NISTEP REPORT No. 1

Employment Trends of Science and Engineering Graduates

June 1989

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Note: Appendixes 1 - 7 are omitted from the English version of this report for the cost reduction of the version, but they are available in the Japanese version as appended to the report.

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I. Introduction

With a rapid progress of the so-called "software emphasis" in economy, employment structure in Japan has changed in the manner shown in Table 1: from 1965 to 1987 employees in the tertiary industry have increased at 89% while those in the secondary industry only at 29%, and the ratio of employees between both sectors has changed from 100:87 in 1965 to 100:60 in 1987.

Under these circumstances, it is indicated for job choosing of science and engineering graduates in recent days that a tendency of being "alienated from manufacturing sector and oriented toward service sector" has been intensified increasingly. If such a tendency continues in the future, there may arise a need of apprehension about the supply of important talents for the development of science and technology in the future.

This report is to clarify recent actual conditions of employment trends of science and engineering graduates quite important for the deployment of science and technology policies in this country in the future, and the report has added some supplements and refinement with more detailed

results of investigation to the "Preliminary Survey of Employment Trends of Science and Engineering Graduates" (Reference 1) published in February this year.

In this report, we have at first investigated and analyzed employment trends of science and engineering graduates all over the country based on the "Fundamental School Research Report" by the Ministry of Education (hereinafter called "Fundamental School Research") and then made clear the regional characteristics of the trends on the basis of a survey of 62 science and engineering faculties in 10 universities conducted individually by our institute.

Next we have tried to analyze the background of changes in employment trends of science and engineering graduates and effects of these changes on the manufacturing industry which were observed in the foregoing analyses according to the results of a hearing survey from university professors and job offering enterprises and questionnaire to students.

Besides the text of this report, we have included materials made in various stages of our research and investigation into the report as appendixes for enabling readers to see detailed data obtained in the process of the research and investigation.

II. Employment trends of science and engineering graduates

1. Graduates from undergraduate courses

According to the Fundamental School Research, national employment trends of science and engineering graduates from 1965 to 1988 are as shown in Table 2. Data by engineering and physical faculty are shown in Appendix 1 and further detailed data are shown in Appendix 2. As shown in Table 2 and Appendix 1, science and engineering students who graduated from universities all over Japan in March, 1988 were 89,750 persons (engineering 76,362 and natural science 13,388 persons), among them 15,321 persons (engineering 12,314 and natural science, 3,007 persons), 17.1% went on to courses of higher grade and 71,081 persons (engineering 61,822 and natural science 9,259 persons), 79.2% were employed.

Among employed graduates, those who found jobs in the manufacturing industry were 35,912 persons (engineering 32,829 and natural science 3,083 persons) and thus 50.5% of employed graduates went to this industry. This percentage was 67.5% in 1970 which showed a tendency to decrease after that and was reduced to 43.2% in 1979. Then the percentage tended to increase and showed a recovery up to 57.1% in 1985, but began to decrease again in 1987 and reduced to 50.5% in 1988 (see Figure 1). The setback in the ratio of employment in the manufacturing industry for the period from about 1975 to 1979

can be attributed to the fact that the manufacturing industry in Japan was depressed by the first oil crisis in 1973 and a succeeding slowdown of economy, refrained from employing new graduates and this situation gave effects on the employment of science and engineering graduates. However, the recent tendency of decrease appearing again in the employment ratio of science and engineering graduates in the manufacturing industry does not consists with recent circumstances where this industry has been actively willing to increase employment and can be considered due to the fact that the demand for science and engineering graduates in various industries other than the manufacturing has been increasing and that more science and engineering graduates have been oriented toward business areas other than the manufacturing industry.

As the business areas that have been rapidly increasing their shares recently in the employment of science and engineering graduates, such industries can be mentioned as finance and insurance (where the number of employed graduates in 1988 has increased at 88% than in the previous year), transport and communication (with the same increases at 54 and 48% respectively), which seems to reflect strongly the inclination toward the tertiary industry in recent Japanese economy (see Table 2). In the finance and insurance business, in particular, employment of science and engineering graduates has radically increased in 1987 and 1988 (see Figure 2). As shown in Table 2 and Figure 2, the ratio of science and engineering graduates who found jobs in the finance and

insurance business also increased in the period of the oil crisis and the following economic depression, but the recent increase in employment of science and engineering graduates in the above sectors is characteristic in that it appears under the circumstances where the manufacturing industry is actively employing new graduates.

Our institute investigated the first destination of graduates from undergraduate and master courses from 1986 to 1988 individually for 62 science and engineering faculties in 10 universities all over the country (hereinafter called the "individual survey") and the results of this survey show that the employment ratio of graduates from undergraduate courses in the manufacturing industry has been decreased while that in the finance and insurance business has been increased (see Table 3).

The employment ratio of science and engineering graduates in the finance and insurance business was 2.2% in 1988 for universities all over the country according to the Fundamental School Research, while it was 5.0% in the same year in the individual survey. This difference suggests the variance among universities for the employment tendency of science and engineering graduates in the finance and insurance business. Table 4 shows the employment ratio in the finance and insurance business by faculty of university in 1988 obtained from the individual survey. According to the table, the tendency of science and engineering graduates to find jobs

in the finance and insurance business appears strongly in specific universities in the Metropolitan District and specific universities in the Kansai district follow them. Accordingly, the tendency of science and engineering graduates to be employed in the finance and insurance business is a phenomenon more remarkable in specific universities in metropolitan areas than those in provincial areas and it seems to be a phenomenon variable among universities.

2. Graduates from master courses

Employment trends of graduates from science and engineering master courses all over the country from 1965 to 1988 are as shown in Table 5 according to the Fundamental School Research. As in the case of graduates from undergraduate courses, data of graduates from master courses by engineering and natural science faculty are shown in Appendix 1 and more detailed data in Appendix 2. As shown in Table 5 and Appendix 1,graduates from science and engineering master courses all over the country in March,1988 were 13,506 persons (engineering 11,129 and natural science 2,377 persons). Among them, 1,747 persons (engineering 995 and physical science 752 persons), about 12.9% went on to doctor courses and 11,283 persons (engineering 9,824 and natural science 1,459 persons), 83.5% were employed.

Among employed graduates, those who found jobs in the manufacturing industry were 7,499 persons (engineering 6,585

and natural science 914 persons) and thus 66.5% of employed graduates went to this industry. With the recent increase of the total number of graduates from science and engineering master courses, the absolute number of employed graduates in the manufacturing industry has been increasing, but the employment ratio of them in the manufacturing industry has been decreasing after 1987 as in the case of graduates from science and engineering undergraduate courses (see Figure 3).

As in the case of graduates from undergraduate courses, the business areas which have been rapidly increasing their shares in the employment of graduates from science and engineering master courses are finance and insurance (where the number of employed graduates in 1988 has increased at 74% than in the previous year), transport and communication (with the same increases at 70 and 46% respectively), and the number of these graduates who find jobs in service businesses excluding medical insurance, juridical service, education, religion and nonprofit organizations and including computer software and consultant businesses, etc. has also been increasing remarkably (with the same increase at 37%, see Table 5). As in the case of graduates from undergraduate courses, the industrial sector in which especially increasing employment is observed is the finance and insurance business, but the recent growth of employment of graduates from master courses in this sector is notably greater than that of graduates from undergraduate courses. Thus, the number of graduates from science and engineering master courses employed in the finance and

insurance business in 1988 has increased at 13.7 times as much as the level in 1982 (see Figure 4), while the similar number of graduates from undergraduate courses has shown an increase of 4.2 times during the same period (see Figure 2). As a result, the ratio of graduates from master courses in the total of science and engineering graduates employed in the finance and insurance business has increased from 2.9% in 1982 to 8.9% in 1988, which suggests a tendency that the academic career of science and engineering graduates employed in this sector has been shifting to higher grade.

Also in the above-mentioned individual survey, employment trends of graduates from science and engineering master courses from 1986 to 1988 show a decrease in the employment ratio in the manufacturing industry and an increase in the employment ratio in the finance and insurance business (see Table 6). According to the Fundamental School Research, the employment ratio of graduates from science and engineering master courses in the finance and insurance business for graduate schools all over the country stood at 1.3% in 1988 while according to the results of the individual survey it was 2.3% in the same year, which suggests the variation among universities in the employment tendency toward the finance and insurance business for graduates from science and engineering master courses as well as for those from undergraduate courses. It can also be seen that a university which has a great employment ratio of graduates from undergraduate courses in the finance and insurance business tends to have a great employment

ratio of graduates from master courses as well in the same business sector (see Table 4, and see Appendix 3 for details).

3. Graduates from doctor courses

According to the Fundamental School Research, employment trends of graduates from science and engineering doctor courses (as in the Fundamental School Research, in this report "graduates from doctor courses" include those students who have attended the doctor courses for the prescribed period or longer and mastered prescribed units, but not obtained the doctor degree and been removed from the course) across the country from 1965 to 1988 are as shown in Table 7 (for details see Appendixes 1 and 2). As seen in Table 7 and Appendix 1, graduates from science and engineering doctor courses in March, 1988 across the country were 1,310 persons (engineering 721 and natural science 589 persons), and 790 persons(engineering 492 and natural science 298 persons), 60.3% of them were employed. Almost all of the remainder, that is, 389 persons (engineering 141 and natural science 248 persons), 29.7% of these graduates were those who were not employed (those who were identified as neither going on to study nor being employed). This ratio can be said to be very high in comparison with that the ratios of those who were not employed among graduates from science and engineering undergraduate courses and those from science and engineering master courses in 1988 were 2.5 and 2.2% respectively (see Tables 2 and 5).

Employment areas of those employed have no such great variety as in the case of graduates from undergraduate courses and those from master courses. Education has the largest share in the employment areas of graduates from doctor courses and 371 persons (engineering 223 and natural science 148 persons), 47.0% of those employed have found jobs in the education sector. The manufacturing industry follows education in this share and 209 persons (engineering 138 and natural science 71 persons), 26.5% of those employed have found jobs in this industry, but the employment ratio in this industry tends to decrease in recent several years as in the case of graduates from undergraduate courses and those from master courses, although a slight increase was seen in 1988 (refer to Figure 5). However, there is no tendency of increase in employment in the finance and insurance business for graduates from doctor courses.

III. Background of increasing employment of graduates from undergraduate courses and those from master courses in finance and insurance business

1. Trends looking for a variety of talents in finance and insurance business

As described in Chapter II, the employment ratio of graduates in the manufacturing industry in the total number of those employed tends to decrease in spite of that the

manufacturing industry has been strongly willing to employ new graduates recently, while the ratio of those employed in the finance and insurance has been increasing rapidly. As the background of these trends, it can be cited that the movements to employ science and engineering graduates have been intensified in the finance and insurance business.

According to the Fundamental School Research, it can be seen that the major disciplines of graduates employed in the finance and insurance business tends to show a greater variety at present. Thus, when comparing the major disciplines of graduates from undergraduate courses and master courses employed in the finance and insurance business in 1984 and of those employed in the same sector in 1988, the share of graduates majoring in social science (law, politics, economics, etc.) tends to decrease, and the shares of other disciplines have been increasing rapidly, such as engineering (3.3 times as much as the share in 1984) as the top of them, followed by domestic science (2.3 times), education (twice), natural science (1.7 times) and humanities (1.5 times) (see Table 8). These data suggests that the finance and insurance business is trying to employ various sorts of talents at present.

An interview survey with officials in charge of employment in enterprises of the finance and insurance business shows that these enterprises consider it necessary to obtain a variety of talents in order to cope with radically changing

economic conditions. (see Appendix 5 for details of the results of the interview survey with enterprises.)

In this way major disciplines of graduates who find jobs in the finance and insurance business tend to be diversified, and among these graduates the share of science and engineering graduates has been growing remarkably. Thus, the share of graduates of engineering and natural science disciplines as a whole in the total of graduates employed in the finance and insurance was 2.0 % (engineering 1.2 and natural science 0.8 %) in 1984 and increased to 5.2 % (engineering 3.9 and natural science 1.3 %) in 1988, that is, 2.6 times as much as the share in 1984 (see Table 8). The increase of science and engineering graduated employed in the finance and insurance business can be understood as a phenomenon appearing remarkably in particular in the tendency to look for various sorts of talents in this business sector.

2. Differences among enterprises in finance and insurance business

It must also be noted that the increase of science and engineering graduates employed in the finance and insurance business in recent days is a phenomenon especially conspicuous for major private enterprises in this sector. For example, according to a survey conducted by Nihon Keizai shimbun Inc. on employment of new graduates from universities including those from master courses by major enterprises in Japan, the number

of graduates employed by 46 companies [22 banks (11 metropolitan banks, 4 provincial banks, 4 trust and banking companies and 3 long credit banks), 11 securities companies and 13 insurance companies], for which are available actual employment data of graduates by liberal arts and science and engineering faculty from 1986 through 1988, among leading private companies in the banking, securities and insurance sectors investigated by the press stood at 12,552 in 1988, and among them the number of science and engineering graduates stood at 1,468 (see Table 9). On the other hand, according to the Fundamental School Research, the total number of graduates from undergraduate courses and master courses employed in the finance and insurance business in the same year was 33,144, and among them the number of graduates from science and engineering faculties in a broader sense (in this case, graduates of natural science, engineering, agriculture, health care and mercantile marine disciplines were counted as those from science and engineering faculties in a broader sense) was 2,012. Accordingly, the above mentioned 46 major private companies in the finance and insurance business have employed only 37.9 % of graduates employed in this sector as a whole, but if the parent population of graduates is defined to those from science and engineering faculties in a broader sense, these companies have employed 73.0 % of them (when including domestic science faculties in this definition of science and engineering faculties, this percentage stands at 57.7 %, although the former is somewhat uncertain whether it is classified into science and engineering or liberal arts

faculties). Moreover, when coupling the results of the Fundamental School Research and the data of Table 9 together, the number of science and engineering graduates employed in the above-mentioned 46 companies of the finance and insurance sector has increased from 525 in 1986 to 1,468 in 1988, that is, at 2.8 times for these 2 years, while science and engineering graduates employed in other enterprises in the same sector have increased from 317 to 544, only at 1.7 times for the same period (see Table 10).

In the interview survey with private enterprises, it is shown that metropolitan banks and major insurance companies have been radically increasing employment of science and engineering graduates in recent years while local banks have had few actual results of employment of this sort of graduates although some of them are strongly willing to employ these graduates (see Appendix 5).

3. Background of tendency looking for science and engineering graduates in finance and insurance business

According to the results of an interview survey with professors responsible for students' employment in 38 faculties of 11 universities all over the country, these professors view the reasons why the finance and insurance business looks for science and engineering graduates to be as follows: (For details of the interview survey with university professors, see Appendix 4.)

A. necessity of thinking in the ways of science and engineering for using computers effectively;
B. trying to get a hybrid effect by obtaining a variety of talents for management innovation (evaluating these talents as persons of marked individuality with original ideas);
C. needs in technical knowledge about customers; and
D. expectation to this sort of graduates as being sincere, usable for various purposes and becoming a part of business force instantly.

According to an interview survey with officials responsible for employment in the finance and insurance business about the reasons why this sector has been increasing employment of science and engineering graduates, following conditions are mentioned which coincide in general with the views of university professors (for details of the interview survey with officials in enterprises, see Appendix 5).

A. Science and engineering graduates have been trained fundamentally in logical thinking based on numerical formulae, and business activities requiring such a sort of ability (for example, development of new financial services and market analysis) are increasing in this sector.
B. Needs for talents who can operate modern computer systems are increasing.
C. It is necessary to obtain a variety of talents in order to cope with radically changing economic conditions.

D. Technical knowledge is useful in transactions and negotiations with enterprises in the manufacturing industry.
E. Graduates from science and engineering faculties are enthusiastic about research and investigation.

As above discussed,the background of the tendency to look for increasingly graduates from science and engineering faculties in the finance and insurance business consists in the development of computer technology, expansion of economic activities across national borders, changing conditions with more rapid paces and other factors. Therefore, the increase in employment of science and engineering graduates in this sector can be considered to be an inevitable movement for it to cope with the changing circumstances, which will continue in the future as well.

4. Changing consciousness of science and engineering graduates

On the other hand, it seems that those science and engineering students who are willing to find jobs in the finance and insurance business are increasing recently.

According to a questionnaire survey to science and engineering students in 7 faculties of 4 universities conducted to investigate consciousness of those to be employed in the finance and insurance business, following results were obtained about consciousness of science and engineering students whom a

company in this business sector has decided to employ unofficially: these students like studies on disciplines in their own faculties but want to challenge various sorts of work in the future,being free from specialties and thus have selected their first destination in this business; and after being employed they want to play an active part in the same kind of work as graduates from liberal arts faculties irrespective of specialties (for details of the questionnaire, see Appendix 6).

Views of officials responsible for employment in finance and insurance companies shown in the above-mentioned interview survey with these officials were also in that indeed those students who want to be free from narrow special disciplines and are willing to be a generalist to challenge a variety of things have been increasing recently among science and engineering students and that with the background of these changes in consciousness of them increasingly more science and engineering students are looking for jobs in the finance and insurance business (see Appendix 5).

In the same interview survey with officials in enterprises we asked those responsible for employment in the manufacturing industry the reasons why more science and engineering students are looking for jobs in the finance and insurance business, and following answers were obtained (see Appendix 5):

A. some difference of pay is said to be exist between the finance and insurance and the manufacturing industries (pay is said to be higher in the former);
B. job sites in the finance and insurance business locate in urban areas while those in the manufacturing industry locate in many cases in provinces;
C. students in engineering departments tend to lose a sense of duty to be an engineer; and
D. field work has become less attractive to them.

According to the results of the interview survey with university professors in charge of employment, these professors view the reasons why science and engineering students select the finance and insurance businesses follows (see Appendix 4):

A. good pay is attractive (a considerable number of professors indicated), (a viewpoint that the degree of pay shows social value and importance):
B. students make the selection by considering their own aptitude (a great number of professors suggested);
C. because graduates from undergraduate courses cannot find jobs in research and development divisions in manufacturers;
D. because mass media report the future of manufacturers is not bright; and
E. students have the image that financial operation is a more refined work than making goods.

As above described, in the views of officials in

enterprises and professors in universities is found an apprehension that there may be a difference of pay between the manufacturing and the finance and insurance industries, lowered image of making goods in the field work and other factors in the background of the recent tendency of science and engineering graduates to be alienated from the manufacturing industry and more oriented toward the finance and insurance business.

Moreover, as shown in Table 8, the existence of a paradoxical situation cannot be denied where a tendency of increasing employment in the finance and insurance business among those students who have shown apparently a good aptitude to studies on science and engineering disciplines is observed in that the ratio of graduates from master courses employed in the finance and insurance business, although the absolute number of them is yet small, has been increasing rapidly and that the number of those science and engineering students to be employed in the finance and insurance business who like to work on disciplines of their own faculties is characteristically much greater than the number of similar students to be employed in the manufacturing industry (see Appendix 6).

5. Variation among universities

As discussed in Sections 1 and 2 of Chapter II, the tendency of science and engineering students to find jobs in the finance and insurance business can be considered a

phenomenon remarkable especially in specific universities in metropolitan areas and variant among universities.

Moreover, as described in Section 2 of Chapter II, since in the universities where graduates from undergraduate courses have a strong tendency to be employed in the finance and insurance business, graduates from master courses also tend to find jobs in this business sector according to the results of the individual survey, surroundings of a university may have effect on the employment tendency of students to the finance and insurance business (see Appendix 3).

According to the results of the questionnaire to science and engineering students, it is found that localities of universities have stronger influence than students' native places on consciousness of students in selecting employment (see Appendix 6), which suggests that surroundings of a university where students learn have strong effect on the employment
tendency of the students.

With respect to the variation among universities, those enterprises in the finance and insurance business which actively employ science and engineering graduates are focusing on specific universities as the target of employment, and it is inferred that a strong tendency toward the finance and insurance business is particular to students of specific universities (see Reference 2).

IV. Effects on manufacturing industry

What effect does the tendency of "science and engineering students to be alienated from the manufacturing industry" have on employment in this industrial sector? According to the results of the interview survey,answers to this question by officials responsible for employment in enterprises of this sector are in many cases as follows: they commonly feel the insufficiency of the absolute number of science and engineering graduates they want to employ; as to whether the increase in employment of science and engineering graduates by the finance and insurance business have any effect on employment of them by the manufacturing industry, these officials consider the increase to be a factor which may intensify further the keen enough at present competition among enterprises looking for talents; but many of the officials consider that the increase has not influenced directly the manufacturing industry because the competition for obtaining talents among enterprises in this sector is more intense (see Appendix 5).

In the interview survey with university professors, with respect to the tendency of science and engineering students to be alienated from the manufacturing industry, a considerable number of professors have an apprehension in view of the future of Japan, but some of them view the tendency to be only a temporary one and also a considerable number of them

consider that there is no problem because students select their first destination by examining themselves sufficiently their own aptitude.

V. Discussion

1. Prospect of science and engineering graduates' choosing employment in finance and insurance business in the future

According to the results of the interview survey with officials responsible for employment in enterprises, those officials in enterprises in the finance and insurance business which have past records of recruitment of science and engineering graduates were energetic to employ them in the future as well, and the officials in enterprises in the same sector which have few similar past records were also willing strongly to employ science and engineering graduates (see Appendix 5).

The tendency of increasing employment of science and engineering graduates in the finance and insurance business may be considered to continue for the time being for the following reasons.

A. According to statistical data, employment of science and engineering graduates in this business showed a remarkable

increase in 1988, too.

B. In most of several enterprises in this business sector which provided employment data in the above-mentioned interview survey, the tendency of increase in employment of science and engineering graduates has been continuing for the graduates employed in April, 1989 (see Table 11).

C. Conditions listed in Section 3 of Chapter III as the reasons for the finance and insurance business to look for science and engineering graduates may be considered to continue in the future as well.

D. Difference in pay between the finance and insurance business and the manufacturing industry about which officials in the latter sector and university professors are anxious rather tends to increase at least in recent several years and does not shown yet any symptom of reduction (see Appendix 7).

According to the report of National Science Foundation (NSF) in the U.S., needs for scientists and engineers are increasing at present in the U.S. as well and the finance business is mentioned as the top of sectors in which the needs are estimated to increase in the future as well. That is, according to the forecast by NSF, the ratio of the finance business in the jobs of scientists and engineers in private enterprises was 3.8 % in 1977, increased to 5.6 % in 1986 and is estimated to increase up to 6.8 % in 2000 (see Reference 3). Finance and insurance services in Japan are also expected to develop as in the U.S. in the future, and it may be quite

natural to forecast that Japan will follow the U.S. in the direction above described.

2. Orientation of science and engineering students toward finance and insurance business and the future of Japan

With respect to the tendency of science and engineering students being oriented toward the finance and insurance business, as described in Chapter IV as views of university professors, the view apprehending the tendency in view of the future of Japan and the optimistic view regarding that the tendency has no problem because students choose jobs by examining adequately their own aptitude go halves with each other.

Views positively appreciating the tendency of science and engineering students toward the finance and insurance business are as follows: expansion of activity areas of science and engineering graduates to the finance and insurance sector not only means an inevitable progress of this business to cope with recent deregulation, diversification and development across national borders in economic activities as well as rapidly changing environment, but also indicates that the development of science and technology has been extending to those business sectors which have had little interest in science and technology in the past; and the tendency is desirable in that it gives people in finance and other sectors an opportunity to have greater understanding of science and

technology. It may be desirable also from the viewpoint of development of science and technology in this country, if appreciation of science and engineering graduates is enhanced in broader areas, young people are increasingly attracted to learn science and engineering disciplines and increasingly more excellent talents come to science and engineering jobs.

On the other hand, however, negative views on the tendency of science and engineering students toward the finance and insurance business are also persuasive. According to these views, this tendency reflect the trends that those young people are increasing who are attracted to financial operation and desk work in a neat office, being free from their own special disciplines rather than the activities to make things by using their special knowledge or to challenge to making things practically as engineers, that is, the trends that feeling of young people is going away from activities in science and technology, indicating symptoms of danger which may destruct the base of Japan's industrial and scientific and technological activities in terms of human resources.

Similar tendency is argued now in the U.S. in the context that the ratio of students willing to learn science and engineering disciplines in universities tends to decline (see Table 12, Figure 6 and Reference 4 and 5). Because of this tendency, human resources in science and technology in the U.S. tend to decrease and it is apprehended that the U.S. will not be able to cope adequately with the needs of science and

technology in the future in terms of human resources (see Reference 6 and 7).

In order to define the long-range meaning of the tendency of science and engineering students to be alienated from the manufacturing industry and oriented toward the finance and insurance business, which is seen at present in Japan, it is necessary yet to observe the progress of the tendency and examine it deliberately. But it may be possible that the above-mentioned phenomena appearing now in the U.S. will occur sooner or later in Japan, too. To cope with these circumstances, it is important at any rate to make efforts from now on to improve remunerations to scientists and engineers, raise their social status, improve image of science and technology as a whole and bring up feelings of the youth to be oriented toward activities in the area of science and technology.

Reference

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5. OTA, "Higher Education for Science and Engineering--A Background Paper--", OTA-/BP-SET-52, Mar. 1989
6. The Task force on Women, Minorities, and the Handicapped in Science and Technology, "Changing America: The New Face of Science and Engineering", Sept. 1988.
7. OTA, "Educating Scientists and Engineers--Grade School to Grad School --", OTA-SET-377, June 1988

Additional remark and acknowledgement

This report has summarized comprehensively the following surveys conducted as a part of "Research and Investigation on Conditions for making sure Supply of Science and Engineering Graduates as Creative Scientific and Technological Talents" started in 1988 by the 1st Policy-

Oriented Research Group.

A. Progress of national trends in choosing first destination of science and engineering students based on statistical figures in the "Fundamental School Research" by the Ministry of Education.
B. Sampling survey on employment trends of graduates from individual science and engineering faculties.
C. Interview survey with university professors responsible for employment about first destination of science and engineering students.
D. Interview survey with officials responsible for employment in enterprises about consciousness in employing science and engineering graduates.
E. Questionnaire to science and engineering students on consciousness in choosing jobs.
F. Comparison of annual incomes between workers in the manufacturing industry and those in the finance and insurance business.

Research and investigation in this report have been performed jointly by Nishigata senior researcher and Nakanishi special researcher as responsible researchers under Mitsuo Hayashi director of the 1st Policy-Oriented Research Group (until the end of January, 1989, present Director of Administration Division, National Institute for Research in Inorganic Materials, Science and Technology Agency) and his successor Yukihiro Hirano (since February, 1989). Shares of

research work between Nishigata, Nakanishi and others are roughly as follows.

* The early stage of the survey of A was performed by Nishigata and the stage from input into computer to finish was performed by Nakanishi.
* In the survey of B collection of basic data and arrangement of them were carried out by Nishigata and Nakanishi performed summarization.
* As for the survey of C, under the cooperation of the 2nd Policy-Oriented Research Group, researchers of the 2 groups shared the work of interviews and Nishigata performed final arrangement.
* In the survey of D researchers of the 1st Group shared the work of interviews and Nishigata performed final arrangement.
* As for the survey of E, the stage of planning and request by questionnaire was performed jointly by Nishigata and Nakanishi and Nakanishi carried out summarization.
* The survey of F was performed by Nishigata.

Final arrangement of this report as a whole was performed by Nakanishi as responsible person.

We express our heartful gratitude to officials in enterprises and university professors who cooperated to our interview survey in this research and investigation, professors and students of universities who cooperated to our

questionnaire survey, those people who provided us with materials of employment trends of students in individual science and engineering faculties and Ms. Maria Papadakis, NSF official who sent us materials of NSF in the U.S. We are also most grateful to Mr. Hajime Nagahama, director of the 2nd Policy-Oriented Research Group who gave us special cooperation in obtaining various materials and performing the interview survey with university professors as well as to many people in and out of our institute who cooperated with us in this research and investigation.

In conclusion we are much obliged to Mr. Hayashi, our former director for that he had made the first orientation of this research and investigation and set it on its way.

Table 1. Number of employees by industrial sector

Ten thousand persons (%)

Year	1965	1975	1980	1985	1987
Primary industry	63 (2)	46 (1)	45 (1)	43 (1)	44 (1)
Secondary industry	1,266 (46)	1,530 (42)	1,572 (40)	1,655 (38)	1,635 (37)
Tertiary industry	1,455 (52)	2,069 (57)	2,352 (59)	2,607 (61)	2,744 (62)

Source: Management and Coordination Agency; "Labor Force Survey"

Table 2. Employment trends of science and engineering graduates from undergraduate courses

Year	1965		1970		1975		1976		1977		1978		1979		1980	
Number of graduates	34,869	100%	55,690	100%	74,926	100%	77,048	100%	79,455	100%	81,855	100%	85,205	100%	85,062	100%
Number of those who went on to higher grade courses	3,893	11.2%	6,186	11.1%	8,190	10.9%	9,236	12.0%	8,971	11.3%	8,783	10.7%	8,820	10.4%	9,154	10.8%
Number of those who were not employed	239	0.7%	1,184	2.1%	3,332	4.4%	4,907	6.4%	4,641	5.8%	4,763	5.8%	4,146	4.9%	3,452	4.1%
Others	517	1.5%	1,321	2.4%	2,762	3.7%	3,438	4.5%	2,709	3.4%	2,932	3.6%	2,847	3.3%	2,735	3.2%
Number of employed	30,220	86.7%	46,999	84.4%	60,642	80.9%	59,467	77.2%	63,134	79.5%	65,377	79.9%	69,392	81.4%	69,721	82.0%
Number of employed (listed again)	30,220	100%	46,999	100%	60,642	100%	59,467	100%	63,134	100%	65,377	100%	69,392	100%	69,721	100%
Manufacturing	19,462	64.4%	31,706	67.5%	30,194	49.8%	29,670	49.9%	32,315	51.2%	32,367	49.5%	29,948	43.2%	33,638	48.2%
Wholesale and retail trade	969	3.2%	2,218	4.7%	4,747	7.8%	4,482	7.5%	4,692	7.4%	4,536	6.9%	7,308	10.5%	5,908	8.5%
Finance and insurance	173	0.6%	344	0.7%	990	1.6%	964	1.6%	1,007	1.6%	880	1.3%	756	1.1%	629	0.9%
Transport	285	0.9%	499	1.1%	847	1.4%	892	1.5%	648	1.0%	1,036	1.6%	1,343	1.9%	1,013	1.5%
Communication	393	1.3%	405	0.9%	582	1.0%	646	1.1%	529	0.8%	455	0.7%	552	0.8%	385	0.6%
Services (Note 1)	256	0.8%	574	1.2%	3,372	5.6%	2,993	5.0%	3,724	5.9%	3,921	6.0%	5,099	7.3%	5,040	7.2%
Not elsewhere classified (Note 2)	8,682	28.7%	11,253	23.9%	19,910	32.8%	19,820	33.3%	20,219	32.0%	22,182	33.9%	24,386	35.1%	23,108	33.1%

Year	1981		1982		1983		1984		1985		1986		1987		1988	
Number of graduates	86,991	100%	85,348	100%	81,343	100%	82,720	100%	84,094	100%	86,130	100%	89,232	100%	89,750	100%
Number of those who went on to higher grade courses	9,605	11.0%	10,413	12.2%	10,521	12.9%	11,504	13.9%	12,350	14.7%	13,120	15.2%	14,248	16.0%	15,321	17.1%
Number of those who were not employed	3,477	4.0%	2,971	3.5%	3,064	3.8%	2,945	3.6%	2,486	3.0%	2,352	2.7%	2,515	2.8%	2,204	2.5%
Others	2,432	2.8%	1,906	2.2%	1,691	2.1%	1,573	1.9%	1,276	1.5%	1,528	1.8%	1,325	1.5%	1,144	1.3%
Number of employed	71,477	82.2%	70,058	82.1%	66,067	81.2%	66,698	80.6%	67,982	80.8%	69,130	80.3%	71,144	79.7%	71,081	79.2%
Number of employed (listed again)	71,477	100%	70,058	100%	66,067	100%	66,698	100%	67,982	100%	69,130	100%	71,144	100%	71,081	100%
Manufacturing	37,817	52.9%	38,714	55.3%	36,533	55.3%	36,079	54.1%	38,813	57.1%	39,473	57.1%	39,807	56.0%	35,912	50.5%
Wholesale and retail trade	4,284	6.0%	3,439	4.9%	3,059	4.6%	3,385	5.1%	2,329	3.4%	2,404	3.5%	2,615	3.7%	3,158	4.4%
Finance and insurance	424	0.6%	373	0.5%	403	0.6%	523	0.8%	626	0.9%	603	0.9%	836	1.2%	1,573	2.2%
Transport	906	1.3%	756	1.1%	333	0.5%	359	0.5%	494	0.7%	500	0.7%	475	0.7%	732	1.0%
Communication	437	0.6%	399	0.6%	336	0.5%	338	0.5%	311	0.5%	492	0.7%	736	1.0%	1,091	1.5%
Services (Note 1)	5,655	7.9%	5,875	8.4%	6,044	9.1%	8,067	12.1%	7,786	11.5%	9,014	13.0%	10,081	14.2%	11,232	15.8%
Not elsewhere classified (Note 2)	21,954	30.7%	20,502	29.3%	19,359	29.3%	17,947	26.9%	17,623	25.9%	16,644	24.1%	16,594	23.3%	17,383	24.5%

(Note 1). Services excluding medical insurance, juridical service, education and nonprofit organizations.

(Note 2). Including agriculture, forestry and fisheries, mining, construction, real estate, electricity, gas and water supply, education, government service, etc.

(Note 3). This table was made on the basis of statistical figures in the "Fundamental School Research" by the Ministry of Education.

Table 3. Employment ratio of science and engineering graduates from undergraduate courses by industrial sector according to the individual survey conducted by our institute.

Persons (%)

Year		1986	1987	1988
Number of graduates (from faculties investigated).		4,419	4,403	4,384
Number of employed		2,878	2,879	2,787
	Manufacturing	2,125 (73.8)	2,042 (70.9)	1,783 (64.0)
	Finance and insurance	42 (1.5)	72 (2.5)	138 (5.0)
	Wholesale and retail trade	140 (4.9)	158 (5.5)	160 (5.7)
	Services other than education	304 (10.6)	382 (13.3)	397 (14.2)
	Not elsewhere classified	267 (9.3)	225 (7.8)	305 (10.9)

(Note). Investigation on graduates from 62 science and engineering faculties of 10 universities all over the country.

Table 4. Employment ratio of graduates from science and engineering faculties in 1988 in the finance and insurance business according to the individual survey conducted by our institute.

(%)

Area	Northern Japan	Metropolitan District						Kansai district			Western Japan		
University	A	B	C	D	E	F	Total	G	H	Total	I	J	Total
Faculties of mechanical engineering (including those of computing and mathematical engineering)	2.1 (0)	22 (4.4)	24 (3.3)	6.9 (1.0)	0	0 (0)	5.4 (2.0)	16 (2.7)	2.6 (0)	6.9 (2.4)	3.4 (0)	0 (0)	2.1 (0)
Faculties of electric and electronic engineering	0 (0)	4.9 (6.1)	0 (0)	7.3 (2.6)		0.4 (0)	3.6 (2.6)	4.0 (1.9)	1.9 (0)	2.3 (1.6)	0 (0)	0 (0)	0 (0)
Faculties of metallurgical engineering	18 (0)	20 (0)	0 (7.1)	16 (12)		3.6 (0)	9.4 (7.9)	21 (0)		21 (0)	0 (0)	0 (0)	0 (0)
Faculties of chemical engineering	0 (0)	33 (0)	29 (0)	12 (3.3)		1.1 (0)	5.4 (1.8)	6.3 (0)	8.2 (0)	7.8 (0)	15 (0)	0 (0)	5.4 (0)
Faculties of biological science in physical science departments	0 (0)	25					25	11 (13)		11 (13)			
Faculties of physics in physical science departments	12 (0)	15	17 (21)	0 (5.6)	1.9 (0)	4.5 (0)	4.1 (6.7)	6.3 (0)	13 (0)	8.9 (0)			
Grand total	3.0 (0)	18 (4.0)	15 (4.2)	8.1 (3.6)	0.8 (0)	1.2 (0)	5.1 (3.5)	11 (2.3)	4.2 (0)	6.7 (1.9)	3.0 (0)	0 (0)	1.3 (0)

(Note 1) Investigation on graduates from 62 science and engineering faculties in 10 universities all over the country.

(Note 2) In each column graduates from undergraduate courses are shown in the upper line and graduates from master courses are shown within parentheses in the lower line.

Table 5. Employment trends of graduates from science and engineering master courses

Year	1965		1970		1975		1976		1977		1978		1979		1980	
Number of graduates	2,452	100%	5,193	100%	7,442	100%	7,271	100%	8,517	100%	9,265	100%	9,279	100%	8,784	100%
Number of those who went on to higher grade courses	1,012	41.3%	1,336	25.7%	1,305	17.5%	1,512	20.8%	1,483	17.4%	1,363	14.7%	1,313	14.2%	1,191	13.6%
Number of those who were not employed	41	1.7%	146	2.8%	288	3.9%	583	8.0%	467	5.5%	518	5.6%	374	4.0%	343	3.9%
Others	112	4.6%	131	2.5%	207	2.8%	223	3.1%	241	2.8%	257	2.8%	202	2.2%	147	1.7%
Number of employed	1,287	52.5%	3,580	68.9%	5,642	75.8%	4,953	68.1%	6,326	74.3%	7,127	76.9%	7,390	79.6%	7,103	80.9%
Number of employed (listed again)	1,287	100%	3,580	100%	5,642	100%	4,953	100%	6,326	100%	7,127	100%	7,390	100%	7,103	100%
Manufacturing	778	60.5%	2,435	68.0%	3,844	68.1%	3,028	61.1%	4,128	65.3%	4,523	63.5%	4,760	64.4%	4,838	68.1%
Wholesale and retail trade	6	0.5%	14	0.4%	37	0.7%	28	0.6%	48	0.8%	77	1.1%	65	0.9%	46	0.6%
Finance and insurance	0	0.0%	9	0.3%	13	0.2%	17	0.3%	33	0.5%	17	0.2%	20	0.3%	13	0.2%
Transport	11	0.9%	32	0.9%	70	1.2%	65	1.3%	81	1.3%	81	1.1%	99	1.3%	77	1.1%
Communication	16	1.2%	80	2.2%	169	3.0%	172	3.5%	151	2.4%	178	2.5%	174	2.4%	161	2.3%
Services (Note 1)	4	0.3%	52	1.5%	93	1.6%	180	3.6%	236	3.7%	259	3.6%	241	3.3%	244	3.4%
Not elsewhere classified (Note 2)	472	36.7%	958	26.8%	1,416	25.1%	1,463	29.5%	1,649	26.1%	1,992	28.0%	2,031	27.5%	1,724	24.3%

Year	1981		1982		1983		1984		1985		1986		1987		1988	
Number of graduates	8,641	100%	9,079	100%	9,516	100%	10,221	100%	10,620	100%	11,639	100%	12,626	100%	13,506	100%
Number of those who went on to higher grade courses	1,170	13.5%	1,185	13.1%	1,193	12.5%	1,268	12.4%	1,332	12.5%	1,547	13.3%	1,627	12.9%	1,747	12.9%
Number of those who were not employed	277	3.2%	281	3.1%	317	3.3%	256	2.5%	320	3.0%	270	2.3%	320	2.5%	294	2.2%
Others	117	1.4%	111	1.2%	92	1.0%	54	0.5%	94	0.9%	112	1.0%	178	1.4%	182	1.3%
Number of employed	7,077	81.9%	7,502	82.6%	7,914	83.2%	8,643	84.6%	8,874	83.6%	9,710	83.4%	10,501	83.2%	11,283	83.5%
Number of employed (listed again)	7,077	100%	7,502	100%	7,914	100%	8,643	100%	8,874	100%	9,710	100%	10,501	100%	11,283	100%
Manufacturing	5,016	70.9%	5,438	72.5%	5,702	72.0%	6,198	71.7%	6,391	72.0%	7,005	72.1%	7,416	70.6%	7,499	66.5%
Wholesale and retail trade	28	0.4%	31	0.4%	37	0.5%	37	0.4%	61	0.7%	64	0.7%	79	0.8%	90	0.8%
Finance and insurance	11	0.2%	11	0.1%	16	0.2%	9	0.1%	25	0.3%	35	0.4%	87	0.8%	151	1.3%
Transport	64	0.9%	77	1.0%	31	0.4%	49	0.6%	68	0.8%	72	0.7%	90	0.9%	153	1.4%
Communication	132	1.9%	144	1.9%	150	1.9%	182	2.1%	168	1.9%	236	2.4%	310	3.0%	452	4.0%
Services (Note 1)	219	3.1%	240	3.2%	254	3.2%	352	4.1%	325	3.7%	414	4.3%	453	4.3%	620	5.5%
Not elsewhere classified (Note 2)	1,607	22.7%	1,561	20.8%	1,724	21.8%	1,816	21.0%	1,836	20.7%	1,884	19.4%	2,066	19.7%	2,318	20.5%

(Note 1). *Services excluding medical insurance, juridical service, education and nonprofit organizations.*

(Note 2). Including agriculture, forestry and fisheries, mining, construction, real estate, electricity, gas and water supply, education, government *service, etc.*

(Note 3). This table was made on the basis of statistical figures in the "Fundamental School Research" by the Ministry of Education.

Table 6. Employment ratio of graduates from science and engineering master courses by industrial sector according to the individual survey conducted by our institute

( ) %

Year of graduation		1986	1987	1988
Number of employed (Note 1)		872	1,113	1,178
	Manufacturing	730 (83.7)	854 (76.7)	770 (65.4)
	Finance and insurance	4 (0.5)	10 (0.9)	27 (2.3)
	Wholesale and retail trade	6 (0.7)	15 (1.4)	20 (1.7)
	Services other than education	45 (5.2)	74 (6.6)	114 (9.7)
	Not elsewhere classified	87 (10.0)	160 (14.4)	247 (21.0)

(Note 1) Employed graduates from master courses in the faculties investigated.

(Note 2) Investigation on graduates from master courses in 62 science and engineering faculties of 10 universities all over the country.

Table 7. Employment trends of graduates from science and engineering doctor courses

Year	1965		1970		1975		1976		1977		1978		1979		1980	
Number of graduates	408	100%	981	100%	1,064	100%	1,036	100%	1,226	100%	1,073	100%	1,211	100%	1,246	100%
Number of those who went on to higher grade courses	0	0.0%	0	0.0%	1	0.1%	3	0.3%	10	0.8%	3	0.3%	2	0.2%	3	0.2%
Number of those who were not employed	76	18.6%	221	22.5%	327	30.7%	422	40.7%	444	36.2%	460	42.9%	437	36.1%	484	38.8%
Others	15	3.7%	100	10.2%	92	8.6%	99	9.6%	115	9.4%	99	9.2%	113	9.3%	66	5.3%
Number of employed	317	77.7%	660	67.3%	644	60.5%	512	49.4%	657	53.6%	511	47.6%	659	54.4%	693	55.6%
Number of employed (listed again)	317	100%	660	100%	644	100%	512	100%	657	100%	511	100%	659	100%	693	100%
Manufacturing	32	10.1%	192	29.1%	180	28.0%	105	20.5%	191	29.1%	143	28.0%	229	34.7%	235	33.9%
Wholesale and retail trade	0	0.0%	0	0.0%	1	0.2%	0	0.0%	2	0.3%	1	0.2%	2	0.3%	0	0.0%
Finance and insurance	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Transport	0	0.0%	1	0.2%	3	0.5%	0	0.0%	1	0.2%	3	0.6%	5	0.8%	0	0.0%
Communication	0	0.0%	6	0.9%	8	1.2%	14	2.7%	11	1.7%	16	3.1%	9	1.4%	11	1.6%
Services (Note 1)	0	0.0%	3	0.5%	9	1.4%	7	1.4%	17	2.6%	7	1.4%	8	1.2%	16	2.3%
Education	242	76.3%	391	59.2%	294	45.7%	283	55.3%	319	48.6%	258	50.5%	321	48.7%	326	47.0%
Nonprofit organizations	9	2.8%	19	2.9%	34	5.3%	26	5.1%	26	4.0%	26	5.1%	24	3.6%	26	3.8%
Not elsewhere classified (Note 2)	34	10.7%	48	7.3%	115	17.9%	77	15.0%	90	13.7%	57	11.2%	61	9.3%	79	11.4%

Year	1981		1982		1983		1984		1985		1986		1987		1988	
Number of graduates	1,292	100%	1,190	100%	1,161	100%	1,092	100%	1,162	100%	1,152	100%	1,243	100%	1,310	100%
Number of those who went on to higher grade courses	7	0.5%	6	0.5%	6	0.5%	5	0.5%	1	0.1%	1	0.1%	3	0.2%	2	0.2%
Number of those who were not employed	472	36.5%	394	33.1%	391	33.7%	380	34.8%	392	33.7%	367	31.9%	389	31.3%	389	29.7%
Others	148	11.5%	129	10.8%	119	10.2%	47	4.3%	71	6.1%	84	7.3%	159	12.8%	129	9.8%
Number of employed	665	51.5%	661	55.5%	645	55.6%	660	60.4%	698	60.1%	700	60.8%	692	55.7%	790	60.3%
Number of employed (listed again)	665	100%	661	100%	645	100%	660	100%	698	100%	700	100%	692	100%	790	100%
Manufacturing	253	38.0%	211	31.9%	232	36.0%	231	35.0%	237	34.0%	232	33.1%	183	26.4%	209	26.5%
Wholesale and retail trade	2	0.3%	1	0.2%	0	0.0%	3	0.5%	1	0.1%	0	0.0%	1	0.1%	1	0.1%
Finance and insurance	1	0.2%	0	0.0%	0	0.0%	0	0.0%	1	0.1%	1	0.1%	3	0.4%	0	0.0%
Transport	2	0.3%	1	0.2%	1	0.2%	1	0.2%	0	0.0%	1	0.1%	0	0.0%	0	0.0%
Communication	11	1.7%	14	2.1%	12	1.9%	7	1.1%	10	1.4%	7	1.0%	9	1.3%	9	1.1%
Services (Note 1)	12	1.8%	22	3.3%	13	2.0%	18	2.7%	17	2.4%	16	2.3%	26	3.8%	29	3.7%
Education	280	42.1%	292	44.2%	273	42.3%	274	41.5%	270	38.7%	302	43.1%	347	50.1%	371	47.0%
Nonprofit organizations	11	1.7%	39	5.9%	35	5.4%	30	4.5%	22	3.2%	48	6.9%	39	5.6%	62	7.8%
Not elsewhere classified (Note 2)	93	14.0%	81	12.3%	79	12.2%	96	14.5%	140	20.1%	93	13.3%	84	12.1%	109	13.8%

(Note 1). Services excluding medical insurance, juridical service, education and nonprofit organizations.

(Note 2). Including agriculture, forestry and fisheries, mining, construction, real estate, electricity, gas and water supply, education, government service, etc.

(Note 3). This table was made on the basis of statistical figures in the "Fundamental School Research" by the Ministry of Education.

Table 8. Major disciplines of graduates from undergraduate courses and master courses employed in finance and insurance

Year	1984				1988			
Course	Undergraduate	Master	Total	%	Undergraduate	Master	Total	%
Humanities	2,276	3	2,279	8.5	4,321	8	4,329	13.0
Social science	23,078	25	23,103	86.6	25,175	72	25,347	76.3
Physical science	200	2	202	0.8	380	37	417	1.3
Engineering	323	7	330	1.2	1,193	114	1,307	3.9
Agriculture	163	36	199	0.7	248	27	275	0.8
Domestic science	183	0	183	0.7	534	0	534	1.6
Education	258	2	260	1.0	678	3	681	2.0
Others	119	2	121	0.5	348	6	354	1.1
Total	26,600	77	26,677	100	32,877	267	33,144	100

(Note). This table was made on the basis of statistical figures in the "Fundamental School Research" by the Ministry of Education.

Table 9. Number of graduates from universities by liberal arts and science and engineering faculty employed recently in major enterprises in finance, insurance and other industries.

Industrial sector		1986	1987	1988
Banks	Liberal arts	3,904 (93.6)	4,489 (92.0)	5,195 (89.5)
	Science and engineering	269 (6.4)	391 (8.0)	611 (10.5)
	Total	4,173 (100)	4,880 (100)	5,806 (100)
Securities	Liberal arts	2,907 (93.5)	3,237 (89.2)	4,229 (86.4)
	Science and engineering	203 (6.5)	393 (10.8)	666 (13.6)
	Total	3,110 (100)	3,630 (100)	4,895 (100)
Insurance	Liberal arts	1,315 (96.1)	1,517 (93.4)	1,660 (89.7)
	Science and engineering	53 (3.9)	107 (6.6)	191 (10.3)
	Total	1,368 (100)	1,624 (100)	1,851 (100)
Total of the finance and insurance business	Liberal arts	8,126 (93.9)	9,243 (91.2)	11,084 (88.3)
	Science and engineering	525 (6.1)	891 (8.8)	1,468 (11.7)
	Total	8,651 (100)	10,134 (100)	12,552 (100)
Trading companies	Liberal arts	1,118 (89.5)	979 (87.8)	860 (87.2)
	Science and engineering	131 (10.5)	136 (12.2)	126 (12.8)
	Total	1,249 (100)	1,115 (100)	986 (100)
Department stores	Liberal arts	1,281 (89.5)	1,560 (88.7)	1,585 (88.4)
	Science and engineering	150 (10.5)	198 (11.3)	208 (11.6)
	Total	1,431 (100)	1,758 (100)	1,793 (100)
Total	Liberal arts	10,525 (92.9)	11,782 (90.6)	13,529 (88.2)
	Science and engineering	806 (7.1)	1,225 (9.4)	1,802 (11.8)
	Total	11,331 (100)	13,007 (100)	15,331 (100)

(Note 1). Within parentheses ratios to the total (%) are shown.

(Note 2). In this table, 62 major private enterprises [22 banks (11 metropolitan banks, 4 provincial banks, 4 trust and banking companies and 3 long credit banks), 11 securities companies, 13 insurance companies, 9 trading companies, 7 department stores and others], for which actual employment data of graduates by liberal arts and science and engineering faculty from 1986 through 1988 were available, were selected from the enterprises listed in "100 Companies in Japan - Enterprise Commentary Edition" published by Nihon Keizai Shimbun, Inc., and the numbers of graduates by liberal arts and science and engineering faculty employed in the 62 companies were totaled by industrial sector.

(Note 3). Graduates from universities include those from master courses.

Table 10. Number of graduates from science and engineering faculties in a broader sense employed in finance and insurance business

Year				1986	1988	88/86
the whole finance and insurance business. (Note 1)	Total number of employed university graduates (A) (Note 2)			25,982	33,144	1.28
	Graduates from undergraduate courses (Note 2).			25,841	32,877	1.27
	Graduates from master courses. (Note 2)			141	267	1.89
	Number of employed graduates from science and engineering faculties in a broader sense (B) (Note 3).			842	2,012	2.39
		Graduates from undergraduate courses.		762	1,834	2.41
			Physical science	236	380	1.61
			Engineering	367	1,193	3.25
			Agriculture	131	248	1.89
			Health care	26	11	0.42
			Mercantile marine	2	2	1
		Graduates from master courses		80	178	2.23
			Physical science	8	37	4.63
			Engineering	27	114	4.22
			Agriculture	44	27	0.61
			Health care	1	0	0
			Mercantile marine	0	0	–
Number of university graduates employed in 46 major finance and insurance enterprises. (Note 4).	Graduates of all disciplines (C)			8,651	12,552	1.45
	Graduates of science and engineering disciplines in a broader sense (D)			525	1,468	2.80
Number of university graduates employed in other enterprises than the above-mentioned 46 in the finance and insurance business.	Graduates of all disciplines (A-C)			17,331	20,592	1.19
	Graduates of science and engineering disciplines in a broader sense (B-D)			317	544	1.72

(Note 1). Based on statistical figures in the "Fundamental School Research" by the Ministry of Education.
(Note 2). Including graduates from undergraduate courses and master courses.
(Note 3). "Science and engineering faculties in a broader sense" include those disciplines as physical science, engineering, agriculture, health care and mercantile marine.
(Note 4). Based on "100 Companies in Japan - Enterprise Commentary Edition" (1990's edition) published by Nihon Keizai Shimbun Inc.

Table 11. Recent employment trends of university graduates in 4 finance and insurance companies investigated in the interview survey by our institute

Year		1985	1986	1987	1988	1989
A company	Liberal arts	About 130	About 130	130	155	143
	Science and engineering	2	6	10	8	17
	Total	About 132	About 136	140	163	160
B company	Liberal arts			54	78	106
	Science and engineering	1~2	1~2	3	11	14
	Total			57	89	120
C company	Liberal arts			125	114	135
	Science and engineering			17	26	21
	Total			142	140	156
D company Note 1	Liberal arts	139	178	221	210	270
	Science and engineering	3	9	9	30	71
	Total	142	187	230	240	341
Total	Liberal arts	–	–	530	557	654
	Science and engineering	–	–	39	75	123
	Total	–	–	569	632	777

Note 1). Data only for male graduates from universities.
Note 2). This table was made on the basis of detailed data provided at the time of the interview survey by 4 finance and insurance companies about the number of recently employed university graduates including those from master courses.

Table 12. Distribution of freshmen of American universities by probable major field of study (1975 - 85)

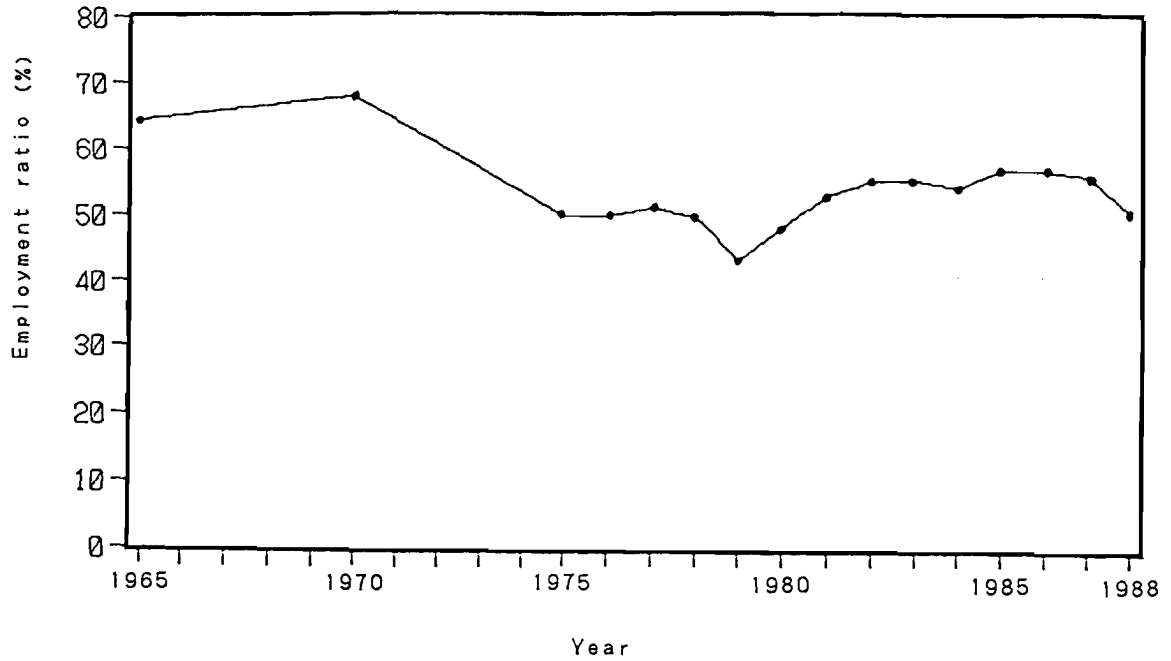
Probable major field of study	1975		1978		1980		1982		1983		1984		1985	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
	Percent in each field													
Agriculture/forestry	5.7	1.9	4.5	2.0	4.1	1.8	3.8	1.4	2.9	0.9	3.3	1.0	3.3	1.0
Arts/humanities	12.7	12.8	7.4	10.6	6.4	10.1	6.8	9.7	6.8	9.0	6.6	8.8	7.1	8.8
Biological Sciences	7.1	5.5	4.8	4.4	3.7	3.8	3.7	3.8	4.1	3.4	4.1	4.2	3.4	3.3
Business	20.1	17.5	25.0	23.1	22.9	24.5	22.3	25.7	22.7	26.0	25.1	27.5	25.7	27.5
Education	4.6	15.5	3.3	12.1	3.3	11.6	2.4	9.0	2.9	8.9	2.8	9.6	3.3	10.4
Engineering	14.0	1.3	18.8	2.3	21.0	3.2	22.3	3.6	20.6	3.5	20.1	3.0	19.3	3.0
Health professions (Non-MD)	1.8	13.2	2.0	14.6	1.9	13.3	1.6	17.8	2.1	14.9	2.3	13.8	2.0	11.6
Mathematics/statistics	1.1	1.1	1.1	0.8	0.7	0.6	0.6	0.7	0.8	0.8	0.8	0.9	0.8	0.8
Computer science	NA	NA	1.6	1.2	2.7	2.4	4.9	4.0	5.4	3.7	4.3	2.7	3.1	1.6
Physical sciences	4.0	1.3	3.5	1.3	3.6	1.6	2.6	1.0	2.5	1.0	2.5	1.1	2.3	0.9
Premed/predent/prevet	NA	NA	4.0	2.9	3.6	3.2	3.2	3.0	3.3	3.2	3.2	3.1	3.1	3.2
Social sciences	3.7	8.9	5.0	9.5	4.5	8.6	4.2	7.2	4.2	7.6	5.1	8.4	5.2	9.6
Other fields (tech)	10.3	6.7	7.0	2.0	8.5	2.9	9.7	4.3	9.9	3.8	7.7	2.4	7.5	2.4
Other fields (non-tech)	10.2	8.8	8.1	7.9	9.3	6.9	8.2	3.3	8.1	7.1	8.0	7.6	9.0	8.1
Undecided	4.6	5.5	3.9	5.3	3.8	5.5	3.7	5.5	4.0	5.7	4.1	6.2	4.7	6.9

Note: Totals may not equal 100% due to rounding.

SOURCE: Cooperative Institutional Research Program, *The American Freshman: National Norms for Fall 1985*, and reports with the same title for 1971-1984, University of California at Los Angeles and American Council on Education (December, 1985)

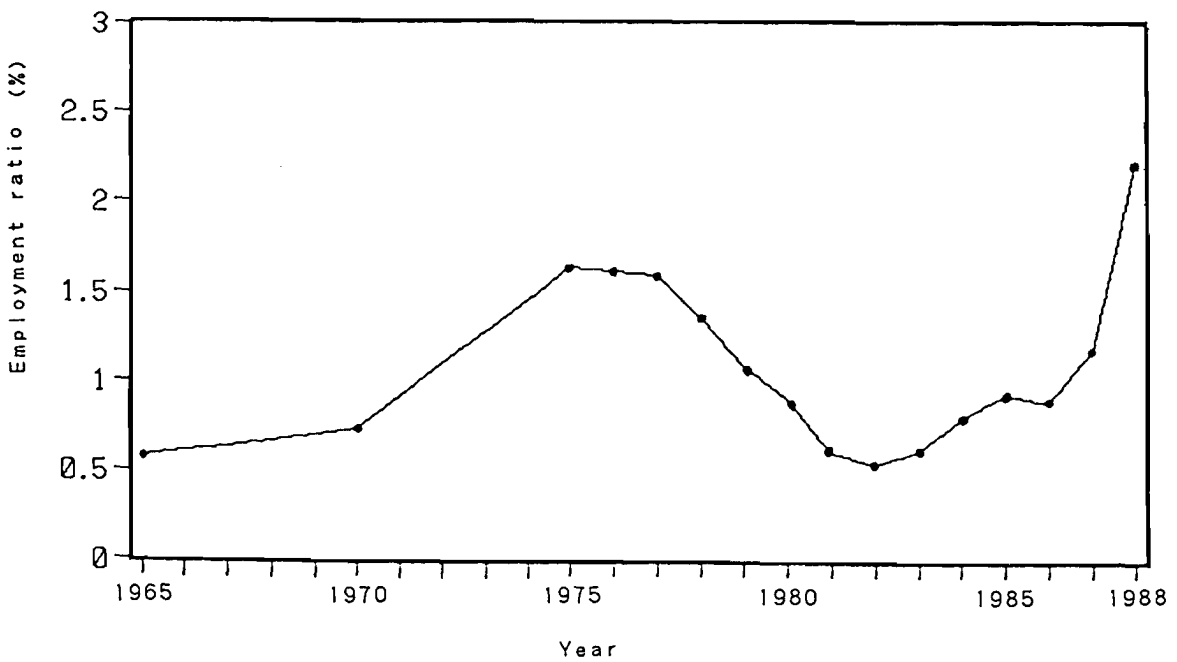
(Source : Reference 4)

Figure 1. Employment ratio of science and engineering graduates from undergraduate courses in the manufacturing industry



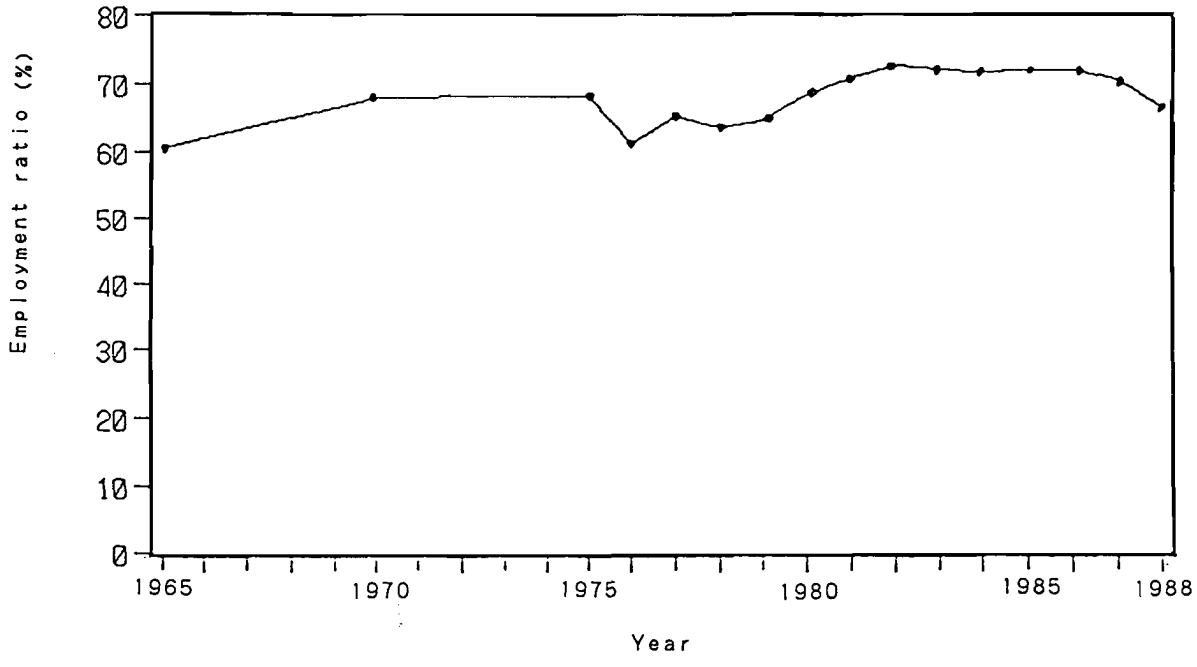
(Note). Made on the basis of statistical figures in the "Fundamental School Research" by the Ministry of Education.

Figure 2. Employment ratio of science and engineering graduates from undergraduate courses in the finance and insurance business.



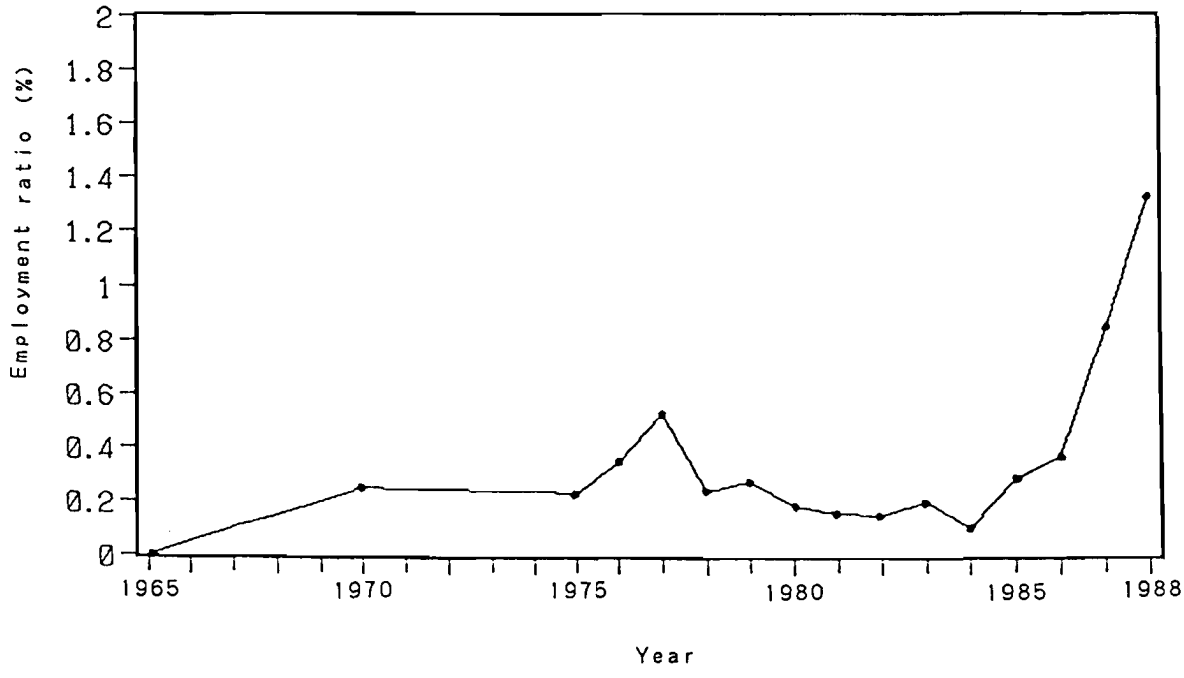
(Note). Made on the basis of statistical figures in the "Fundamental School Research" by the Ministry of Education.

Figure 3. Employment ratio of graduates from science and engineering master courses in the manufacturing industry



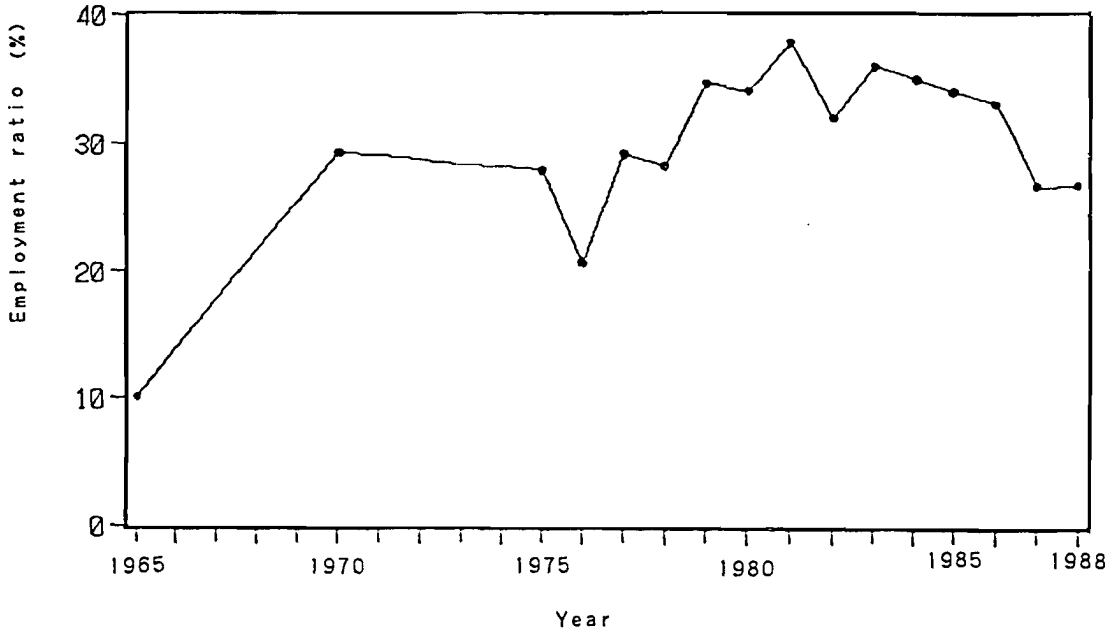
(Note) Made on the basis of statistical figures in the "Fundamental School Research" by the Ministry of Education.

Figure 4. Employment ratio of graduates from science and engineering master courses in the Finance and insurance industry



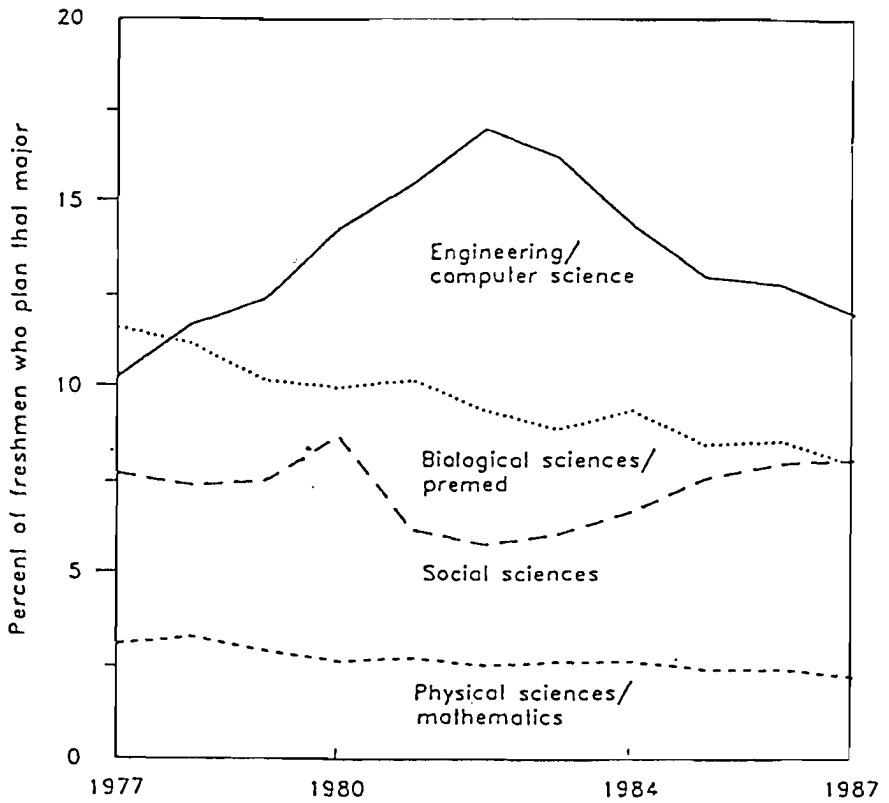
(Note) Made on the basis of statistical figures in the "Fundamental School Research" by the Ministry of Education.

Figure 5. Employment ratio of graduates from science and engineering doctor courses in the manufacturing industry



(Note). Made on the basis of statistical figures of the "Fundamental School Research" by the Ministry of Education.

Figure 6. Ratio of freshmen of American universities by probable major field of study



SOURCE: Cooperative Institutional Research Program, The American Freshman (Los Angeles, CA: University of California, Los Angeles, annually).

(Source: Reference 5)