the economy. As such, the Organisation for Economic Co-operation and Development (OECD) and the European Patent Office (EPO), in partnership with patent offices in countries such as the U.S.A. and Japan, have held the IP Statistics for Decision Makers Conference annually since 2003, in an effort to publicize the outcomes of empirical research concerning IP rights and IP systems, as well as facilitating networking among researchers.

This chapter examined what kind of empirical research is currently being conducted concerning the impact of IP systems on the economy, as well as trends in that research, by providing an overview of the research reports at the 2015 IP Statistics for Decision Makers Conference (held in Vienna). The conference featured the following six sessions.

Session 1: IP commercialization and markets)

Session 2: Patents in bio and pharma

Session 3: Patent markets and agents

Session 4: Patent system design

Session 5: Innovation policy

Session 6: IP economic performance

The content of the research reported covered a wide range of topics, involving sophisticated research techniques in most cases, so it offered useful suggestions for this report. Of these, the studies reported in Sessions 1, 4, and 5 have a very profound connection to the analyses in Chapters 1, 2, and 3 of this report. In addition, there are close relationships between Session 2 and the analysis in Chapter 3, and Session 6 and the analysis in Chapter 4.

These studies involved empirical analysis of the role of IP based on unique viewpoints and incorporated patent and other data. It seems likely that analyses combining IP statistics with other data would yield more detailed, rigorous research output that could be used as evidence for policy-making in Japan as well. In this sense, the IP Statistics for Decision Makers Conference provided an insight into the way in which advances in empirical economic research are contributing to policy-making in the field of IP.

(Isamu YAMAUCHI)

6 Study Using Data from Survey of Intellectual Property-Related Activities

This chapter used the JPO's Survey on Intellectual Property-Related Activities to gain a more objective

understanding of the propensity of Japanese companies to hold patents and file patent applications, or to keep inventions as trade secrets, and then analyzed the impact that this propensity has on corporate performance. For the purposes of analysis, companies were classed as either SMEs or large corporations. The problem that arises when analyzing the impact of patent acquisition on a company's performance is the question of endogeneity, including the reverse causal relationship of high-performing companies acquiring patents. Accordingly, in the analysis of SMEs, to guarantee exogeneity, we used Fuzzy RDD (Regression Discontinuity Design), taking examination request and patent fee reduction/exemption systems as the instrumental variable. In the case of large corporations, no suitable instrumental variable of this kind is available, so we used the research of Hall et al. (2005) to analyze the effectiveness of companies' patent application/ownership strategies via evaluations of the companies in capital markets. The results of the analyses revealed that whereas examination request and patent fee reduction/exemption systems increase the number of patents held and the number worked by the company itself, as well as the propensity to file a patent application (number of patent applications/number of inventions disclosed), such systems reduce the propensity to keep inventions as trade secrets (number of inventions kept as trade secrets/number of inventions disclosed). This result shows that examination request and patent fee reduction/exemption systems play a part in encouraging companies to file patent applications and maintain rights, while preventing inventions from being kept secret. Furthermore, it emerged that the number of patents held through such systems and the number of patents worked by the company itself have a positive impact on the company's performance. On the other hand, we obtained results suggesting that keeping inventions a trade secret might have a negative effect on performance. It would be fair to say that the results of these estimates show that for SMEs, holding patents plays a key role in improving performance, while keeping inventions as a trade secret does not increase the appropriability of an invention.

In regard to the relationship between the patents held and applications filed by a company and that company's corporate value, focusing on large corporations, the results showed a statistically significant negative relationship in the case of the simple number of patent applications, including the possibility that this was due to multicollinearity. On the other hand, it also emerged that the number of patents worked by the company itself has a positive impact on the company's value. More detailed analysis is required, but these results suggest that selectively filing patent applications for inventions likely to result in the acquisition of rights is important in increasing corporate value. In other words, it would appear to be vital

to file patent applications strategically, based on an approach of selection and concentration that also includes the option of keeping an invention a trade secret.

(Koichiro ONISHI, Yoichiro NISHIMURA)

III Revising Survey of Intellectual Property-Related Activities

We examined the survey items in the JPO's Survey on Intellectual Property-Related Activities and considered whether or not they need to be changed to take account of the current status of IP worldwide. This study revealed the following: (1) looking at individual response data, improvements in the accuracy level of responses are required, because a few companies that seem likely to be engaged in licensing have answered "No" to the question about whether or not their company has licenses, but although suggestions for improvements to this question have been put forward several times in the past, a conclusive proposal for improvement has yet to emerge; (2) additional survey items required include overseas net sales and overseas research expenditure, and qualitative data would also be useful; it would also be desirable to conduct an additional survey of tangible fixed assets and total assets to analyze the relationship to performance; (3) in regard to the potential for analyses linked to other statistics, particular caution is required concerning differences in the definitions of survey items, and it would be desirable to standardize survey items and definitions with other statistics to increase the potential for analysis; and (4) in terms of minor improvements to survey items, the mixed use of statistics on a calendar year basis and statistics on a fiscal year basis renders analysis difficult; the definitions of research and development expenditure and research staff differ from those used in other statistics; and when asking about group companies, the survey should ask separate questions about whether the company has a parent company and whether it has any subsidiaries. In light of this, adding survey items and improving the questionnaire would be desirable from the perspective of gaining a comprehensive understanding of IP activities, improving the accuracy of the survey, and analyzing the results in conjunction with other surveys. However, adding survey items could potentially have an adverse impact on the response rate or the accuracy of responses. Moreover, revisions to the definitions of survey items would not necessarily be desirable from the perspective of the continuity of the survey. We would recommend caution in addressing these issues.

(Koichiro ONISHI, Yoichiro NISHIMURA)

(Researcher: Mitsutoshi SHINOZAKI)