WIPO - UNU Joint Research Project

Impact of the Intellectual Property System on Economic Growth

Fact-Finding Surveys and Analysis in the Asian Region

Country Report - Japan

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1. Introduction

1.1 Outline of the Present Intellectual Property System in Japan

Japan enforces all of the major intellectual property laws including patent law, utility model law, design law, trademark law and copyright law. Intellectual property laws are thought to have played an important role in the development of the Japanese economy.

A patent is one of the most effective types of intellectual property for achieving economic development. In the 1980's, the number of Japanese patent applications increased although the number of patent applications filed annually has remained approximately the same since that time. (Fig.1)[1]

Japan has accelerated the nation's intellectual property policy since the Japanese prime minister's statement in 2002. The Basic Law on Intellectual Property was enacted in 2002. Based on this basic law, the Intellectual Property Strategy Headquarters was established, and the Intellectual Property Strategic Program[2] has been published annually. The goal of the intellectual property policy is to transform Japan into an IP-based nation.

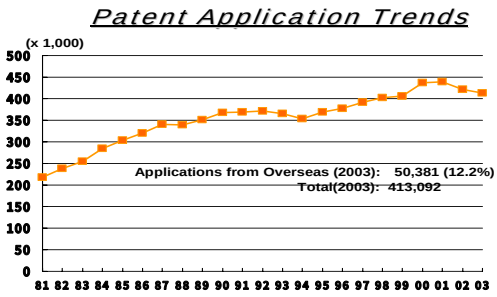

Fig.1 Patent Application Trends

1.2 Outline of the Present Economic Situation in Japan

In Japan, GDP increased until the late 1980's. In those days, electrical appliances and automobiles were major products, and these industries were growing. However, Japan had been in the midst of an economic slump since the late 1980's. The growth of GDP was relatively slow in 1990's. (Fig.2)[3]

Recently, the Japanese economy has been improving because GDP has increased due to the growth of certain industries including machinery, automobiles, pharmaceuticals, and information technology (IT).

The IT industry is one of the fastest growing industries, and the sales of IT products such as computers and cellular phones have been increasing in Japan.

There seems to be a close relationship between intellectual property and economic growth because similar patterns are displayed in Fig. 1 and Fig. 2.

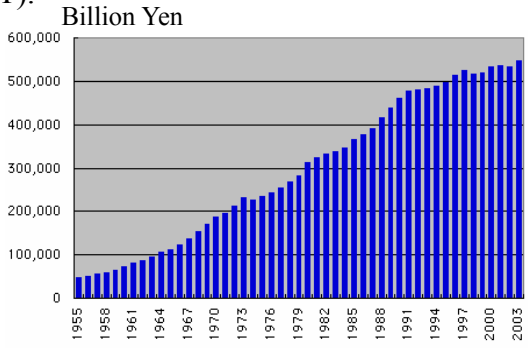

Fig.2 GDP Trends

2. Survey on Reforms towards IP - based Economic Development

2. 1 Brief History of Intellectual Property Laws and Policies in Japan

2.1.1 Patent System and Utility Model System

In Japan, it became clearly apparent that a patent system must be created in order to speed up the modernization efforts which began in the latter half of the 18th century, and the "Patent Monopoly Act" was publicly proclaimed in Japan in 1885. In addition, the New Utility Model Law was enacted in 1905 in order to complement the patent system.

The patent system was gradually created in the following years. The system for assigning priority to the date on which a patent application for an invention was filed rather than to the date on which the invention was discovered, which had been the policy up until that point, started under the Patent Law which was adopted in 1921. This created the foundation on which the current system of patent laws is based. In 1959, the patent law was completely revised so that it was very similar to the present patent law. In 1975, the patent law was amended, and the patent system for substances was introduced.

For past 10 years, the patent law was revised almost every year because of the recent policy for the strong protection of the intellectual property in Japan.

2.1.2 Design System and Trademark System

The first examples of the protection of design in Japan were the design bylaws adopted in 1888. There were several revisions of the design laws in the following years, and the current design law in Japan was the result of a complete revision of the design law in 1959.

The first trademark law was enacted in Japan in 1884, one year before the "Patent Monopoly Act" was adopted. Subsequently, there were several reforms of the trademark law, similar to the reforms of patent law, and the current trademark law was the result of a complete revision of the trademark law in 1959.

2.1.3 Intellectual Property Policy

The Act Promoting Technology Transfer from Universities to Industry (so called, TLO Law) was enacted in 1998, and technology transfer from university to industry was promoted.

The Basic Law on Intellectual Property was issued in 2002. Based on this basic law, Intellectual Property Strategy Headquarters was established in 2003, and the Intellectual Property Strategic Program has been annually revised since 2003. The local government also introduced the Intellectual Property Strategic Program to rural regions in 2003.

2.2 Identification of Reforms towards IP-based Economic Development

2.2.1 Introduction of Patent System for Substances in 1975

In 1975, the patent system for substances was introduced, and in that year, the Japan Patent Office started to issue patents for substances.

The number of patents granted to inventors in the pharmaceutical industry has increased since the introduction of patent system for substances. (Fig. 3)[4]

The R&D expenditures in the pharmaceutical industry has also increased since the introduction of the patent system for substances. (Fig. 4)[5]

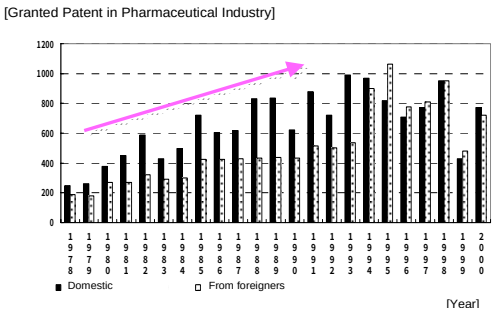

Fig.3 Patents Granted in the Pharmaceutical Industry

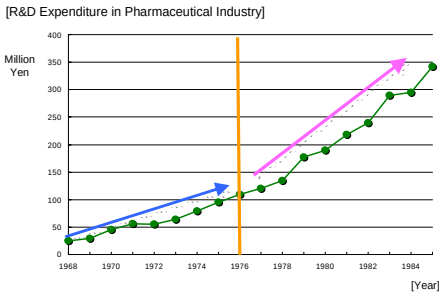

Fig. 4 R&D Expenditures in the Pharmaceutical Industry

Technology trade in the pharmaceutical industry has increased since the introduction of the patent system for substances. (Fig. 5)[6]

In Japan, new medicines are approved for production and sale by the Ministry of Health, Labor and Welfare. The number of medicines approved by the Ministry of Health and Welfare has increased since the introduction of the patent system for substances.

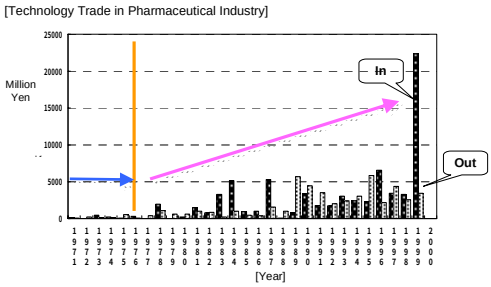

Fig.5 Technology Trade in the Pharmaceutical Industry

2.2.2 Promotion of Policy for Patent Licensing in 1998

The Act Promoting Technology Transfer from Universities to Industry was enacted in 1998, and TLOs (Technology Transfer Organizations) were established in many regions of Japan. Through TLOs, the technology transfer from university to industry was advanced. Contracts concluded under the Promotion Policy for Patent Licensing has increased since TLO law was enacted. (Fig.6)[7] The economic impact of the promotion of policy for patent licensing has increased since the the enactment of the TLO law. (Fig.7)[8]

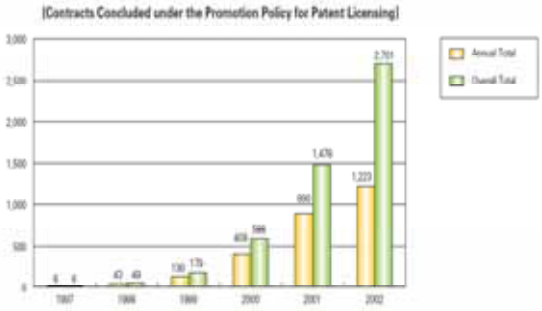

Fig.6 Contracts concluded under the Promotion Policy for Patent Licensing

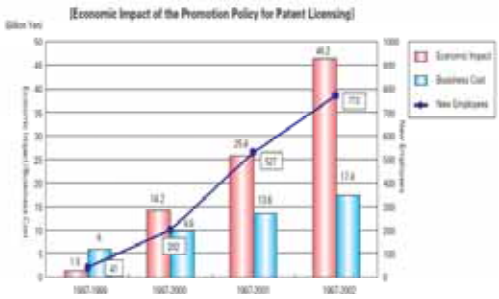

Fig.7 Economic Impact of the Promotion Policy for Patent Licensing

2.2.3 Enactment of Basic Law on Intellectual Property in 2002

The Basic Law on Intellectual Property, which established very fundamental rules on intellectual property, was enacted in 2002,.

The Basic Law on Intellectual Property has had a significant impact on Japanese society because it was the basis for establishing the Intellectual Property Strategy Headquarters and is the basis for planning the Intellectual Property Strategic Program.

One of the impacts of the Basic Law on Intellectual Property has been the change in the competitiveness ranking of Japan among the nations of the world after the year of 2002. (Fig. 8)[9]

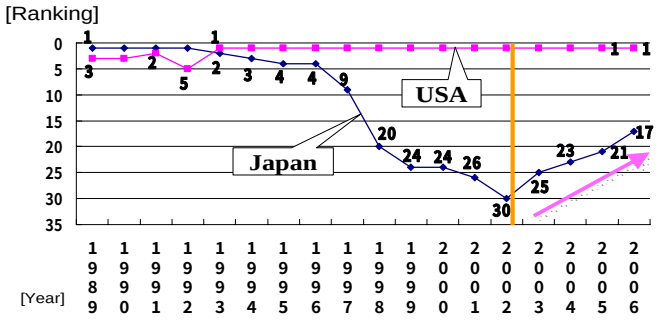

Fig.8 Ranking of World Competitiveness

2.3 Results of Analysis

In this section of our paper, the relationship between the intellectual property system and economic growth was examined. We focused on three measures: i) the introduction of the patent system for substances in 1975, ii) the advancement of policy for patent licensing in 1998 and iii) the enactment of the Basic Law on Intellectual Property in 2002.

As a result of the introduction of the patent system for substances in 1975, the number of granted patents, R&D expenditures, and technology trades in the pharmaceutical industry has increased since 1975.

As a result of the promotion of policy for patent licensing in 1998, the number of contracts made under the advancement of policy for patent licensing has increased since 1998. Additionally, the economic impact of the promotion policy for patent licensing was reported.

As a result of the enactment of the Basic Law on Intellectual Property in 2002, the competitiveness ranking of Japan among the world has been rising since 2002.

According to the data before and after the introduction of these measures, the number of granted patents, R&D expenditures, technology trades, and licensing contracts increased. This means that it is possible that a relation exists between the intellectual property system and economic growth.

3. Case Studies on Companies Utilizing the IP System to develop Business or increase Economic Activity

3.1 Comparison of Company Data among Major Industrial Fields

The number of patent applications filed annually with the Japan Patent Office has remained high at more than 400,000 since 1998. (Fig.9)[10] The number of applications in all the technical fields has remained approximately the same.

If all the company data is displayed in one figure, no trends are indicated. Therefore, it is necessary to divide the data by technical field as follows.

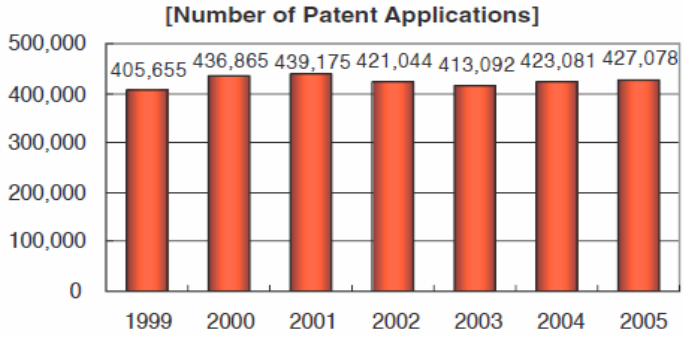

Fig.9 Recent Patent Applications in Japan

3.1.1. Pharmaceutical Industry

Patents for substances tend to have a significant economic impact because the invention of substances can be usually applied to a lot of other technologies widely. Therefore, IP strategy is very important for pharmaceutical companies.

Five major companies in the pharmaceutical field were selected. The royalties of these five companies has increased since around 1999. (Fig.10)[11] This trend seems to have been caused by a change in intellectual property policy to place priority on utilizing patents rather than obtaining patents.

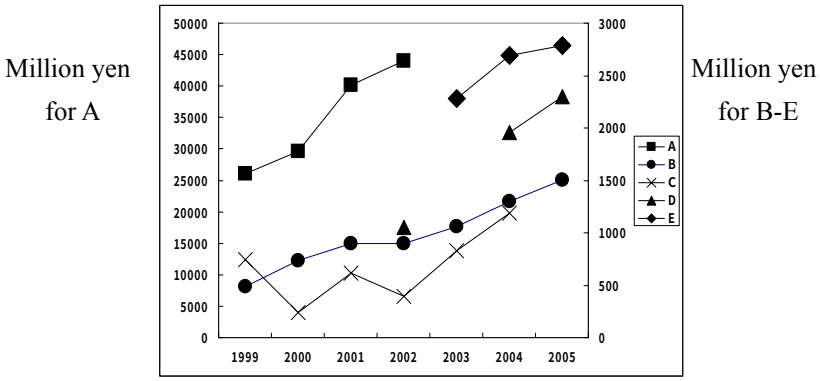

Fig.10 Royalties of Five Pharmaceutical Companies

Takeda Pharmaceutical Company Limited is one of the IP-based companies in the pharmaceutical field in Japan. Technological level in the pharmaceutical field is changing rapidly because biotechnology plays an important role for development of new medicines. Takeda is applying many patents of biotechnology in order to develop biotechnology-related new medicines. Takeda has connected IP division and the research division in order to plan IP strategy effectively. Takeda has advanced strategic patent applications and the utilization of IP, which provided a lot of royalty to Takeda. Intellectual property has been one of the most important factors for current Takeda's success.

3.1.2 Information Technology Industry and Manufacturing Industry

The manufacturing industry is growing. The IP system might be contributing to this growth because the royalties in this industry have been increasing as follows.

Five major companies in the information technology and manufacturing industries were selected. The royalties of companies in the information technology industry have increased since around 1999. (Fig.11)[12] Intellectual Property Policy has changed to place priority on utilizing patents over obtaining patents. This trend in royalties seems to have been caused in part by intellectual property policy.

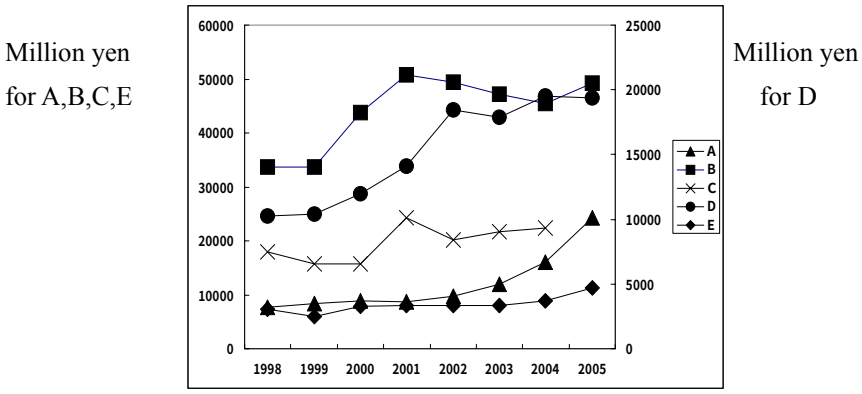

Fig.11 Royalty of five IT and Machinery companies

Sony is one of the IP-based companies in the field of the information technology. The economic growth in this field has been very active because of the diffusion of digital technology. Sony is actively utilizing IP, and selecting IP strategy from self-utilization, license and cross-license in respective cases. Recently, Sony collaborated with Samsung in the utilization of IP. Sony's IP strategy includes so called "the patent portfolio", which has been applied to the Organic electroluminescence (EL) display in Sony. Sony's IP strategy also includes so called "the patent pool" because many patents tend to be included in one product. Intellectual property has been one of

the most important factors for current Sony's success.

Canon is one of the IP-based companies in the field of manufacturing of precision instruments. Many patent applications tend to be filed in this field because manufacturing technology covers many technical fields. Canon is one of the companies which have applied many patents in this field. Canon has traditionally put high priority on the intellectual property as its culture. Canon has encouraged researchers to apply patents as well as scientific reports. Then, the section of the intellectual property has linked to that of R&D. Management for the intellectual property has been one of the most important factors for current Canon's success.

3.1.3 Automobile Industry

Five major companies in the automobile industry were examined. The R&D expenditures of the companies in the automobile industry have increased since around 1999. (Fig.12)[13] It means that new technology is being aggressively created in this field. Companies are applying aggressively for patents because of the competitive nature of the industry.

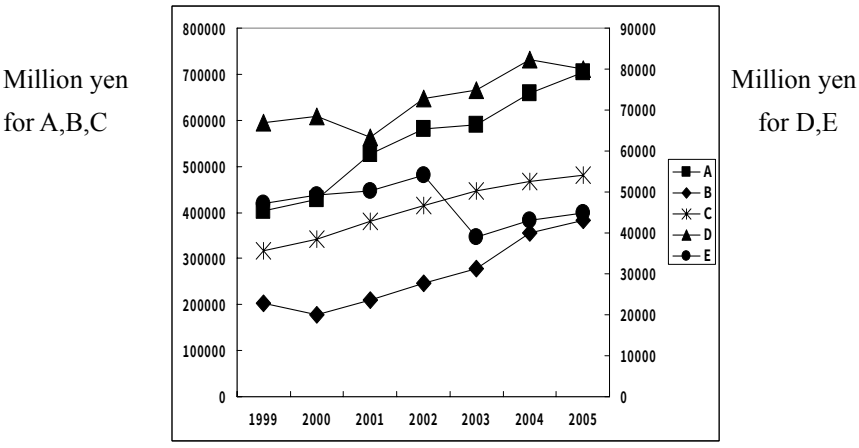

Fig.12 R&D Expenditures of Five Automobile Companies

Toyota is one of the IP-based manufacturers in the automobile industry. The patent applications are of high quality, and this trend is very stable in the automobile industry. Also, R&D expenditures are the same trend as the patent application. Toyota's IP strategy includes so called "the patent portfolio", which has been applied to many automobile because they are comprised of many intellectual properties. Toyota is advancing selected important fields by the analysis of the patent application trends. Intellectual property has been one of the most important factors for current Toyota's success.

3.2 Results of Analysis

The annual number of patent applications filed in Japan has remained relatively unchanged at more than 400,000 since 1998. If all company data put is displayed in one figure, there is no apparent trend. Therefore, it is necessary to divide the data by technical field.

In the pharmaceutical field, the royalties of five major companies have increased since around 1999, which seems to have been the result of intellectual property policy. IP strategy is very important for pharmaceutical companies because patents for substance tend to have a significant economic impact. Takeda is representative company in the pharmaceutical field, and advancing the strategic patent application and utilization of patents.

In the information technology and manufacturing fields, the royalties of five major companies have increased since around 1999, which seems to have been the result of intellectual property policy. SONY is representative company in the information technology field, and advancing “Patent Pool”.

In the automobile industry, the R&D expenditures of companies has increased since around 1999, which means that new technology is being aggressively created in the automobile industry. Toyota is representative company in the automobile industry, and advancing “Patent Portfolio”.

Major technological fields have their own characteristics related to company’s IP strategy as above in Japan.

4. Analysis of Reforms that Exerted Influence on Economic Development Underpinned by the IP System using Economic Models

We carried out an econometric analysis of the impact of the Intellectual Property (IP) Strategic Program implemented by the respective local governments since 2003 by using public data. Some prefectures have been promoting IP strategic programs since FY2003. These strategies are diverse, but they all intend to promote the creation, protection and use of IP rights and to revitalize their local economies.

However, a quantitative analysis has not been carried out yet as to whether these IP policies have been effective. In this section, we analyze, to the extent possible, how the IP strategic programs by local governments have affected their local economies by using the currently accessible data.

4.1 Establishing the Economic Models

We use the difference-in-differences analysis, which has been widely used in recent years for analysis related to policy evaluation.[14] This method, which applies conventional econometric analysis techniques, allows a more accurate estimation of policy effects than before. Therefore, it is used for estimating the effects of a wide range of policies including labor and medical policies.

The estimation formula is as follows.

$Y_{it} = \alpha_0 + \alpha_1$ (dummy for a prefecture that formulated an IP strategy)$_i + \alpha_2$ (dummy for the year of IP strategy formulation)$_t + \alpha_3$ (dummy for a prefecture that formulated an IP strategy)$_i \times$(dummy for the year of IP strategy formulation)$_t + X_{it}\alpha_4 + \varepsilon_{it}$

The subscript i indicates the prefecture and the subscript t indicates the year. Y is an explained variable. In this paper, the number of patent filings per employee or per prefectural gross production or the number of trademark filings per employee or per prefectural gross production are used as the explained variable. The number of patent filings and the number of trademark filings are based on data from the “Japan Patent Office Annual Report” compiled by the Japan Patent Office, and the number of employees by prefecture is based on the 2003 data from the “Monthly Report on Prefectural Statistics” compiled by the Cabinet Office.

The dummy variable for a prefecture that has formulated an IP strategic program is 1 for a prefecture that has formulated an IP strategic program by FY2004 and 0 for any other prefecture. Since IP strategic programs have been formulated by prefectures either in 2003, 2004 or later, an ordinary year dummy is used as the dummy for the year of IP strategy formulation. The data source is the “Progress Status of IP Strategies: Reference Materials for the IP Strategic Program 2006,” Intellectual Property Policy

Headquarters. If the formulation of an IP strategy by a prefecture has had an effect on the number of patent filings or trademark filings, α_3, which is the coefficient of the cross term between (dummy for a prefecture that formulated an IP strategy) $_i$ and (dummy for the year of IP strategy formulation) $_t$, should be significantly positive statistically.

X is a control variable. The natural log-transformed prefectural gross production, percentage of primary industry, and growth rate of the number of the employed is used as this control variable X. Since companies' IP activities including patent filings and trademark filings are likely to be more active in prefectures where economic activities are more vigorous, the coefficient of the natural log-transformed prefectural gross production is expected to be significantly positive. In addition, R&D activities are likely to be less active in prefectures where the percentage of the primary industry is higher. Therefore, the coefficient of the percentage of the primary industry is expected to be negative. The growth rate of the number of the employed is a variable that expresses the growth potential of the prefecture's economic activities. Since prefectures with higher economic growth are likely to produce more IP, the coefficient of the growth rate of the number of the employees is expected to be significantly positive.* An estimation is made based on the least-squares method.

4..3 Results of Analysis

The results of the analysis are as shown below. First, a statistically significant increase was observed in the number of patent filings and the number of trademark filings in the prefectures that formulated an IP strategic program. Secondly, when we categorized the prefectures into groups by the fiscal year in which they formulated their IP strategic program, and estimated the effects of their IP promotion plans, we found a significant change in the number of patent filings and the number of trademark filings only for the prefectures that formulated their IP promotion plans in FY2003. This suggests that IP strategic programs are only effective in progressive prefectures and not necessarily in all prefectures.[15]

* As a matter of course, it is also possible to show that economic growth was achieved as a result of active IP protection. Thus, we cannot deny the possibility that there is a simultaneity problem. However, as we do not pay attention to the coefficient of the growth rate of the number of the employed in this paper, we carry out the analysis without referring to this problem.

Explained Variable	Number of Patent Filings/Number of the Employed	
Model	OLS	OLS
Dummy for the period after IP strategy formulation	2.42852**	
	(0.95076)	
Dummy for the period after IP strategy formulation （Introduction in FY2003）		2.50901**
		(1.19847)
Dummy for the period after IP strategy formulation （Introduction in FY2004）		-1.07400
		(2.23025)

Explained Variable	Number of Patent Filings/Prefectural gross production	
Model	OLS	OLS
Dummy for the period after IP strategy formulation	0.23857**	
	(0.09936)	
Dummy for the period after IP strategy formulation （Introduction in FY2003）		0.22379*
		(0.12652)
Dummy for the period after IP strategy formulation （Introduction in FY2004）		-0.10895
		(0.23545)

Explained Variable	Number of Trademark Filings/Number of the Employed	
Model	OLS	OLS
Dummy for the period after IP strategy formulation	0.74163***	
	(0.25606)	
Dummy for the period after IP strategy formulation （Introduction in FY2003）		0.86128**
		(0.34341)
Dummy for the period after IP strategy formulation （Introduction in FY2004）		0.01964
		(0.63905)

Explained Variable	Number of Trademark Filings/Prefectural gross production	
Model	OLS	OLS
Dummy for the period after IP strategy formulation	0.07492***	
	(0.02678)	
Dummy for the period after IP strategy formulation （Introduction in FY2003）		0.07740**
		(0.03635)
Dummy for the period after IP strategy formulation （Introduction in FY2004）		0.01131
		(0.06765)

5. Discussion and Proposal

- In the part of "Survey on Reforms towards IP-based Economic Development," we focused on three measures: i) the introduction of the patent system for substances in 1975, ii) the introduction of the Act Promoting Technology Transfer from universities to industry in 1998 and iii) the enactment of the Basic Law on Intellectual Property in 2002. According to the data before and after the introduction of these measures, the number of granted or applied patents, R&D expenditures, technology trades or licensing contracts greatly increased. This means that it is possible that a relation exists between the IP system and economic growth in Japan. It suggests that IP system is one of the success factors for high economic growth in Japan since 1970's. It is useful for many Asian countries to learn these factors for Japanese success. It is proposed that Japan should explain these results as "Japan's success cases" not only in Japan but also other countries in Asia.

- In the part of Case Studies on Companies, we focused on four industries related to pharmaceutics, information technology, machinery and automobile. In the pharmaceutical industry, the royalties of five major companies has increased since around 1999, which seems to have been the result of recent IP policy. Takeda is representative company in the pharmaceutical field, and Takeda's IP strategy put a higher priority on utilization of IP than application of IP. In the information technology and manufacturing industries, the royalties of five major companies have been stably high or increased since around 1999. Sony and Canon are representative companies in these fields, and they have their own IP strategies such as "patent pool" and "cross-license". In the automobile industry, R&D expenditure has increased since around 1999, which suggests that new technologies are being aggressively created in this field. Toyota is representative company in the automobile field, and "patent portfolio" is one of IP Strategy of Toyota. It is proposed that Japan should plan the IP Strategic Program for each major technology such as the information technology and biotechnology, because IP strategies are different among technological fields. Also, Japan should advance utilization of IP more than application of IP in order to activate Japanese economy.

- In the part of Economic Analysis**,** a statistically significant increase was observed in the number of patent filings and the number of trademark filings in the prefectures that formulated Intellectual Property Strategic Programs. It is proposed that Japan should encourage the local governments to plan Intellectual Property Strategic Programs for their own prefectures, which is expected to be effective on local IP creation and local economic growth in Japan.

<Reference>

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[8] Japan Patent Office,"Trends and issues on Industrial Property Right" (2007)

[9] IMD,"World Competitiveness Yearbook"

[10] Japan Patent Office,"Trends and issues on Industrial Property Right" (2007)

[11] Modified Data based on IPB Corporate Patent & Financial Statistics Database((c)Intellectual Property Bank Corp.)

[12] Modified Data based on IPB Corporate Patent & Financial Statistics Database((c)Intellectual Property Bank Corp.)

[13] Modified Data based on IPB Corporate Patent & Financial Statistics Database((c)Intellectual Property Bank Corp.)

[14] For details on difference-in-differences analysis, see Wooldridge (2005) or other literature.

[15] National Graduate Institute for Policy Studies,"Report about IP and Local Government"(2007)