

A Study on University Patent Portfolios (2): The Impact of Intellectual Property Related Policies and the Change into Corporation of National University

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1. Objective

Universities' activities regarding intellectual property are changing greatly. This study selected three national university corporations as model universities, ascertained all information relating to patent applications between 1993 and 2006, and clarified the status of universities' intellectual contributions in the form of patent applications. By means of an overall analysis, the study elucidated commonalities and differences regarding university patents at the three universities, and observed the impact on university patents by intellectual-property measures begun full scale around 1998, and the conversion of the national universities into national university corporations in 2004. The three universities selected as models for the study have varying sizes of intellectual-property holdings, and their research domains have unique properties as well. This selection made it possible to gain a view of changes in Japan's national university corporations as a whole from the results of the study.

2. Key Points of the Study

Conventionally, studies of university patent applications have mostly employed a sampling approach by applicant. Since this can only ascertain patents belonging to university corporations and TLOs, the numbers of patents have traditionally been under-estimated. Through its study of Tohoku University, however, the National Institute of Science and Technology Policy showed that significant analysis is possible by identifying all patent applications by university researchers working in the role of inventors (these are called "university patents"). This pioneering research showed that before it was incorporated, Tohoku University had made more patent applications than previously known, but that most of these patents belonged to individuals or companies.

The present study adds two more national universities as model universities: Hiroshima University and University of Tsukuba. As in the original study, it identified all patent applications by university researchers acting as inventors (university patents). The study included detailed analysis of the inventors' relationships to their universities and visualization of each university's distinctive technical fields. The study additionally conducts an overall analysis of the patent-application activities of three universities, adding to the first two data from Tohoku University, and considers the impact of intellectual-property measures and the incorporation of

Japan's national universities.

3. Overall Analysis of the Three Universities

The results of the overall analysis of the three universities are shown on the following page. Below is a summary of the three main conclusions.

- 1) Around 1998, a large number of measures relating to intellectual property began to appear in Japan, including the TLO law, the Industry Revitalization Law (the Japanese version of the Bayh-Dole Act), and the Intellectual Property Strategic Program. These measures have increased the number of university patents. Meanwhile, the conversion of the national universities into national university corporations in 2004 affected which organizations were associated with patent applications, rather than total numbers.
- 2) Intellectual property measures increased the numbers of first-time patent applicants among educators (new inventors), which is alleviating the overconcentration of inventors among a small number of individuals and organizations.
- 3) The proportions of applications made jointly with private companies, and the trends thereof, differ according to university. These differences may be a reflection of each university's intellectual-property strategy.

Commonalities among the three universities (1):

Around 1998, Japan began to create a number of measures relating to intellectual property. This began to significantly increase the numbers of university patents, but before their incorporation, most of these patents belonged to private companies conducting joint research with the universities. Meanwhile, following their incorporation the numbers of patents belonging to the universities (or in some cases TLOs) have grown rapidly. Japan has reached an era in which universities lay claim to their intellectual property rights as corporations.

During the period studied (1993 to 2006), the numbers of published university patents (patents in which a university researcher is listed as one of the inventors) were as follows: University of Tsukuba had 782; Hiroshima University had 1,300; and Tohoku University had 4,578. The three universities were found to have the following two points in common.

- Numbers of patent applications are rising at all three universities, and there has been a significant increase since 1998, when intellectual property measures started to come into effect. Some examples of intellectual property measures that have caused an increase in applications are the Law for Promotion of University-Industry Technology Transfer (TLO Law), enacted in 1998; the Industry Revitalization Law (the Japanese version of the Bayh-Dole Act), enacted in 1999; and the creation of the Intellectual Property Strategic Program in 2002.
- Before the incorporation of the national universities, most patents belonged to private companies conducting joint research with the university (or to individual inventors), but after their incorporation there has been a huge increase in so-called institutional patents belonging to the university or its TLO, along with a relative decrease in patents belonging to private companies. Following their incorporation, most national universities have adopted a general policy of seeking institutional patents, and this appears to be a result of this policy.

Incorporation has not changed the amount of intellectual property created by universities, but rather who is claiming ownership over that IP. Before incorporation, the company (or individual inventor) would usually file the patent application with itself (or him/herself) as the inventor for patents created through joint research. After the incorporation of the national universities, however, Japan reached an era in which universities lay claim to their intellectual property rights as corporations.

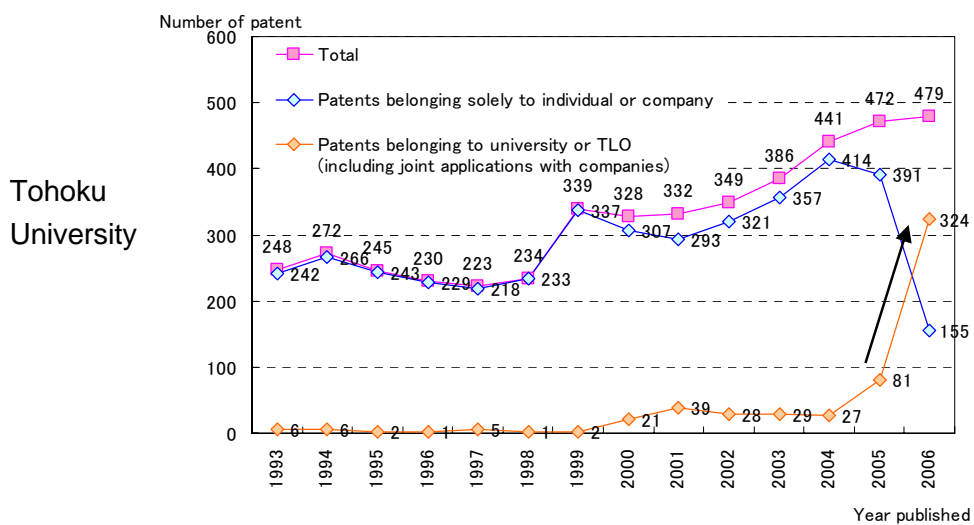
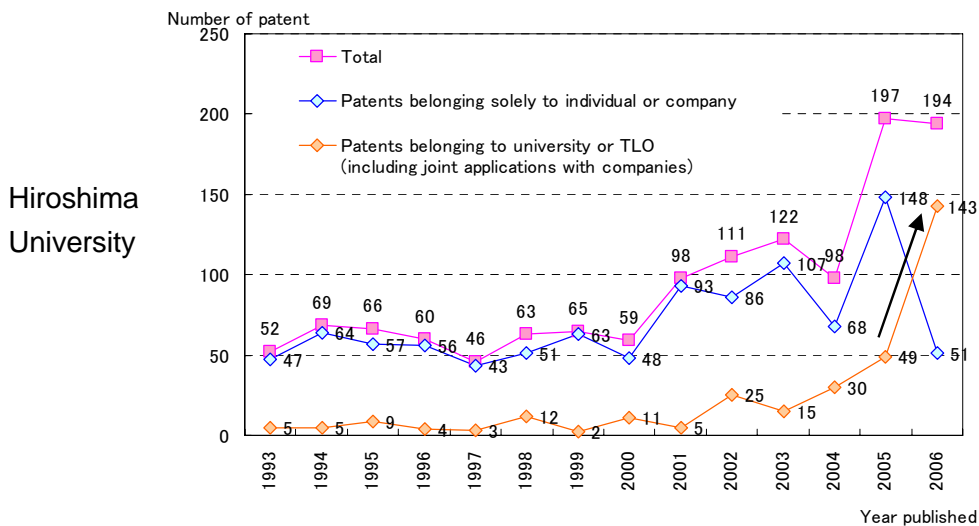
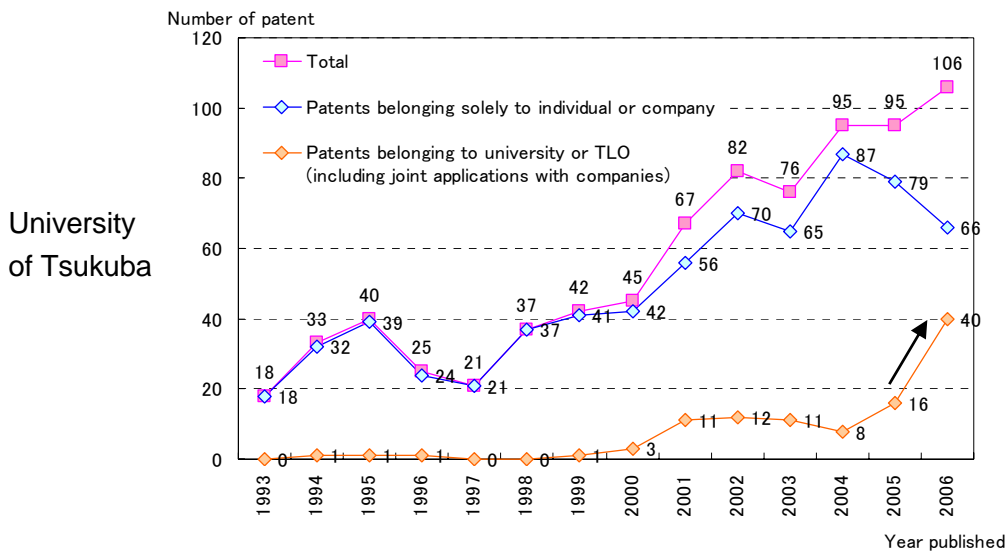


Fig 1. Trends in numbers of patent applications at the three universities

Commonalities among the three universities (2):

Starting around 1999, the numbers of first-time patent applicants among educators (new inventors) began to increase. This is likely due to measures relating to intellectual property, and activities of those involved. This increase in new inventors alleviated the overconcentration of inventors, and should help diversify the intellectual property created by universities.

Could the increase in patent applications be the result a larger number of applications by educators with a passion for intellectual property? Alternately, could it be due to an increase in the numbers of educators involved in patent applications? The study obtained the following data for investigating these questions.

- The number of appearances per inventor each year (number of inventions per year) remained nearly constant at each university, ranging between about 1.4 and close to 2.1 (see Fig. 2).
- At each of the three universities, the numbers of educators involved in patent applications for the first time (new inventors) increased starting around 1998 to 1999 (see Fig. 3). This matches the period in which the total number of university patents began to surge.
- At each of the universities, before incorporation the top few percent of researchers in terms of number of inventions accounted for the majority of all patent applications, while after incorporation the increase in new inventors gradually alleviated this concentration (see Fig. 4).

The overall increase in university patents is likely the result of an increase in the numbers of educators involved in filing patent applications for the first time. In addition to the aforementioned Intellectual property measures, the University Intellectual Property Headquarters Development Project began in 2003, the Industry Collaboration Coordinator program, and other activities may have contributed to the increase in the university inventor population. Nevertheless, only about 20% of educators have contributed to the creation of intellectual property, and nearly all of these made only one or two applications over the 13-year period of the study – and this involvement has only recently begun. It is probably safe to say that there is still room for improvement in the sense of vitalizing universities' patent-creation activities.

Meanwhile, the numbers of first-time inventors are expected to continue to increase, and as a new generation of educators replaces the old, this over-concentration of inventors should be reduced further. As researchers with diverse backgrounds become involved in patent creation as inventors, it should diversify the technological fields in which universities create patents.

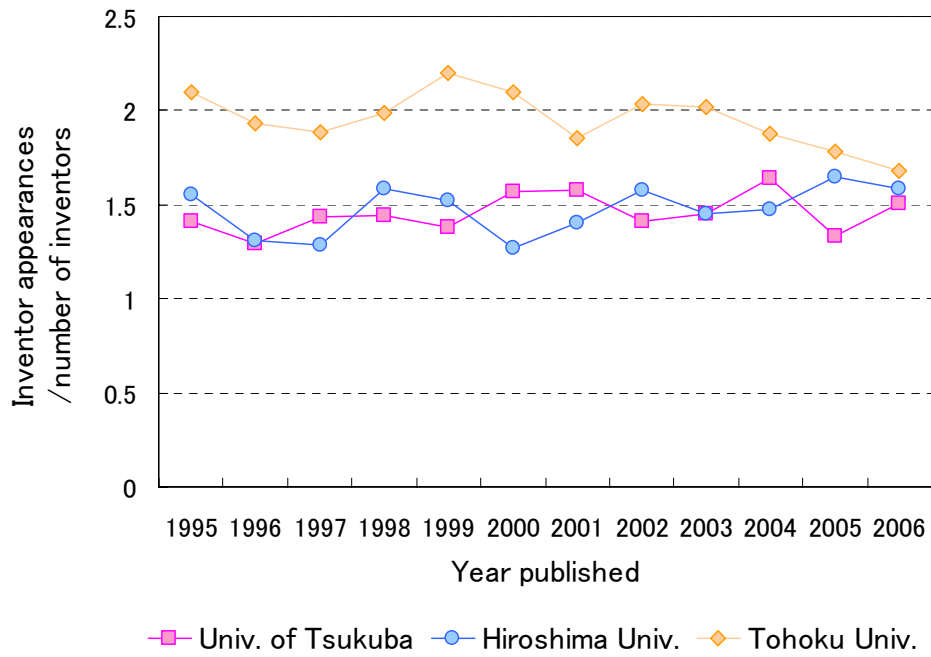


Fig 2. Number of inventions per year per inventor

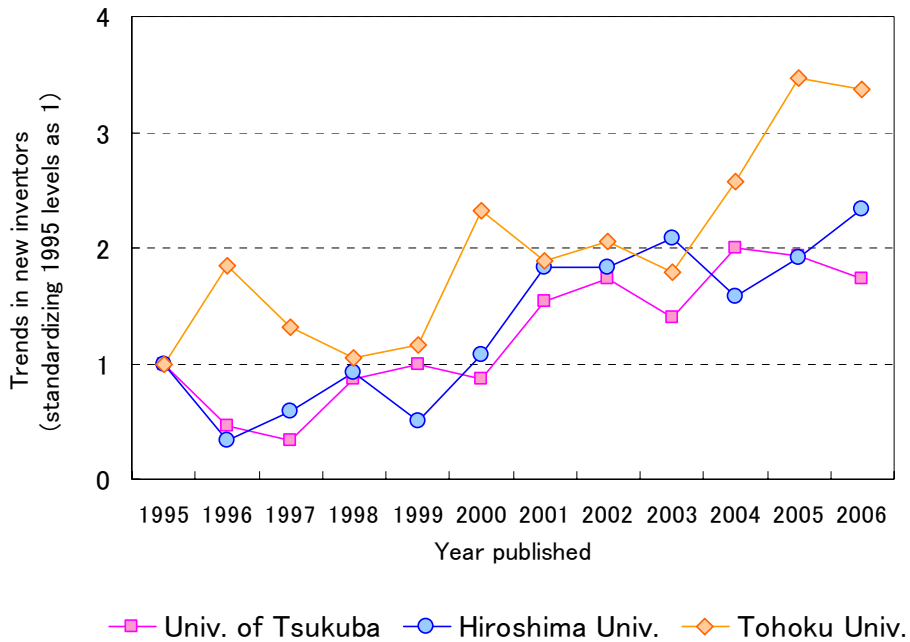
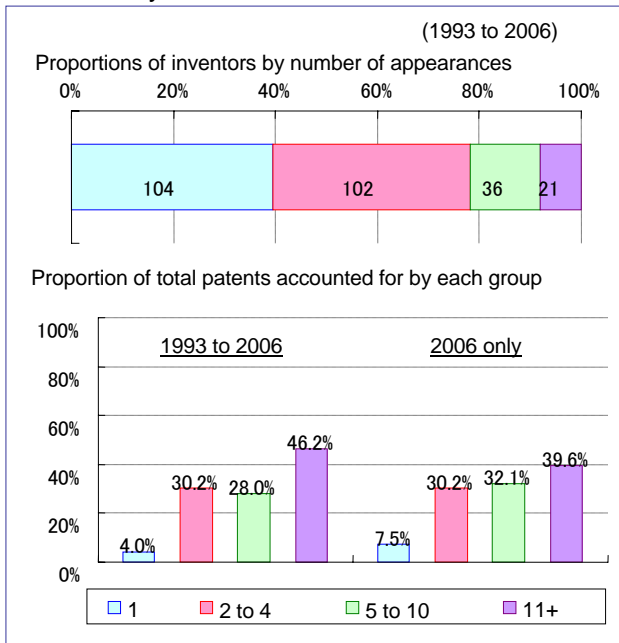
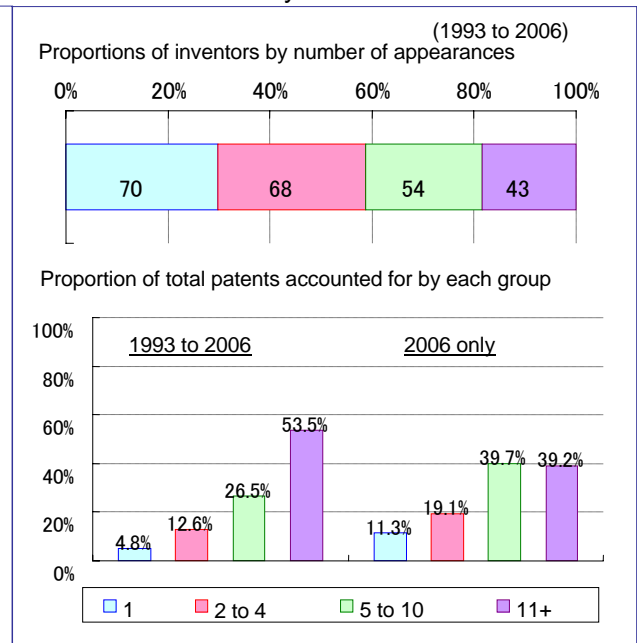


Fig 3. Trends in educators involved in patent applications for first time (new inventors)

University of Tsukuba



Hiroshima University



Tohoku University

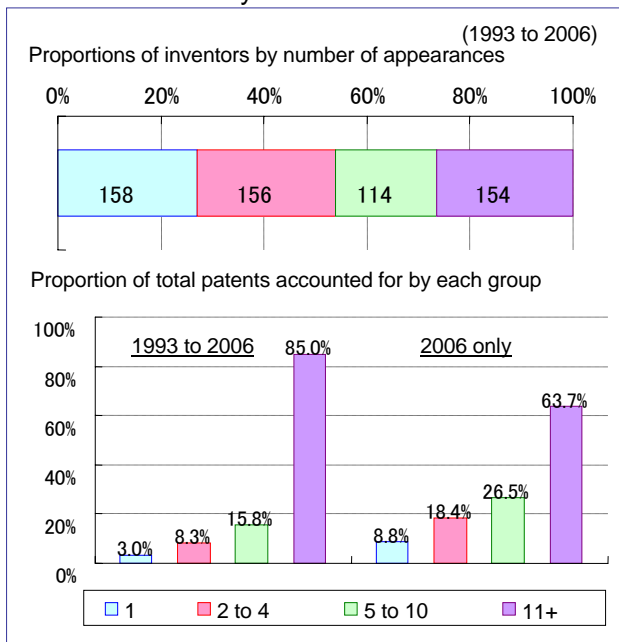


Fig 4. Distributions of people and patent applications due to differences in numbers of inventions

Fields of technology particular to each university:

The fields of technology of the patents applications of each university could be characterized by means of the IPC categories of the patent applications. We visualized the features of each university's fields of technology by means of a patent map, indicating the fields of technology in which each university has a presence.

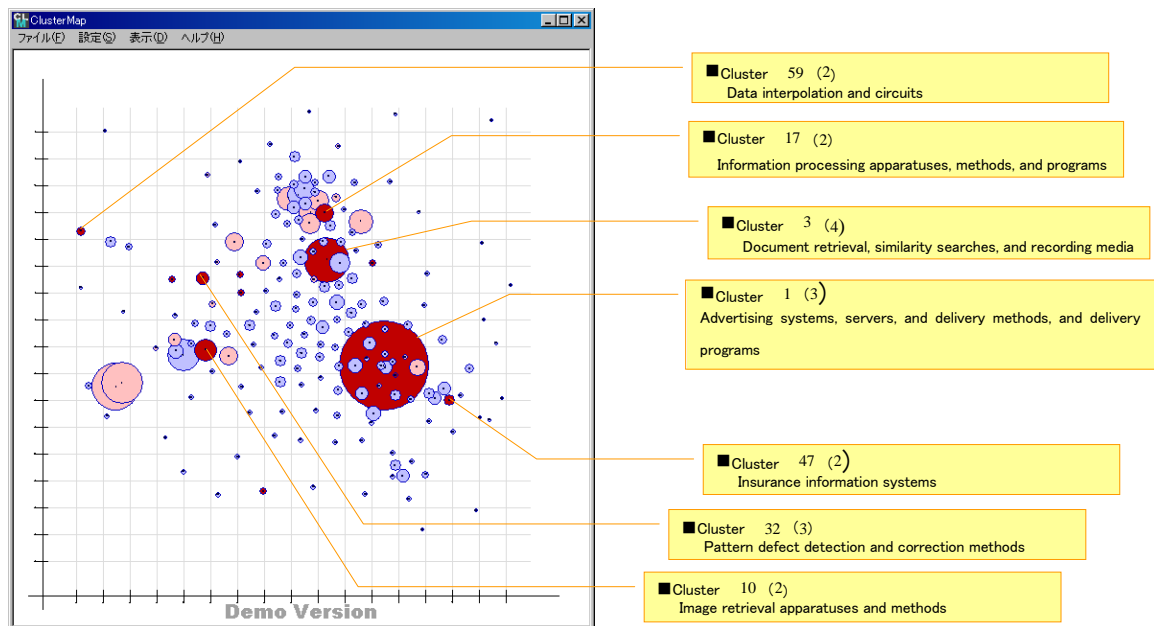


Fig 5. Map of key technology at University of Tsukuba: digital data processing

Note: Cluster colors indicate numbers of university patents at University of Tsukuba. 0: blue; 1: pink; 2 or more: red

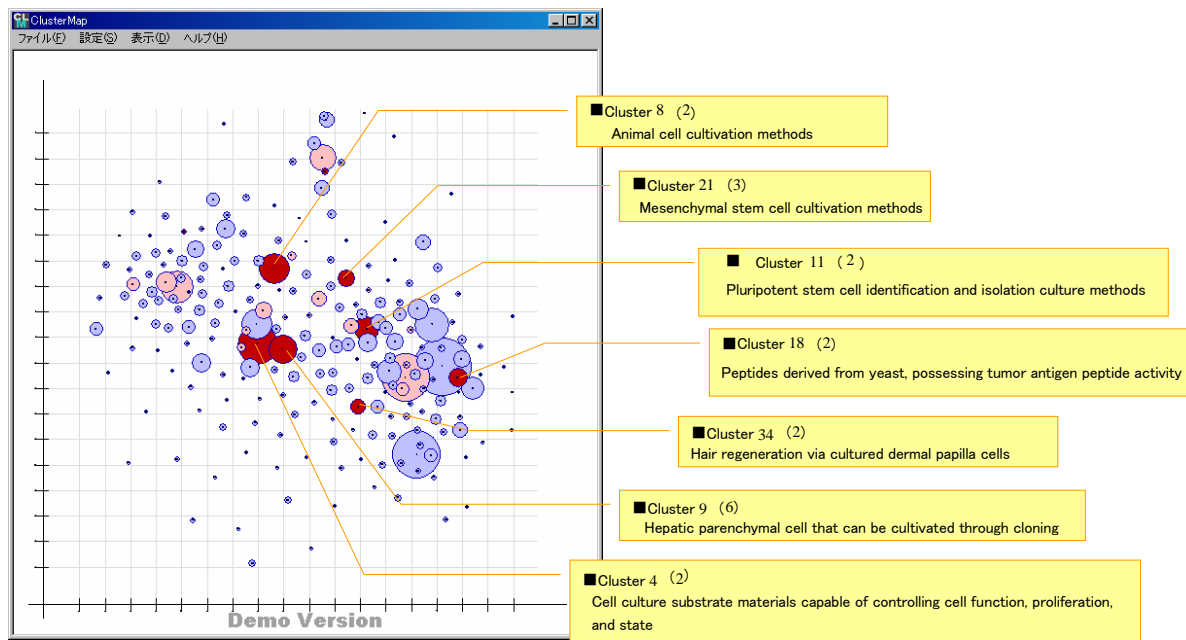


Fig 6. Map of key technology at Hiroshima University: utilization of stem and undifferentiated cells

Note: Cluster colors indicate numbers of university patents at Hiroshima University. 0: blue; 1: pink; 2 or more: red

Differences in university IP strategies:

The proportions of total patents that were filed jointly with companies, and changes in these proportions, differ by university. Filing jointly and singly both have advantages and disadvantages. The differences in the amount of change may be a reflection of each university's intellectual-property strategy.

There are two types of university patent: single applications, in which the university and company/individual researcher file singly, and joint applications, in which these parties file jointly. The expenses until the patent is granted and the use of the patent after it is granted differ greatly depending on whether the filing was made jointly or singly. Studying changes in the ownership of university patents can give a view of the features of the university's intellectual property strategy.

- Before it was incorporated, most of University of Tsukuba's patents were filed singly by private companies. After it was incorporated, however, the numbers of patents filed singly by the university and its TLO on the one hand, and by private companies on the other, were reversed. Meanwhile, the numbers of joint applications remained low, without much change.
- Before it was incorporated, most of Hiroshima University's patent applications were also made singly by private corporations, and after it was incorporated single applications by the university and its TLO made a major turn-around. After it incorporated, its joint applications with private companies also increased, reaching about one third of all applications. As a result, the proportion of patents claimed by the university surged to about 80% of the total, combining single and joint applications.
- Tohoku University has a large number of joint applications. This trend has remained unchanged since 1993. After it was incorporated, however, the numbers of patents filed singly by the university or its TLO have increased, while the number of joint applications remained about the same.

At each of the three universities studied, there have been major changes in the structure of ownership over university patents. The directions and sizes of these changes, however, have differed from one university to the next, reflecting the intellectual property strategy of each university. Filing jointly and singly both have advantages and disadvantages. It is impossible to state categorically which is the best option. For example, over the past few years royalty agreements between universities and private companies have become an issue, and this issue has its roots in joint applications.

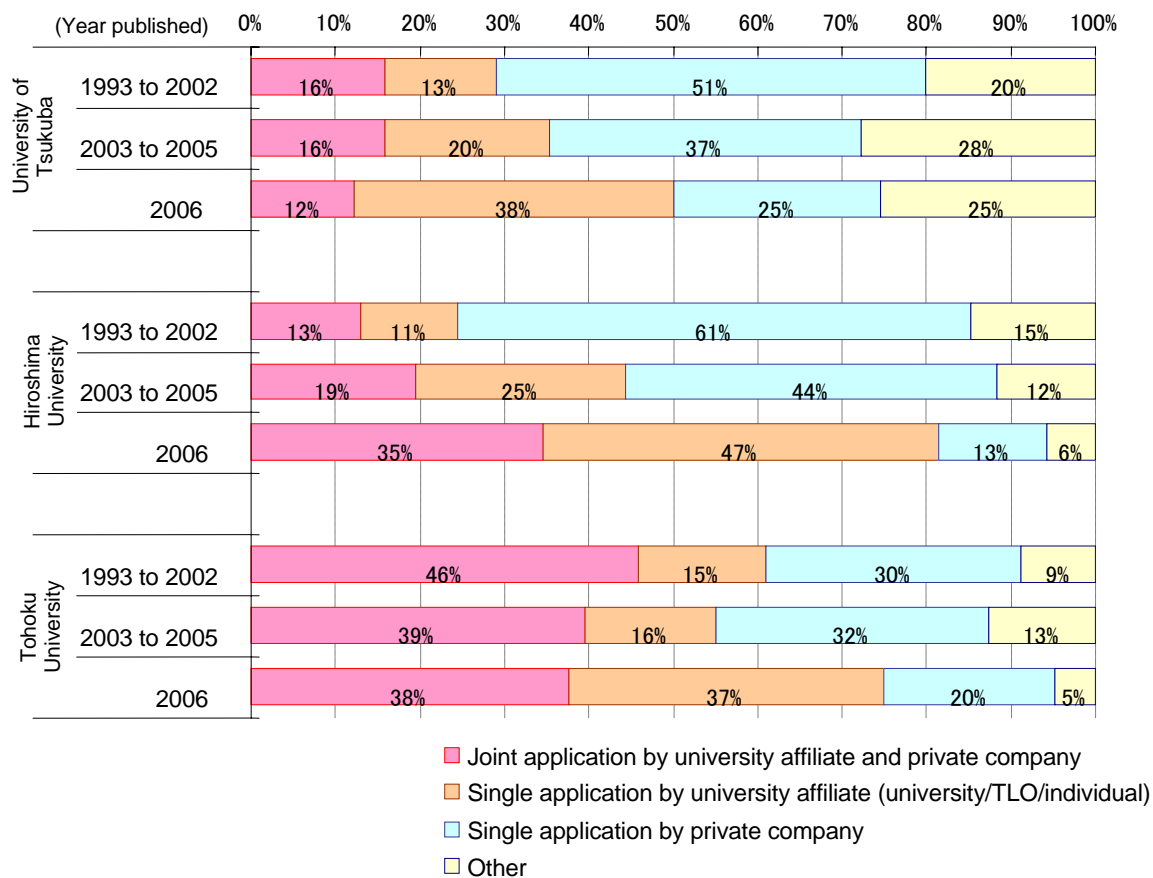


Fig 7. Proportion of joint / sole applications

(Other: mainly Japan Science and Technology Agency (JST) and the New Energy and Industrial Technology Development Organization (NEDO))

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