Preliminary Study on Regional Science and Technology Promotion

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2nd Theory-Oriented Research Group

1. Purpose of the Study

Correcting the present state of major activities concentrated in the metropolitan areas and endeavoring to rebuild a nation with a number of regional centers distributed across the nation are important policy objectives to achieve through the 21st century.

A basic study is needed on the research and development activities at home from the viewpoint of regional development. This study was initiated as a first step for such a purpose to grasp the overall picture of research and development activities by private institutions and universities by region.

2.Summary of the Results of the Study

(1) Research and Development Capabilities of Universities

Basic data on the present states of higher educational institutes including universities by region have been developed by reprocessing by region the original data for the School Survey of fiscal 1987 and the School Teachers Survey of fiscal 1986 prepared by the Ministry of Education.

The study analyzed the regional distributions of university faculties and their educational staff, and educational staff and students in the faculties of science and technology, with an emphasis placed on the faculties of technology.

The study also investigated regional characteristics of the faculties of engineering separately for national/public institutes and private institutes and also by scale. The study compared regional differences in industrial activities and present states of universities and colleges.

The major results of the study are as follows.

1) As may be noted from Figure 1, about 30 percent and 20 percent of the educational staff of universities and colleges are located in the Tokyo Metropolitan Area and Kinki Metropolitan Area, respectively. Both areas combined account for about half the educational staff of Japan.

faculty, these two areas are characterized by having high ratios of educational staff in literary arts and social science.

2)There is no denying concentration of faculties of engineering in metropolitan areas. About 30 percent and 20 percent of the faculties of engineering, educational staff and students are located in the Tokyo Metropolitan Area and Kinki Metropolitan Area, respectively.

Viewed in terms of numbers of educational staff and students per population, the regional discrepancy is smaller. The faculties of engineering, those of national universities in particular, are relatively evenly distributed throughout the nation. However, as may be noted from Figure 2, the research capability is centered in the major prefectures and areas in the respective regions. There are significant discrepancies among prefectures and areas within a given region.

3)Evaluation of the quality of research and development capability is by no means easy and should only be done with great care. Globally, the following statements may be presented.

a. From the viewpoints of the greater numbers of educational staff and greater numbers of graduate students engaged in research and development, and smaller numbers of

undergraduate students per one teacher, the national universities in general may be considered to be more powerful in research and development than private universities.

b. In addition to the Tokyo and Kinki Metropolitan Areas, more educational staff and graduates students are located in such regions as Hokkaido, the Tohoku Region and Kyushu than the national averages. In view of the fact that educational staff and graduate students are rather concentrated in the universities outstanding in such regions, these regions may be considered to have outstanding research and development capabilities.

(2)Research and Development Activities of Private Enterprises by Region

The research and development activities of Japanese private enterprises have been summarized in the Surveys of Research and Development of the Statistics Bureau of Management and Coordination Agency. The reports summarize the private research and development activities by company and therefore do not provide information on research and development activities by region. Therefore, this study conducted a survey on individual departments and sections in charge of research and development of each private enterprise. The list of the organizations to be surveyed was prepared from available sources of information like the Nationwide List of Research Institute published by Lattice Co. under the supervision of the Science and Technology Agency. This study was consigned to the Institute for Future Technology.

The questionnaire was sent to 3,179 organizations of which 972 organizations, or 29.2 percent, responded to the questionnaire. There was no significant difference in recovery rate by region or by industry.

The result of the survey is expressed not in absolute number but in share by region and regional characteristics are compared. The results of the survey are outlined as follows

1)Regional Distribution of Researchers and Research Expenses

As may be noted from Figure 3, the research and development activities of private enterprise are centered in the Tokyo Metropolitan Area, Tokyo and Kanagawa Prefecture in particular. The Tokyo Metropolitan Area, Kinki Metropolitan Area, the Kanto Region excluding the Tokyo Metropolitan Area, the Tokai Region, Chugoku, Kyushu, and the four regions of Hokkaido, Tohoku, Hokuriku, Shikoku combined account for 41%, 20%, 15%, 14%, 4%, 3% and less than 1 percent, respectively.

Figure 4 shows the ratios of the number of researchers to the population by region. The Tokyo Metropolitan Area, Kinki Metropolitan Area and the Tokai Region have higher ratios than the national average registering 2.6 times, 1.2 times and 1.1 times, respectively, the national average. By contrast, Hokkaido, the Tohoku Region, Shikoku and Kyushu registered very low ratios smaller than a quarter of the national average. The research and development activities are evidently centered in metropolitan areas, notably the Tokyo Metropolitan Area. The four highest regions, the Tokyo Metropolitan Area, the Kinki Metropolitan Area, the Tokai Region and the Kanto Region, jointly represent 61 percent of the population, while in number of researchers these four regions collectively occupy 90 percent.

It may be noted from the comparisons of industrial production and research expenses by region that the Tokyo Metropolitan Area ranks first in research expense though it ranks fourth in industrial production. Obviously, private enterprises tend to locate production centers in the regions around the major metropolitan areas like the Tokai and Kanto Regions but concentrate their research activities in the Tokyo and Kinki Metropolitan Areas.

2) Regional Distribution of Research and Development Activities by Theme

In the Tokyo Metropolitan Area research activities in mechanical engineering, electric and electronic engineering are concentrated. The Kinki Metropolitan Area has high shares of researches in chemistry, fiber, materials (ceramics, iron and steel and new materials),

electric and electronic engineering but has low shares of researches in biology and medicine. The Tokai Region is characterized by high shares of researches in chemistry and fiber. The Kanto Region has high shares in biology, medicine and materials.

3)Difference is small among regions in the hierarchy of researches -- basic research, applied research or development --, also in the age of researchers.

(3)Number of Patent Applications

The number of patents is an important indicator of achievements of research and development activities. The number of patent applications in 1986 was surveyed by prefecture from the Patent Gazettes. The following four items representing major branches of advanced technology were selected from the International Patent Classification and the total number of inventors was obtained for each prefecture, according the addresses of the representative inventors.

International Patent Classification	Contents
B23	Machine tool;Metal products not otherwise classified;
C04	Cement; Imitation stone; Ceramices, Fier-resistant materials;
C12	Biochemical products; Beer; Spirits; Wine; Vinegar; Microbiology; Enzymology; Mutation or genetic engineering;
G16	Computing; Calculation

Table 5 shows the classified total.

The numbers of applications in B23 (machine tool and others) were 35 percent for the Tokyo Metropolitan Area, 24 percent for the Tokai Region, 18 percent for the Kinki Metropolitan Area, 12 percent for the Kanto Region, 5 percent for the Chugoku Region, 3 percent for Kyushu, 2 percent for the Hokuriku Region, less than 1 percent for Hokkaido, the Tohoku Region and Shikoku combined.

In C04 (Ceramics and others) the Tokyo Metropolitan Area and Kinki Metropolitan Area were close at 27 and 24 percent, respectively, followed by the Tokai Region at 19 percent, the Kanto Region at 13 percent, Chugoku and Kyushu both at 7 percent and the Tohoku Region at 2 percent. Other regions represent one percent or even less. The applications in this field are relatively distributed at local areas.

In C12 (Biochemistry, genetic engineering and others) the Tokyo Metropolitan Area occupied 35 percent, followed by the Kinki Metropolitan Area at 27 percent, the Kanto Region at 18 percent, the Tokai Region at 8 percent, Chugoku Region at 5 percent, the Kyushu Region at 4 percent and the Hokuriku Region at 2 percent. Other regions accounted for less than one percent.

The applications in G06 (Computing calculation) were predominantly concentrated in the Tokyo Metropolitan Area at 76 percent, followed by the Kinki Metropolitan Area at 13 percent, the Kanto Region at 4 percent. Other regions were all at less than one percent.

3. Conclusion

As are discussed above, research and development activities of Japan are obviously centered in major metropolitan areas, notably in the Tokyo Metropolitan Area. It is important to clarify the reasons for such uneven distribution and conditions for locating research and development organizations. It is also important to clarify the role to be played by research and development organizations in the development of their areas. Regarding the research and development activities of private enterprises, development of more detailed

quantitative data is the subject to be pursued in the future.

It would perhaps be necessary to survey all domestic establishment to achieve this objective.

The results of this study will be compiled in a separate report. For details of summation and analysis, reference should be made to the detailed report.