NISTEP REPORT No.12

Choice of Fields of Study among University Applicants

: How many young people in Japan are planning to study science and engineering in universities ?

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I. Introduction

Recently it has been pointed out that graduates of science and engineering (S&E) departments of universities are "less interested in the manufacturing sector and oriented toward the service sector." There is hence concern about securing manpower important for future development of science and technology (S&T).

Since 1988 NISTEP has been conducting in a Japan "Research on Conditions for Securing Supply of Science and Engineering Graduates as Creative Scientific and Technological Talent." As a part of it NISTEP published a report on "Employment Trends of Science and Engineering Graduates" (NISTEP Report No. 1) to shed light on their alienation from the manufacturing sector.

This study also pointed out that some high school students are strongly social science oriented when they choose universities. If such a tendency is to continue there would be concern about securing of manpower important to development of science and technology.

For this reason, in order to adopt measures to provide the S&T system with enough personnels this report has conducted a survey on applications patterns to universities by department and high school students' future plans. It thereby seeks to shed light on the actual condition of the course selection of the recent university applicants.

First the report first estimates and analyzes the trends of university applicants by department based on the Ministry of Education, Science and Culture's "Report of Basic Survey on Schools" (hereafter referred to as the "Basic Survey").

Second, it attempts to analyze the attitudes of university applicants based on a survey on future plans conducted on 4,211 students of 22 public high schools throughout the country (plus 1,143 students of 12 high schools attached to a private university for purposes of comparison).

II. University Applicants' Choice of University Department

To find out about the applicants' choice of university department, the trends of the applicants by department (technology, science, law, economics and commercial science) were estimated based on the statistical data made available in the Basic Survey.

For the estimation method and detailed data see Appendix 1.

Table 1 and Figure 1 show the trends of the estimated number of university applicants ("net number of university applicants by department" given in Appendix 1) by department.

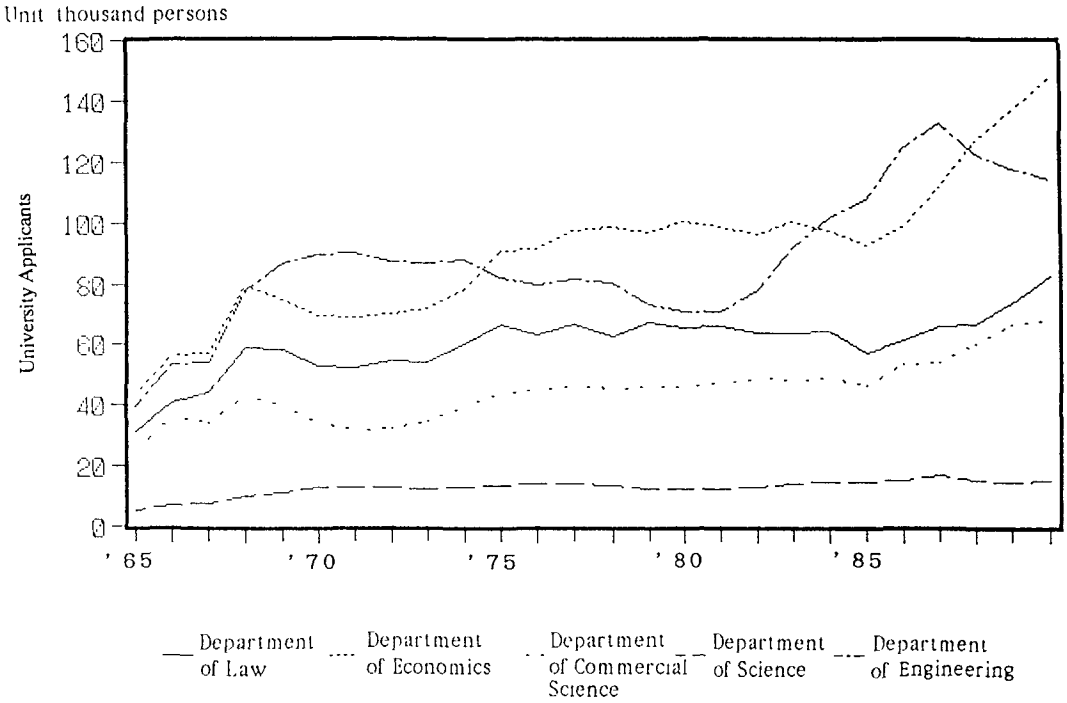
Table 1. Number of University Appendix by Department (Estimate)

Unit: persons

Year	Total	Department of Law	Department of Economics	Department of Commercial Science	Department of Science	Department of Engineering
'65	300,231	31,326	43,721	25,580	5,592	39,294
'66	408,343	40,915	56,932	35,760	7,297	53,610
'67	412,466	44,002	57,560	34,234	7,385	54,559
'68	566,083	59,255	79,969	43,057	10,264	78,027
'69	559,416	58,369	75,066	39,854	11,421	86,620
'70	538,861	53,196	69,550	34,410	12,889	89,455
'71	542,485	52,430	68,942	32,136	13,008	90,315
'72	551,275	54,799	69,970	32,351	13,167	87,413
'73	578,146	54,546	71,806	35,068	12,252	86,516
'74	601,759	60,329	78,654	39,563	13,247	87,880
'75	640,220	66,547	90,794	44,062	13,554	81,777
'76	650,065	62,913	91,390	44,697	14,298	79,633
'77	672,043	66,901	97,586	46,568	14,290	81,558
'78	653,636	62,437	98,621	45,291	13,815	80,554
'79	636,849	67,343	96,824	46,142	12,205	72,952
'80	636,953	65,606	100,099	45,979	12,617	70,683
'81	637,011	66,218	98,838	46,973	12,222	70,905
'82	644,293	67,750	96,437	49,133	13,021	78,029
'83	673,837	63,517	100,542	48,592	14,029	92,265
'84	674,481	64,392	97,370	48,827	14,716	101,303
'85	658,336 (515,771) (142,565)	57,366 (51,189) (6,177)	92,611 (87,412) (5,199)	46,651 (43,939) (2,712)	14,958 (12,375) (2,583)	107,596 (104,663) (2,933)
'86	724,021 (566,958) (157,063)	61,174 (54,372) (6,802)	98,614 (92,821) (5,793)	53,949 (50,609) (3,340)	15,108 (12,391) (2,717)	124,805 (121,740) (3,065)
'87	781,522 (608,781) (172,741)	65,863 (58,099) (7,764)	111,383 (104,192) (7,191)	54,270 (50,373) (3,897)	17,357 (14,230) (3,127)	133,065 (129,685) (3,380)
'88	810,548 (625,820) (184,728)	67,008 (57,808) (9,200)	127,062 (117,325) (9,737)	60,399 (55,446) (4,953)	15,400 (12,710) (2,690)	122,520 (119,084) (3,436)
'89	843,588 (646,325) (197,263)	73,908 (63,015) (10,893)	137,076 (125,383) (11,693)	66,539 (60,345) (6,194)	14,668 (12,000) (2,668)	117,896 (114,142) (3,754)
'90	886,335	82,863	148,261	68,708	15,340	114,747

Notes The figures for 1985-1989 in parentheses indicate those for males (upper row) and females (lower row). (These figures for 1990 were not available as the data were taken from a tentative report of the Basic Survey.)

Figure 1. Trends of University Applicants by Department (Estimate)



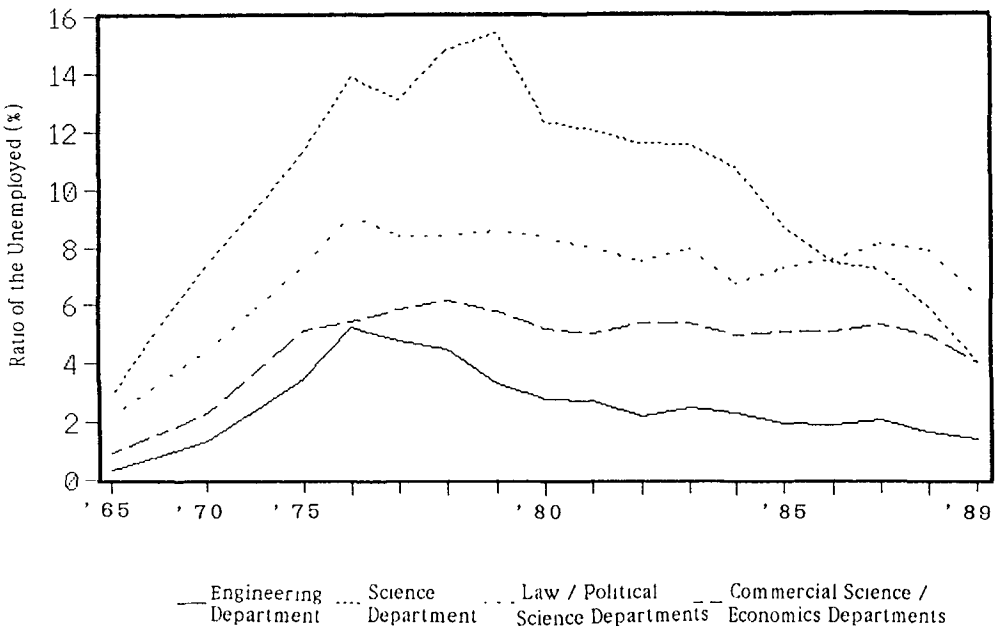
The number of applicants to the engineering department increased from 1965 to the end of the 1960s. It subsequently decreased toward the end of the 1970s and again increased from the early 1980s to 1985-1986. After 1987 it has again decreased. The number of applicants to the science department has also shown similar trends.

The number of applicants to the departments of economics, commercial science and law has shown more or less opposite tendencies.

The increase of applicants to science and engineering departments from 1965 to the end of the 1960s coincides with the period in Japan when the high economic growth from the mid 1950s further developed and when the manufacturing businesses prospered. The subsequent slow down coincides with the period of decline of the manufacturing businesses due to the first and second oil crises. The increase of applicants to science and engineering departments from the early 1980s to 1985-1986 overlaps with the period in which the manufacturing businesses recovered from the oil crises and increased the employment of science and engineering graduates. Hence the increase and decrease up to 1986 can be understood as due to circumstances specific to the side of the manufacturing businesses.

In addition, examination of the unemployed among university graduates by department based on the Basic Survey (Figure 2) shows the small ratio of the unemployed among engineering graduates. While the ratio of the unemployed among science graduates was large during the period of the oil crises, after the peak of 15.4% in 1979 it went down to 4.1% in 1989. This underlines the boom of the manufacturing business in recent years.

Figure 2. Ratio of the Unemployed among University Graduates by Department



However, the recent trends away from science and engineering departments and popularity of the economics department among university applicants have emerged in a period when manufacturing businesses are prospering. Hence they are believed to be of a nature different from the past changes in the number of applicants. They are believed to coincide with the trend away from manufacturing businesses among science and engineering graduates which have emerged in the statistics after 1987.

Comparison of the recent estimated umber of applicants for the departments of technology and economics which are marked with large number of applicants shows that the applicants to technology departments have decreased after the peak of 133,065 in 1987 (122,520 in 1988, 117,896 in 1989 and 114,747 in 1990).

The share of technology departments' applications on the total has also decreased after the peak of 17.2% in 1986 (17.0% in 1987, 15.1% in 1988, 14.0% in 1989 and 12.9% in 1990).

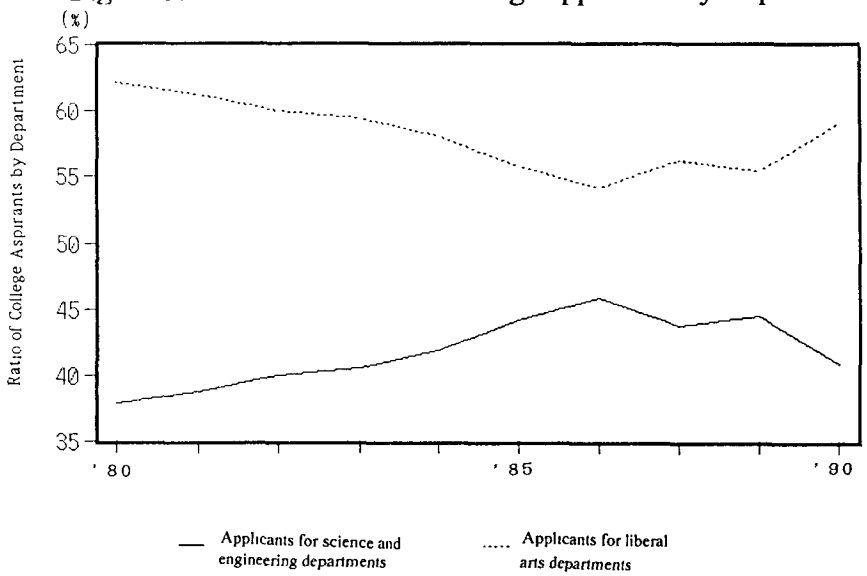
In contrast, the number of applicants for economics departments has substantially increased from 92,611 in 1985 to 98,614 in 1986, 111,383 in 1987, 127,062 in 1988, 137,076 in 1989 and 148,261 in 1989. After 1988 it has exceeded the number of applicants for technology departments.

The share of economics departments in the total number of applicants has increased from the low of 13.6% in 1986 to 14.3% in 1987, 15.7% in 1988, 16.3% in 1989 and 16.7% in 1990. Hence the number of applicants for economics departments has substantially been increasing after 1987.

In terms of applicants' gender (Table 1), both male and female applicants for economics departments have substantially increased in the recent years (1987-1989 comparison: up 21,191 or around 20% for males and up 4,502 or around 63% for females). In contrast male applicants for engineering departments have drastically decreased after the peak in 1987 (down 15,543 or 12% from 1987 to 1989). Female applicants for engineering departments have only slightly increased whereas applicants for economics departments have increased considerably (up 374 or around 11% during 1987-1989).

Figure 3 shows recent ten year trend of the ratio of applicants for university science and engineering departments (including medical and dentistry) and for social science and liberal arts departments from 16 high schools which gave cooperation to this research.

Figure 3. Trends of Ratio of College applicants by Department



The ratio of science and engineering applicants in 16 high school from which data could be obtained rose from 37.8% in 1980 to 45.9% in 1986. After 1987 it began to decrease, recovered to 44.6% in 1988 and again decreased to 40.9% in 1989. (Only ratios are used because only a few years' data could be obtained at some high schools.) The actual record of number of entrants to colleges by department (science and engineering excluding medical and dentistry, social science and liberal arts and medical and dentistry) obtained from 11 high schools (Table 2) also shows that entrants to science and engineering departments are decreasing in the recent years.

Table 2. Trends of Entry to College by Department

Unit: %

	'80	'81	'82	'83	'84	'85	'86	'87	'88	'89
Science and Engineering	32.1	32.4	34.7	35.5	38.1	38.5	35.3	36.1	35.2	34.4
Social Science and Liberal Arts	63.2	61.4	59.5	60.3	58.3	57.4	60.2	59.7	60.9	61.4
Medical and Dentistry	4.7	6.2	5.8	4.1	3.7	4.1	4.5	4.2	3.9	4.2

Hence the trends of applicants for science and engineering departments estimated from the Basic Survey and those of applicants for the respective departments obtained from high schools show similar trends. There is concern for a trend away from science and engineering departments among university applicants.

III. Survey of High School Students' Future Plans

The college plans of twelfth-graders of 22 public high schools throughout the country having many students who aspire to colleges were surveyed from November 1989 to January 1990.

For the survey method and detailed findings see Appendix 2.

Table 3 shows the breakdown of respondents by region. The number of high schools surveyed were 1 in Hokkaido, 3 in Tohoku, 3 in Kanto, 2 in Hokuriku, 1 in Shinetsu, 3 in Tokai, 4 in Kinki, 2 in Chugoku and Shikoku and 3 in Kyushu.

For comparison the college-bound students of 12 high schools attached to a private university were also surveyed.

Table 3. Number of Respondents by Region

	Hokkaido Tohoku	Kanto	Hokuriku Shinetsu	Tokai	Kinki	Chugoku Shikoku Kyushu	Total
Males	443	281	303	532	412	579	2550
Females	117	265	217	243	274	507	1623
Unspecified	6	5	7	7	3	10	38
Total	566	551	527	782	689	1096	4211

The respondents' future plans after graduation from high school were as follows: entry to four-year colleges (national or public): 70.6%, entry to four-year colleges (private): 20.9%, entry to junior colleges: 4.2%, entry to technical colleges: 1.8%, undecided: 0.8% (total of applicants for higher educations: 98.3%), find employment: 0.9%, undecided whether to go on to higher educations or find employment: 0.2%, other: 6.1% and N.A.: 0.5%. Hence an overwhelming proportion wished to go on to higher educations. (The proportion of applicants for higher educations in the case of the high schools attached to a private university was 95.9%.)

1. Fields of Study

Table 4 summarizes the results. When the survey was conducted (autumn of the third year) 42.4% wished to join science or engineering departments (including 5.8% who had "more or less" decided so), 54.0% wished to go on to social science and liberal arts departments (including 3.5% "more or less") and 0.7% had not decided. By this time most of the students had decided which type of department they wanted to join.

Table 4. Ratio of College Applicants by Department

	Science and Engineering Departments	Social Science and Liberal Arts Departments
Total	42.4	54.0
Males	51.2	44.5
Females	28.3	69.3

(%)

These figures more or less coincide with the choice of high school courses the students belonged (45.1% in science, 53.5% in social science and liberal arts and 1.3% in others).

As for the specific university departments they wished to enter, the three most popular departments among science course males were engineering departments (54.5%), science departments (15.8%) and medical departments (11.4%). Those among science course females were medical (24.0%), pharmaceutical (18.0%) and science (14.2%). Those among social science and liberal arts course males were economics (26.9%), law (26.8%) and commerce and business administration (12.6%). Those among social science and liberal arts course females were foreign language and international relations (20.7%), literature (18.6%) and law (9.3%).

The proportion of applications submitted to university science and engineering departments by high school students to graduate in 1989 as calculated by NISTEP based on the Basic Survey was 27.1%. (See Table 5.)

Table 5. Number of Applicants by University Department

High school students to graduate in 1989

University Department		Total	Males	Females	Total (%)	Males (%)	Females(%)
Science and engineering	Science	37,003	29,244	7,759	6.16%	5.68%	9.03%
	Engineering	327,950	316,166	11,784	54.56%	61.38%	13.71%
	Agriculture, forestry, fishery, veterinary and stock raising	46,804	34,408	12,396	7.79%	6.68%	14.42%
	Medical and dentistry	38,856	23,826	15,030	6.46%	4.63%	17.48%
	Pharmaceutics	47,323	17,156	30,167	7.87%	3.33%	35.09%
	Information processing	1,194	1,062	132	0.20%	0.21%	0.15%
	Other science and engineering	101,904	93,211	8,693	16.95%	18.10%	10.11%
	Science and engineering subtotal	601,034	515,073	85,961	<27.05%>	<31.90%>	<14.15%>
Social science and Liberal arts	Law	174,262	144,155	30,107	10.75%	13.11%	5.77%
	Economics	362,058	327,365	34,693	22.33%	29.77%	6.65%
	Commerce and business administration	341,544	305,733	35,811	21.07%	27.81%	6.86%
	Literature	318,409	107,967	210,442	19.64%	9.82%	40.33%
	Foreign language and international relations	68,663	30,055	38,608	4.24%	2.73%	7.40%
	Physical education	18,901	14,154	4,747	1.17%	1.29%	0.91%
	Music and arts	38,658	17,960	20,698	2.38%	1.63%	3.97%
	Pedagogy	99,669	37,166	62,503	6.15%	3.38%	11.98%
	Domestic science	31,577	674	30,903	1.95%	0.06%	5.92%
	Other	167,514	114,288	53,226	10.33%	10.39%	10.20%
	Liberal arts subtotal	1,621,255	1,099,517	521,738	<72.95%>	<68.10%>	<85.85%>
Total		2,222,289	1,614,590	607,699	<100.00%>	<100.00%>	<100.00%>

Note Those who submitted applications to a number of departments are counted as applicants to those departments

Despite the specific characteristics of the schools surveyed, there were no major differences between the students of the 22 public high schools and those of the 12 taken for comparison. Hence they are believed indicative of the tendencies and attitudes shared among college-bound high school students throughout the country.

2. Time for Deciding the Academic Career

About half of those aspiring to science and engineering departments had at least "more or less" decided which type of university department they wanted to go on to around by the second year in junior high school. In contrast only about 30% of those aspiring to social science and liberal arts departments had done so. Moreover, a comparison of the answers given by those who had decided their plan around the first trimester of the second year in high school and when the survey was conducted (autumn of the third year) shows that those aspiring to science and engineering departments had slightly decreased (from 44.2% to 42.4%) while those aspiring to liberal arts departments had considerably increased (from 46.4% to 54.0%).

This means that at least 2% of the students changed their plan from science and engineering to liberal arts after the first trimester of the second year and that most of the students who had not decided on their plan by the first trimester of the second year later decided to go on to liberal arts departments.

Also, among those who had decided to go on to science and engineering departments, 14% had only more or less decided so when the survey was conducted. The corresponding percentage for liberal arts aspirants was 6%.

These findings are indicative of the fact that liberal arts aspirants make the academic decision later than science and engineering aspirants. But once they have made the decision they are less likely to change their mind.

3. Factors Related to Academic Decision

The factors related to twelfth-graders' decision regarding university department were analyzed in terms of its relationship with sex, region, favorite and weak subjects, school club activities and self image. The major factors relevant to the academic decision are believed to be the following.

(1) Gender

Among males, 60% were science and engineering oriented while 40% were liberal arts oriented. Among females the figure is quite the opposite with 30% science and engineering oriented and 70% liberal arts oriented. Hence sex seems to influence

the academic choice to some degree. As discussed in section 1. above, the specific university departments to which students aspire also show major gender differences. It can be seen that gender is a major factor when deciding the department of choice.

(2) Favorite and weak subjects

Many of the students aspiring to science and engineering departments were good at mathematics, chemistry and physics. Many of those aspiring to liberal arts were good at Japanese, social studies and English (Table 6).

In contrast many of the science and engineering students were poor at Japanese, English and social studies while liberal arts students were poor at mathematics, chemistry and physics. The liberal arts students' favorite subjects were science and engineering students' weak subjects. Hence favorite and weak subjects are deeply associated with academic choice.

A more detailed examination shows that in none of the subjects more than 40% of S&E students felt very weak. In contrast over 40% of the liberal arts students were very weak at physics (44.2%) and mathematics (40.8%). Hence weakness in these subjects appears to be a major factor for the liberal arts orientation.

Table 6. Favorite and Weak Subjects

	Science and Engineering Students		Social Science and Liberal Arts Students	
	Favorite ("very" and "somewhat")	Weak ("very" and "somewhat")	Favorite ("very" and "somewhat")	Weak ("very" and "somewhat")
Mathematics	57.4	41.9	26.6	73.1
Chemistry	44.5	53.6	13.1	63.5
Physics	35.2	57.6	6.5	60.9
Sciences (all)	47.4	46.3	14.9	67.8
Biology	24.1	34.3	26.9	56.8
Earth science	14.9	36.1	13.8	51.8
English	32.2	67.2	45.1	54.5
Social studies	36.5	62.9	55.5	44.1
Japanese	30.4	69.2	58.0	41.8

(%)

(3) Self-image

The self images social science and liberal arts males more often had than science and engineering males were "I am interested in things which happen in society" (34.1% versus 23.7%), "I like to write and read" (17.9% vs. 9.1%) and "I am more liberal arts-oriented" (40.6% vs. 3.8%). Those which science and engineering males more often had than liberal arts males were "I am good at mechanical things" (16.7% vs. 5.0%), "I like to make plastic models and other things" (32.3% vs. 14.1%), "I like to use personal computers" (32.3% vs. 14.1%), "I like lab experiments" (27.3% vs. 8.0%) and "I am science and engineering-oriented" (44.2% vs. 5.0%).

Females also showed similar tendencies. Frequent self images among science and engineering females were "I like nature such as the sea and mountains" (53.0% vs. 46.3%) and "I like to raise animals" (36.8% vs. 26.9%).

Hence it appears that those who like to actually touch things are strongly science and engineering oriented.

4. Choice of University Department and Faculty

The survey asked high school students what they relied on or emphasized when choosing the university department and faculty.

(1) What they relied on

For each item the students were asked if they relied on it very much, somewhat, did not rely on it much or did not rely on it at all.

As a whole the things the students relied on very much or somewhat were books and magazines on academic planning (76.9%), conversation with classmates (63.3%), academic guidance materials prepared by the school (61.8%), results of extramural trial examinations (58.6%), conversation with teachers (56.4%) and pamphlets issued by universities (53.6%). These applied both to science/engineering and social science and liberal arts applicants. However social science and liberal arts applicants tended to rely more on these sources. Hence it appears that they are more willing to follow this kind of information.

(2) What they emphasized

The students were asked in the same way as (1). As a whole the items they emphasized the most were "I want to study what I want to study" (50.1%), "I want to enjoy the student life" (38.6%) and "I want to acquire qualifications" (31.6%).

Science and engineering applicants tended more to "Learn the most up-to-date things," "I like to make things and do minute things," "I am interested in natural phenomena and organisms," "I like to pursue things' workings and mechanisms" and "I am good at science subjects." Liberal arts aspirants were interested in "social systems and movements," "foreign languages and cultures," "want to enjoy the student life" and the "number of examination subjects" of the university they wanted to enter. As touched on in Appendix 2 the desire to "enjoy student life" seems to be strengthening among students recently. Such students tend more to aspire to social science or liberal arts departments. (In the background seems to be the idea that one is required to study less in a social science or liberal arts department.) Hence increase of students who emphasize the joy of student life is believed to strengthen the social science and liberal arts orientation.

5. High School Students' Image of College Life

To see if the image of college life is affecting the choice of academic career the high school students were asked what kind of life they wanted to lead after they entered college, junior college or technical college and what kind of image they had of the college life of social science and liberal arts and science and engineering students.

(1) Priority areas of college life

As a whole the items the students emphasized the most were relations with friends (57.3%), own interest (53.5%), acquisition of qualifications (41.7%) and study and research (41.4%). Both male and female science and engineering applicants tended to emphasize more study and research. Social science and Liberal arts applicants tended to emphasize more part-time working, relations with friends and travel and leisure. Hence students who emphasize activities other than study in college life tend to prefer social science or liberal arts departments.

(2) Image of college life by department

High school students had more or less common images. They felt the life of social science or liberal arts college students to be cheerful but lacking seriousness, not busy with studies and without many employment opportunities and future prospects. The image of science and engineering department students was that they had no worries about future employment, but are required to study hard and would have a cheerless college life.

Liberal arts applicants had a somewhat better image of social science and liberal arts college students and vice versa. However science and engineering applicants felt they would be very busy with their studies.

The foregoing findings show that basically there is no major difference between high school students' image of the college life of social science and liberal arts and science and engineering students. However liberal arts students' primary image of social science and liberal arts college life was that it was "cheerful." "Employment" or "future prospects" seem to be of secondary importance. In contrast science and engineering applicants' primary image of science and engineering college life was that they will have a "serious" college life in which they will be required to study hard but they will have advantages in terms of employment and future prospects.

6. High Schools Students' Occupational Choice and Image

(1) Occupational choice

High school students' major criteria of occupational choice were "Want to do the job I like" (96.5%), "The job is stable" (90.8%), "The pay is good" (88.6%) and "Can use the knowledge and technology acquired in schools" (87.6%). Science and engineering applicants tended more to say they can specialize in certain areas (76.1% vs. 65.5%) and social science and liberal arts applicants tended more to say the job involves less overtime work and more holidays (75.5% vs. 69.7%), it will allow them to meet many people (57.8% vs. 47.3%), it will enable international activities (56.6% vs. 45.2%) and it will enable working in cities (56.6% vs. 45.2%). Hence social science and liberal arts applicants tended more to emphasize the possibility of meeting people and environmental conditions related to private life than the job itself.

The favorite occupations of male science and engineering applicants were engineering (machinery, electric machinery, civil engineering and construction,

44.3%), science and technology research (18.9%) and medical (12.9%). Science and engineering women applicants selected medical (49.9%), science and technology research (15.1%) and engineering (12.4%). Social science and liberal arts men applicants preferred financial and distribution and other business professions (15.0%) and civil service (13.6%). Those among female social science and liberal arts applicants were educational (19.1%).

(2) Occupational image

The students were asked the image they had of three occupations : "science and technology researcher," "design engineer of a major automobile maker" and "banker." They had negative images of "science and technology researcher" and "design engineer" which are science and engineering oriented occupations. They pointed out "low pay," "instability" and "non-sociability" as demerits in terms of social aspects. They however had good images of the contents of these occupations, considered "creative" and "interesting." As an occupation the contents of the job of the banker which is a social science and liberal arts occupation was negatively imaged such as "not interesting" and "not creative." It was positively imaged in terms of social implications such as "well paid," "stable" and "sociable."

7. High School Students' View of Science and Technology

The students were asked for their view of science and technology. Science and engineering applicants had a better image of science and technology than social science and liberal arts applicants. They tended more to feel they wanted to do jobs related to science and technology, were interested in their newest trends, often read newspaper articles on them and wanted to utilize their fruits. These attitudes were related to their strong interest in science and technology. Hence interest in science and technology is believed to greatly affect the choice of academic career.

IV. Discussion

1. Necessity to Make Science and Technology More Attractive

The trend among college applicants away from science and engineering departments which emerged after 1987-1988 and the popularity of economics departments after 1987 coincided with the trend among science and engineering college graduates away from manufacturing businesses and their orientation for finance and insurance businesses which emerged in the statistics after 1987. Hence these moves can be believed to be related.

The present trends of science and engineering department graduates away from manufacturing businesses and their orientation for finance and insurance businesses are indicative of the great demand for science and engineering graduates. Yet at the same time college applicants are turning away from science and engineering departments. There is a possibility that a new change not seen before is occurring among today's young Japanese. (See Reference 3.)

It is likely that in the background has been a change in young people's attitude.

The following summarizes the findings from the survey regarding differences in the attitude of science and engineering applicants and social science and liberal arts applicants regarding choice of academic career.

(1) In choosing the academic career social science and liberal arts applicants make the decision later than science and engineering applicants and based on more information. Although they know that the social science and liberal arts career is disadvantageous when it comes to employment or future prospects they choose it because they want to enjoy the college life in a cheerful environment.

In contrast about half of science and engineering applicants make the decision before they finish junior high school. Their major reasons include interest in science and technology and willingness to study science and engineering based on a desire to find a job in scientific fields.

(2) Many of the students who are "very weak" at physics, mathematics and chemistry are very strongly social science or liberal arts oriented.

(3) Those who like manual work are strongly science and engineering oriented.

(4) Regarding future occupation, social science or liberal arts oriented students tend to emphasize the possibility of meeting people or environmental conditions related to private life than the work itself.

(5) Students regard scientific occupations as being creative. However they have bad images about their social aspects (such as low pay, instability and unsociability).

Based on the foregoing findings from the survey and the analysis in NISTEP Report No. 1 an attempt to simplify the process of academic career decision-making shows the following typical pattern.

(1) Days up to junior high school

Those who like manual work, are very interested in science and technology, want to engage in creative occupations and want to enter science and engineering courses. In the background is believed to be an understanding that scientific occupations are creative.

Many of those who will be aspiring to liberal arts courses have not decided their future academic plan at the junior high stage.

(2) High school stage

The following students who had not decided their academic plan in the junior high stage tend to want to go on to liberal arts.

a. Those who are no good at mathematics or science.
b. Those who want to enjoy university life.
c. Those who are eagerly following diverse kinds of information.

In the background are believed to the following understanding:

a. One will be required to study hard in scientific university departments.
b. The college life in a scientific department is too sober and gloomy.
c. Occupations such as of a banker which is a representative liberal arts occupation have better social implications (such as pay, stability and sociability).

In contrast, those who are willing to face sober and study-filled college life to acquire employment of the type they want by placing the primary importance on the content of work tend to aspire to science and engineering. However some who wanted

to aspire to science and engineering in the junior high stage, change their aspiration to liberal arts as they acquire information regarding occupational conditions (such as low pay).

College applicants are believed to be increasingly liberal arts oriented recently because of 1) increase of students who want to enjoy college life, 2) many people have come to know the pay and other differences between manufacturing and finance and insurance businesses and 3) due to the chronic shortage of young workers there are no major worries about getting employed.

(3) College stage

Some of the students who have entered science and engineering university departments through the foregoing process are believed to have the following doubts as they come to know the media reports and industrial conditions: Are scientific occupations really creative? Won't they be locked up in narrow technical areas? and Will they be able to enjoy full social merits commensurate with their hard work?

On the other hand financial and insurance firms which have employed many social science and liberal arts graduates have come to execute many operations which handle numbers due to computerization, internationalization and diversification of the scope of operation and intensification of competition in Japan and abroad. Since social science and liberal arts graduates tend to be weak at mathematics and had not studied much math in college there is believed to be an increasing demand for science and engineering graduates who are not allergic to mathematical analysis.

Hence science and engineering students who have come to have the foregoing doubts, who do not want to be locked up in narrow technical areas and want to try out their possibilities in diverse fields tend to go into such areas as finance and insurance.

If the above mentioned pattern causes the college applicants' move away from science and engineering departments and science and engineering graduates' move away from manufacturing businesses, the question is why such moves are occurring now when manufacturing businesses are booming and science and engineering graduates are favorably being employed. While this phenomenon may seem contradictory it can be understood as something naturally occurring when the present boom of the Japanese economy and the brilliance of corporate activities in large cities

are being highlighted and such ideas and views are spreading among recent young people as

(1) There are no major worries in getting employed (the students can take the initiative in choosing companies).

(2) They will lose nothing by enjoying their college life.

(3) Scientific jobs are hard but do not offer commensurate social merits.

No changes are expected to occur in the conditions (1) and (2) if the shortage of young workers is to continue in the future. Hence the above moves are expected to continue for a long time unless there are major changes in condition (3).

The tendency for young people to turn away from science and engineering careers in the period of economic prosperity has also emerged in the United States from around 1983 in the form of college freshmen turning away from science and engineering majors. Hence the country is also facing the problem of having to secure future science and engineering talent (Table 7).

Table 7. Distribution of U.S. College Freshmen by Major and Career

	1982	1983	1984	1985	1986	1987
	Percent					
Probable major						
Biological sciences	3.7	3.8	4.2	3.4	3.9	4.4
Engineering	12.6	11.7	11.0	10.7	10.9	9.4
Physical sciences[1]	2.5	2.5	2.6	2.4	2.4	2.6
Social sciences	5.8	6.1	6.7	7.6	8 0	10.1
Computer science	4.4	4.5	3.4	2.3	1.9	1.6
Business	24.2	24.4	26.4	26.8	26.9	25.7
Education	6.0	6.0	6.5	7.1	8.1	8.8
Arts and humanities	8.2	7.9	7.7	8.3	9.0	11.3
One of the professions	13.3	14.4	14.1	12.9	11.7	10.7
Probable career occupation						
Computer programmer or analyst	8.8	8.5	6.1	4.4	3.5	2.4
Scientific researcher	1.5	1.5	1.5	1.4	1.4	1.8
Engineer	12.0	10.8	10.4	10.0	9.7	8.4
College teacher	0.2	0.2	0.3	0.3	0.3	0.3

[1]Includes mathematics.

(Source: Reference Material 4)

Analysis by the Office of Technology Assessment (OTA) of the U.S. Congress sums up the attitudes of the recent young Americans as follows. They manifest tendencies similar to the foregoing attitudes of young Japanese. (Reference Material 5)

(1) Many of the students who choose scientific academic careers are already interested in science and technology before they enter high schools.
(2) The choice of majors by freshmen is greatly affected by the labor market trends at the time. (The proportion of college freshmen who majored in science and engineering subjects increased from the 1970s to the beginning of the 1980s. The OTA analyzes that this was because since the U.S. economy was stagnating at that time students sought to acquire technologies in high-tech areas which were believed less vulnerable to recession.)
(3) Compared to the students of the 1960s those of the 1980s more emphasize pay, promotion speed, the occupation's social evaluation and comfort in the area of private life. They no longer place much emphasis on community activities and ability development.

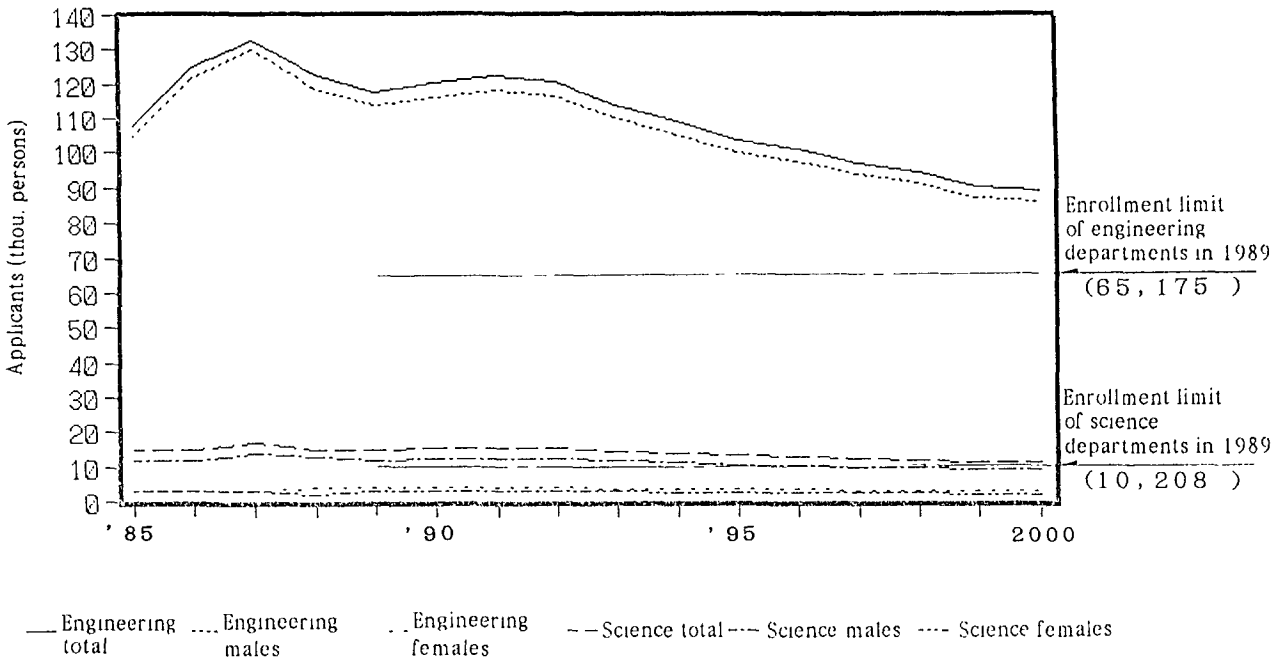
2. Estimation of the Number of Applicants to Science and Engineering Departments

The number of applicants to science and engineering departments by gender in the year 2000 was roughly estimated for the following two cases based on the estimate of the population aged 18 (Reference Material 6: those who will turn 18 on October 1, 2000) and the number of applicants estimated by this report.

Case 1: When the ratio of applicants to science and engineering departments to the total 18-year-old population remains the same (Figure 4)

If the ratio of the applicants to science and engineering departments to the total 18-year-old population is assumed to remain unchanged from what it is in 1989 as obtained in the present study (male applicants to engineering departments: 11.2%, female: 0.41%, male applicants to science departments: 0.75%, female: 0.31%), the number of applicants is expected to decrease to around 89,000 (engineering) and 11,000 (science) by the year 2000.

Figure 4. Forecast of Applicants to Science and Engineering Departments (Case 1)

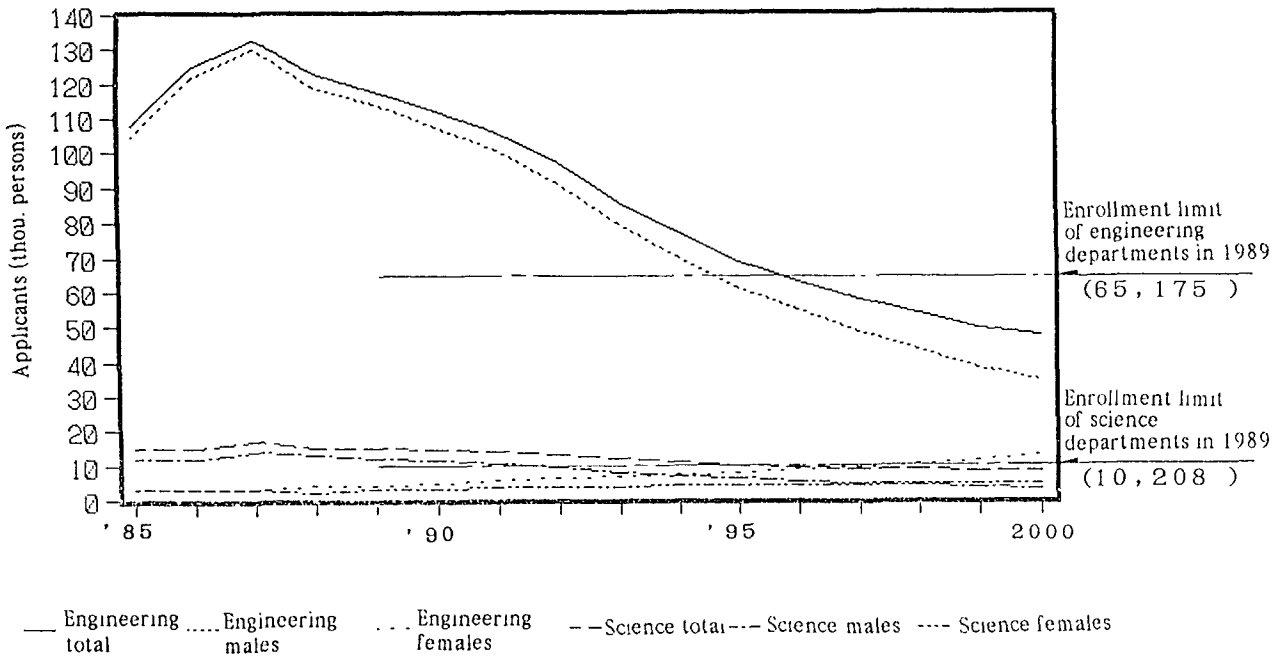


Case 2: When the rate of increase/decrease of applicants to science and engineering departments from 1987 to 1989 is assumed to continue (Figure 5)

If the rate of increase/decrease of applicants to science and engineering departments during 1987-1989 continues* the number of applicants will fall below 1989's enrollment limit (65,175 for engineering and 10,208 for science) in 1995 in the case of science departments and 1996 in the case of engineering departments. By the year 2000 the applicants will decrease to 47,000 (engineering) and 8,000 (science).

*Specifically, if the ratio of applicants to science and engineering departments to the total 18-year-old population after 1990 and by sex is assumed to increase or decrease every year at the rate obtained by averaging the rates for 1987-1988 and 1988-1989 (male engineering department: down 8%, female: up 14%, male science department: down 9%, female: up 7%).

Figure 5. Forecast of Applicants to Science and Engineering Departments (Case 2)



3. Future Issues

This paper has thus examined college applicants' move away from science and engineering academic careers and its background. The situation where young people do not have major worries about getting employed due to the shortage of young workers is basically expected to continue. Moreover, while the share of the tertiary industries in the Japanese economy has been increasing students are placing the emphasis on enjoying their college life. On the other hand people are talking much about the society's information-orientation and the economy's software-orientation. They hence tend to forget the importance of the act of making things which are at the source of such changes. Such a social trend is believed to be greatly affecting the young people.

Given such circumstances, in stopping college aspirants' move away from science and engineering academic careers or science and engineering graduates' move away from manufacturing businesses it is believed necessary to examine the following issues in the future.

(1) Period up to junior high school

This is an important period in which a considerable portion of those who will be aspiring to science and engineering academic careers start to think of this as a viable alternative. The survey also found that those who like manual work are strongly science-oriented.

On the other hand, some concerned with education have pointed out:

a. These days there are few opportunities for people to come in contact with nature and the sense of seasons has thinned out. Students often find out the contents of experiments from TV. They are more used to indirect experience, are less curious and are not easily excited by lab experiments.

b. Many children now have lower ability to use things such as knives.

c. Classroom work is mainly based on textbooks and there are less lab experiments.

Therefore, as regards children in this period it is believed effective to increase their interest in science and technology by having them actually touch things by utilizing every opportunity and by letting them know the great joy and excitement of creation associated with activities of scientists and engineers such as by having them read appropriate biographies.

In addition, if children come to feel that they are weak at science or mathematics such becomes a great barrier in making the decision to aspire to scientific academic careers. Hence scrupulous consideration will be required not to let them feel this way.

(2) High school stage

In this stage those who eagerly follow various information from books and magazines related to schooling and conversation with classmates are more likely to turn away from the scientific career. Hence it will be necessary to actively incorporate the fun of science and engineering and excitement associated with activities of scientists and engineers in the information coming from schooling-related magazines, mass media and others and to try to create a general atmosphere such as among classmates which will improve the image of science and engineering.

It is also believed effective to set up opportunities for high school students to come in contact with front-line scientists and engineers with outstanding records and

pride in their work so as to develop good impression regarding the occupations of scientists and engineers (that they are creative occupations). Of course, for this reason the scientists and engineers who appear before young people would have to be good talkers and give good impression and also be able to accurately convey the great inspiration they acquired from science and engineering based on their experience. Otherwise the meeting will have the opposite effect.

(3) University stage

By this stage the students are already grown ups. Simple image-building tactics are believed ineffective.

Those who aspire to technical occupations are believed to be looking for creativity in work. Hence it will first be necessary to ensure that the contents of the scientific occupations in manufacturing businesses will not betray their expectations. Moreover they are required to study harder in college than liberal arts students and to actively continue their studies after they get employed so as to keep abreast with the ever-accelerating wave of technological innovation. Hence it will be necessary to ensure occupational treatment and environment which are no worse than those of other occupations (such as finance) engaged in by those having equal abilities.

If these conditions are met and science and engineering students can actively be informed that jobs where they can fully display their creativity and treatment which is fully commensurate with their efforts are available such students can be expected to come back to the fields of science and technology.

V. Conclusion

Since Japan is scarce in resources it has no choice than to develop itself through science and technology. Given such circumstances failing to supply the science and technology manpower to promote creative science and technology will be to block the way to develop the country through science and technology. It will be necessary to make efforts to turn young people's eyes again to science and technology.

The basic conditions will be to ensure creative job contents and comfortable job environment for scientists and engineers and substantially improve their treatment.

It will be difficult to radically solve the problem without the determination to make available job contents and environment in which scientists and engineers can fully display their creativity and occupational treatment and social evaluation fully commensurate with their efforts and achievements.

Hence it will be necessary for the government offices and the related private and university organizations to cooperate with each other and set up active measures to turn young people's eyes to science and technology.

Also, young people's behavior recently sensitively responds to social conditions. In view of this characteristic, to more accurately understand future trends of science and technology manpower it will be necessary to follow changes in the young people's attitude by capturing every opportunity.

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In conducting the survey on high school students' future academic plan the Group obtained cooperation by numerous persons concerned with high schools and universities and the Educational Research Institute of Fukutake Publishing Co., Ltd. In addition, regarding academic plans of college aspirants based on the statistics made available in the Basic Survey the Group obtained comment by NISTEP's visiting researcher Shin'ichi Kobayashi from the Engineering Department of the Tokyo Institute of Technology.

The Group would like to express gratitude for the guidance and cooperation provided by the related persons in conducting this research.

Appendix-1

Appendix-1

Survey of University Applicants by Department

NISTEP Study Group No. 1

Summary

As part of the "Research on Conditions for Securing Supply of Science and Engineering Graduates as Creative Scientific and Technological Talent" the trends of university aspirants by department during the 25 years from 1965 to 1989 were studied. (Departments of law, economics, business administration, science and technology.)

It was found that aspirants to science and engineering departments increased from the mid 1960s to the mid 1970s with the prosperity of manufacturing businesses and decreased with the slump of the same due to the first and second oil crises.

Subsequently the aspirants increased with the recovery of the manufacturing businesses and increase of university aspirants in general. However they have decreased after the peak in 1987 (1986 in the case of technology department aspirants) while aspirants to economics and business administration departments have increased. Hence the study has produced data suggesting a trend of university aspirants away from science and engineering departments.

1. Objectives

Recently it is pointed out that science and engineering graduates of universities are "alienated from the manufacturing sector and strongly oriented toward the service sector" when they seek employment. Hence there has been concern regarding securing of manpower important for future development of science and technology. While NISTEP has been conducting "Research on Conditions for Securing Supply of Science and Engineering Graduates as Creative Scientific and Technological Talent," since 1988 it has been conducting surveys on employment trends and attitudes of science and engineering graduates and hearings on enterprises' attitudes on employment of the same. In June of 1989 NISTEP published the findings in "Employment Trends of

Science and Engineering Graduates" (NISTEP Report No. 1) to shed light on the actual condition of the trend away from manufacturing.

In the process of this study some of the interviewees concerned with universities expressed concern that in the background of the recent trend among science and engineering students away from manufacturing and orientation for finance and insurance businesses might be that the recent young people are increasingly being attracted to fund management and desk work in clean offices without being bound by one's area of specialty rather than activities of engineers who make things by making use of their specialty and actually wrestling with things. Hence there might be a current of young people's orientation away from scientific and technological activities (NISTEP Report No. 1).

If such concern is warranted such is believed to be a "dangerous sign which could undermine the foundation of industrial activities and scientific and technological activities in Japan from the side of human resources" (NISTEP Report No. 1). Hence the trends of university aspirants by department was studied as a basic study to explore the presence or not of such a tendency.

2. Study Method

The study used the statistical data on university aspirants made available in the Ministry of Education, Science and Culture's "Report of Basic Survey on Schools" (hereafter referred to as the "Basic Survey") as basic data.

In grasping the academic orientation of college aspirants during the period from 1965 to 1989 it is necessary to know the number of aspirants by college department. In reality however there are students who apply to both technology and science departments and colleges which do not determine students' department when they are first enrolled. Hence the average number of departments applied was calculated from the said statistics using the method described below and the net number of university aspirants by department was estimated based on the said average.

The "net number of university aspirants by department" means the number of aspirants by department such as technology or science estimated using the method described below. Hence such number of aspirants has been set up as an index in examining the academic orientation of university aspirants.

The estimation was conducted for three groups: 1) all university aspirants, 2) high school students to graduate in March ("new high school graduates") and 3) those who had already graduated from high schools ("past high school graduates"). The estimations for these groups were also compared. ("Past high school graduates" includes graduates of foreign high schools, of advanced courses at special training schools and others such as successful candidates of high school equivalence tests. Only the figures for the entire university aspirants were estimated for the years from 1965 to 1972 because "new" and "past" high school graduates could not be distinguished from the data made available in the Basic Survey.)

The liberal arts departments covered consisted of the departments of law, economics, business administration and commercial science which are believed to be closely associated with corporate activities. The science and engineering departments consisted of the departments of science, technology and science and engineering.

The average number of departments applied was calculated and the net number of aspirants by department was estimated as follows.

Average number of departments applied

The Basic Survey makes available two kinds of data: 1) the number who submitted applications to universities as reported by the universities (total number and by department) and 2) the number of high school graduates who submitted applications to universities as reported by their high schools (data by department are not available).

In this report the average number of departments applied was obtained by dividing the former data with the latter.

Net university aspirants by department

The available materials did not contain data on the net number of university aspirants by department. Hence it was estimated by dividing the number of university aspirants by department made available in the Basic Survey with the average number of departments applied. (The net university aspirants by department was calculated for "new" and "past" high school graduates and added to obtain the total figure.) This estimation method assumes that aspirants to any department have applied for the same number of departments.

3. Findings

1) Average number of departments applied

The average number of departments applied by all college aspirants fluctuated from 1965 to 1968. Until 1973 it remained more or less at the same level, between 3.3-3.6 departments. From 1974 to 1978 it climbed to 4 to 5 departments, then somewhat declined, remained on the same level until 1986 at 4.0 or 4.1 and again rose after 1987 to 4.9 departments in 1989.

Comparison of "new" and "past" high school graduates shows that the average number of departments applied by past graduates has exceeded that applied by new graduates by two to three departments. Aside from this the two groups have shown more or less similar tendencies of increase. In the recent years (1980-1986) the average number of departments applied by new graduates has remained more or less at the same level between 3.1 and 3.3. After 1987 it increased up to 3.8 in 1989 (up 1.2 times from 1986).

The average number of departments applied by past high school graduates more or less remained on the same level between 5.9-6.3 (1980-1986). As in the case of new graduates it has been rising recently to 7.2 in 1989 (up 1.2 times from 1986).

The net estimated number of university aspirants by department was based on these averages of departments applied.

See:
Table 1. Number of University Aspirants by Department and Average Number of Departments Applied
Figure 1. Average Number of University Departments Applied

2) Net number of university aspirants by department

The ratio of aspirants to the departments of technology, science and science and engineering combined increased from 1965 to the early 1970s. After it decreased in the late 1970s. It increased from the early 1980s to around 1985-1987 and has again subsequently decreased.

The ratio of aspirants to the departments of economics, commercial science and business administration has shown opposite tendencies.

In terms of the recent trends of aspirants to technology and science departments, after the peak of 133,065 technology and 17,357 science aspirants in 1987 the number of aspirants to these departments has been decreasing (1988: 122,520 technology and 15,400 science (down 10,545 and 1,957, respectively, from 1987) and 1989: 117,896 technology and 14,668 science (down 15,169 and 2,689, respectively, from 1987)).

The net number of aspirants to the departments of economics, business administration and law had been decreasing despite increase of the total number of university aspirants. After the lowest in 1985 however it has begun to increase. Aspirants to departments of commercial science have also shown similar tendencies.

The net number of aspirants to economics departments has increased dramatically:

1985: 92,611
1986: 98,614 (up 6,003 from 1985)
1987: 111,383 (up 18,772 ")
1988: 127,064 (up 34,451 ")
1989: 137,076 (up 44,465 ").

After 1988 it has exceeded the number of aspirants to technology departments.

The number of new high school graduates aspiring to science and engineering departments has substantially decreased after the peak of 93,092 technology and 11,287 science in 1987 (1988: 83,496 technology and 9,703 science; 1989: 81,299 technology and 9,641 science). In contrast, aspirants to economics departments have drastically increased from 70,279 in 1986 to 78,267 (1987), 87,878 (1988) and 94,335 (1989).

See:
Table 2. Net Number of University Aspirants by Department (estimate)
Figure 2-1. Net Number of University Aspirants by Department (all aspirants)
Figure 2-2. Net Number of University Aspirants by Department (new high school graduates)
Figure 2-3. Net Number of University Aspirants by Department (past high school graduates)

In terms of the yearly ratio of university aspirants by department the share of technology departments has drastically decreased after the peak of 17.2% in 1986 (new graduates: 17.5% in 1986 and past graduates: 17.2% in 1987) to 17.0% (1987), 15.1% (1988) and 14.0% (1989)(new graduates: 15.0% in 1988 and 14.0% in 1989 and past graduates: 15.5% in 1988 and 13.8% in 1989). In contrast aspirants to economics departments have been increasing after the lowest of 13.6% in 1986 (new graduates: 13.6% and past graduates: 13.8%) to 14.3% (1987), 15.7% (1988) and 16.3% (1989)(new graduates: 15.7% in 1988 and 16.3% in 1989 and past graduates: 15.6% in 1988 and 16.2% in 1989).

Next, after 1985 the share of women aspiring to liberal arts departments (law, business administration, commercial science and economics) has significantly increased.

In the case of the law and economics departments which are marked with a large number of aspirants, the share of women during 1985-1989 rose from 10.8% to 14.7% (law department aspirants) and from 5.6% to 8.5% (economics department aspirants). In contrast the share of women applying to technology and science departments has only slightly increased, from 2.7% to 3.2% (technology department aspirants) and from 17.3% to 18.2% (science department aspirants)(1985-1989).

See:
Table 3. Net Ratio of University Aspirants by Department
Figure 3-1. Net Ratio of University Aspirants by Department (all aspirants)
Figure 3-2. Net Ratio of University Aspirants by Department (new high school graduates)
Figure 3-3. Net Ratio of University Aspirants by Department (past high school graduates)
Table 4. Net Number of Female University Aspirants by Department (estimate) and their Ratio
Figure 4. Net Ratio of Female University Aspirants by Department (all aspirants)

3) Number of university entrants by department

The departments have shown similar tendencies of increase and decrease of entrants. After 1985 the number of entrants rapidly increased. The growth has been obvious particularly in the case of technology and economics departments:

Year	Tech. Dept.	Econ. Dept.	Up from 1985
1985	65,937	53,505	
1988	75,223	63,472	9,286/9,967
1989	73,511	63,828	7,574/10,323

The departments have had more or less similar shares of entrants during the past 25 years (technology departments: 15-16% and economics departments: 13-14%). Hence there has been no correlation with the recent decrease of aspirants to science and engineering departments and increase of those to economics departments.

See:
Table 5. University Entrants by Department
Figure 5-1. University Entrants by Department
Figure 5-2. Ratio of University Entrants by Department

4. Discussion

1) College aspirants' trend away from science and engineering departments and orientation for economics departments

The foregoing findings point to the following:

(1) The ratio of aspirants to technology departments substantially grew from 11.13% to 17.24% during the five years from 1981 to 1986. The ratio after 1987 however has been decreasing. Comparison of new and past high school graduates shows that while the decrease of the ratio of new aspirants to technology departments started in 1987 that among past graduates started a year later in 1988. This means that the trend is more evident among younger students.

(2) The ratio of aspirants to science departments has not shown large fluctuations as in the case of technology department aspirants. Yet as for the tendency of increase and decrease it has shown similarities with technology aspirants.

(3) After 1987 the ratio of aspirants to economics departments has substantially grown.

2) Trends of popularity of science and engineering departments and attitudes of young people

The net increase of aspirants to science and engineering departments from around 1965 to the early 1970s coincides with the period in which the high economic growth came to an end and manufacturing businesses prospered the most. The subsequent decrease coincides with the period of decline of manufacturing businesses due to the two oil crises.

The net increase of aspirants from 1982 to 1987 (both new and past high school graduates) overlaps with the period in which manufacturing businesses recovered from the oil crises and increased the employment of science and engineering graduates. During that period, science and technology became crucial for Japan's development, typified by the creation of the science and technology promotion fund in 1981, the Nobel prize in chemistry awarded to Ken'ichi Fukui, the "biotechnology boom" and holding of the science and technology expo in 1985 in Tsukuba. Such emphasis on science and technology both in the government and private sectors and favorable employment of university graduates by manufacturing businesses may be said to have attracted young people to science and engineering departments.

However college aspirants' move away from science and engineering departments which has appeared as a tendency after 1988 and the popularity of economics departments after 1987 coincide with the science and engineering graduates' move away from manufacturing businesses and orientation for finance and insurance businesses which have appeared in the statistics after 1987. These moves are believed to be related. In the background is believed to be a change of attitude among young people specifically of the kind discussed in 1. Objectives.

3) Concern regarding decrease of science aspirants

Among the tendencies discussed so far the decrease of the net number of aspirants to science departments is a matter of concern of basic because of the increased importance research in Japan.

The estimated number of new high school graduates aspiring to science departments in 1988 (9,703) was smaller than the number of those who entered science departments in April of that year (10,492). A similar tendency is shown in 1989. If such a trend continues it will cause great hindrance to the supply of science department graduates who must play important roles in conducting basic research.

4) Necessity to make science and technology more attractive

Needless to say the success or failure of promotion of science and technology in Japan in the future depends on ensuring of high-quality manpower. The data obtained in the present study however suggest that college aspirants are turning away from science and engineering departments and oriented toward economics departments. This runs counter to the hopes of promoting Japan's science and technology in the future.

The decline of the ratio of students willing to study science and engineering subjects in universities has also been evidenced in the United States in the 1980s (see NISTEP Report No. 1). As was discussed in the Report such a phenomenon could also eventually appear in Japan. In preparing for such an event it is believed important to instill in young people the desire to aspire to activities in the area of science and technology by improving the social status of scientists and engineers including their occupational treatment as well as the image of science and technology in general.

Table 1. Number of University Aspirants by Department and Average Number of Departments Applied

(Unit: persons)

Year		Total (1)	Total	Law	Economics	Business administration	Commercial science	Science	Engineering	Science and engineering	Average number of departments applied
'65	All aspirants	300,231	1,203,337	125,553	175,232	30,001	102,523	22,413	157,492	47,777	4.008
'66	All aspirants	408,343	1,516,506	151,960	211,445	52,742	132,813	27,102	199,106	59,368	3.714
'67	All aspirants	412,466	1,769,995	188,812	246,992	65,020	146,897	31,688	234,112	78,568	4.291
'68	All aspirants	566,083	1,896,060	198,445	267,815	74,565	144,199	34,374	261,313	86,877	3.349
'69	All aspirants	559,416	1,979,647	206,568	265,659	86,235	141,042	40,420	306,548	92,543	3.539
'70	All aspirants	538,861	1,943,207	191,825	250,796	80,225	124,084	46,479	322,576	104,226	3.606
'71	All aspirants	542,485	1,952,684	188,749	248,190	84,235	115,688	46,829	325,135	109,799	3.600
'72	All aspirants	551,275	1,975,590	196,400	250,772	78,478	115,946	47,191	313,287	106,013	3.584
'73	All aspirants	578,146	2,071,785	204,032	254,655	96,149	125,356	45,286	310,176	107,975	3.583
	New high school graduates	406,799	1,220,130	102,041	155,533	59,317	74,454	23,749	182,296	53,246	2.999
	Past high school graduates	171,347	851,655	101,991	99,122	36,832	50,902	21,537	127,880	54,729	4.970
'74	All aspirants	601,759	2,320,113	242,681	300,445	111,452	152,160	52,490	337,122	108,822	3.856
	New high school graduates	433,080	1,380,239	124,904	184,159	66,883	91,244	28,496	203,842	53,170	3.187
	Past high school graduates	168,679	939,874	116,286	116,286	44,569	60,916	23,994	133,280	55,652	5.572
'75	All aspirants	640,220	2,756,699	299,032	389,523	134,707	190,389	60,014	349,144	124,647	4.306
	New high school graduates	457,363	1,614,495	151,566	230,803	77,584	110,243	32,031	210,073	63,048	3.530
	Past high school graduates	182,857	1,142,204	147,466	158,720	57,123	80,146	27,983	139,071	61,599	6.246
'76	All aspirants	650,065	2,794,518	286,219	395,539	150,427	195,884	62,424	332,459	117,215	4.299
	New high school graduates	459,491	1,601,043	135,155	221,696	79,898	105,382	34,007	208,466	61,468	3.484
	Past high school graduates	190,574	1,193,475	151,064	173,843	70,529	90,502	28,417	123,993	55,747	6.263
'77	All aspirants	672,043	2,957,894	308,325	430,677	159,840	208,173	64,195	349,181	120,161	4.401
	New high school graduates	476,571	1,723,089	153,007	248,709	86,871	115,129	34,908	222,262	64,823	3.616
	Past high school graduates	195,472	1,234,805	155,318	181,968	72,969	93,044	29,287	126,919	55,338	6.317
'78	All aspirants	653,636	3,127,128	311,668	472,516	165,347	221,260	66,952	373,095	132,629	4.784
	New high school graduates	455,924	1,779,586	152,611	267,545	85,547	117,164	36,453	235,760	69,165	3.903
	Past high school graduates	197,712	1,347,542	159,057	204,971	79,800	104,096	30,499	137,335	63,464	6.816
'79	All aspirants	636,840	2,796,686	311,198	429,936	157,658	207,933	53,958	308,982	115,038	4.392
	New high school graduates	451,784	1,591,540	150,921	237,731	80,506	109,686	30,249	196,841	60,537	3.523
	Past high school graduates	185,056	1,205,146	160,277	192,205	77,152	98,247	23,709	112,141	54,501	6.512
'80	All aspirants	636,964	2,658,633	289,953	420,018	147,727	194,758	52,952	281,322	112,326	4.174
	New high school graduates	452,065	1,512,885	136,938	235,223	75,102	105,899	29,633	184,027	60,075	3.347
	Past high school graduates	184,899	1,145,748	153,015	184,795	72,625	88,859	23,319	97,295	52,251	6.197

(Unit: persons)

Year		Total (1)	Total	Law	Economics	Business administration	Commercial science	Science	Engineering	Science and engineering	Average number of departments applied
'81	All aspirants	637,011	2,608,930	287,251	408,180	144,787	196,098	50,019	272,593	124,336	4.096
	New high school graduates	452,214	1,470,311	134,869	224,285	70,111	104,232	28,250	183,495	66,521	3.251
	Past high school graduates	184,797	1,138,619	152,382	183,895	74,676	91,866	21,769	89,098	57,815	6.161
'82	All aspirants	644,293	2,590,165	270,759	394,581	146,792	202,601	52,585	294,623	125,042	4.020
	New high school graduates	456,113	1,466,189	128,245	211,501	72,097	105,927	29,366	199,862	68,203	3.215
	Past high school graduates	188,180	1,123,976	142,514	183,080	74,695	96,674	23,219	94,761	56,839	5.973
'83	All aspirants	673,837	2,697,177	268,009	410,354	145,831	199,848	56,904	349,973	137,948	4.003
	New high school graduates	479,690	1,543,388	129,193	220,884	71,060	104,955	31,237	234,086	73,699	3.217
	Past high school graduates	194,147	1,153,789	138,816	189,470	74,771	94,893	25,667	115,887	64,249	5.943
'84	All aspirants	674,481	2,794,692	282,483	410,166	138,783	209,009	62,747	403,791	150,600	4.143
	New high school graduates	470,463	1,525,255	128,553	212,869	63,409	103,127	31,347	246,435	74,147	3.242
	Past high school graduates	204,018	1,269,437	153,930	197,297	75,374	105,882	31,400	157,356	76,453	6.222
'85	All aspirants	658,336	2,729,799	254,015	391,138	127,862	199,739	64,377	433,731	158,064	4.147
	New high school graduates	444,209	1,376,538	104,426	186,809	52,597	91,495	29,012	236,949	66,981	3.099
	Past high school graduates	214,127	1,353,261	149,589	204,329	75,265	108,244	35,365	196,782	91,083	6.320
'86	All aspirants	724,021	2,918,628	257,729	398,389	140,357	222,089	64,473	498,932	161,813	4.031
	New high school graduates	518,176	1,654,077	127,707	224,329	71,214	118,252	30,645	289,613	73,598	3.192
	Past high school graduates	205,845	1,264,551	130,022	174,060	69,143	103,837	33,828	209,319	88,215	6.143
'87	All aspirants	781,522	3,541,188	312,032	504,440	155,445	250,967	81,487	603,939	162,554	4.531
	New high school graduates	548,568	1,967,618	150,442	280,742	76,950	130,923	40,485	333,920	71,879	3.587
	Past high school graduates	232,954	1,573,570	161,590	223,698	78,495	120,044	41,002	270,019	90,675	6.755
'88	All aspirants	810,548	3,766,338	324,984	589,439	183,683	286,080	74,493	572,371	173,802	4.647
	New high school graduates	558,575	2,036,392	152,956	320,404	87,896	145,635	35,378	304,428	75,243	3.646
	Past high school graduates	251,973	1,729,946	172,028	269,035	95,787	140,445	39,115	267,943	98,559	6.866
'89	All aspirants	843,588	4,119,609	378,694	668,600	221,336	330,393	73,060	574,500	197,038	4.883
	New high school graduates	579,045	2,222,289	174,262	362,058	108,556	169,027	37,003	312,027	85,571	3.838
	Past high school graduates	264,543	1,897,320	204,432	306,542	112,780	161,366	36,057	262,473	111,467	7.172

Note: The figures for "Total (1)" were taken from Table 242 of the Basic Survey (1989 edition) section on primary and secondary educational institutions, special training schools and miscellaneous schools. Other figures were taken from Table 16 of the Basic Survey (1989) section on higher educational institutions and the corresponding tables in earlier editions of the Basic Survey.

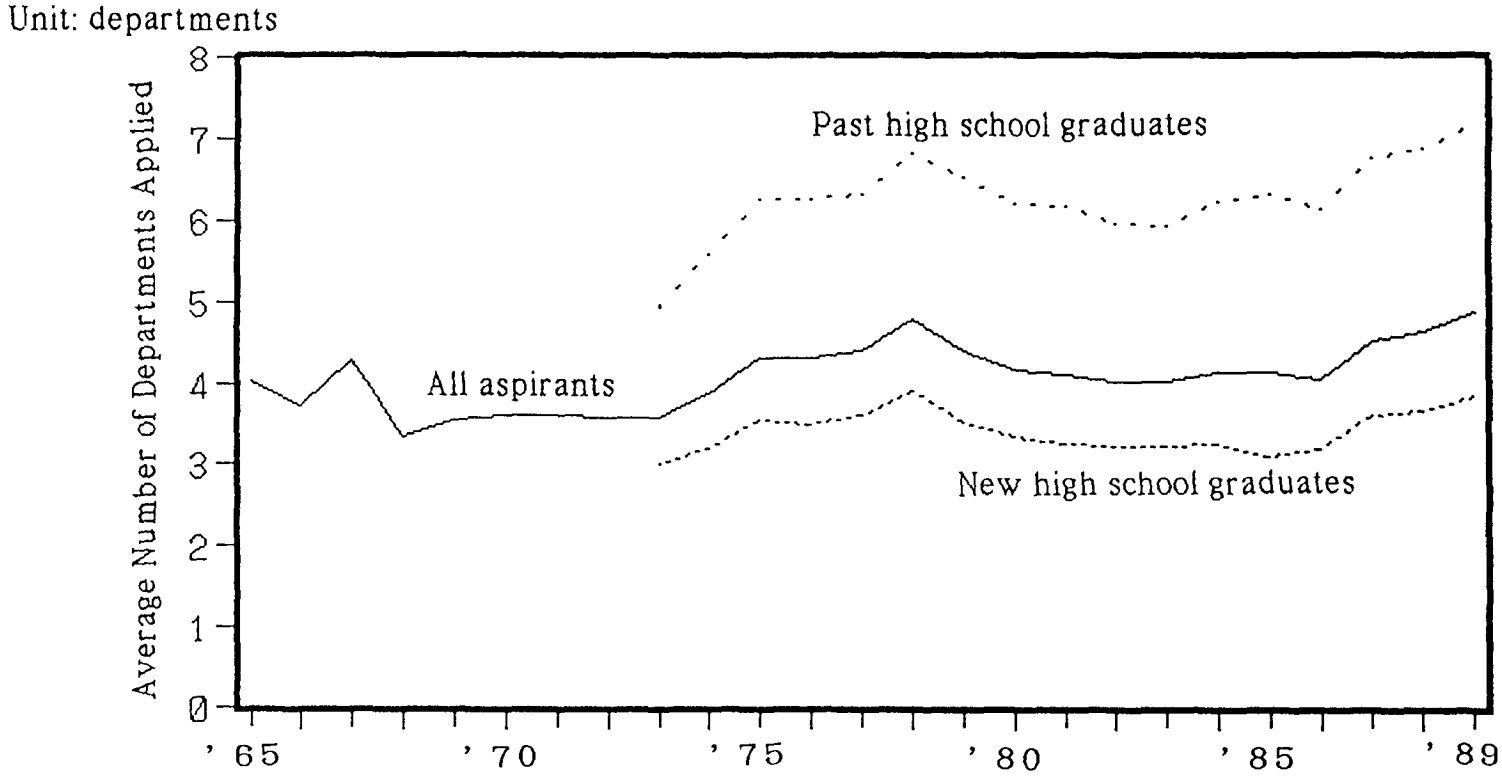

Figure 1. Average Number of University Departments Applied

Table 2. Net Number of University Aspirants by Department (estimate)

(Unit: persons)

Year		Total	Law	Economics	Business administration	Commercial science	Science	Engineering	Science and engineering
'65	All aspirants	300,231	31,326	43,721	7,485	25,580	5,592	39,294	11,920
'66	All aspirants	408,343	40,915	56,932	14,201	35,760	7,297	53,610	15,985
'67	All aspirants	412,466	44,002	57,560	15,153	34,234	7,385	54,559	18,310
'68	All aspirants	566,083	59,255	79,969	22,265	43,057	10,264	78,027	25,941
'69	All aspirants	559,416	58,369	75,066	24,367	39,854	11,421	86,620	26,149
'70	All aspirants	538,861	53,196	69,550	22,248	34,410	12,889	89,455	28,903
'71	All aspirants	542,485	52,430	68,942	23,399	32,136	13,008	90,315	30,500
'72	All aspirants	551,275	54,799	69,970	21,897	32,351	13,167	87,413	29,580
'73	All aspirants	578,146	54,546	71,806	27,190	35,068	12,252	86,516	28,767
	New high school graduates	406,799	34,025	51,862	19,779	24,826	7,919	60,786	17,755
	Past high school graduates	171,347	20,521	19,944	7,411	10,242	4,333	25,730	11,012
'74	All aspirants	601,759	60,329	78,654	28,985	39,563	13,247	87,880	26,671
	New high school graduates	433,080	39,192	57,784	20,986	28,630	8,941	63,960	16,683
	Past high school graduates	168,679	21,137	20,870	7,999	10,933	4,306	23,920	9,988
'75	All aspirants	640,220	66,547	90,794	31,124	44,062	13,554	81,777	27,723
	New high school graduates	457,363	42,937	65,383	21,978	31,230	9,074	59,511	17,861
	Past high school graduates	182,857	23,610	25,411	9,146	12,832	4,480	22,266	9,862
'76	All aspirants	650,065	62,913	91,390	34,194	44,697	14,298	79,633	26,544
	New high school graduates	459,491	38,793	63,633	22,933	30,247	9,761	59,835	17,643
	Past high school graduates	190,574	24,120	27,757	11,261	14,450	4,537	19,798	8,901
'77	All aspirants	672,043	66,901	97,586	35,575	46,568	14,290	81,558	26,687
	New high school graduates	476,571	42,314	68,549	24,024	31,839	9,654	61,466	17,927
	Past high school graduates	195,472	24,587	28,806	11,551	14,729	4,636	20,092	8,760
'78	All aspirants	653,636	62,437	98,621	33,626	45,291	13,815	80,554	27,032
	New high school graduates	455,924	39,101	68,549	21,918	30,019	9,340	60,405	17,721
	Past high school graduates	197,712	23,336	30,072	11,708	15,272	4,475	20,149	9,311
'79	All aspirants	636,849	67,343	96,824	34,641	46,142	12,205	72,952	25,509
	New high school graduates	451,784	42,730	67,308	22,793	31,055	8,564	55,731	17,140
	Past high school graduates	185,065	24,613	29,516	11,848	15,087	3,641	17,221	8,369

(Unit: persons)

Year		Total	Law	Economics	Business administration	Commercial science	Science	Engineering	Science and engineering
'80	All aspirants	636,953	65,606	100,099	34,158	45,979	12,617	70,683	26,381
	New high school graduates	452,065	40,914	70,279	22,439	31,640	8,854	54,983	17,949
	Past high school graduates	184,888	24,692	29,820	11,719	14,339	3,763	15,700	8,432
'81	All aspirants	637,011	66,218	98,838	33,687	46,973	12,222	70,905	29,846
	New high school graduates	452,214	41,485	68,990	21,566	32,062	8,690	56,443	20,462
	Past high school graduates	184,797	24,733	29,848	12,121	14,911	3,533	14,461	9,384
'82	All aspirants	644,293	67,750	96,437	34,930	49,133	13,021	78,029	30,730
	New high school graduates	456,113	39,890	65,786	22,425	32,948	9,134	62,165	21,214
	Past high school graduates	188,180	23,860	30,651	12,505	16,185	3,887	15,865	9,516
'83	All aspirants	673,837	63,517	100,542	34,670	48,592	14,029	92,265	33,720
	New high school graduates	479,690	40,159	68,661	22,089	32,625	9,710	72,765	22,909
	Past high school graduates	194,147	23,358	31,881	12,581	15,967	4,319	19,500	10,811
'84	All aspirants	674,481	64,392	97,370	31,673	48,827	14,716	101,303	35,159
	New high school graduates	470,463	39,652	65,660	19,559	31,810	9,669	76,013	22,871
	Past high school graduates	204,018	24,740	31,710	12,114	17,017	5,047	25,290	12,288
'85	All aspirants	658,336	57,366	92,611	28,881	46,651	14,958	107,596	36,026
	New high school graduates	444,209	33,697	60,280	16,972	29,524	9,362	76,460	21,614
	Past high school graduates	214,127	23,669	32,331	11,909	17,127	5,596	31,136	14,412
'86	All aspirants	724,021	61,174	98,614	33,566	53,949	15,108	124,805	37,417
	New high school graduates	518,176	40,008	70,279	22,310	37,046	9,601	90,731	23,057
	Past high school graduates	205,845	21,166	28,335	11,256	16,903	5,507	34,074	14,360
'87	All aspirants	781,522	65,863	111,383	33,072	54,270	17,357	133,065	33,462
	New high school graduates	548,568	41,941	78,267	21,452	36,499	11,287	93,092	20,039
	Past high school graduates	232,954	23,922	33,116	11,620	17,771	6,070	39,973	13,423
'88	All aspirants	810,548	67,008	127,062	38,059	60,399	15,400	122,520	34,993
	New high school graduates	558,575	41,953	87,878	24,108	39,944	9,703	83,496	20,638
	Past high school graduates	251,973	25,055	39,184	13,951	20,455	5,697	39,024	14,355
'89	All aspirants	843,588	73,908	137,076	44,010	66,539	14,668	117,896	37,838
	New high school graduates	578,012	45,404	94,335	28,285	44,040	9,641	81,299	22,296
	Past high school graduates	264,294	28,504	42,741	15,725	22,499	5,027	36,597	15,542

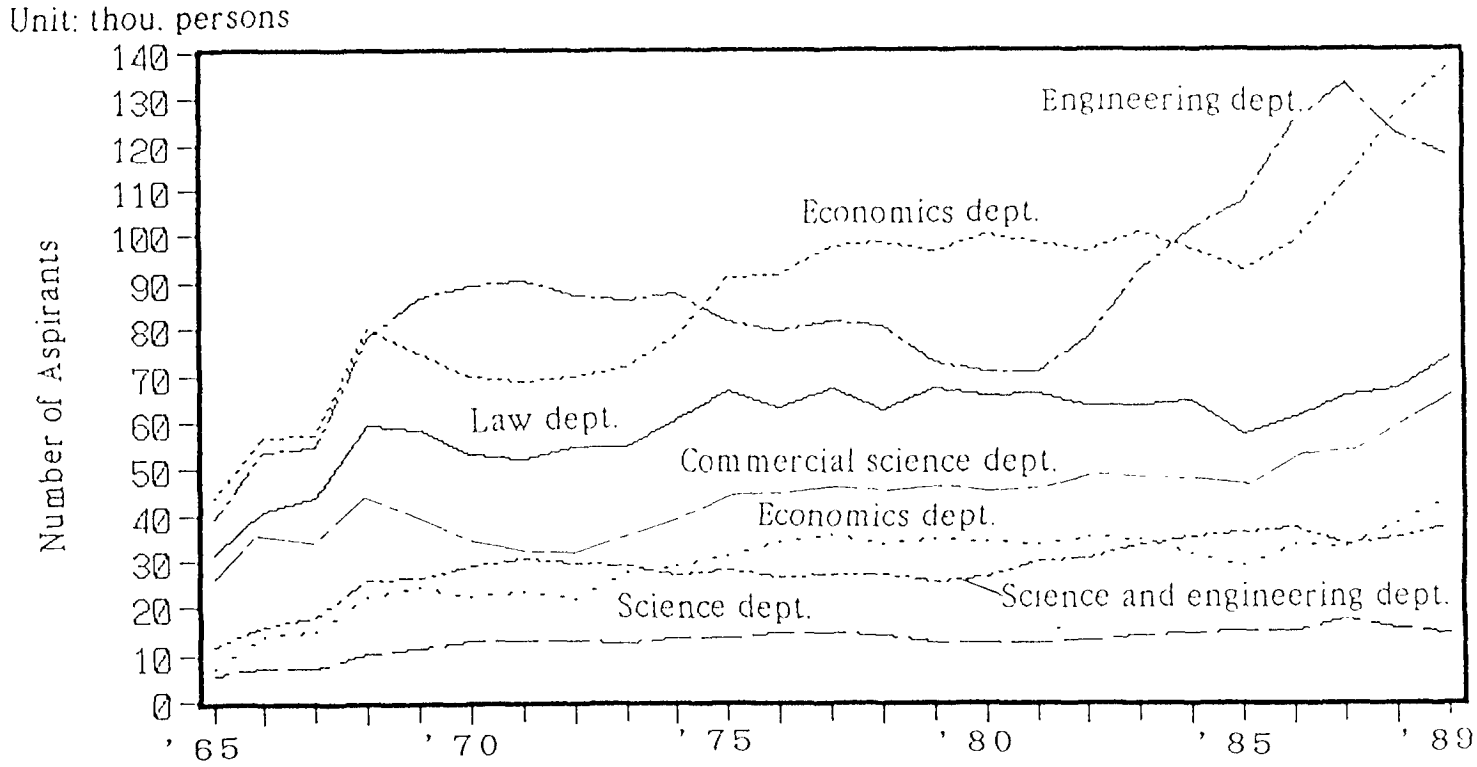

Figure 2-1. Net Number of University Aspirants by Department (all aspirants)

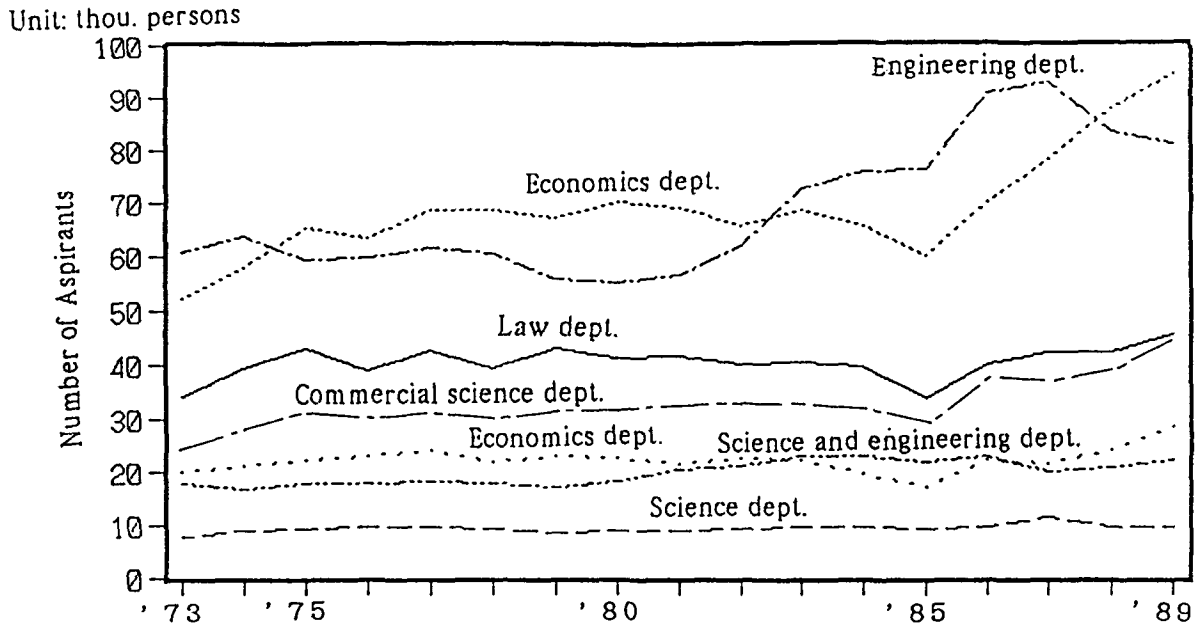

Figure 2-2. Net Number of University Aspirants by Department (new high school graduates)

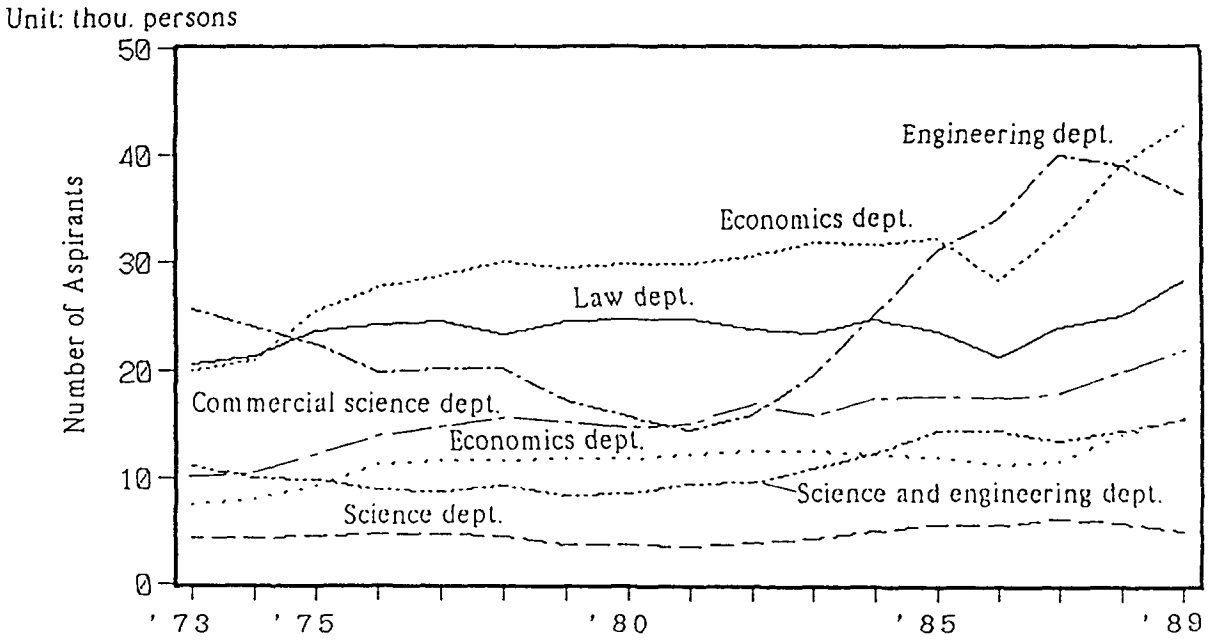

Figure 2-3. Net Number of University Aspirants by Department (past high school graduates)

Table 3. Net Ratio of University Aspirants by Department

(%)

Year		Total	Law	Economics	Business administration	Commercial science	Science	Engineering	Science and engineering
'65	All aspirants	100	10.43	14.56	2.49	8.52	1.86	13.09	3.97
'66	All aspirants	100	10.02	13.94	3.48	8.76	1.79	13.09	3.92
'67	All aspirants	100	10.67	13.96	3.67	8.30	1.79	13.23	4.44
'68	All aspirants	100	10.47	14.13	3.93	7.61	1.81	13.78	4.58
'69	All aspirants	100	10.43	13.42	4.36	7.12	2.04	15.48	4.67
'70	All aspirants	100	9.87	12.91	4.13	6.39	2.39	16.60	5.36
'71	All aspirants	100	9.67	12.71	4.31	5.92	2.40	16.65	5.62
'72	All aspirants	100	9.94	12.69	3.97	5.89	2.39	15.86	5.37
'73	All aspirants	100	9.44	12.42	4.70	6.07	2.12	14.96	4.98
	New high school graduates	100	8.36	12.75	4.86	6.10	1.95	14.94	4.37
	Past high school graduates	100	11.98	11.64	4.33	5.98	2.53	15.02	6.43
'74	All aspirants	100	10.03	13.07	4.82	6.58	2.20	14.60	4.43
	New high school graduates	100	9.05	13.34	4.85	6.61	2.07	14.77	3.85
	Past high school graduates	100	12.53	12.37	4.74	6.48	2.55	14.18	5.92
'75	All aspirants	100	10.39	14.06	4.86	6.88	2.12	12.77	4.33
	New high school graduates	100	9.39	14.30	4.81	6.83	1.98	13.01	3.91
	Past high school graduates	100	12.91	13.90	5.00	7.02	2.45	12.18	5.39
'76	All aspirants	100	9.68	14.06	5.26	6.88	2.20	12.25	4.08
	New high school graduates	100	8.44	13.85	4.99	6.58	2.12	13.02	3.84
	Past high school graduates	100	12.66	14.57	5.91	7.58	2.38	10.39	4.67
'77	All aspirants	100	9.96	14.52	5.29	6.93	2.13	12.14	3.97
	New high school graduates	100	8.88	14.43	5.04	6.68	2.03	12.90	3.76
	Past high school graduates	100	12.58	14.74	5.91	7.54	2.37	10.28	4.48
'78	All aspirants	100	9.55	15.09	5.14	6.93	2.11	12.32	4.14
	New high school graduates	100	8.58	15.04	4.81	6.58	2.05	13.25	3.89
	Past high school graduates	100	11.80	15.21	5.92	7.72	2.26	10.19	4.71
'79	All aspirants	100	10.57	15.20	5.44	7.25	1.92	11.46	4.01
	New high school graduates	100	9.46	14.90	5.05	6.87	1.90	12.34	3.79
	Past high school graduates	100	13.30	15.95	6.40	8.15	1.97	9.31	4.52

Year		Total	Law	Economics	Business administration	Commercial science	Science	Engineering	Science and engineering
'80	All aspirants	100	10.30	15.72	5.36	7.22	1.98	11.10	4.14
	New high school graduates	100	9.05	15.55	4.96	7.00	1.96	12.16	3.97
	Past high school graduates	100	13.36	16.13	6.34	7.76	2.04	8.49	4.56
'81	All aspirants	100	10.40	15.52	5.29	7.37	1.92	11.13	4.69
	New high school graduates	100	9.17	15.26	4.77	7.09	1.92	12.48	4.53
	Past high school graduates	100	13.38	16.15	6.56	8.07	1.91	7.83	5.08
'82	All aspirants	100	9.90	14.97	5.42	7.63	2.02	12.11	4.77
	New high school graduates	100	8.75	14.42	4.92	7.22	2.00	13.63	4.65
	Past high school graduates	100	12.68	16.29	6.65	8.60	2.07	8.43	5.06
'83	All aspirants	100	9.43	14.92	5.15	7.21	2.08	13.69	5.00
	New high school graduates	100	8.37	14.31	4.61	6.80	2.02	15.17	4.78
	Past high school graduates	100	12.03	16.42	6.48	8.22	2.23	10.04	5.57
'84	All aspirants	100	9.55	14.44	4.70	7.24	2.18	15.02	5.21
	New high school graduates	100	8.43	13.96	4.16	6.76	2.06	16.16	4.86
	Past high school graduates	100	12.13	15.54	5.94	8.34	2.47	12.40	6.02
'85	All aspirants	100	8.71	14.07	4.39	7.09	2.27	16.34	5.47
	New high school graduates	100	7.59	13.57	3.82	6.65	2.11	17.21	4.87
	Past high school graduates	100	11.05	15.10	5.56	8.00	2.61	14.54	6.73
'86	All aspirants	100	8.45	13.62	4.64	7.45	2.09	17.24	5.17
	New high school graduates	100	7.72	13.56	4.31	7.15	1.85	17.51	4.45
	Past high school graduates	100	10.28	13.77	5.47	8.21	2.68	16.55	6.98
'87	All aspirants	100	8.43	14.25	4.23	6.94	2.22	17.03	4.28
	New high school graduates	100	7.65	14.27	3.91	6.65	2.06	16.97	3.65
	Past high school graduates	100	10.27	14.22	4.99	7.63	2.61	17.1	5.76
'88	All aspirants	100	8.27	15.68	4.70	7.45	1.90	15.12	4.32
	New high school graduates	100	7.51	15.73	4.32	7.15	1.74	14.95	3.70
	Past high school graduates	100	9.94	15.55	5.54	8.12	2.26	15.49	5.70
'89	All aspirants	100	8.76	16.25	5.22	7.89	1.74	13.98	4.49
	New high school graduates	100	7.84	16.29	4.89	7.61	1.67	14.04	3.85
	Past high school graduates	100	10.78	16.16	5.94	8.51	1.90	13.83	5.88

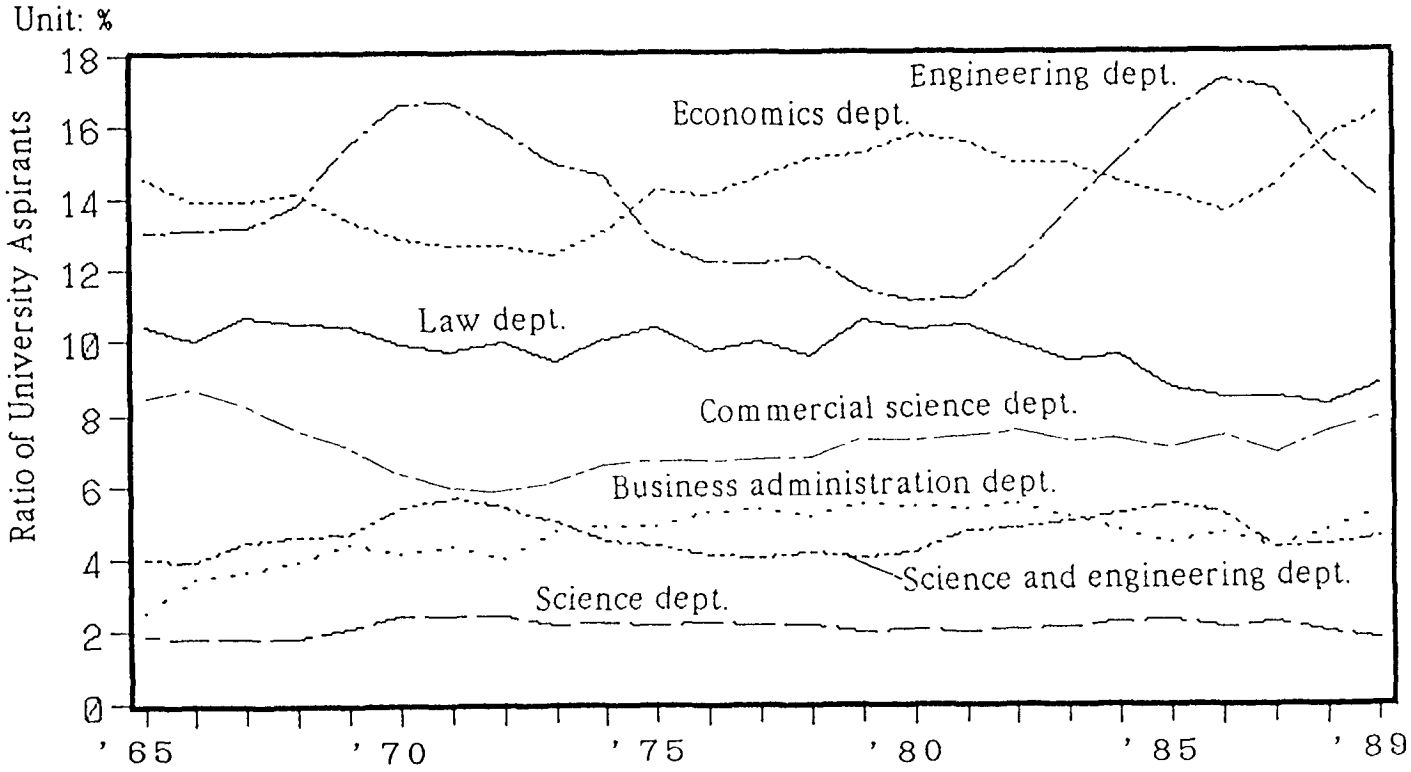

Figure 3-1. Net Ratio of University Aspirants by Department (all aspirants)

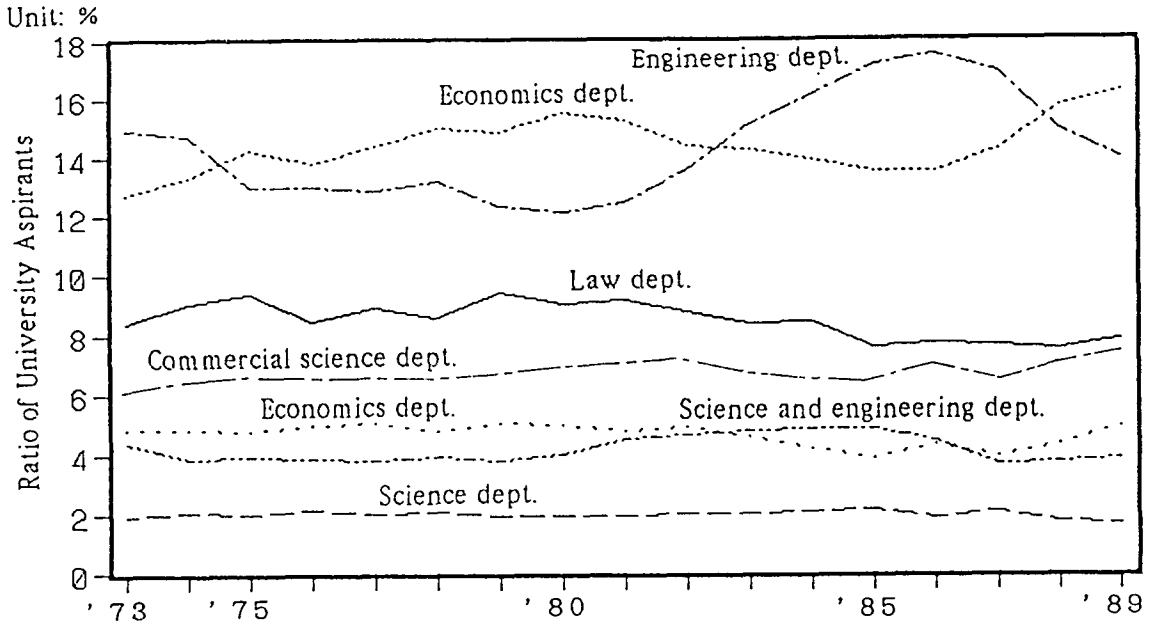

Figure 3-2. Net Ratio of University Aspirants by Department (new high school graduates)

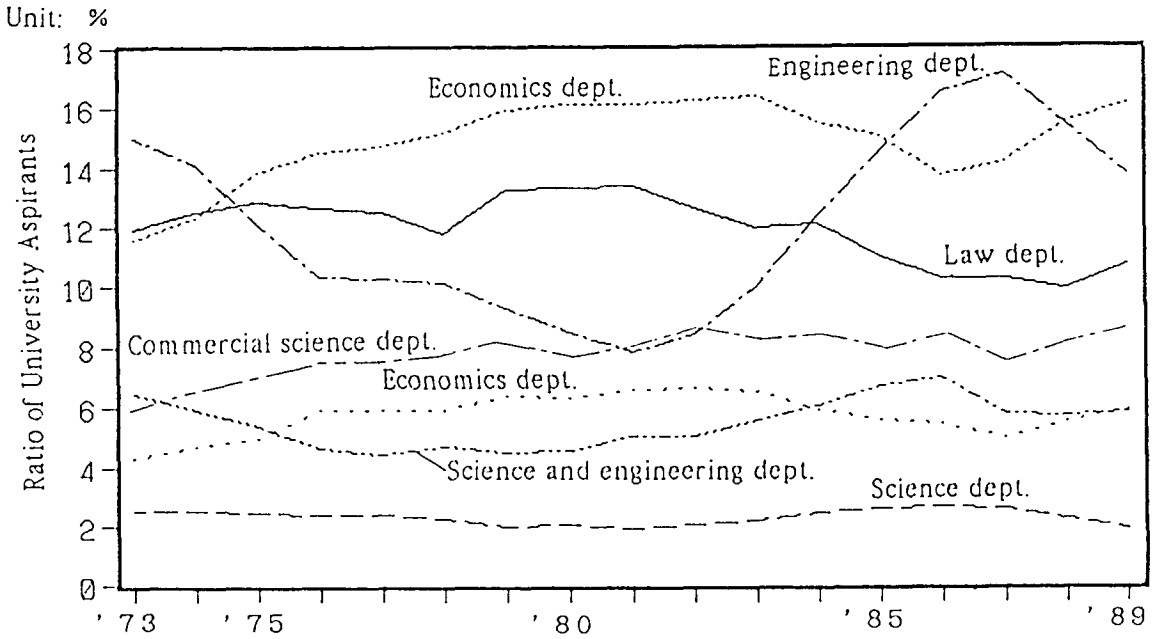

Figure 3-3. Net Ratio of University Aspirants by Department (past high school graduates)

Table 4. Net Number of Female University Aspirants by Department (estimate) and their Ratio

Unit: persons (parentheses: ratio of women to all aspirants)

Year		Total	Law	Economics	Business administration	Commercial science	Science	Engineering	Science and engineering
'65	All aspirants	136,634	4,849	5,153	1,581	2,308	1,716	665	758
		(21.34)	(7.29)	(5.68)	(5.08)	(5.24)	(12.66)	(0.81)	(2.73)
	New high school graduates	113,878	3,504	4,071	1,262	1,838	1,356	517	571
		(24.90)	(8.16)	(6.23)	(5.74)	(5.89)	(14.94)	(0.87)	(3.20)
	Past high school graduates	22,756	1,345	1,082	319	470	360	148	187
		(12.44)	(5.70)	(4.26)	(3.49)	(3.66)	(8.04)	(0.66)	(1.90)
'70	All aspirants	135,615	5,182	4,766	1,786	2,447	1,855	1,233	1,219
		(21.29)	(7.90)	(4.76)	(5.23)	(5.32)	(14.70)	(1.74)	(4.62)
	New high school graduates	110,623	3,607	3,620	1,377	1,885	1,459	977	921
		(24.47)	(8.82)	(5.15)	(6.14)	(5.96)	(16.48)	(1.78)	(5.13)
	Past high school graduates	24,992	1,575	1,146	409	562	396	256	298
		(13.52)	(6.38)	(3.84)	(3.49)	(3.92)	(10.52)	(1.63)	(3.53)
'85	All aspirants	142,565	6,177	5,199	1,832	2,712	2,583	2,933	2,103
		(21.66)	(10.77)	(5.61)	(6.34)	(5.81)	(17.27)	(2.73)	(5.84)
	New high school graduates	113,626	4,266	3,840	1,318	1,931	1,951	2,198	1,480
		(25.58)	(12.66)	(6.37)	(7.77)	(6.54)	(20.84)	(2.87)	(6.85)
	Past high school graduates	28,939	1,911	1,359	514	781	632	735	623
		(13.51)	(8.07)	(4.20)	(4.32)	(4.56)	(11.29)	(2.36)	(4.32)
'86	All aspirants	157,063	6,802	5,793	2,296	3,340	2,717	3,065	2,007
		(21.69)	(11.12)	(5.87)	(6.84)	(6.19)	(17.98)	(2.46)	(5.36)
	New high school graduates	130,217	5,001	4,537	1,817	2,541	2,047	2,312	1,425
		(25.13)	(12.50)	(6.46)	(8.14)	(6.86)	(21.32)	(2.55)	(6.18)
	Past high school graduates	26,846	1,801	1,256	479	799	670	753	582
		(13.04)	(8.51)	(4.43)	(4.26)	(4.73)	(12.17)	(2.21)	(4.05)
'87	All aspirants	172,741	7,764	7,191	2,450	3,897	3,127	3,380	1,773
		(22.10)	(11.79)	(6.46)	(7.41)	(7.18)	(18.02)	(2.54)	(5.30)
	New high school graduates	140,912	5,568	5,510	1,860	2,848	2,378	2,497	1,236
		(25.69)	(13.28)	(7.04)	(8.67)	(7.80)	(21.07)	(2.68)	(6.17)
	Past high school graduates	31,829	2,196	1,681	590	1,049	749	883	537
		(13.66)	(9.18)	(5.08)	(5.08)	(5.90)	(12.34)	(2.21)	(4.00)
'88	All aspirants	184,728	9,200	9,737	3,098	4,953	2,690	3,436	1,835
		(22.79)	(13.73)	(7.66)	(8.14)	(8.20)	(17.47)	(2.80)	(5.24)
	New high school graduates	149,966	6,805	7,574	2,386	3,727	2,003	2,506	1,244
		(26.85)	(16.22)	(8.62)	(9.90)	(9.33)	(20.64)	(3.00)	(6.03)
	Past high school graduates	34,762	2,395	2,163	712	1,226	687	930	591
		(13.80)	(9.56)	(5.52)	(5.10)	(5.99)	(12.06)	(2.38)	(4.12)
'89	All aspirants	197,263	10,893	11,693	4,305	6,194	2,668	3,754	2,119
		(23.38)	(14.74)	(8.53)	(9.78)	(9.31)	(18.19)	(3.18)	(5.60)
	New high school graduates	159,532	7,904	9,108	3,328	4,709	2,037	2,775	1,458
		(27.55)	(17.41)	(9.65)	(11.77)	(10.69)	(21.13)	(3.41)	(6.54)
	Past high school graduates	37,731	2,989	2,585	977	1,485	631	979	661
		(14.26)	(10.49)	(6.05)	(6.21)	(6.60)	(12.55)	(2.68)	(4.25)

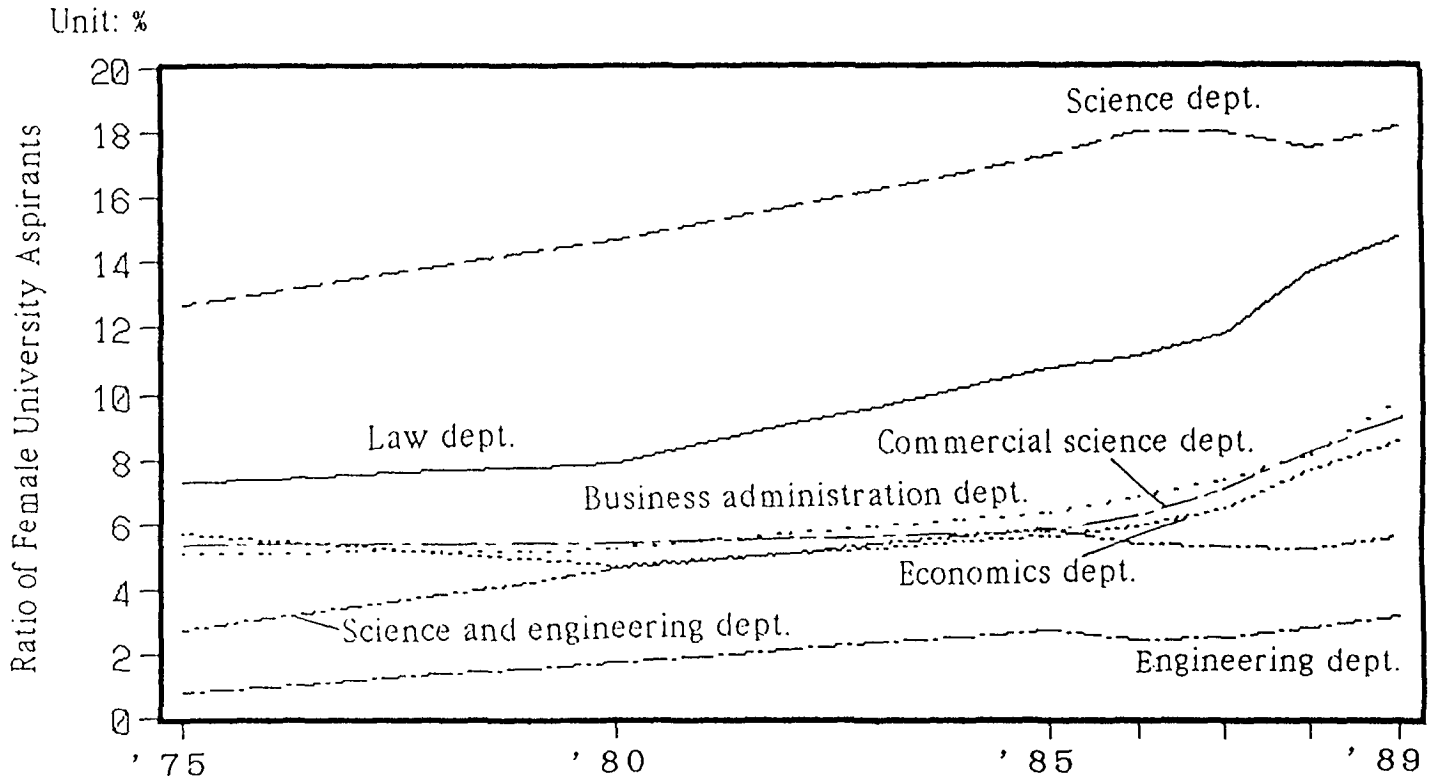

Figure 4. Net Ratio of Female University Aspirants by Department (all aspirants)

Table 5. University Entrants by Department

Year		Total	Law	Economics	Business administration	Commercial science	Science	Engineering	Science and engineering
'65	Entrants (persons)	249,917	23,036	35,057	5,323	21,022	5,688	37,831	10,925
	Ratio (%)	100	9.22	14.03	2.13	8.41	2.28	15.14	4.37
'66	Entrants (persons)	292,958	25,969	41,376	8,287	23,083	6,309	44,592	12,168
	Ratio (%)	100	8.86	14.12	2.83	7.88	2.15	15.20	4.15
'67	Entrants (persons)	312,747	29,241	44,913	10,003	23,174	6,615	47,603	13,527
	Ratio (%)	100	9.35	14.36	3.20	7.41	2.12	15.22	4.33
'68	Entrants (persons)	325,632	30,795	45,769	10,810	24,635	6,721	50,214	13,694
	Ratio (%)	100	9.46	14.06	3.32	7.57	2.06	15.42	4.21
'69	Entrants (persons)	329,374	29,896	46,599	11,735	24,183	6,761	53,842	14,029
	Ratio (%)	100	9.08	14.15	3.56	7.34	2.05	16.35	4.26
'70	Entrants (persons)	333,037	30,921	46,528	12,251	24,487	7,306	55,029	13,175
	Ratio (%)	100	9.29	13.97	3.68	7.35	2.19	16.50	4.10
'71	Entrants (persons)	357,821	33,166	49,110	12,695	25,523	7,249	59,046	14,683
	Ratio (%)	100	9.40	13.73	3.55	7.13	2.03	16.50	4.10
'72	Entrants (persons)	376,147	35,731	52,083	13,876	26,692	7,696	59,777	14,624
	Ratio (%)	100	9.50	13.85	3.69	7.10	2.05	15.89	3.89
'73	Entrants (persons)	389,560	36,698	52,334	14,866	27,512	7,924	60,976	15,234
	Ratio (%)	100	9.42	13.43	3.82	7.06	2.03	15.65	3.91
'74	Entrants (persons)	407,528	38,405	56,313	16,520	29,335	7,778	62,565	15,362
	Ratio (%)	100	9.42	13.82	4.05	7.20	1.91	15.35	3.77
'75	Entrants (persons)	423,942	39,334	58,894	16,445	30,798	7,888	65,899	14,902
	Ratio (%)	100	9.28	13.89	3.88	7.27	1.86	15.54	3.52
'76	Entrants (persons)	420,616	36,980	58,011	16,628	29,925	7,980	65,271	14,819
	Ratio (%)	100	8.79	13.79	3.95	7.12	1.90	15.52	3.52
'77	Entrants (persons)	428,412	37,824	60,125	15,622	29,731	8,460	67,101	14,369
	Ratio (%)	100	8.83	14.03	3.65	6.94	1.98	15.66	3.35
'78	Entrants (persons)	425,718	37,871	58,973	15,385	30,296	8,797	66,708	13,581
	Ratio (%)	100	8.90	13.85	3.61	7.12	2.07	15.67	3.19

Year			Law	Economics	Business administration	Commercial science	Science	Engineering	Science and engineering
'79	Entrants (persons)	407,635	35,154	55,642	14,219	28,831	8,993	62,241	13,099
	Ratio (%)	100	8.62	13.65	3.49	7.07	2.21	15.27	3.21
'80	Entrants (persons)	412,473	35,605	56,533	14,573	28,750	9,322	64,412	12,852
	Ratio (%)	100	8.63	13.71	3.53	6.97	2.26	15.62	3.12
'81	Entrants (persons)	413,236	36,011	55,826	13,593	28,131	9,559	64,412	14,424
	Ratio (%)	100	8.71	13.51	3.29	6.81	2.31	15.59	3.49
'82	Entrants (persons)	414,536	35,164	54,805	13,656	27,042	9,654	66,202	13,990
	Ratio (%)	100	8.48	13.22	3.29	6.52	2.33	15.97	3.38
'83	Entrants (persons)	420,458	35,872	55,965	13,214	26,966	9,869	66,928	14,786
	Ratio (%)	100	8.53	13.12	3.14	6.38	2.35	15.90	3.52
'84	Entrants (persons)	416,002	35,131	54,562	12,930	26,966	9,921	65,928	13,627
	Ratio (%)	100	8.45	13.12	3.11	6.48	2.39	15.85	3.28
'85	Entrants (persons)	411,993	34,982	53,505	13,009	26,587	9,759	65,937	13,326
	Ratio (%)	100	8.49	12.99	3.16	6.45	2.37	16.00	3.24
'86	Entrants (persons)	436,896	37,971	58,040	13,567	27,310	9,848	70,051	13,817
	Ratio (%)	100	8.69	13.29	3.11	6.25	2.25	16.03	3.16
'87	Entrants (persons)	465,503	40,958	62,377	15,546	28,727	10,368	74,597	14,962
	Ratio (%)	100	8.80	13.40	3.34	6.17	2.23	16.03	3.21
'88	Entrants (persons)	472,965	41,687	63,472	15,938	29,058	10,492	75,223	14,103
	Ratio (%)	100	8.81	13.42	3.37	6.14	2.22	15.91	2.98
'89	Entrants (persons)	476,786	42,431	63,828	16,266	28,376	10,680	73,511	16,323
	Ratio (%)	100	8.90	13.39	3.41	5.95	2.24	15.42	3.42

Note: The number of entrants was taken from Table 17 of the Basic Survey (1989) section on higher educational institutions and the corresponding tables in earlier editions.

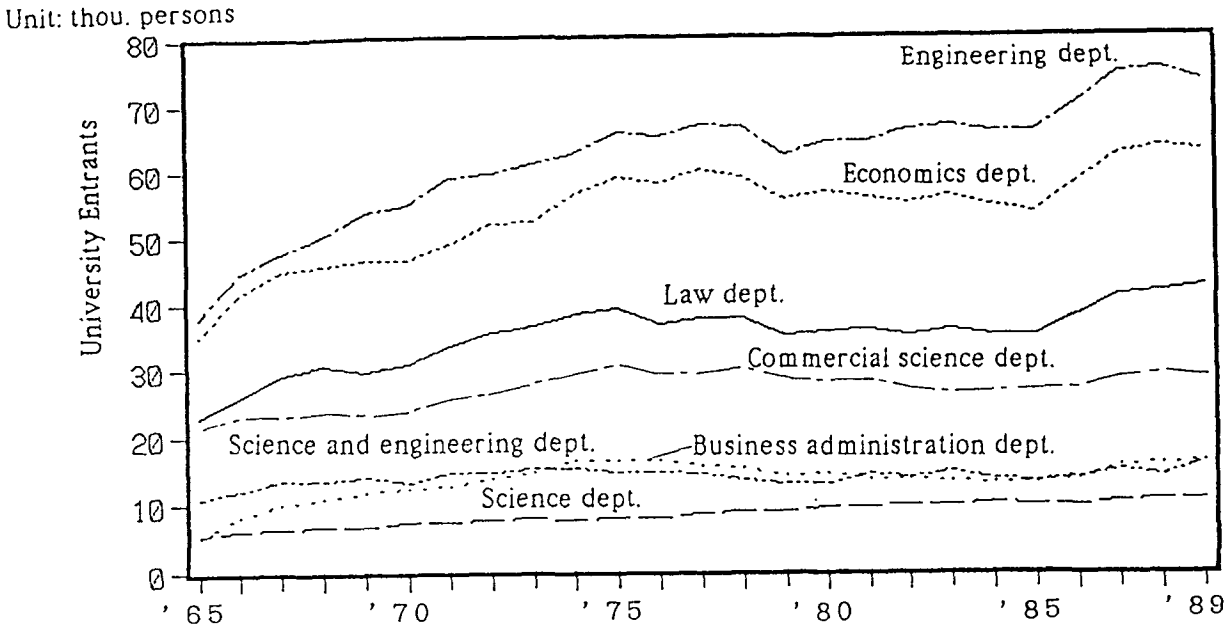

Figure 5-1. University Entrants by Department

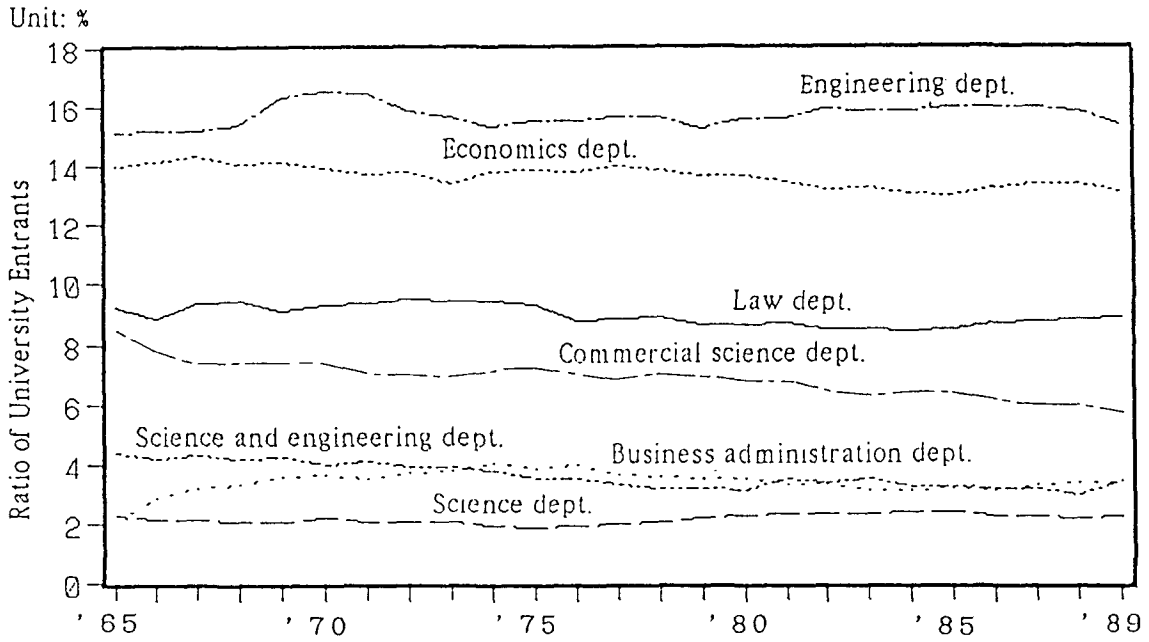

Figure 5-2. Ratio of University Entrants by Department

Appendix-2

Appendix-2

Study of High School Students' Academic Plan

NISTEP Study Group No. 1

Summary

As part of the "Research on Conditions for Securing Supply of Science and Engineering Graduates as Creative Scientific and Technological Talent" high school students' future academic plans and general attitudes regarding science and technology were surveyed. The following summarizes the findings.

1. 98.3% of the high school students surveyed wished to go on to higher schools (colleges, junior colleges and technical colleges). Slightly over 40% were science and engineering oriented and slightly over 50% were liberal arts oriented. Among males 60% were science and engineering oriented and 40% were liberal arts oriented. Among females the figures were 30% science and engineering oriented and 70% liberal arts oriented.

2. Science and engineering oriented students tended to be good at mathematics, chemistry and physics and liberal arts oriented students tended to be good at Japanese, social studies and English. There was hence close relationship between favorite school subjects and academic orientation.

3. The students' image of liberal arts college life was that it was rosy and not busy with studies while their image of science and engineering college life was that it was gloomy and mainly devoted to studies. They hence had different images regarding liberal arts and science and engineering college life.

4. Being in an information-oriented society, high school students are collecting more information regarding university departments and faculties than before. Compared to four years ago in particular they now have more opportunities to come in contact

with books and magazines on academic planning, guidance materials on academic planning prepared by the school, conversation with siblings and other relatives and explanatory meetings held by universities. However science and engineering oriented students were making less efforts to collect such information.

5. High school students' main criteria of occupational choice were occupational preference, stability, pay and possibility of using the knowledge and technology acquired in schools. Over 90% of the students rated these as their criteria.

6. By academic orientation science and engineering oriented students tended more to see the possibility of devoting to certain fields as their criterion of occupational choice.

7. The specific occupational choices of science and engineering oriented students were medical related, scientific professions and machinery and electric engineers. Those of liberal arts oriented students were education related and civil service. Hence high school students already manifested science/engineering and liberal arts difference in occupational choice.

8. The high school students' images of scientific occupations such as engineers and science and technology researchers were that the contents of their work were "creative" or "interesting." They however did not have good images regarding their social implications such as sociability, stability and pay.

9. The high school students' attitude regarding science and technology was that they wanted to utilize the fruits of science and technology in their lives. They also had keen interest in the social responsibility of scientists and the influence of science and technology on people.

10. Science and engineering oriented students were more positive toward science and technology on a daily basis than liberal arts oriented students. They tended more to be interested in the trends of new science and technology, often read newspaper articles

on science and technology and wanted to find jobs related science and technology in the future.

I. Objectives

In the recent years it has been pointed out that science and engineering graduates are "alienated from the manufacturing sector" when they seek employment. Some have also pointed out that high school students are also turning away from science and engineering academic careers when they aspire to universities.

If such a trend continues there will be concern regarding securing of manpower important for future development of science and technology. Therefore, as part of the efforts to forecast the supply of science and engineering manpower in the future and formulate policies for developing such manpower high school students' academic plans and general attitude regarding science and technology were surveyed to shed light on the actual conditions.

II. Study Contents

1. High school students' academic orientation
2. Factors related to such orientation
3. Their choice of college department and faculty
4. Their image of college life
5. Their occupational choice and image
6. Their view of science and technology

III. Selection of Schools

Since the study's objective was to study high school students' college plan 22 public high schools were selected from all over the country. These are regular high schools attended by many students who wish to go on to universities.

The schools thus selected consisted of 1 in Hokkaido, 3 in Tohoku, 3 in Kanto, 2 in Hokuriku, 1 in Shinetsu, 3 in Tokai, 4 in Kinki, 2 in Chugoku and Shikoku and 3 in Kyushu.

As a comparative group college-bound students of 12 high schools affiliated with a private university were also surveyed.

IV. Respondents

The respondents were 4,211 students (2,550 males, 1,623 females and 38 unspecified) of 22 high schools throughout the country. (The respondents in the comparative group from the high schools affiliated with a private university were 956 males, 177 females and 10 unspecified with a total of 1,143.)

The respondents' plans after graduation from high school were entry to four-year colleges (national or public) 70.6%, four-year colleges (private) 20.9%, junior colleges 4.2%, technical colleges 1.8%, undecided 0.8% (total number wishing to go on to higher schools: 98.3%), find employment 0.9%, undecided whether to go on to higher schools or find employment 0.2%, other 0.1% and NA 0.5%. Hence the overwhelming proportion wished to go on to higher education. (The ratio of the students of the high schools affiliated with the private university who wished to go on to higher schools was 95.9%.)

V. Survey Period and Method

The survey was conducted from November 1989 to January 1990. The students were asked to fill out the questionnaires in classrooms.

VI. Findings

1. Academic orientation

Almost all of the students (98.3%) wished to go on to higher schools (colleges, junior colleges or technical colleges). The students were asked for their academic orientation (science/engineering or liberal arts) in the following three ways.

(1) When they decided their science/engineering or liberal arts aspiration
(2) Their high school course (science/liberal arts)
(3) Their choice of university department, faculty or major

The results follow.

(1) When they decided their college aspiration

The students were asked for their college aspiration in four periods in their lives (around fifth-sixth grade, second year in junior high school, first trimester in the second year of high school and at present). The alternatives were "definitely" or "more or less" liberal arts or science/engineering oriented and "undecided." Table 1 shows the results.

As a whole 80% of the students were undecided when they were in elementary school and 50% when they were in junior high school. By the second year in high school however most of them (over 90%) had decided their college aspiration. In the second year of junior high school science and engineering aspirants (28.5%) exceeded liberal arts aspirants (18.9%) by almost 10%. In the second year of high school however liberal arts aspirants (46.4%) slightly exceeded science and engineering aspirants (44.2%). By fall of the third year (present) liberal arts aspirants (54.0%) exceeded science and engineering aspirants (42.4%) by more than 10%.

By gender science and engineering oriented males exceeded liberal arts oriented males by around 15% (52.0% against 37.2%) in the second year of high school. In the fall of the third year in high school (present) they also exceeded liberal arts aspirants by 7% (51.2% against 44.5%). Among females liberal arts aspirants exceeded science and engineering aspirants by nearly two times (61.1% against 31.7%) in the second year of high school. By the fall of the third year women were overwhelmingly liberal arts oriented (69.3% against 28.3%). However it is also worth noting that slightly under 30% of the them were also science and engineering oriented.

(2) High school course

Figure 1 shows the results of students' answers regarding the high school course they took. 45.1% were in science courses (38.4% national or public university and 6.7% private university) and 53.5% were in liberal arts courses (38.9% national or public university and 14.6% private university). Hence more students belonged to liberal arts courses.

By sex 55.3% of the males belonged to science courses and 44.0% to liberal arts courses and 68.7% of the females belonged to liberal arts courses and 29.1% to science courses. Hence males more often belonged to science courses and females to liberal arts courses.

(3) University department, faculty or major of choice

The students were asked which university department, faculty or major they wanted to go on to. The choices given were 19 types of departments such as science, technology, law, economics and domestic science and the students were asked to give their top three choices.

43.0% of the students named science departments as their first choice (science 6.8%, technology 19.3%, agriculture, forestry and fisheries 1.8%, veterinary and animal husbandry 0.6%, medical 6.7%, dentistry 0.8%, pharmaceutical 3.0%, information processing 3.4% and other science 1.0%). 46.2% named liberal arts departments as their first choice (law 10.2%, economics 9.6%, commercial science and business administration 5.6%, literature 7.4%, foreign language and international relations 7.6%, physical education 0.9%, music and arts 1.8% and other liberal arts 3.1%). 9.8% named educational and domestic science departments (7.7% and 2.1%) and 0.4% were undecided.

Hence the students' first choice of university department, faculty or major showed only a slight difference between science/engineering and liberal arts (3.2%). Compared to high school courses somewhat fewer students were liberal arts oriented. However, when educational and domestic science departments are counted as liberal arts departments liberal arts total comes to 56.0%. This exceeds science/engineering total by 12.6% which is similar to the results obtained regarding high school courses.

By sex 52.7% of the males were science and engineering oriented, 41.9% liberal arts oriented and 4.8% educational and domestic science oriented. Hence science/engineering males were more numerous. Among females 28.3% were science/engineering oriented, 53.0% liberal arts oriented and 17.8% educational and domestic science oriented. Hence liberal arts oriented females were more numerous. To sum up, slightly over 50% of the males were science/engineering oriented and slightly over 40% were liberal arts oriented. Slightly under 30% of the females were science/engineering oriented and slightly over 50% were liberal arts oriented. Hence

more males were science/engineering oriented and more females were liberal arts oriented.

The high school students' academic orientation was thus examined using three methods. Under any of the methods slightly over 40% were science/engineering oriented and slightly over 50% were liberal arts oriented.

To examine the relationship between science/engineering orientation and liberal arts orientation uncovered using the three methods Table 2 compares high school courses and academic orientation.

It shows that over 90% of the science/engineering oriented students belonged to high school science courses and liberal arts oriented students belonged to liberal arts courses showing clear correspondence between academic orientation and high school course.

Table 3 shows the relationship between academic orientation and college department of choice (first choice). 95.1% of the science/engineering oriented students (98.2% when educational and domestic science are included) selected science/engineering departments, faculties or majors and 81.6% of the liberal arts oriented students (96.9% when educational and domestic science are included) selected liberal arts departments, etc. Hence there was clear correspondence between academic orientation and the choice of college department, etc.

In terms of second choice however only 64.6% (68.8% when education and domestic science are included) of the science/engineering oriented students chose science/engineering departments or faculties and only 68.4% (78.8% when education and domestic science are included) of the liberal arts oriented students chose liberal arts departments or faculties. However only 8.4% of science/engineering oriented students chose liberal arts departments or faculties and only 4.9% of liberal arts oriented students chose science/engineering departments or faculties. The foregoing resulted because many students did not have second choices.

Hence the students' answers to the three questions asking for their academic orientation are mutually related and coincide. Hence there will be no problems in using any of these questions as key in conducting the subsequent analyses. Used in the study was the first question which asked for the choice of college academic career

("definitely" and "more or less" liberal arts or science/engineering in the fall of the third year in high school when the survey was conducted).

2. Factors Related to Academic Orientation

Factors which were seen to influence high school students' academic orientation were analyzed. These were gender, school record, region, favorite and weak subjects, school club activities and self image.

(1) Gender

60% of the males were science/engineering oriented and 40% were liberal arts oriented. The figures for females were 30% and 70%. Hence gender is believed to influence the academic orientation.

(2) School record

Table 4 shows the results of having students self-assess their academic orientation and ranking in the class. There is virtually no correlation between school record and academic orientation. Hence school record cannot be said a major determinant of academic orientation.

(3) Region

Table 5 divides the country into six regions and shows the ratio of science/engineering and liberal arts oriented males and females by location of school. Liberal arts oriented students were more numerous in the Kanto, Hokuriku and Shinetsu regions where females' ratios were high and science/engineering oriented students were more numerous in Hokkaido and Tohoku regions where females' ratios were low. However Chugoku, Shikoku and Kyushu regions had more science/engineering oriented students despite the fact that their female ratios were high.

Hence there was no regular pattern in academic orientation by region.

(4) Favorite and weak subjects

Students were asked if they were good or poor at the given school subjects (Figures 2 and 3).

Many of the science/engineering oriented students were good ("very good" and "good") at mathematics (57.4%), chemistry (44.5%) and physics (35.2%). Many of the liberal arts oriented students were good at Japanese (58.0%), social studies (55.5%) and English (45.1%).

Science/engineering oriented students were poor ("very poor" and "poor") at Japanese (69.2%), English (67.2%) and social studies (62.9%). Liberal arts oriented students were poor at mathematics (73.1%), chemistry (63.5%) and physics (60.9%).

(5) School club activities

While students participate in school club activities based on their preferences there were no academic orientation differences in terms of participation in sports clubs. There was a slight tendency for science/engineering students to participate in science/engineering clubs and for liberal arts students to participate in liberal arts clubs.

(6) Self image

Table 6 examines the relationship between academic orientation and self image (personality and preferences).

Among males, liberal arts oriented students tended more to be interested in things which happened in society, to like to read and write and to feel they were liberal arts oriented. Science and engineering oriented males tended more to like mechanical things, to make plastic models and other things, to use personal computers, to carry out lab experiments and to feel they were science and engineering oriented.

Women also showed similar tendencies. In addition, science and engineering oriented women tended more to like nature such as the sea and mountains and to raise animals. They were less than 50% likely to like plastic models and computers in comparison to make students. They however tended more to like nature and animals.

(7) Realistic choice of academic orientation

The choice of university academic career or the occupation after graduation is not solely based on personal preferences. The decision is a realistic one made after evaluation of gains and losses. Hence the students were asked to imagine three specific situations which often occurred in reality and to answer which alternative they would choose.

A. "Suppose you belonged to a high school's science course and took the examination for a science and engineering department of a national university and an economics department of a private university and only passed the examination for the economics department. What would you do?"

1. Enroll in the economics department
2. Confirm the decision and try to enter the science and engineering department again next year.

60% of the students said they would enroll in the economics department and slightly under 40% said they would try again. However around 20% more male and 10% more female science and engineering oriented students said they would try again even waiting one year.

B. "Suppose you are a twelfth grader who belongs to a national and public university science course. In a recent trial examination your science and math scores went down and English, Japanese and social studies scores went up. What would you do?"

1. Change to liberal arts orientation
2. Stay with science and engineering orientation

Slightly over 20% said they would change to liberal arts and slightly under 80% said they would remain science and engineering. However around 20% more liberal arts males and 10% more liberal arts females favored the change.

C. "You are a senior of a technology department of a prestigious national university and you just started to look for employment opportunities. A major bank which is said to pay well offered to take you in. What would you do?"

1. Accept the offer
2. Decline the offer and look for a company where you can use your expertise

Slightly over 50% said they would accept the offer and slightly under 50% said they would look for the manufacturer. Among both sexes around 10% more science and engineering oriented students said they would seek a manufacturing company.

3. Choice of University Department and Faculty

Students were asked what they relied on or emphasized when they chose their college department.

(1) What they relied on

Table 7 shows to what degree the students relied on ("very much," "somewhat," "not much" and "not at all") the 16 items when deciding the department.

This question was the same as the one used in a study four years ago (Fukutake Shoten, Inc., Monograph: High School Student, Vol. 16, 1985. The survey was conducted in March 1985 by covering twelfth graders of four public and four private high schools in Tokyo). Comparison of the data with those of four years ago revealed the following:

A. The top six items the students relied on in making the decision did not change from four years ago (books and magazines on schooling, guidance materials on schooling prepared by the school, conversation with classmates, results of extramural trial examinations, conversation with high school teachers and conversation with parents).

B. The degree to which the students relied on the 16 items increased from four years ago except conversation with preparatory school teachers which declined and two others which remained the same.

The items which increased compared to four years ago were books and magazines on schooling (up 14.0%), guidance materials prepared by the school (up 12.1%), conversation with relatives other than parents (up 10.3%) and explanatory meetings held by universities (up 10.0%).

Comparing the academic orientation using the data obtained in the present survey shows that the items on which the students often relied were more or less common to both science and engineering and liberal arts oriented students. As a whole however liberal arts students were gathering more information. For example 58.1% of them as against 48.0% of science and engineering relied on pamphlets prepared by universities which is a large difference by around 10%.

(2) What they emphasized when selecting the department or faculty

Students were asked what they emphasized when choosing the department and to rate 21 items in five steps ("emphasized very much," "emphasized, "neither," "did not emphasize much" and "did not emphasize at all").

Twelve of the items were borrowed from the Fukutake Shoten survey four years ago enabling some comparison.

Table 8 compares the ratio of those emphasizing the items in the Fukutake Shoten survey four years ago and the present survey. The ratio of those emphasizing the item "very much" decreased for all items except "Want to enjoy the student life" which slightly increased.

Table 9 ranks the items by academic orientation. The top ranking items were "Like to study," "Want to enjoy student life" and "Want to acquire qualifications" for both orientations.

The items more often emphasized by science and engineering students were "Want to study the most up-to-date things" (difference with liberal arts students: 22.5%), "I am good at science subjects" (18.1%), "Interested in natural phenomena and organisms" (18.0%), "I like to find out how things work" (17.9%) and "Like to make things and do minute things" (17.4%). The items more often emphasized by liberal arts students were "I am interested in how the society works" (21.8%), "Interested in foreign languages and culture" (17.0%), "Want to enjoy student life" (12.6%) and "Number of entrance examination subjects required by college" (9.5%).

4. Students' Image of College Life

The study examined high school students' images of the college life they aspired to. It is possible that such images affect their choice.

They were asked two questions. One concerned what kind of life they wanted to lead once they got into colleges. The other concerned what kind of image they had of the life of college students by academic orientation.

(1) Priority points of life in colleges

The students were asked what they wanted to emphasize after they got into colleges. They were asked to rate ten items such as study and social activities in 5 steps

("Want to emphasize very much," "Want to emphasize," "Neither," "Do not want to emphasize" and "Will never emphasize." Table 10 shows the results.

The top four items the students wanted to emphasize were friends (57.3%), hobby (53.5%), acquisition of qualifications (41.7%) and study and research (41.4%).

By orientation science and engineering students tended more to emphasize study and research (both sexes) and acquisition of qualifications (females only). Most of the other items were more emphasized by liberal arts students.

(2) Image of college life by orientation

The students were asked what kind of image they had of the life of the present college (junior college, technical college) students by academic orientation and by rating seven items such as bright/gloomy and interesting/not interesting.

The answers were given the scores -2 for "very" (bright, etc.), -1 for "somewhat," 0 for "neither," 1 for "somewhat" (gloomy, etc.) and 2 for "very" (Figures 4 through 6).

Figure 4 plots the results by college students' academic career. The high school students are believed to have very different images of the life of science/engineering and liberal arts college students.

The college life of a liberal arts student was thought to be bright but lacking seriousness, and that such college students cannot have hopes about employment or future prospects.

That of a science and engineering student was imaged as being busy with studies and gloomy although such students had no worries about employment or future prospects.

Figure 5 compares high school students' image of liberal arts college life by their academic orientation. It is clear that they have a certain image of such college life. Moreover liberal arts high school students had a better image of liberal arts college life than their science and engineering counterparts.

Figure 6 shows the high school students' image of science and engineering college life. It can be seen that they have a certain image of such college life. It is clearly shown that science and engineering high school students have a better image of science and engineering college life than their liberal arts counterparts.

However, more science and engineering high school students had the image that science and engineering college students were busy with their studies. Hence they are believed to be quite prepared to study hard once they enter science and engineering college life.

5. High School Students' Occupational Choice and Image

(1) Occupational choice

Table 11 shows the data on students' criteria for future occupational choice. The most frequent answer was "Can do the job I like" (96.5%) followed by "The job is stable" (90.8%), "It pays well" (88.5%) and "Can use the knowledge and technology learned in schools" (87.6%).

By sex, more males pointed out "Possibility of success in the world" (65.9% against 50.2% among females). Females more often pointed out "Can use the knowledge and technology learned in schools" (92.1% vs. 84.6%), "Can contribute toward the society and people" (75.7% vs. 68.5%), "Can specialize in one thing" (73.9% vs. 67.7%) and "Can meet many people" (56.5% vs. 50.7%).

Table 12 ranks the criteria by academic orientation. "Can specialize in one thing" ranked higher among science and engineering students (76.1% vs. 65.5%). Ranking higher among liberal arts students were "Involves less overtime work and more holidays" (75.5% vs. 69.8%), "Can meet many people" (57.9% vs. 47.3%), "Can be active internationally" (56.7% vs. 45.2%) and "Can work in cities" (43.7% vs. 34.5%).

By sex, in addition to academic orientation, many of the science and engineering females pointed out "Can specialize in one thing." By high school course students who belonged to private science and engineering university courses often pointed out "Can specialize in one thing" and those belonging to private liberal arts university courses often pointed out "Can meet many people," "Can be active internationally" and "Can work in cities." Hence private university course students tended more than national and public university course students to manifest typically academically oriented criteria of occupational choice.

By school record there was a tendency for higher ranking students to more often point out "Want to use the knowledge and technology learned in schools," "Can

contribute toward the society and people," "Possibility of success in the world" and "Can be active internationally."

Some of the most popular occupations were medical (10.8%), educational (9.8%) and scientific professions (8.1%). These top three were followed by machinery and electric engineers (8.0%), civil service (7.7%), business professions (6.8%), mass media (6.5%) and information processing (5.2%).

By sex, popular occupations among males were scientific professions (10.4% vs. 4.4% among females) and machinery and electricity engineer (12.8% vs. 0.4%). Those among females were medical (16.3% vs. 7.3%) and educational (14.8% vs. 6.7%).

By academic orientation science and engineering students more often chose medical (22.4% vs. 1.8% among liberal arts students), scientific professions (17.9% vs. 0.1%), machinery and electricity engineer (17.8% vs. 0.3%), information processing (10.0% vs. 1.5%) and civil engineering and construction engineer (8.3% vs. 0.5%). Popular occupations among liberal arts students were educational (15.3% vs. 3.1%), civil service (11.0% vs. 2.9%), business professions (6.7% vs. 1.2%), mass media (11.1% vs. 0.9%), general business (6.7% vs. 1.2%), liberal arts professions (7.3% vs. 0.2%) and legal (5.5% vs. 0.0%).

By sex, popular occupations among science and engineering males were machinery and electricity engineer and information processing. Those among science and engineering females were medical. Those among liberal arts males were civil service and business professions and those among liberal arts females were educational.

By high school course scientific professions were popular among students belonging to national and public university science and engineering courses and educational and civil service were popular among national and public university liberal arts course students. Art related jobs were popular among students belonging to other courses.

(2) Occupational image

"Design engineer of a major automobile maker" and "science and technology researcher" were considered scientific occupations and "employee of a major bank" was considered a liberal arts occupation. The students were asked to give their image of

these occupations by rating ten items such as bright/gloomy and creative/not creative in five steps ("very (bright, etc.)," "somewhat," "neither," "somewhat (gloomy, etc.)" and "very").

Figure 7 plots the scores as rated in Figure 4 (2 or -2 points for "very," 1 or -1 point for "somewhat" and 0 for "neither").

The banker which is a liberal arts occupation was negatively imaged as "not interesting" and "not creative" as far as the content of the work was concerned. However its social implications were positively imaged such as "well paid," "stable" and "sociable."

Engineer and science and technology researcher which are scientific occupations were negatively imaged in terms of social implications such as "not well paid," "unstable" and "not sociable." However the content of their work was positively imaged such as "creative" and "interesting."

Other items such as "smart" and "not smart," "busy" and "not busy," "promising" and "not promising" and "socially respected" and "not socially respected" did not manifest major differences by type of occupation.

Academic orientation did not show major differences in the image of engineers (Figure 8). However science and engineering students tended slightly more to see the occupation as "bright." By sex, liberal arts males tended the least to see the occupation as "bright."

Figure 9 examines the image of science and technology researcher which is also a scientific occupation. Science and engineering oriented students tended more to consider the occupation as "bright," "smart," "sociable," "stable," "promising" and "busy."

By sex, science and engineering oriented females tended more to see the occupation as "bright" and science and engineering oriented males tended more to see it as "busy," "stable" and "promising."

Figure 10 examines the image of the banker which is a liberal arts occupation. Science and engineering oriented students tended slightly more to see it as "bright" and "sociable" and tended less to see it as "busy." Liberal arts oriented students tended more to see it as "stable," "promising," "well paid" and "socially respected." Hence images regarding the banker manifested some difference by academic orientation.

By sex, science and engineering males tended more to see it as "bright" and this image was weak among liberal arts females. Liberal arts females tended more to see it as "stable," "promising" and "socially respected."

6. High School Students' View of Science and Technology

Table 13 shows the results of high school students' view of science and technology.

Nearly 80% (79.4%) felt "Scientists should be more responsible about the social consequences of their inventions." Many also pointed out that "It is good that transportation facilities should speed up" (48.2%), "I want to actively use the fruits of science and technology" (47.4%), "It is good that computers develop and make life easier" (42.9%) and "I am interested in the trends of new science and technology" (42.6%). However only 15.7% thought that "Progress of science and technology will make people happier."

Over half (51.8%) said they were unsure ("neither" and DK) if progress of science and technology will make people happier. Nearly half (49.7%) were also not sure if Japan should make more efforts for advancement of science and technology.

By sex, males more often agreed with most of the items: "It is good that transportation facilities should speed up" (55.0% vs. 37.6%) "Want to actively use the fruits of science and technology" (52.4% vs. 39.5%), "It is good that computers should develop and make life easier" (48.5% vs. 34.0%), "Interested in the trends of newest science and technology" (53.2% vs. 25.8%), "Often read newspaper articles on science and technology" (44.1% vs. 16.3%), "Science and technology are only the means. Politics and economy are what really move the world" (33.8% vs. 26.7%), "Japan should make more efforts for advancement of science and technology" (38.8% vs. 18.4%), "Want to do jobs related to science and technology" (34.3% vs. 10.2%) and "Progress of science and technology will make people happier" (20.9% vs. 7.5%).

Table 14 shows the results by academic orientation. Science and engineering students tended to agree with most of the items: "It is good that transportation facilities should speed up," "Want to actively use the fruits of science and technology," "It is good that computers should develop and make life easier," "Interested in the trends of new science and technology," "Often read newspaper articles on science and

technology," "Japan should make more efforts for advancement of science and technology," "Want to do jobs related to science and technology" and "Progress of science and technology will make people happier." Science and engineering students were nearly 30% more likely than liberal arts students to be "Interested in the trends of newest science and technology," "Often read newspaper articles on science and technology" and "Want to do jobs related to science and technology in the future."

By sex, liberal arts males often pointed out "Science and technology are only the means. Politics and the economy are what really moves the world." Science and engineering males more often agreed with all other items. By high school course those belonging to national and public university science and engineering courses were often "Interested in the trends of newest science and technology," "Often read newspaper articles on science and technology" and "Want to do jobs related to science and technology."

VII. Conclusion

- High school students' academic orientation was closely associated with favorite and weak school subjects. Liberal arts oriented students' favorite subjects were science and engineering oriented students' weak subjects.

As for self images science and engineering oriented students often liked plastic models, mechanical things, personal computers, lab experiments and nature while liberal arts students often liked social affairs and to read and write. In fostering and securing manpower, the knowledge regarding such differences in self image is believed to be very useful.

In the present study slightly over 40% of the students were science and engineering oriented. However even among these students some changed their orientation to liberal arts when realistically making the decision to take university entrance examinations or choosing the occupation. Such data stress the concern regarding the trend pointed out recently of science and engineering students away from the manufacturing sector.

- Examination of what the high school students relied on or emphasized when selecting the university department or faculty showed that there was virtually no change from a similar study four years ago regarding the items they relied on. These for

instance were books and magazines on schooling and guidance materials on schooling prepared by the high school. However the students tended more to rely on these items than four years ago and this is believed to be because they are gathering more information on academic planning than four years ago given the society's information-orientation.

The items they often relied on were virtually the same regardless of academic orientation. As a whole however liberal arts students gathered more information. Science and engineering students in contrast were found not to be making much efforts at gathering information.

As for the matters they emphasized "very much" when choosing the department or faculty the frequent criteria were the possibility of studying what they wanted to study, of enjoying the student life and of acquiring qualifications. Compared to the study four years ago the ratio of students emphasizing "very much" decreased for all items except "Want to enjoy student life." By academic orientation science and engineering students tended more to point out "Want to study the most up-to-date things" and "Like to make things and do minute things." In contrast liberal arts oriented students tended more to point out items such as "Interested in how the society works."

To secure science and engineering manpower in the future it will be necessary to make appeals for the excitement of learning the most up-to-date technology and knowledge.

- The students' image of science and engineering college life was that it was gloomy and filled with studies. That of liberal arts college life was that it was rosy and not filled with studies. Such images are related to what part of college life they wanted to emphasize. Liberal arts high school students had a rosy image of college life in which they wanted to emphasize not studies but friends, dates, circle activities, part-timing, traveling, leisure and hobbies. In contrast science and engineering students were prepared to lead a heavy-studying college life by refraining from part-time jobs and leisure.
- High school students' primary criterion of occupational choice was occupation of their preference, followed by stability and pay. Nearly 90% also emphasized the possibility of using the knowledge and technology learned in schools which shows that high school students treasured such knowledge and technology. In addition, science

and engineering students were more professionally oriented such as by emphasizing the possibility of devoting to the field of specialty (76.1% vs. 65.5%).

Their frequent choice of occupation was medical, scientific professions and engineers among science and engineering students and educational and civil service among liberal arts students.

The chief images of scientific occupations such as engineers and researchers concerned the contents of the work such as "creative" and "interesting." The students did not have good images regarding their social implications ("sociability," "stability" and "pay").

- High school students had complex attitudes regarding science and technology. While they wanted to use the fruits of science and technology in their lives, they were also very interested in the responsibility of scientists and influence of science and technology on people.

In addition nearly half the students were unsure ("neither" and DK) if "Progress of science and technology will make people happier" or if "Japan should make more efforts for advancement of science and technology." Students' attitude regarding science and technology seems mixed.

- The comparative group students of high schools affiliated with a private university manifested more or less similar tendencies regarding images of college life, factors related to academic orientation and view of science and technology, although there were differences in department and faculty aspiration for such reasons as difference in school characteristics. They manifested similar tendencies regarding academic choice, etc.

Figure 1. High School Course

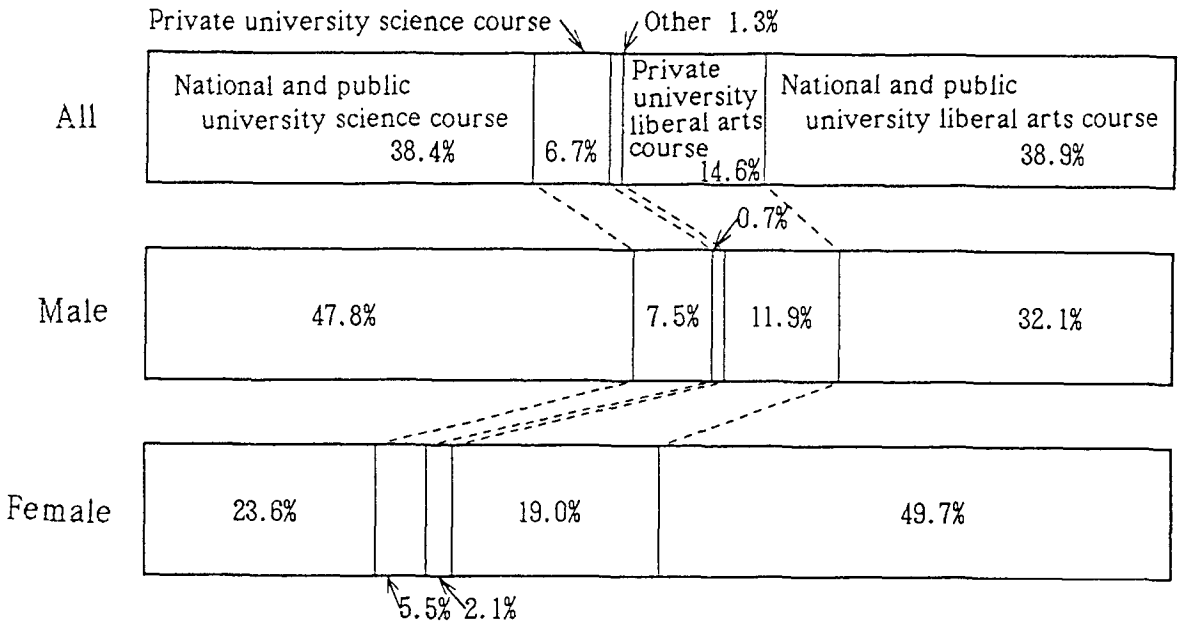

Figure 2. Favorite School Subjects by Academic Orientation

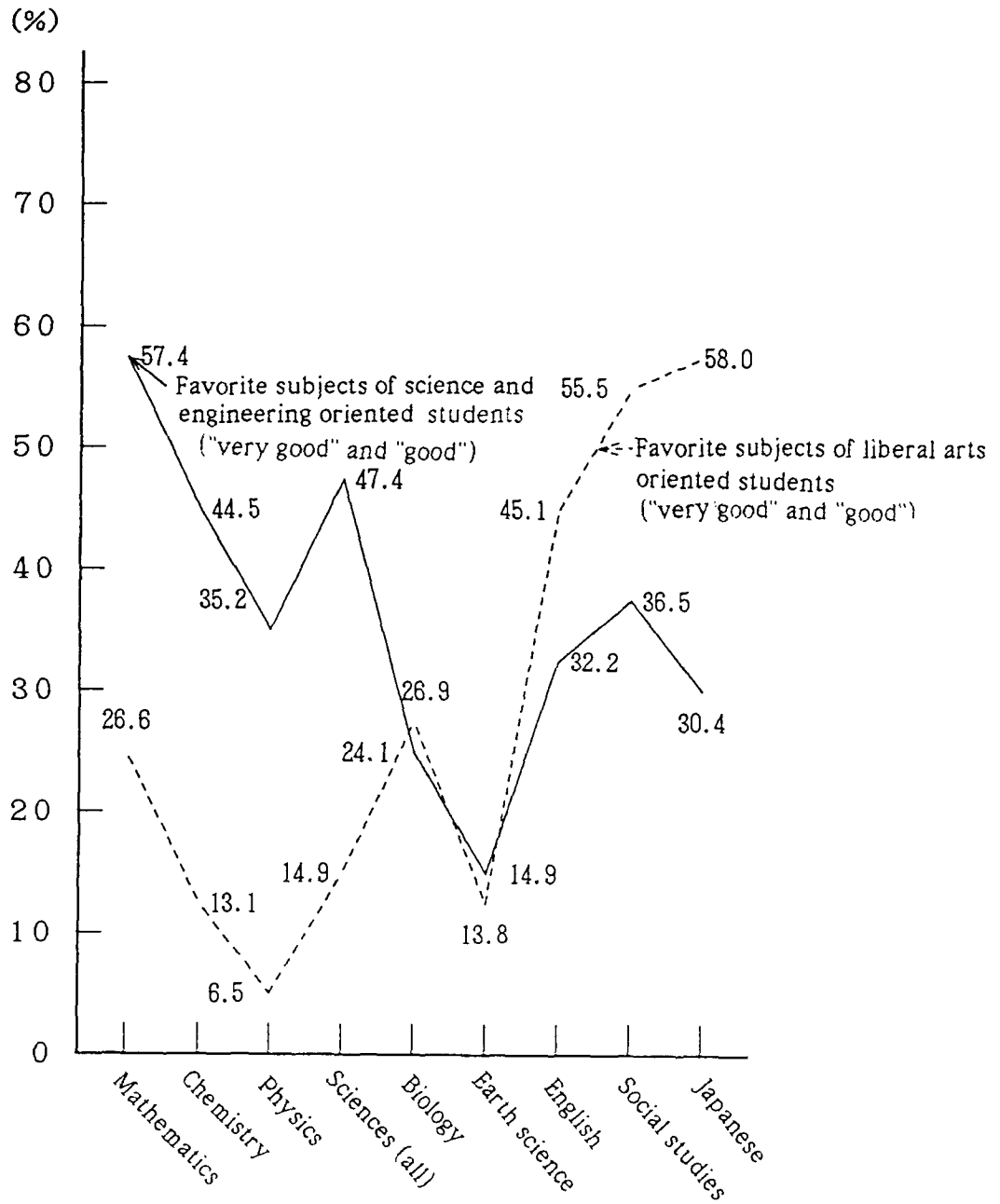

Figure 3. Weak Subjects by Academic Orientation

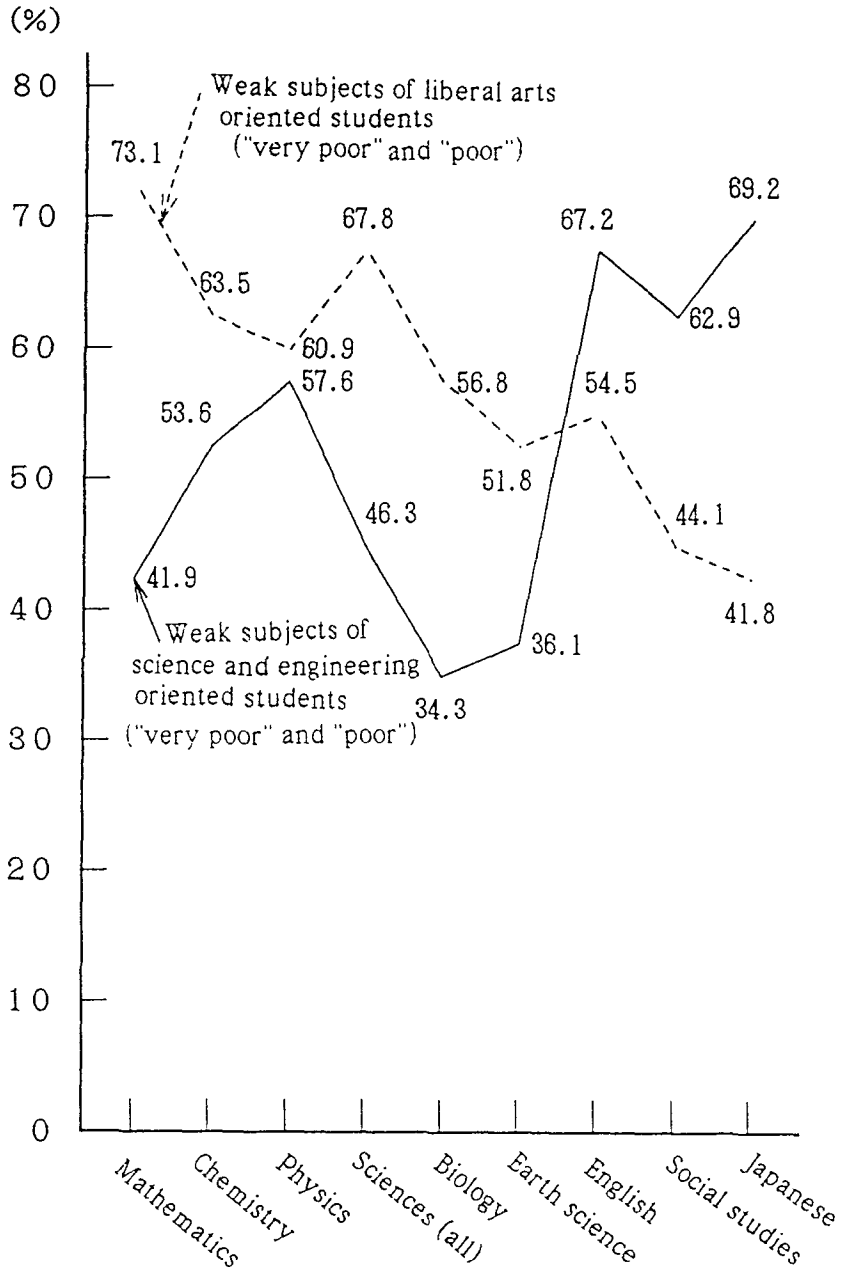

Figure 4. Image of College Life (all)

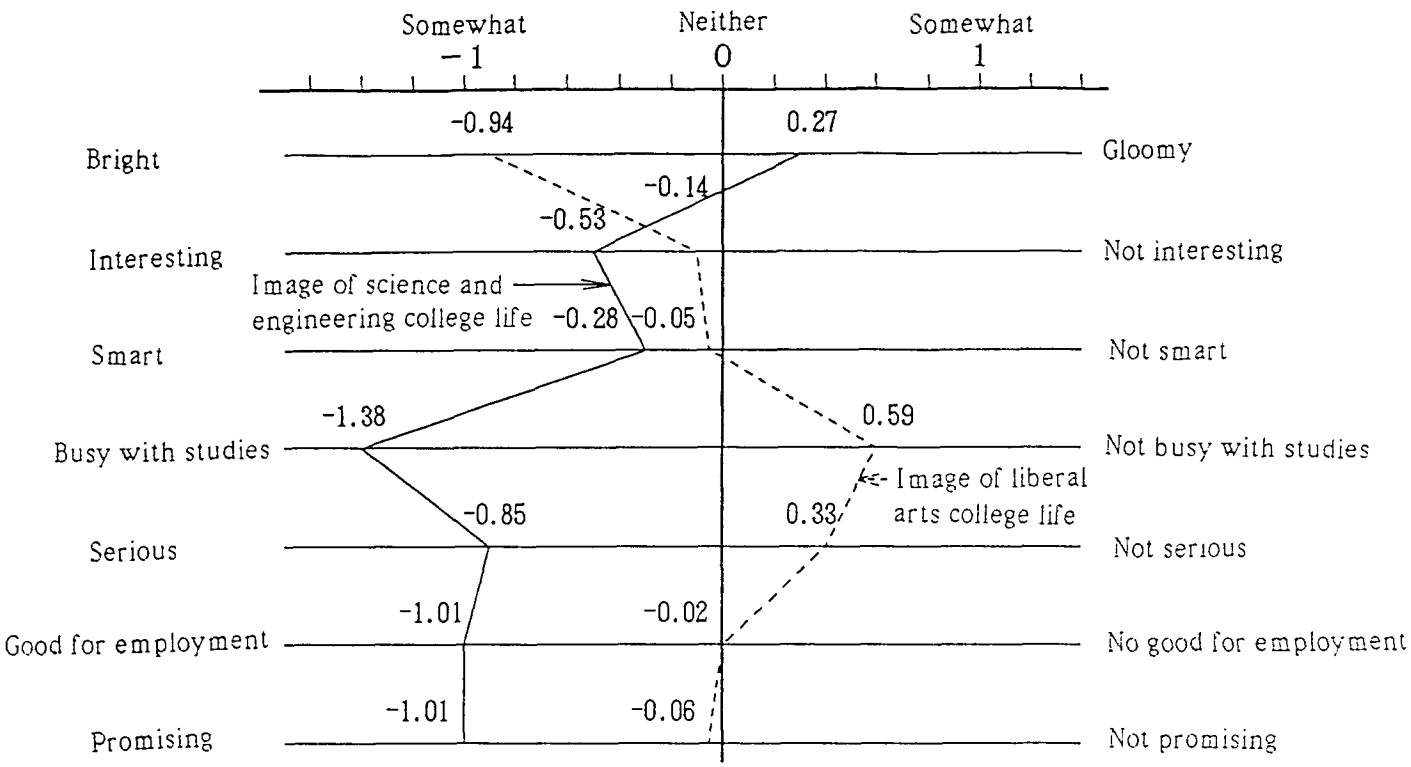

Figure 5. Image of College Life of Liberal Arts Students (by academic orientation)

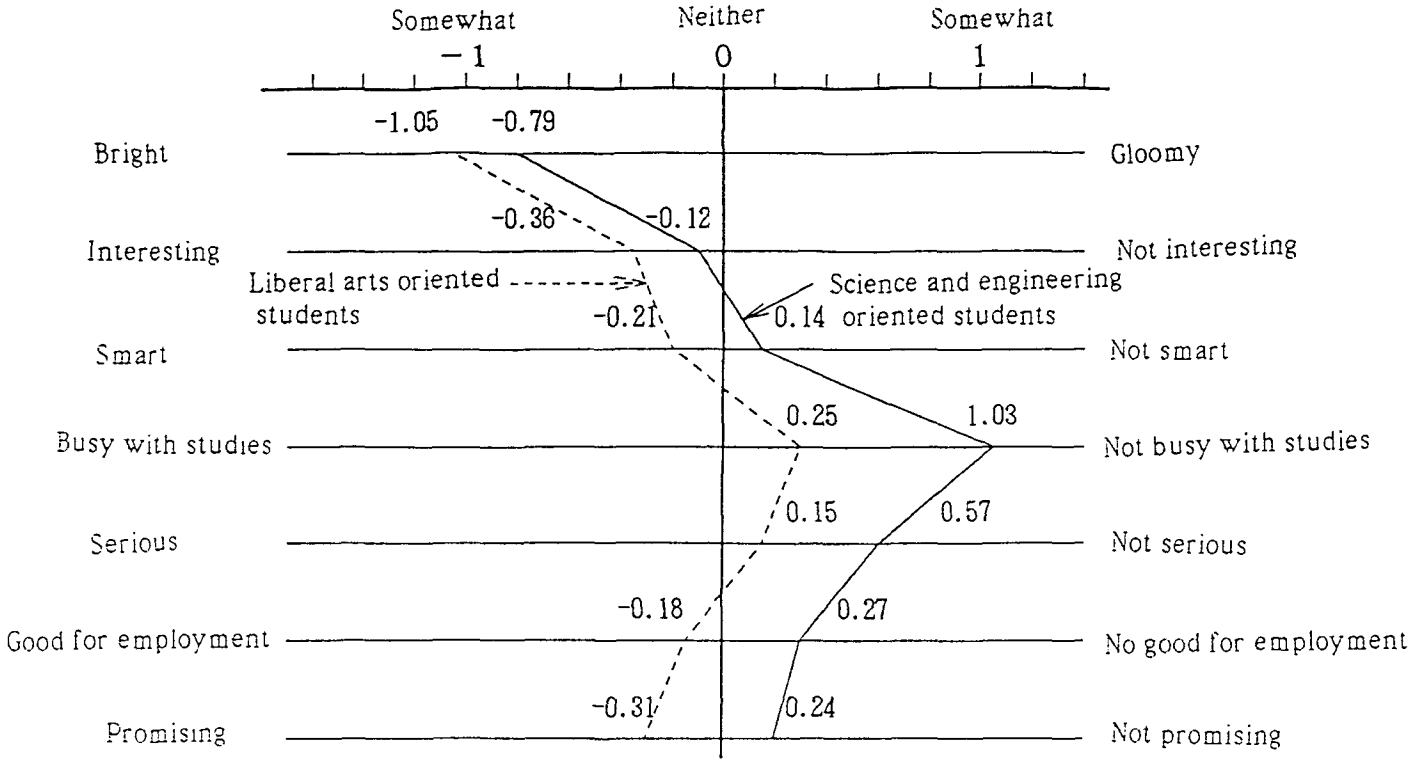

Figure 6. Image of College Life of Science and Engineering Students (by academic orientation)

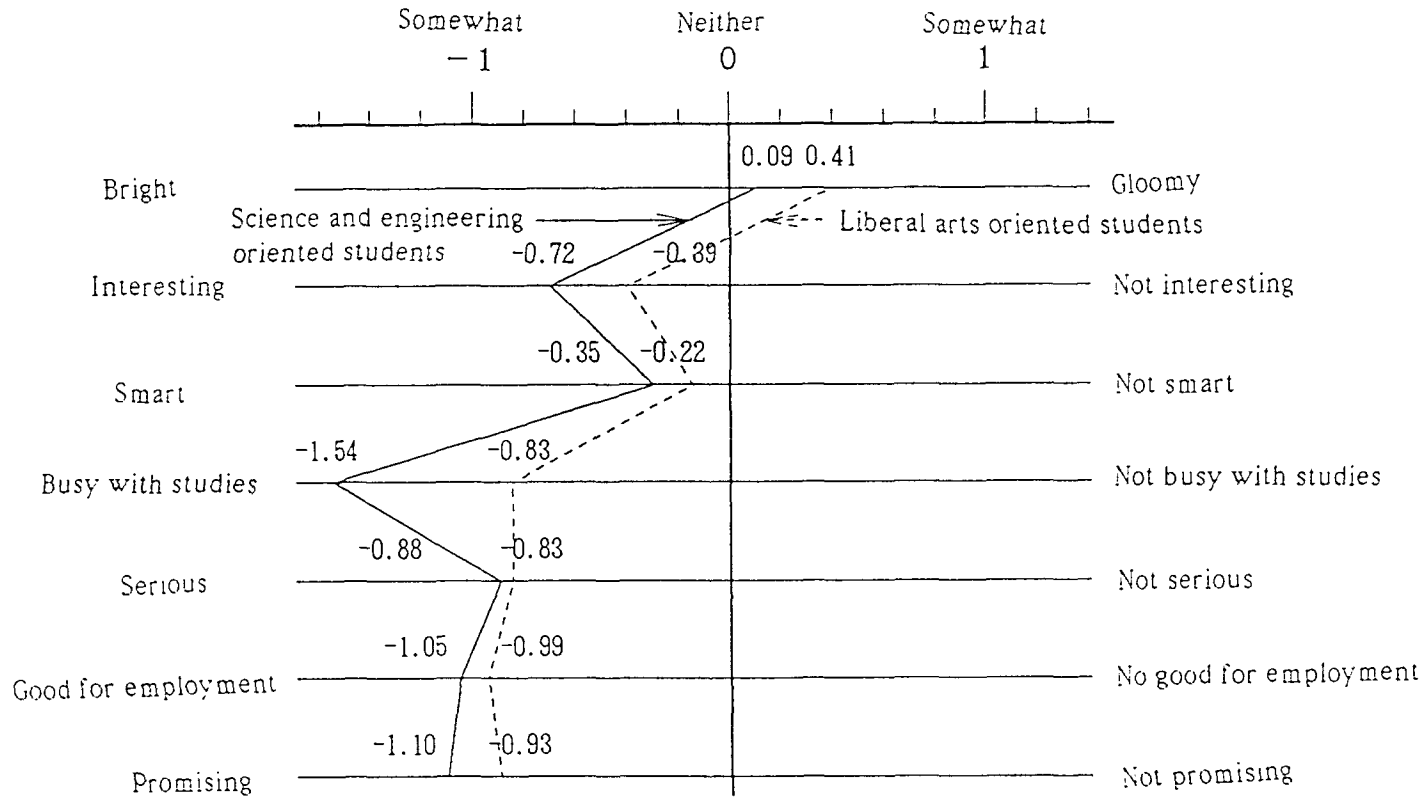

Figure 7. Occupational Image

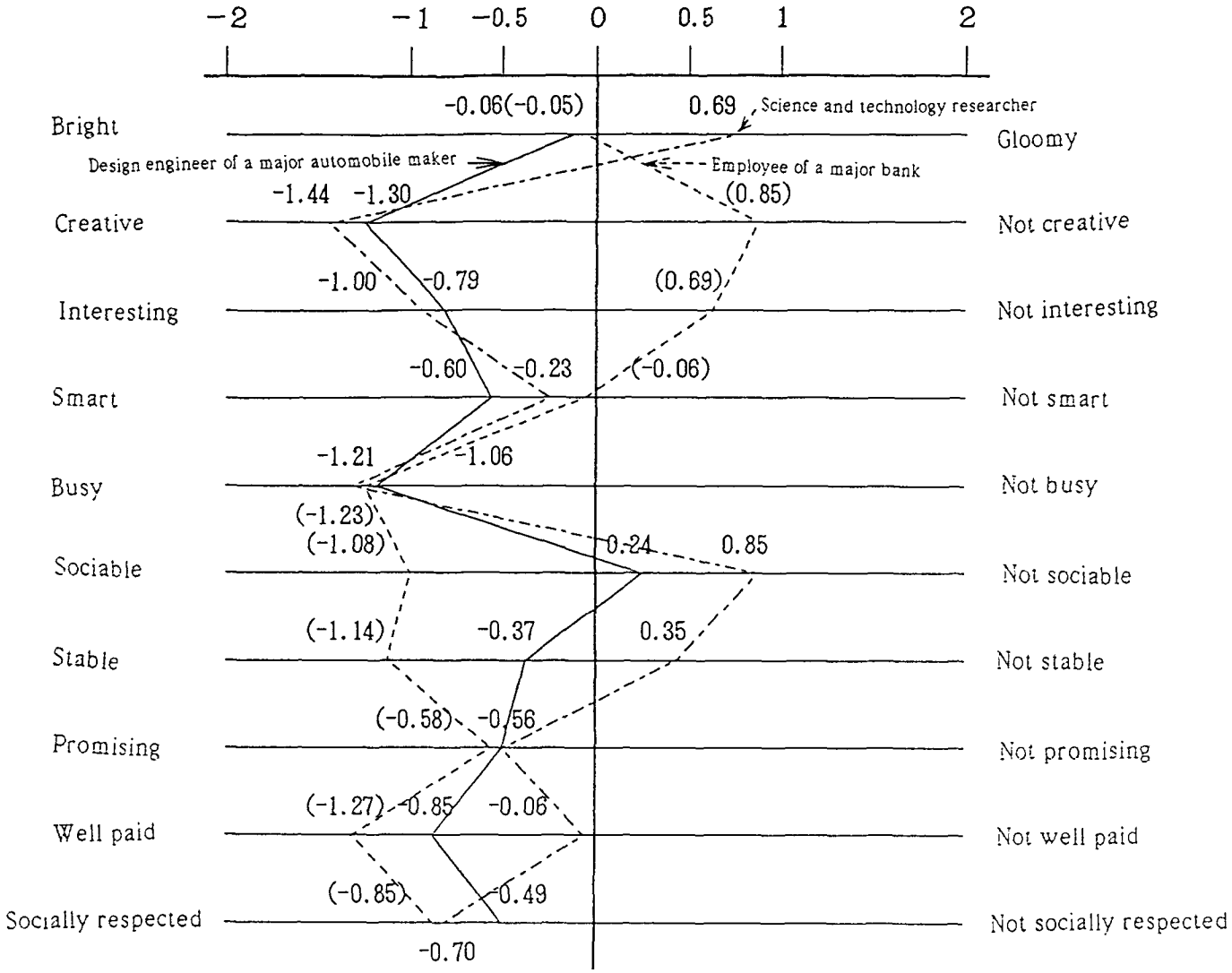

Figure 8. Image of a Design Engineer of a Major Automobile Maker
(by academic orientation)

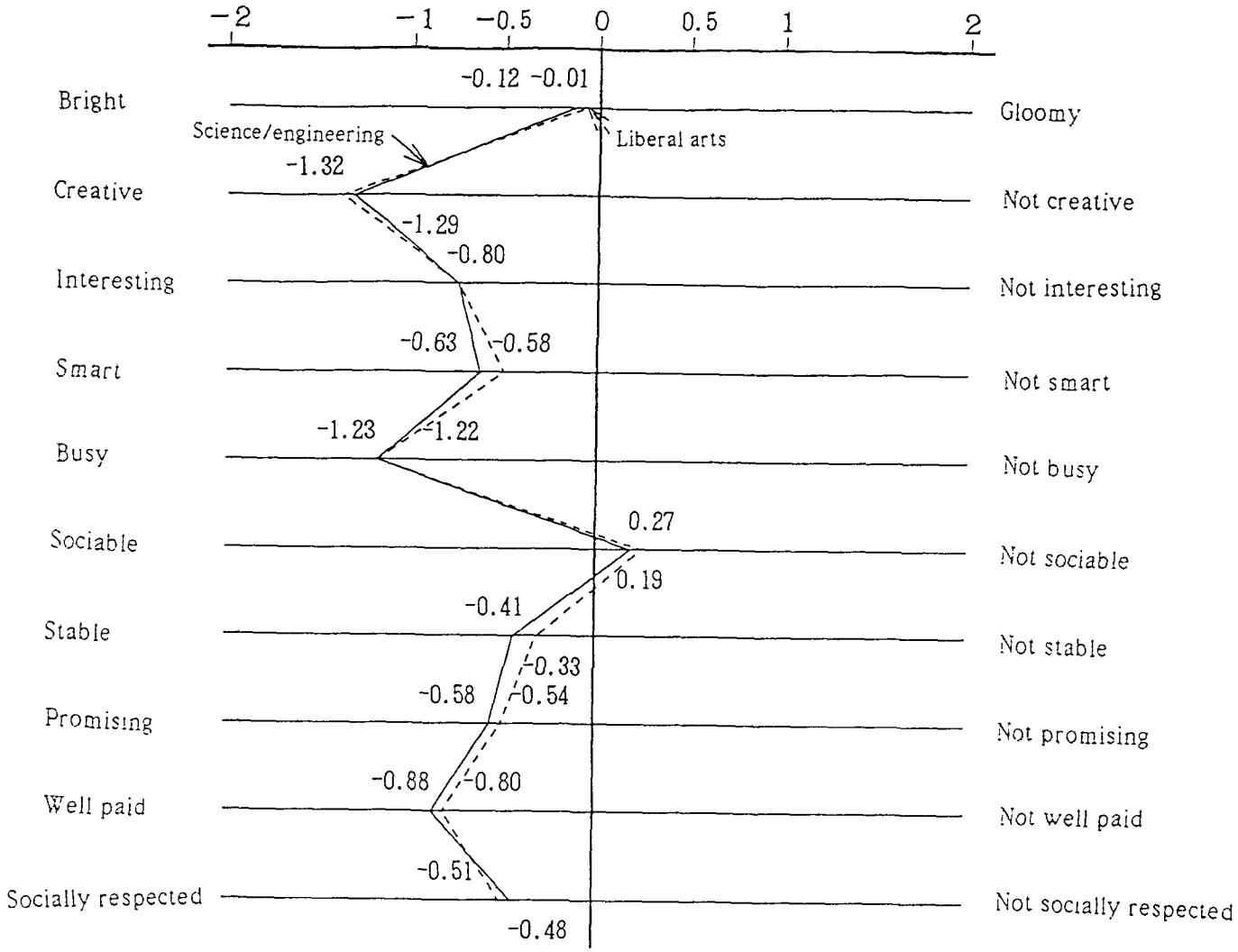

Figure 9. Image of a Science and Technology Researcher (by academic orientation)

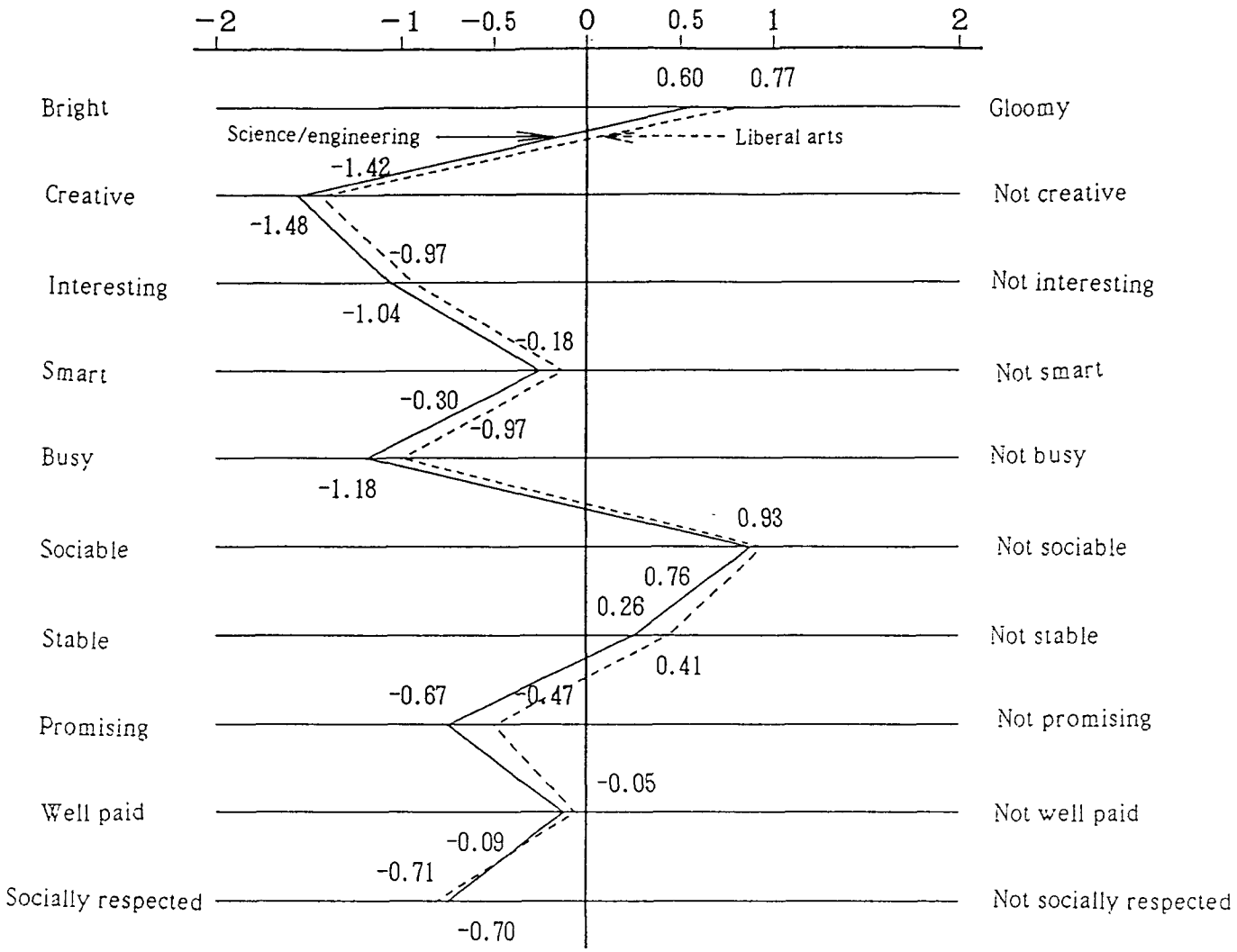

Figure 10. Image of an Employee of a Major Bank (by academic orientation)

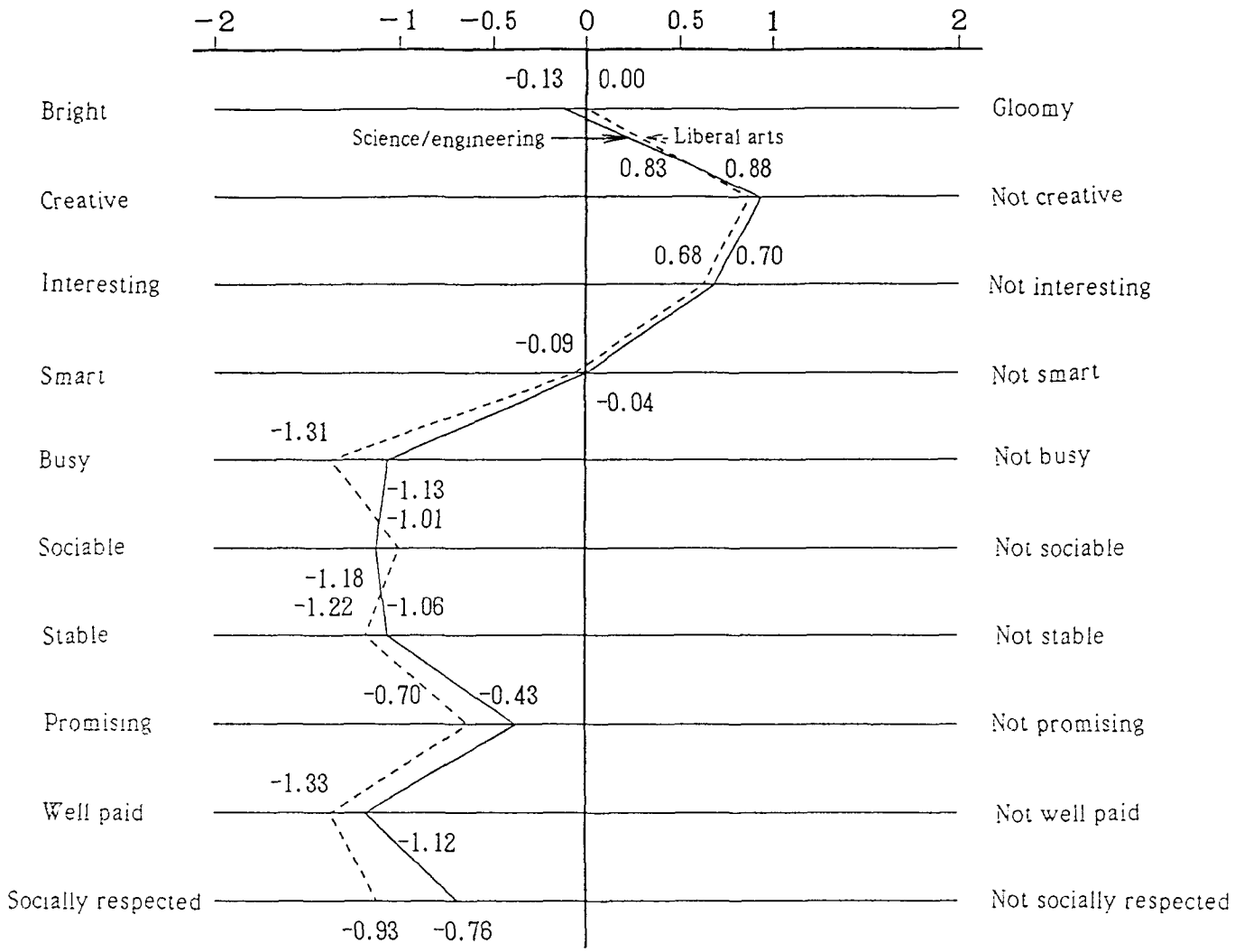

Table 1. College Aspiration: Science/Engineering or Liberal Arts

		Definitely liberal arts	More or less liberal arts	Had not decided	More or less science and engineering	Definitely science and engineering
All	5th-6th grader	2.5	4.2	78.1	7.8	5.1
	8th grader	5.5	13.4	50.1	18.6	9.9
	First trimester of 11th grader	31.1	15.3	7.8	17.3	26.9
	Now	50.9	3.1	0.7	5.8	36.6
Male	5th-6th grader	1.6	2.8	77.4	8.9	6.5
	8th grader	3.7	9.3	51.1	20.9	12.0
	First trimester of 11th grader	23.6	13.6	8.5	18.9	33.1
	Now	41.6	2.9	1.0	6.4	44.8
Female	5th-6th grader	3.9	6.3	79.4	5.8	3.0
	8th grader	8.2	19.7	48.5	15.1	6.7
	First trimester of 11th grader	43.2	17.9	6.5	14.8	16.9
	Now	65.8	3.5	0.4	4.7	23.6

(%)

Table 2. College Aspiration by High School Course

	Aspiration	
High school course	Science and engineering	Liberal arts
National and public university science/engineering	83.2	2.9
Private university science/engineering	14.1	1.0
	97.3	3.9
Private university liberal arts	0.2	68.7
National and public university liberal arts	1.0	26.2
	1.2	94.9
Other	1.3	1.1
NA	0.2	0.1
	100.0	100.0

Table 3. Academic Orientation and University Department/Faculty of Choice

University department/faculty	Academic orientation					
	All		Male		Female	
	Science/ engineering	Liberal arts	Science/ engineering	Liberal arts	Science/ engineering	Liberal arts
Science	15.3	0.1	15.8	0.3	14.2	0.0
Technology	43.5	0.2	54.4	0.3	11.3	0.1
Agriculture, forestry and fisheries	4.1	0.0	3.6	0.0	5.6	0.0
Veterinary and animal husbandry	1.2	0.0	0.9	0.0	2.0	0.1
Medical	14.6	0.6	11.4	0.1	24.0	1.2
Dentistry	1.5	0.1	0.9	0.1	2.9	0.2
Pharmaceutical	6.7	0.1	2.8	0.0	18.0	0.2
Information processing	6.0	1.4	6.8	0.6	4.0	2.2
Other science	2.2	0.0	0.5	0.0	7.3	0.1
Subtotal	95.1	2.5	97.1	1.4	89.3	4.1
Law	0.0	18.1	0.0	26.8	0.0	9.3
Economics	0.1	17.1	0.0	26.9	0.0	7.2
Commercial science and business administration	0.3	9.8	0.3	12.6	0.2	6.8
Literature	0.0	13.4	0.0	8.5	0.0	18.6
Foreign language and international relations	0.1	13.6	0.0	6.6	0.4	20.7
Physical education	0.1	1.3	0.2	1.5	0.0	1.2
Music and arts	0.5	2.7	0.5	1.8	0.4	3.5
Other liberal arts	0.0	5.6	0.0	4.3	0.0	6.9
Subtotal	1.1	81.6	1.0	89.0	1.0	74.2
Educational	1.7	12.6	1.0	9.1	3.6	16.0
Domestic science	1.4	2.7	0.0	0.2	5.3	5.3
Undecided	0.4	0.4	0.5	0.4	0.2	0.3

(%)

Table 4. Academic Orientation and School Record

	School record		
	Upper	Middle	Lower
Definitely liberal arts	50.5	52.6	48.2
More or less liberal arts	1.5	3.1	4.5
Undecided	0.9	0.6	0.9
More or less science/engineering	4.6	5.1	7.7
Definitely science/engineering	39.9	35.6	36.1
NA	2.6	3.0	2.6
Total	100.0	100.0	100.0

(%)

Table 5. School Location, Academic Orientation and Sex

	Hokkaido Tohoku	Kanto	Hokuriku Shinetsu	Tokai	Kinki	Chugoku Shikoku Kyushu	All
Definitely liberal arts	48.5	61.6	53.6	47.7	50.2	48.4	50.9
Male	46.0	50.5	38.5	39.9	39.2	38.7	41.6
Female	58.6	73.8	74.4	64.9	67.0	59.5	65.6
More or less liberal arts	2.7	4.3	3.9	3.0	2.2	3.0	3.1
Male	3.0	4.3	3.7	2.5	1.9	2.7	2.8
Female	1.7	4.4	4.2	4.1	2.6	3.4	3.5
Undecided	0.7	0.9	1.2	1.2	0.3	0.5	0.7
Male	0.7	0.7	1.7	1.5	0.5	0.7	1.0
Female	0.9	1.2	0.5	0.4	0.0	0.2	0.4
More or less science /engineering	5.6	6.4	4.0	5.7	4.8	7.0	5.8
Male	5.5	7.9	5.4	6.3	6.6	6.9	6.4
Female	6.0	4.8	2.3	4.5	2.2	6.9	4.8
Definitely science /engineering	40.4	25.3	35.1	39.2	39.2	37.7	36.6
Male	42.5	35.0	48.2	45.7	47.9	46.5	44.8
Female	31.9	14.3	16.7	24.4	25.6	27.7	23.8
NA	2.2	1.5	2.3	3.2	3.3	3.5	2.8
Male	2.3	1.4	2.7	4.0	3.9	4.6	3.4
Female	0.9	1.6	1.9	1.7	2.6	2.2	1.9
Female ratio	20.7	48.1	41.2	31.1	39.8	46.3	38.5

(%)

Table 6. Self Image

		All	Male	Female	Male		Female	
					Liberal arts	Science/ engineering	Liberal arts	Science/ engineering
A	Enduring	9.0	9.3	8.5	10.1	8.5	8.7	7.8
B	Interested in society	24.5	28.5	18.2	34.1	23.7	19.8	14.4
C	Adaptable	16.7	16.5	17.1	18.0	15.1	17.6	15.3
D	Like people	24.8	23.3	27.4	25.8	21.0	27.6	25.7
E	Job-oriented	16.8	16.7	16.9	19.1	14.1	16.5	14.9
F	Good at mechanical things	8.0	11.3	2.8	5.0	16.7	2.1	4.4
G	Like to read and write	17.9	13.3	25.1	17.9	9.1	27.5	20.8
H	Resolute	13.3	13.2	13.5	13.8	12.4	13.0	13.5
I	Logical	14.6	16.2	12.1	16.3	16.0	12.5	10.9
J	Like stability	16.4	16.0	17.2	18.0	13.8	18.0	14.6
K	Like to make plastic models and other things	18.2	24.1	9.1	14.1	32.3	7.6	13.5
L	Like to use personal computers	16.2	20.4	9.9	12.4	26.7	8.2	13.3
M	Like nature such as the sea and mountains	46.5	45.2	48.7	44.3	44.7	46.3	53.0
N	Like machines than people	3.4	4.7	1.5	1.4	7.3	0.8	2.9
O	I am an audiophile	11.2	15.1	5.0	13.7	16.1	4.7	6.0
P	Like lab experiments	17.4	18.8	15.2	8.0	27.3	7.9	33.3
Q	Like to raise animals	23.4	19.4	29.8	17.8	20.2	26.9	36.8
R	Do not like to be interfered	30.5	29.6	31.9	31.2	28.3	32.2	30.6
S	I am science and engineering oriented	19.2	25.8	8.7	5.0	44.2	2.2	25.9
T	I am liberal arts oriented	25.1	20.9	31.9	40.6	3.8	41.8	7.3

(Ratio of those feeling this way "very much")

Table 7. What Students Relied on when Choosing Departments, etc.
(by academic orientation and comparison with 4 years ago)

		Present survey			1985 (Y)	Increase (X-Y)
		Science and engineering	Liberal arts	All (X)		
A	Books and magazines on schooling	①73.5	①79.6	①76.9	①62.9	14.0
B	TV and radio programs	8.2	9.4	9.0	10.2	-1.2
C	Conversation with parents	⑥48.5	51.0	49.8	40.5	9.3
D	Conversation with brothers/sisters and relatives	33.2	35.8	34.8	24.5	10.3
E	Conversation with classmates	③58.6	②66.9	②63.3	②53.4	9.9
F	Conversation with friends of other schools	18.4	23.5	21.2	18.1	3.1
G	Conversation with past graduates	28.3	33.7	31.2	22.2	9.0
H	Conversation with older acquaintances	35.3	39.3	37.4	30.9	6.5
I	Conversation with old primary school and junior high school teachers	6.1	8.0	7.3	8.4	-1.1
J	Conversation with high school teachers	⑤53.2	⑤59.2	⑤56.4	③53.1	3.3
K	Conversation with preparatory school teachers	15.3	16.0	15.7	22.0	-6.3
L	Pamphlets prepared by universities	48.0	⑥58.1	⑥53.6	④52.4	1.2
M	Guidance materials on schooling prepared by the high school	②59.1	③64.5	③61.8	⑥49.7	12.1
N	Explanatory meetings held by universities	17.5	20.9	19.5	9.5	10.0
O	Results of extramural trial examinations	④56.9	④60.3	④58.6	⑤50.5	8.1
P	Materials of correspondence courses	21.2	27.7	24.7	—	—

(Ratio of students who relied on the items "somewhat" and "very much." Circles indicate ranking.)

Table 8. What Students Emphasized when Choosing Departments, etc. (comparison with 4 years ago)

		This survey	1985
A	Interested in foreign languages and culture	12.6	16.5
B	Want to think about people and life	15.1	16.4
C	Interested in how society works	18.6	20.4
D	Interested in natural systems and organisms	11.7	17.2
E	Interested in how things work	11.0	17.2
F	Like to make things	13.2	17.6
N	Good for employment and promotion	24.4	33.4
O	Like to be alone	4.2	6.3
P	Want to learn the most up-to-date things	21.5	28.4
Q	Want to acquire qualifications	31.6	38.4
S	Want to enjoy student life	38.6	35.4
U	Will enrich my life	15.7	16.3

(Ratio of students emphasizing the items "very much.")

Table 9. What Students Emphasized when Choosing Departments, etc.

順位	Science and engineering		Rank	Liberal arts	
1	Can study what I want to study	50.5	1	Can study what I want to study	51.7
2	Want to study the most up-to-date things	34.0	2	Want to enjoy student life	44.3
3	Want to acquire qualifications	33.8	3	Want to acquire qualifications	29.4
4	Want to enjoy student life	31.9	4	Interested in how society works	28.2
5	Good for employment and promotion	23.8	5	Number of examination subjects required by college	26.7
6	Like to make things and do minute things	22.9	6	Good for employment and promotion	24.8
7	Interested in nature and organisms	22.1	7	Interested in foreign languages and culture	19.9
8	Interested in how things work	20.9	8	Want to think about people and life	19.8
9	I am good at science subjects	20.0	9	The school is famous	16.9
10	Number of examination subjects required by college	17.2	10	Will enrich my life	15.8
11	I am good at mathematics	15.7	11	I am good at social studies	13.9
12	Will enrich my life	15.6	12	The college is located in a large city	13.5
13	The school is famous	11.9	13	I am good at English	11.9
14	Want to think about people and life	9.2	14	Want to learn the most up-to-date things	11.5
15	The college is located in a large city	7.8	15	I am good at Japanese	10.7
16	Like to be alone	6.5	16	Like to make things and do minute things	5.5
17	Interested in how society works	6.4	17	I am good at mathematics	4.5
18	I am good at English	3.7	18	Interested in nature and organisms	4.1
19	Interested in foreign languages and culture	2.9	19	Interested in how things work	3.0
20	I am good at social studies	1.6	20	I like to be alone	2.3
21	I am good at Japanese	1.4	21	I am good at science subjects	1.9

(Ratio of students emphasizing the item "very much.")

Table 10. What Students Want to Emphasize in College, etc.

		All	Male		Female	
			Liberal arts	Science and engineering	Liberal arts	Science and engineering
A	Study and research	41.4	31.3	40.4	46.4	56.2
B	Circle and club activities	36.3	39.2	32.1	39.0	34.7
C	Friends	57.3	55.8	47.6	67.3	63.8
D	Dates	28.8	40.6	33.5	17.7	13.8
E	Hobby	53.5	54.7	51.7	56.8	48.0
F	Acquisition of qualifications	41.7	34.6	32.7	51.0	61.8
G	Employment activities	28.0	27.6	21.4	36.1	29.1
H	Part-timing	36.0	41.5	29.5	41.4	28.7
I	Travel and leisure	36.8	39.8	32.4	41.7	32.0
J	Other	5.8	6.8	7.2	4.3	3.3

(Ratio of students emphasizing the item "very much.")

Table 11. Criteria of Occupational Choice

	All	Male	Female
Favorite occupation	96.5	95.2	98.5
Stability	90.8	89.0	93.7
Pay	88.5	88.0	89.6
Can use the knowledge and technology acquired in schools	87.6	84.6	92.1
Involves less overtime working and more holidays	72.7	72.1	73.7
Can contribute toward the society and people	71.3	68.5	75.7
The company is big	70.3	71.0	69.2
Can specialize	70.1	67.7	73.9
The company is well known	65.8	66.5	65.0
Possibility of success in the world	59.8	65.9	50.2
Can meet many people	53.1	50.7	56.5
Can be active internationally	51.1	51.0	51.4
Can work in cities	39.5	39.2	39.6
Good for marriage	33.1	32.1	34.8

(Ratio of students emphasizing the item "very much" and "somewhat.")

Table 12 Criteria of Occupational Choice (ranked by academic orientation)

Rank	Science and engineering		Rank	Liberal arts	
1	Favorite occupation	97.1	1	Favorite occupation	96.7
2	Can use the knowledge and technology acquired in schools	90.2	2	Stability	91.9
3	Stability	90.0	3	Pay	89.4
4	Pay	87.7	4	Can use the knowledge and technology acquired in schools	86.7
5	Can specialize	76.1	5	Involves less overtime work and more holidays	75.5
6	Can contribute toward the society and people	72.1	6	Can contribute toward the society and people	71.3
7	The company is big	70.1	7	The company is big	71.0
8	Involves less overtime work and more holidays	69.8	8	The company is well known	67.9
9	The company is well known	63.7	9	Can specialize	65.5
10	Possibility of success in the world	61.2	10	Possibility of success in the world	59.5
11	Can meet many people	47.3	11	Can meet many people	57.9
12	Can be active internationally	45.2	12	Can be active internationally	56.7
13	Can work in cities	34.5	13	Can work in cities	43.7
14	Good for marriage	31.4	14	Good for marriage	34.8

(Ratio of students emphasizing the item "very much" and "somewhat.")

Table 13. View of Science and Technology

Rank	Statement	All	Male	Female
1	Scientists should be more responsible about the social consequences of their inventions.	79.4	78.4	80.9
2	It is good that transportation facilities should speed up such as due to the development of magnetically levitated trains.	48.2	55.0	37.6
3	I would like to actively use the fruits of science and technology such as personal computers.	47.4	52.4	39.5
4	It is good that development of computers should make life easier.	42.9	48.5	34.0
5	I am interested in the trends of new science and technology such as superconductivity and biotechnology.	42.6	53.2	25.8
6	I often read newspaper articles on science and technology.	33.4	44.1	16.3
7	Science and technology are only the means. Politics and economy are what really move the world.	30.9	33.8	26.7
8	Japan should make more efforts for advancement of science and technology.	30.8	38.8	18.4
9	I want to find jobs related to science and technology in the future.	24.9	34.3	10.2
10	Progress of science and technology will make people happier.	15.7	20.9	7.5

(Ratio of students agreeing.)

Table 14. View of Science and Technology (ranked by academic orientation)

Rank	Science and engineering		Rank	Liberal arts	
1	Scientists should be more responsible about the social consequences of their inventions.	80.1	1	Scientists should be more responsible about the social consequences of their inventions.	79.5
2	I am interested in the trends of new science and technology such as superconductivity and biotechnology.	62.0	2	It is good that transportation facilities should speed up such as due to the development of magnetically levitated trains.	45.3
3	I would like to actively use the fruits of science and technology such as personal computers.	59.1	3	I would like to actively use the fruits of science and technology such as personal computers.	38.2
4	It is good that transportation facilities should speed up such as due to the development of magnetically levitated trains.	52.1	3	It is good that development of computers should make life easier.	38.2
5	I want to find jobs related to science and technology in the future.	51.8	5	Science and technology are only the means. Politics and economy are what really move the world.	33.6
6	It is good that development of computers should make life easier.	49.2	6	I am interested in the trends of new science and technology such as superconductivity and biotechnology.	27.0
6	I often read newspaper articles on science and technology.	49.2	7	Japan should make more efforts for advancement of science and technology.	21.8
8	Japan should make more efforts for advancement of science and technology.	42.1	8	I often read newspaper articles on science and technology.	20.7
9	Science and technology are only the means. Politics and economy are what really move the world.	27.4	9	Progress of science and technology will make people happier.	11.3
10	Progress of science and technology will make people happier.	21.0	10	I want to find jobs related to science and technology in the future.	3.7

(%)