Trademarks: Economic Measures of Innovation and Effects on Firm Performance (*)

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The importance of policymaking based on evidence has long been advocated. This is also true in innovation policies and the method to accurately measure innovation has become an increasingly significant issue. Amidst such a situation, in recent years, trademarks have been gaining more attention as a possible new innovation indicator. This is based on the idea that, in many cases, trademark applications are filed immediately prior to putting the products or services on the market and thus the trademark applications and the new products or services are linked and trademark data can be used as the proxy variable for innovation. However, this field of research is immature and involves fundamental problems. Moreover, the research methodology, as well as the academic evaluation as an innovation indicator, are yet to be established. Thus, in this study, trademark applications and applicants' behavior in Japan were examined to find whether or not trademark data can be used as an innovation indicator that complements patents. Then, as a result of an empirical analysis into the relationship between trademark applications and corporate outcomes, it was revealed that there was no effect of intensifying trademark activities but productivity improved when competitors launched more new products with trademarks in the same market. This was suggested that there was an externality such that the increase in the product variations led to an increase in product (or product group) recognition and thereby leading to efficiency improvement mainly in downstream processes such as sales and distribution.

I. Introduction

Studies on innovations and intellectual property rights in economics were developed mainly on "research and development" and the "patent system" that protects the outcome thereof. The trademark system, which is the subject of analysis in this research, had been given some slight attention since the 1980s in the context of law and economics, but it never gained widespread attention.

However, in Japan where a total of 1,470,000 applications for trademark registration are filed in a year (2015 results), demand for the trademark system is not insubstantial. In addition, it can be considered that intellectual property rights other than patents are becoming increasingly important on a global basis. The number of trademark applications worldwide, which accounted for about 1 million in 1985, reached 6 million in 2015 (a tripling in number, even if those filed in China are

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excluded). Although it may be an extreme example, in August 2012, in “Apple Inc. v. Samsung Electronics Co.” instituted with the United States District Court, Northern District of California, a jury verdict was rendered ordering Samsung to pay a huge amount in damages, to the sum of approximately one billion dollars. Those damages were awarded with respect to infringement of the design patents. Similarly, in 2012, Apple paid a settlement to the amount of 60 million dollars to a Chinese company in relation to a lawsuit over trademarks concerning iPads in China. Furthermore, recently, under the slogan “IP bundle” (OECD, 2013), the importance of securing competitive advantage by the multiple use of IP rights including patents, design rights and trademarks is being emphasized.

Against this background, since the 2000s, economic analysis of trademarks has been increasingly pursued in foreign countries. However, in Japan, trademark data for research had long been unavailable and thus, studies on trademarks have only just begun. Therefore, in this research, we investigate two themes that are fundamental in studies on trademarks. First, the characteristics of trademark applications in Japan will be examined with respect to the possibility pointed out in several studies such as Mendonça, et al. (2004), namely, the concept that trademark data could serve as an innovation indicator that complements patent data. Secondly, the effects of trademark activities on corporate outcomes will be empirically examined with respect to Japanese listed companies. This research study aims to provide knowledge that serves as a basis for studies on trademarks therefor through the abovementioned analysis.

II. Outline of the Trademark System

Article 1 of the Trademark Act of Japan provides that “The purpose of this Act is, through the protection of trademarks, to ensure the maintenance of business confidence of persons who use trademarks and thereby to contribute to the development of the industry and to protect the interests of consumers.” Patent law is enacted to provide incentives for innovation, whereas trademark law is enacted to maintain the goodwill accumulated in the trademark.

The subject of protection is the “trademark” provided in Article 2 of the Trademark Act which was provided in the past as “any character(s), figure(s), sign(s) or three-dimensional shape(s) or colors, or any combination thereof.” In the current Act enforced in April 1, 2015, “new types of trademarks” have been added to the subject of protection and the relevant provision has been revised to “among those recognizable by human perception, any character(s), figure(s), sign(s) or three-dimensional shape(s) or colors, or any combination thereof, sounds, etc. provided by Cabinet Order.” At present, new trademarks include the following: [i] motion marks (trademarks whose characters or figures, etc. change with time); [ii] hologram marks (trademarks whose characters or

figures, etc. change based on holography and other means); [iii] color marks (trademarks consisting of a single color or combination of colors); [iv] sound marks (trademarks consisting of music, voice, natural sounds, etc. which are recognized by its sound); and [v] position marks (trademarks which specify the position of the goods, etc. to which the marks consisting of characters or figures, etc. will be attached). These marks had already been widely covered by protections under trademark laws in foreign countries and thus the Japanese system required changing.

The primary and most basic function of trademarks is to distinguish one's own goods or services from those of others. Next, based on the first function, the "function to indicate the source," the "function to guarantee the quality" and the "advertising function" are generated. The function to indicate the source is to show the identity of the source of goods or service to which the same trademark is affixed. The function to guarantee the quality is a function which promises consumers that goods or services to which the relevant trademark is affixed have certain qualities, and it is important that this promise provides incentives to companies to maintain the quality into the future. Lands and Posner (1987) described such features of trademarks as "self-reinforcing." If companies are able to provide the goods or services expected by consumers, the trademark will be recognized positively and the trademark itself will have the effect of increasing consumer willingness to buy. This is the advertising function.

Trademarks transmit information to consumers on characteristics that cannot be observed, such as the quality of goods or services, while they provide incentives to companies to maintain or improve the quality of their goods or services. These functions reduce the information asymmetry between companies and consumers, ease the problem of adverse selection, reduce consumers' search costs, and as a result, enable efficient market transactions. However, the use of trademarks that take a free ride on the goodwill of others or cause confusion over the source of goods or services reduces the trademark's functionality in smoothing market transactions. Therefore, legal protection of trademarks can be justified from the standpoint of preventing acts of unfair competition for the purpose of protecting consumer trust.

III. Previous Studies

In the past, trademarks were discussed in the context of laws and economics or marketing as represented by the "brand equity" model of Aaker (1991). In recent years, however, trademarks are gaining more attention in the field of innovation studies. In Chapter III, the following two types of researchs on trademarks were marshalled: [i] studies that discuss the availability of trademarks as an innovation indicator, and [ii] studies on the relationship between trademarks and corporate values and corporate outcomes.

1. Trademarks as an innovation indicator

Developing quantitative indicator for innovation activities had long been one of the central issues in innovation studies. Since the 1990s, attempts to approach innovation activities using questionnaire surveys have been made in various countries by means such as the implementation of innovation surveys based on the Oslo Manual. Meanwhile, R&D expenditure and the number of patents remain as the representative innovation indicator due to their convenience in regard to factors such as the availability of systematic data.

The utility of patent data as an innovation indicator can be found as follows: [i] systematic data collection based on the patent system of each country; [ii] availability of chronological and international comparison thanks to the long history of the patent system; and [iii] technology classification attached to patents. On the other hand, patents are merely inventions which are afforded legal protection and there is uncertainty as to whether or not the relevant invention will have an economic impact. Therefore, when innovation is defined based on Schumpeter's theory, using patents as the proxy variable of innovation is invariably the subject of criticism.

With respect to these criticisms, there is growing literature focused on the availability of trademarks as an innovation indicator complementing patents (e.g., Schmoch, 2003; Mendonça, et al., 2004; Millot, 2009). In a paper titled "Trademarks as an indicator of Innovation and Industrial Change," Mendonça, et al. (2004) stated that while patent applications are often filed at the invention stage, i.e. at an early stage of the innovation process, trademark applications are filed immediately prior to putting the products on the market. Due to the abovementioned timing of filing, in many cases, trademark applications are linked to new products or new services and thus trademarks can be used as the proxy variable for innovations. In addition, Mendonça, et al. (2004) pointed out the fact that while the applicants of patents are mainly large-scale manufacturing companies (especially, companies in the high-tech industries), those of trademark applications include small-scale companies and/or companies in the non-manufacturing industries such as the service industry, and this fact is useful in the sense of complementing patent data. In actuality, some empirical studies have found correlations between the existing innovation indicator and the use of trademarks, and an argument is made for the usefulness of trademarks as an innovation indicator based on such findings (e.g., Schmoch, 2003; Mendonça et al., 2004; Millot., 2009; Jensen and Webster, 2009; Gotsch and Hipp, 2012). However, evidence from Japan is not yet available in the literature.

2. Effects on corporate value/corporate outcomes

If trademarks reflect innovation activities of a company, filing applications for trademarks or holding them could have a positive effect on corporate outcomes. In empirical studies, the impacts of trademarks are analyzed via two major approaches. The first approach analyzes the relation between trademarks and the market value of companies while the second one analyzes the relationship between the outcome variables, such as the sales growth and productivity, and trademarks.

Assuming a stock market with full information and rational behavior, corporate values should be equal to the sum of the present value of net cash flow. Therefore, if intangible assets contribute to future corporate earnings, their effects should be observed as a rise in corporate values. Beginning with Griliches (1981), the corporate value approach analyzes the contribution of intangible assets using the abovementioned relationship and a number of studies have been carried out. In the 2000s, some studies explicitly dealing with trademarks as intangible assets have been reported (e.g., Griffiths and Webster, 2006; Greenhalgh and Rogers, 2012).

In the corporate value approach, the long-term contribution of intangible assets is measured since corporate values are calculated based on their stock price. On the other hand, in the corporate outcome approach, the effect of trademarks on relatively short-term corporate outcomes such as the sales growth and productivity is analyzed (e.g., Greenhalgh and Longland, 2005; Helmers and Rogers, 2011; Greenhalgh and Rogers, 2012). Extensive literature survey has been performed and obtained studies suggested that trademarks have positive impacts on corporate values or corporate outcomes.

IV. Availability of Trademark Data in Japan

Several studies including Mendonça, et al. (2004) have found the availability of trademark data as an innovation indicator. This is based on the idea that trademark applications are linked to new products or new services and thus trademarks can be used as the proxy variable for innovation. In addition, it has been pointed out that the fact that applicants of trademark include small-scale companies or companies in the non-manufacturing industries such as the service industry while those of patent are mostly large-scale manufacturing companies (especially, companies in the high-tech industries) is useful in the sense of complementing patent data. As shown in Chapter III, some empirical studies supporting this idea have been reported. However, behavior characteristics of the potential applicants may be not homogeneous between countries in terms of such as propensity to trademarks. Thus, it remains a priori unclear as to whether the knowledge obtained abroad is applicable in Japan. Thus, in Section 1, the features of the trademark data of Japan were

reviewed with the availability thereof as an innovation indicator in mind. In Section 2, we analyzed the correspondence relations between trademarks and actual new products/services for the Japanese complete vehicle manufacturers and pharmaceutical companies and discussed the issues that we should be aware of when using trademark data.

1. Complementary use of patent data and trademark data

The share of nominal value-added of the service industry, i.e. the tertiary sector of industry, in the nominal GDP, which was about 50% in 1970, constantly increased and reached 73% in 2014. This trend has also been observed in Western countries and servitization of the economy is advancing mainly in developed countries but also on a global basis. With the servitization of the economy, there are increasing demands for the accurate measurement of innovation in the service industry. However, patent data, which has widely been used, presents difficulties in responding to such needs for the following reasons. In the first place, companies in the service industry may not be filing patent applications. Moreover, it is difficult to identify whether or not the patented invention will be used by the manufacturing industry or the service industry. Of course, the bibliographic data of each patent contains information about the technology classification such as IPC and some concordance tables are developed to link the IPC symbols to the industrial classifications (e.g. Schmoch et al., 2003; Lybbert and Zolas, 2014). However, in the existing concordance, technology classification is basically allocated to a single or multiple service industries but is not supposed to correspond to the service industry. Therefore, the fact that the trademark classification, i.e. the Nice international classification, officially supports services is extremely important in terms of measurement of innovation in the service sector.

When the trademark applications filed in Japan during the period from 2002 to 2005 and those filed in 2014 are compared in terms of the class of goods or services, the share of service has increased by 11% in about a decade (from 28% during the period from 2002 to 2005 to 39% in 2014). It is important to note that the increase in trademark applications can be caused by two factors: the increase in innovation and the increase in propensity to trademarks. However, this trend at least suggests that innovation activities in the broad sense that include IP activities in the Japanese service sector have been activated, and this implies that trademark data could be an important source of information in analyzing innovation related to service.

Next, the availability of trademark data is examined based on the distribution of applicants. When classifying the applicants by the annual number of applications (in 2010) filed for patents and trademarks, respectively, it is found that with respect to either patent or trademark, more than 60% of the applicants file only one application in a year. Moreover, it is found that patents and

trademarks have a similar distribution with respect to the composition of the number of applicants.

Looking at the total number of applications in each class, there is a major difference between patents and trademarks. In the case of patents, applications filed by applicants with more than 100 applications a year (who account for only 2% of the total applicants) account for 73% of the total applications. This result is consistent with the statements by Mendonça, et al. (2004) that most patent applications are filed by large-scale companies. On the other hand, with respect to trademarks, the number of applicants with more than 100 applications a year is less than 1% and the number of applications filed by such applicants accounts for only 10% of the total applications. In contrast, the fact that the number of applications filed by applicants who file no more than 5 trademark applications a year accounts for more than 50% of the total number of applications is a characteristic feature in trademark applications. As applicants with no more than 5 applications are presumed to include a large number of individuals and small and medium enterprises (SMEs), it is suggested that trademark data is useful in analyzing the innovation activities carried out by such applicants.

There were 4,786 applicants who filed applications for both patents and trademarks. Such applicants account for only 19.3% of the total number of applicants who filed patent applications and 14.0% of the total trademark applicants. In other words, since the coverage of patent data and trademark data are largely different, complementary use of the two data is expected to provide a more comprehensive grasp of innovation activities. Moreover, it is expected that the upstream and downstream stage of the innovation process can be analyzed in a comprehensive manner by combining patent and trademark data for a single applicant. As stated above, there are 4,786 applicants who filed the both. In addition, the number of patent applications filed by such applicants accounts for about 80% of the total patent applications, and the data reveals the specific class of goods/services for which each applicant filed a trademark application. Therefore, in theory, a linkage between technology and products can be drawn and we can observe the process in which technology becomes embodied in products and services.

2. Trademarks and actual products/services: a case study on Japanese complete vehicle manufacturers and pharmaceutical companies

Although only a few studies have confirmed that trademarks are linked with actual new products/services, Malmberg (2005), the only exception, has found that corporate trademark strategy depends largely on industry practices. Specifically, in the electric machinery and automobile industries, a trademark corresponding to a new product may not be filed because there is a tendency to identify a product by model number, whereas in the pharmaceutical industry, trademarks are filed for each product. In Section 2, we analyzed the correspondence relations

between trademarks and actual new products/services for the Japanese complete vehicle manufacturers and pharmaceutical companies and discussed the issues that we should be aware of when using trademark data.

The key findings from the investigations are as follows: [i] trademarks are linked (to some extent) to actual products/services. Therefore, trademark data are a potential indicator of product innovation; [ii] on the other hand, some trademarks are not affixed to the physical product; [iii] typically, trademarks are attached to "new-to-the-firm" products and services and not to "new-to-the-world" innovations; [iv] among the "new-to-the-firm" products and services, there are "big" products and "small" products; [v] the number of trademark applications depends on industry attributes and the business field where the company operates. Against the background of these points, we have also discussed the difficulty of aggregating trademark data at the firm level.

V. Trademarks and Corporate Outcomes

The purpose of the trademark system is prescribed in the Trademark Act as "through the protection of trademarks, to ensure the maintenance of business confidence of persons who use trademarks and thereby to contribute to the development of the industry and to protect the interests of consumers." As shown in Chapter III, in foreign countries, some empirical studies supporting such legislative intent have been reported. However, in Japan, studies are limited to discussions on the relationship between R&D stock and/or patents and corporate values, and there are extremely few studies on the effect of intellectual properties other than patents. Thus, in this Chapter, the effect of trademark is analyzed based on the corporate outcome approach.

1. Outline of the regression analysis

We employ the Cobb-Douglas production function of the following form:

$$Y = AK^{\alpha}L^{\beta} \qquad (1)$$

where (Y) denotes output (added value), (K) is capital (tangible assets) and (L) is labor. (A) shows the level of productivity. By taking the natural logs of both sides of equation (1), equation (2) is obtained.

$$lnY = lnA + \alpha lnK + \beta lnL \qquad (2)$$

The level of productivity (A) is considered to be dependent on the knowledge stock and

intangible assets in a broad sense. In empirical studies, R&D expenditure, number of patent applications, human capital investments such as training, and IT capital investments (or the stock variables thereof) are often used as the proxy for various types of intangible assets. With reference to Greenhalgh and Rogers (2012), we assume the relationship of equation (3) for (A).

$$lnA = f(R, P, D, TM) \qquad (3)$$

(R) means R&D activities, (P) is patent activities, (D) is design activities, and (TM) shows trademark activities (the proxy variables for each factor are described below). These activities are closely related to the act of putting new products on the market, that is product innovation. New products are expected to realize a higher price premium than that of previous products and thus would lead to increase in the added value. In addition, when process innovation is achieved through R&D or patented inventions, the production cost per unit will be reduced leading to a gain in productivity. Next, Equation (4) is obtained when the specification of (3) is assumed and assigned to (2).

$$lnY = \alpha lnK + \beta lnL + \gamma_1(R/L) + \gamma_2(P/L) + \gamma_3(D/L) + \gamma_4(TM/L) \qquad (4)$$

We use financial data and IP data, namely patents, designs and trademarks. Financial data of Japanese listed companies (except for companies in the finance and insurance sector) was obtained from the data contained in the "Corporate Finance Data Bank" published by Japan Economic Research Institute, Inc. Patent data was obtained from the "IIP Patent Database" by the Institute of Intellectual Property (IIP) while design data was obtained from "NISTEP Design Database" by National Institute of Science and Technology Policy (NISTEP). Trademark data was extracted from the "Standardized Data" (*Seiri Hyojunka* data, in Japanese) offered by the Japan Patent Office (JPO). The sample period is from 2003 to 2010. The number of sample companies was about 1,600 to 1,800 a year and slightly less than 14,000 companies in total. Companies in the manufacturing industry accounted for 62% of total companies while companies in the service industry (including utility companies) covered 30%.

Dependent variables are natural logarithm of the added value (V). The added value was calculated by summing up the operating profits, personal expenses, rental expenses, taxes and dues, paid patent fee, and depreciation expenses.

As explanatory variables, total tangible fixed assets were used for capital (K) and the number of employees at year end was used for labor (L). Both (K) and (L) are natural logarithm as of the end of the preceding term. The level of productivity (A) was assumed to be affected by R&D activities (R), patent activities (P), design activities (D), and trademark activities (TM). Since the

knowledge and ability generated by these activities are considered to be accumulated and contribute to productivity, they might be treated as stock variables. However, we employed flow variables in light of the availability of long-term design and trademark data as well as the considerations made in existing literature (e.g., Hall, 2000; Greenhalgh and Longland, 2005). Specifically, as the factors assumed to affect productivity, the figures obtained by dividing the following elements by the number of employees were added to the explanatory variables: [i] R&D expenditure; [ii] number of patent applications; [iii] number of design registrations; and [iv] number of trademark applications.

Moreover, the variables mentioned in [ii] to [iv] above aggregated at the market level (which is equivalent to the minor industry level of the Japan Standard Industrial Classification) are introduced as the variables indicating the competitive situation in the market faced by the relevant company. Specifically, they are defined as the variables obtained by dividing the total number of trademark applications filed by all of the companies in the market except the relevant company itself by the total number of employees of such companies (the same method is used for patents and designs). It was expected that if trademarks were used in a strictly competitive environment, like a zero-sum game, the relevant variable will have a negative coefficient and that a market-stealing effect of trademarks will be detected.

2. Estimation results

The following results were obtained by the panel estimation including the firm fixed effects and year dummies to absorb the macro-shock that affects output of the firm targeting all sample companies, manufacturing companies and service companies in a broad sense.

The coefficient of the labor was consistently significant and positive. The coefficient of capital saw a decrease in the significance in the regression on manufacturing companies but generally showed a positive effect against the added value. Accordingly, a basic relationship was confirmed that the increase in capital and labor expands output.

The variables concerning R&D and intellectual property rights introduced as the factor determining productivity (A) showed a significant positive coefficient only with respect to the number of patent applications. This effect was observed regardless of industry, suggesting that the more actively patent applications are filed the more productivity increases. However, the effect of activating applications for designs or trademarks could not be confirmed.

Next, variables reflecting the competitive situation within the market faced by the relevant company were added. Each variable is measured by the intensity of IP activities at the market level. Although no significant effects could be found in the estimation covering all industries, the variable

showing the competitive situation measured by trademark applications had an almost significantly positive coefficient ($p = 0.105$) in the regression on manufacturing companies.

The results related to trademarks can be summarized as follows from the abovementioned results and the results of pooled OLS estimation conducted in a supplementary manner (using the industry dummies equivalent to the middle classification instead of the firm fixed effects). Companies actively filing applications for trademarks can be observed as having constantly put new products on the market and making efforts to accumulate goodwill and brand strength based on trademarks. Accordingly, price premium is generated for the goods or services of such a company and it will show high productivity in comparison with other companies. However, on average, the effect of intensifying trademark activities does not exist. With respect to the competitive situation related to trademarks, it was assumed that the relevant company's share would be taken away in the short-term if competitors actively put new products on the same market with trademarks (market-stealing effect). However, the estimation results did not support such an hypothesis, and rather it was revealed that increased competition pressure expands the company's output when other conditions are constant. This suggests that there are externalities such that the increase in the variation of products with trademarks led to an increase in the awareness of the product (or a product group including it) and thereby led to efficiency improvement mainly in downstream processes such as sales and distribution.

VI. Conclusion

In this study, trademark applications and applicants' behaviors in Japan were examined whether or not trademark data can be used as an innovation indicator that complements patent data. We confirmed the veracity of this notion, as also suggested by Mendonça et al. (2004). The complementarity between patents and trademarks as innovation indicators is attributed to their differences vis-à-vis markets, innovation process stages and applicants. Thus, trademark data can be justifiably and widely applied for the purposes of innovation policy-making. In addition, as a result of an empirical analysis into the relation between trademark applications and corporate outcomes (productivity), it was revealed that there was no effect of intensifying trademark activities (intensity of the number of trademark applications to the number of employees), but productivity improved when competitors launched more new products with trademarks in the same market. This suggests an externality such that the increase in the product variations led to an increase in product (or product group) recognition, thereby leading to efficiency improvements mainly in downstream processes such as sales and distribution.

Here, we discuss the remaining issues. First, there is a problem of trademark data and

connectable data. It is thought that trademark data will demonstrate potential when connected with other economic data. For example, if it is an application that analyses innovation activities of small and medium enterprises (SMEs) that are difficult to capture with patent data, the attribute information on who is the trademark applicant is crucial. However, data on such SMEs is extremely difficult to obtain. It is important to this research field that corporate data that can be used in combination with intellectual property (IP) data are systematically collected and easily available. Second, in light of this and existing studies, it is appropriate to a certain degree that companies filing trademark applications are achieving innovation successes. However, it is not always clear whether companies achieving innovation successes are filing trademark applications. As a result of the regression analysis employed herein, it was found that there was no effect to make such companies intensify trademark activities. However, the cause therefore remains unclear, i.e., whether it is caused by lack of contribution of trademarks on firm performance or lack of filing trademark applications for innovation. Nevertheless, it is extremely important to identify such causes in considering the significance of trademark applications.

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