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United Nations Industrial Development Organization

Secretary-General  
Department of Economic and Social Affairs  
Singapore, 21 November 1972

COMMERCIAL POLICY OF INDUSTRIAL RESEARCH

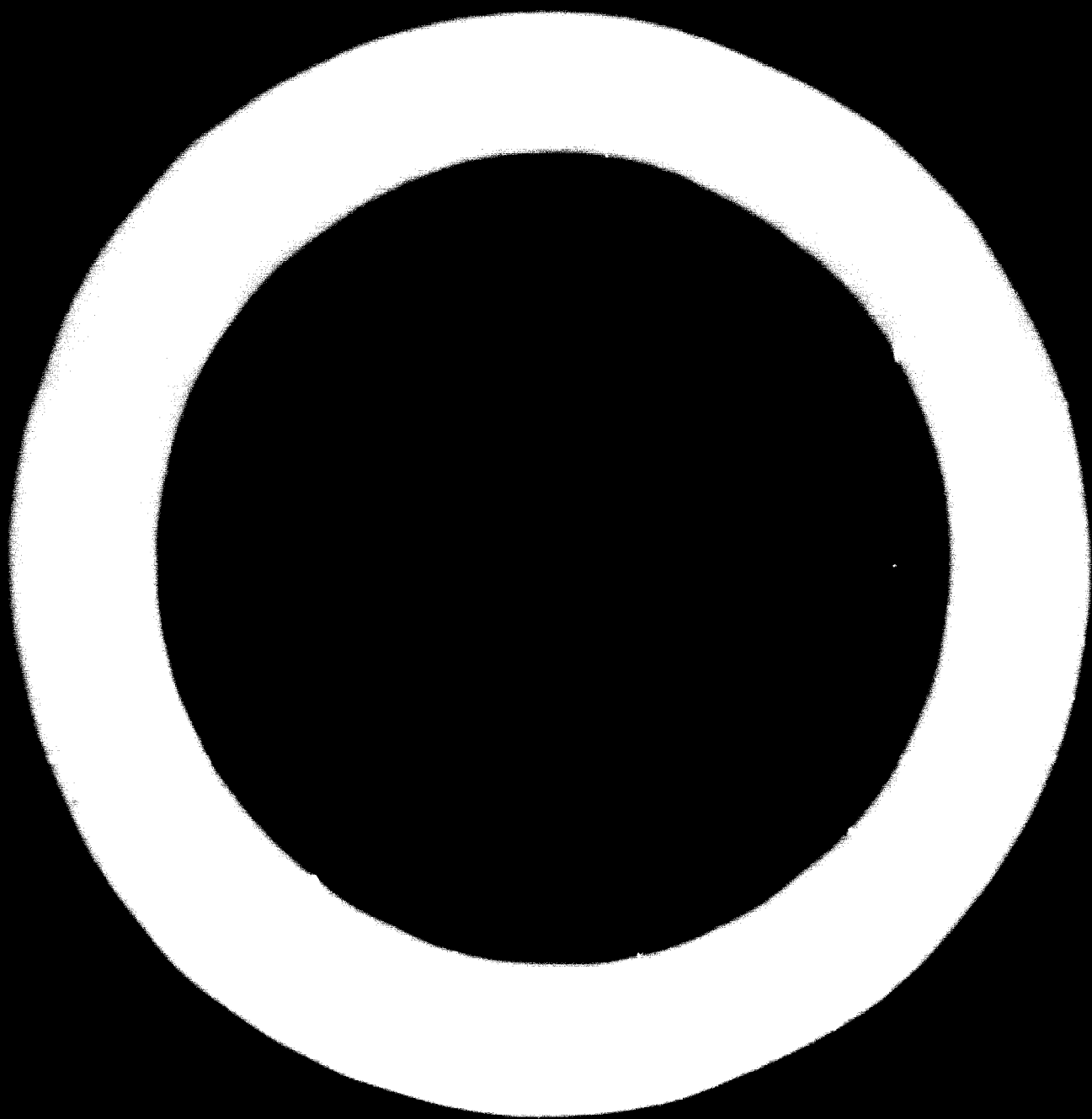
RESULTS IN JAPAN

by

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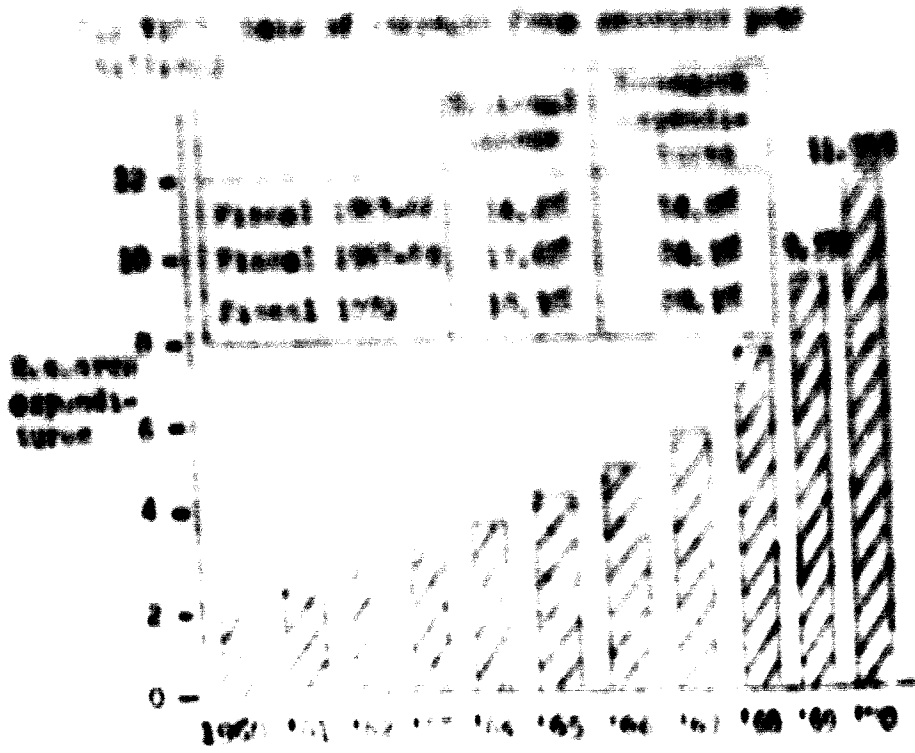


1. **GENERAL FINDINGS**

a. **RESEARCH EXPENDITURES**

The research expenditures for the period 1950-1960 increased steadily to \$1.1 billion. The highest rate of increase was in 1954, when expenditures reached \$1.1 billion, an increase of 25% over the 1953 level. The rate of increase over the period 1950-1960 was 11.5% per annum. The highest rate of increase was in 1954, when expenditures reached \$1.1 billion, an increase of 25% over the 1953 level. The highest rate of increase was in 1954, when expenditures reached \$1.1 billion, an increase of 25% over the 1953 level.

Figure 1. Trends in research expenditures in 1960





# Commercialization of Industrial Research Results in Japan

June, 1950

## Introduction

Generally speaking, most commercialization of industrial research results in Japan has been carried out by private enterprises but technological development in the field of public utilities such as railway and telecommunication has been initiated by respective public enterprises.

Industrial researches are made at government and non-government universities, public and private research institutes and business enterprises and those made in industrial enterprises are as a matter of course followed by further development for commercial exploitation. On the other hand, industrial researches in universities and public research institutes are generally insufficient in development for direct commercial application.

After the World War II, Japan has achieved industrialization by introduction of many developed technologies from highly industrialized countries and Japanese enterprises were apt to be inattentive in commercialization of research results in Japan. Many promising research outcomes in Japan were often left underdeveloped. With technological advancement in recent years, there is a tendency to endeavour at commercializing of domestic research outcomes in business enterprises in Japan.

I would like to report on present situation of industrial research in Japan and then measures undertaken by the Japanese government for the stimulation of commercialization of industrial research results.

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Figure 6. Trends in research manpower

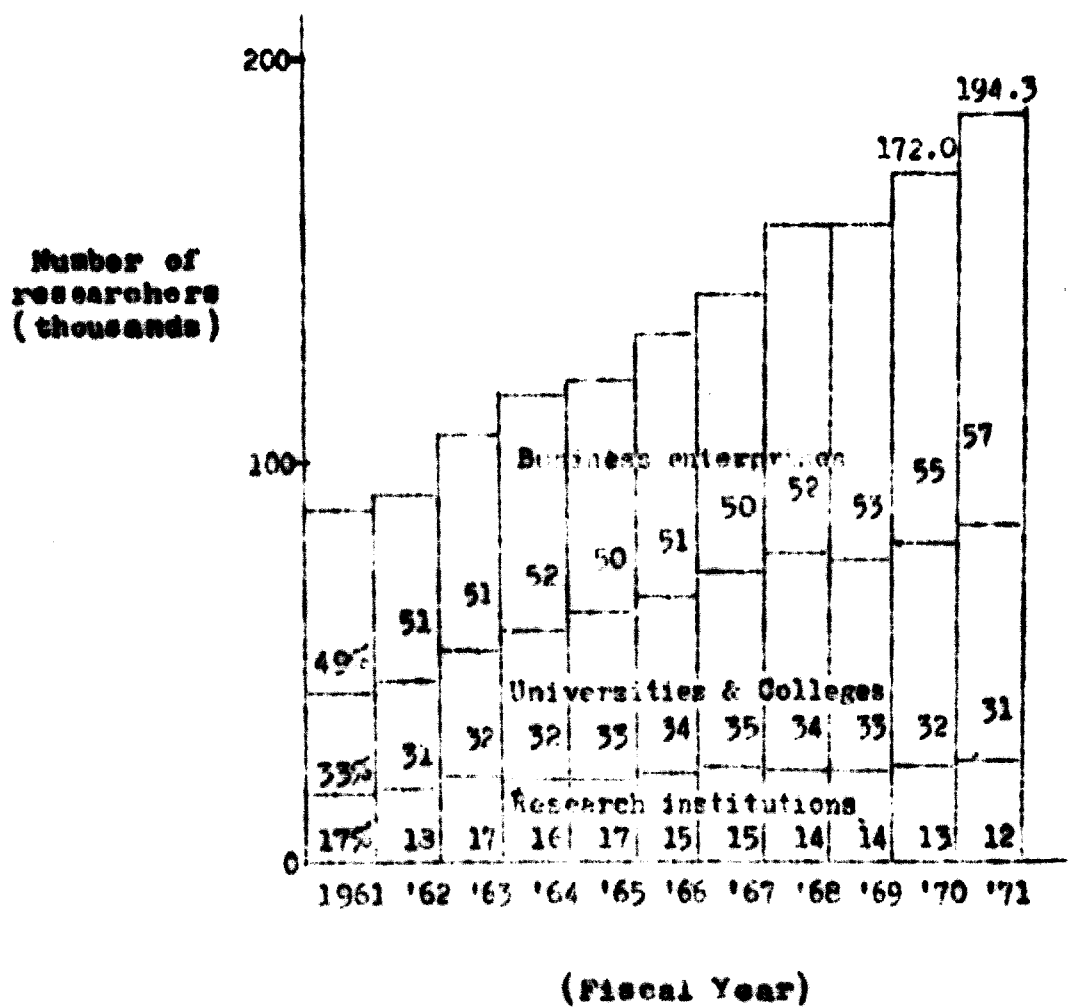


Figure 7. Distribution of research workers

(as of April 1, 1971)

	Researchers	Research ass stants	Technician-	Other persons concerned
Total	45.3%		18.7%	21.8%
Business enterprises	39.8		23.8	25.3
Research institutions	44.7		9.8	18.5
Universities & colleges	61.2		8.6	13.3

Table 1. Distribution of corporate research expenditures by type of industry (FY 1970)

1. Manufacturing industries	92.5%
a. Electric machinery industry	27.7%
b. Chemical industry	21.3%
c. Transportation machinery industry	11.5%
d. Mechanical industry	8.8%
e. Iron and steel industry	4.4%
f. Food industry	2.4%
g. Precision instrument industry	2.2%
h. Others	14.2%
2. Transportation, communications, public utilities	4.7%
3. Agriculture-forestry-fisheries, mining, construction	2.8%

The ratio of research spendings to sales proceeds was, as shown in Fig.8, 1.3% on the average covering all industries, with the 3.3% ratio recorded by the electric machinery industry in the first place. Averages for all industries were 4.1% in the United States and 3.2% in France, considerably higher than that in Japan.

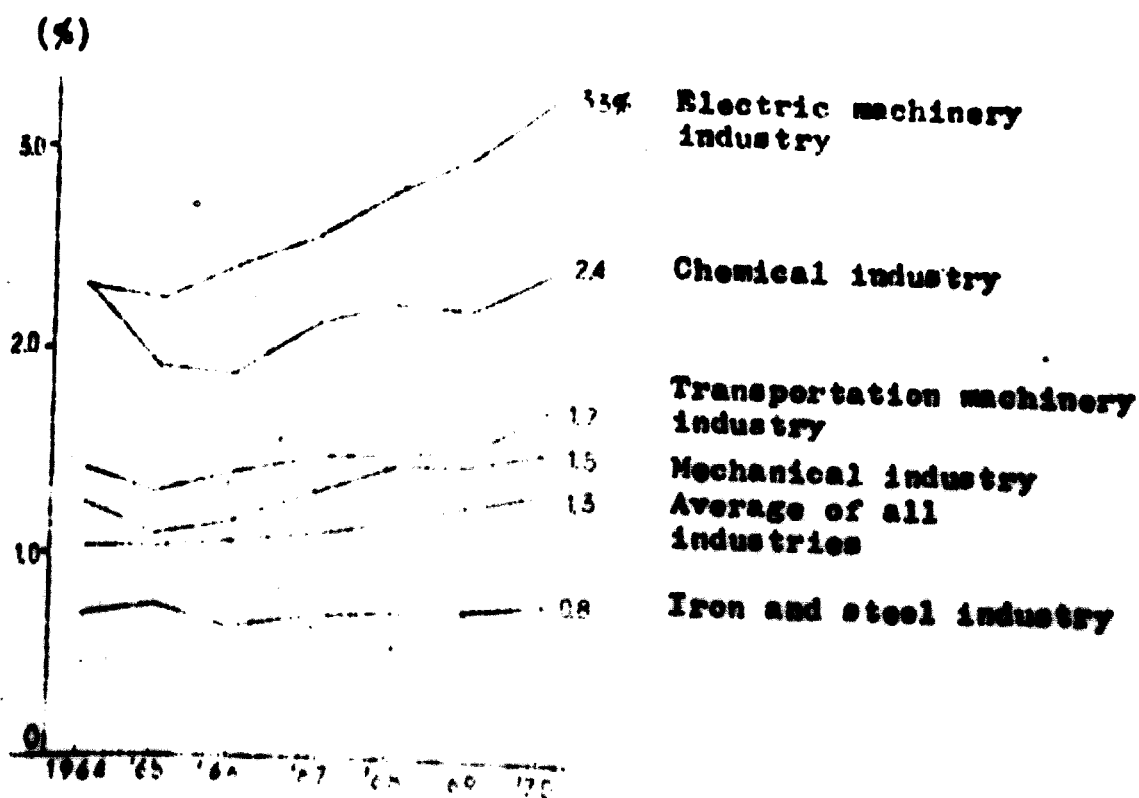
The number of researchers was 111,200, which meant an 18.2% increase over the previous year.

#### b. Research Activities of Research Organizations

Research expenditures at research organizations amounted to ¥154,600 million, which was 21.3% more than those in the previous year. As for a breakdown by management status, government-managed research organizations spent ¥51,600 million; public-managed research organizations, ¥54,200 million; private research organizations, ¥14,600 million; and special corporations, ¥34,200 million.

The number of researchers was 23,400, which meant an only 2.9% increase from the previous year.

Figure 8. Trends in ratio of research expenditures to sales proceeds



### C. Research Activities at Universities and Others

Research expenditures at the universities and the like amounted to ¥217,400 million, a 22.5% increase over the previous year. A breakdown by types of organization is ¥31,800 million by Governmental institutions, ¥16 billion by public ones, and ¥69,700 million by <sup>other</sup> ones. Another breakdown, by disciplines, is ¥25,700 million in natural science, ¥83,700 million in engineering, ¥23 billion in agriculture, and ¥85,100 million in medicine.

The number of researchers was 59,700, which meant an 8.2% increase from the previous year.

### 3. Science and Technology Budget

The amount of science and technology budget, that is, appropriations made by the Government for promotion of science and technology, in fiscal 1971 was ¥305,500 million, a 15.9% increase over the ¥263,600 million in FY 1970 (Fig.9).

Japan's science and technology budget is markedly smaller than those of the United States (¥5,818 billion in FY 1971) and the Soviet Union (¥2,360 billion in FY 1969). It is smaller than that of France (¥758,700 million in FY 1969), Britain (¥563,900 million in FY 1971) and West Germany (¥367,500 million in FY 1969) (Fig.10). Meanwhile, the ratio of the science and technology budget to the general-account budget is 8.0% in the United States, 7.2% in France, 5.0% in West Germany and 4.6% in Britain, all higher than 3.3% in Japan.



Figure 9. Trends in budget related to promotion of science and technology

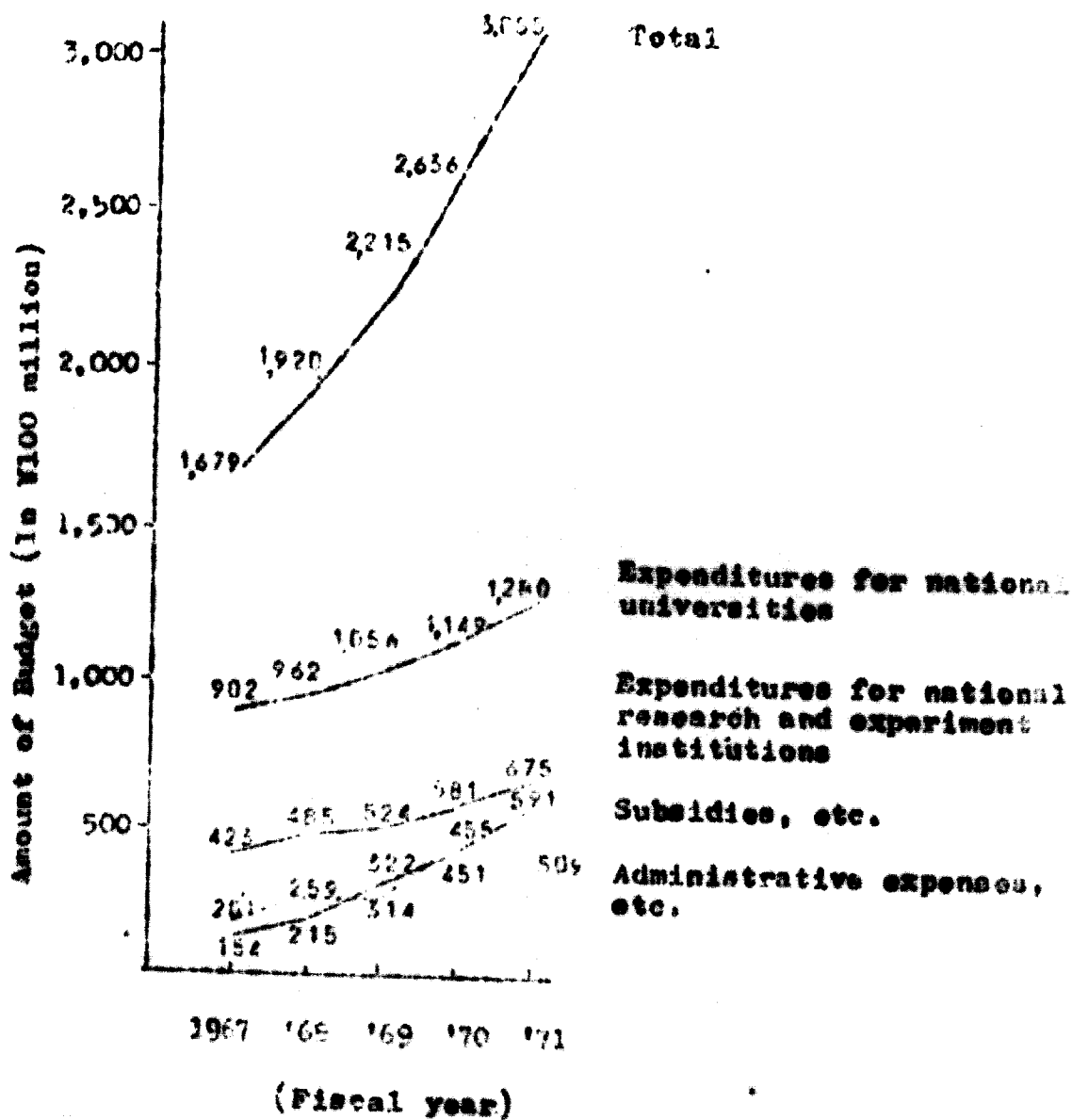
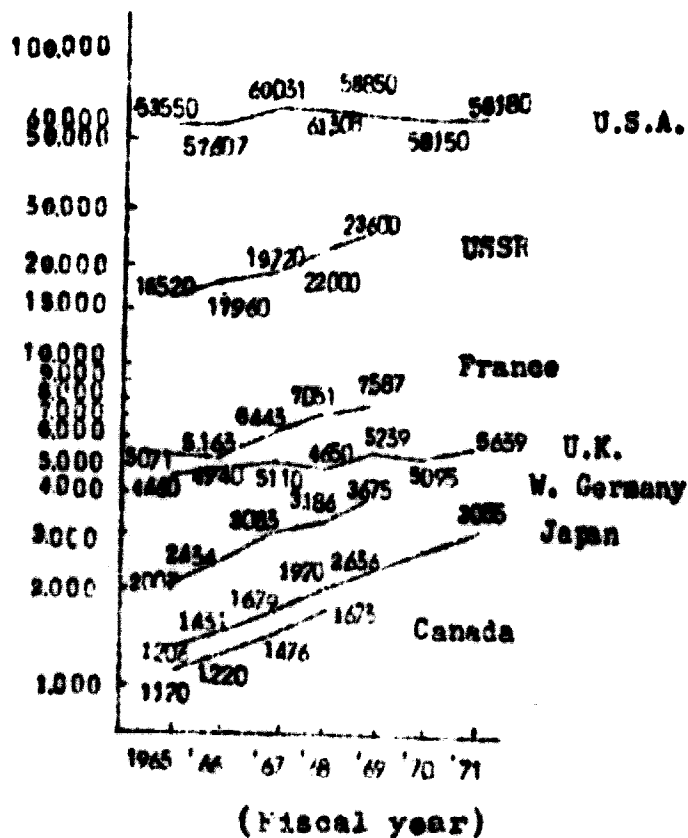


Figure 10. Trends in science and technology budgets of major countries

(in V100)  
million



Source:

- U.S.A.: National Science Foundation
- USSR : Annual Statistical Report on National Economy, Soviet Embassy in Tokyo
- France: Delegation Générale à la Recherche Scientifique et Technique
- U.K. : Statement of Budget
- FRG : B.M. für Bildung und Wissenschaft
- Canada: Bureau of Statistics

Note:

- (1) Because of downward revaluation of the pound, the yen equivalent to the figures for Britain in and after fiscal 1968 are smaller than those based on the old conversion rate (£507 million in FY 1967, £538 million in FY 1968, £606 million in FY 1969, £590 million in FY 1970, £653 million in FY 1971).
- (2) Although the franc was revalued downward in August 1969, the figure for the FY 1969 budget is based on the old conversion rate.

**CHAPTER II Measures Taken by the Government for  
Commercialization of Industrial Research Results**

Industrial research results should be fully developed to decrease the technical risks before commercialization. In Japan, research and development for commercialization is generally carried out by industrial enterprises attaching importance to the production of new machineries or goods and the improvement of the production methods. For these activities, big pilot plants or equipments and many researchers are generally required, so the research and development becomes expensive.

The government has been giving aids to promote research and development activities and commercialization of the research results as follows:

**1. Subsidies**

In the fiscal year 1970, budget of the government for subsidies and contract monies given to the research and development amounted to ¥56,000 million. Proportion of subsidies given to private enterprises is small and the most subsidies are given to researches in universities and to basic medical and agricultural researches in other research organizations.

Subsidies to the private enterprises for the promotion of research and development were disbursed by as follows:

Ministry of International Trade and Industry	¥2,000 million
Ministry of Transportation	181 million
Ministry of Construction	24 million
Agency of Science and Technology	400 million

Research loans which are outside of the subsidies by MITI in the fiscal year 1971 were as follows:

- 1 Information system (Computer, etc.)
- 2 Electronics (semi conductor, LDR, etc.)
- 3 Petrochemicals
- 4 Aircrafts
- 5 Ocean development
- 6 Housing
- 7 Pollution control
- 8 Automation
- 9 New industrial materials

## 2. Loans

Measures were taken to expand and improve the loan system of the Japan Development Bank and the Small and Medium Enterprise Finance Corporation for commercialization of industrial research results. In the fiscal year 1971, the Japan Development Bank financed ¥23,000 million to 52 projects of commercialization of industrial research results and the Small and Medium Finance Corporation financed ¥2,000 million to many projects. These loans have longer term of repayment with lower rate of interest compared with the private banks.

	annual interest	term
Japan Development Bank	6.5%	15 years
Small and Medium Enterprise Finance Corporation	6.5 - 8.2%	7-10 years

3. The following...

- (1) 1/3 of the...
- (2) 1/3 of the...

4. Research Development Corporation of Japan

Research Development Corporation of Japan was established on July 4, 1961, under the Research Development Corporation Act. The purpose of this national corporation, operating under science and technology ministry, is to promote the advancement of scientific research in Japan on an industrial level and to promote the effective exploitation of such development.

Many scientific research projects, however, although potentially applicable to industry, are left at a stage at which they require further development before they can be fully exploited by industry. This problem is partly due to difficulties in transferring projects to fields new to industry and partly due to a lack of sufficient development capital within industry.

To meet this situation a program was put forward by the Japan Science Council as well as by concerned groups in industry. It called for the establishment of a national organization devoted entirely to the task of bringing promising research projects to the attention of industrial circles to ensure

1. The first part of the document is a general introduction to the subject of the report. It discusses the importance of the subject and the objectives of the study. It also mentions the scope of the report and the methods used for data collection and analysis.

(2) **Methodology**

The methodology section describes the research design and the procedures used to collect and analyze data. It includes information about the sample size, the selection criteria, and the data collection methods. It also discusses the statistical methods used for data analysis.

The methodology section also discusses the limitations of the study and the potential sources of error. It mentions the need for further research to address these limitations and to confirm the findings of the study.

(3) **Results**

The results section presents the findings of the study. It includes a summary of the key results and a detailed discussion of the data. It also includes tables and figures to illustrate the results.

1. The first result is that the majority of the sample (approximately 70%) reported a high level of satisfaction with the service provided.
2. The second result is that there was a significant difference in satisfaction levels between the two groups of respondents.
3. The third result is that the majority of respondents (approximately 80%) reported that they would recommend the service to others.

(4) **Conclusions**

1. The first conclusion is that the service provided was generally well-received by the majority of respondents.
2. The second conclusion is that there is a need for further research to address the limitations of the study.

The study has several limitations, including a relatively small sample size and a cross-sectional design. These limitations may have affected the generalizability of the findings. Further research is needed to address these limitations and to confirm the findings of the study.

conducts a close examination of submitted research projects undertaken by these organizations to determine whether any should be classified as "company owned" research projects in that they may be difficult to develop out with a potential industrial application.

After further consideration of these research projects by the Development Council, some are selected by the Corporation as new development projects.

**b) Selection of an Industrial Enterprise for a Commission**

The Corporation then proceeds to tailor the selected project to its requirements and takes the measures necessary for its full development such as obtaining licenses from the researcher. It will then be announced publicly that the project is available for bids by interested enterprises. After receiving tenders, the Corporation carefully examines the applicants' qualifications for commission on the basis of their technical competency, financial soundness and interest in carrying out the developmental work. Thus a company suitable for a commission will be selected.

**c) Method of Granting a Commission**

Between the Corporation and the selected enterprise negotiations will proceed in the following manner:

1. Detailed study of the development project
2. Determination of the financial assistance to be advanced by the Corporation and its method of payment
3. Licensing and other protective measures
4. Setting of standards to determine the success or failure of the project
5. Determination of royalties and method of payment

When agreement is reached on all questions and the contract signed, the Corporation, by acting as co-ordinator



between the research group and the selected enterprise, supervises the development work.

d) Evaluation of the Development

Upon completion of the developmental work, the Corporation, on the advice from the Development Council, will assess the results to determine success or failure in accordance with the standards set in the initial agreement. Evaluation is based on whether or not the project has reached a stage at which it can be considered a success in terms of its industrial application. This criterion is set out as specific a manner as possible, both from the economic and technological points of view.

e) Steps to be Taken after Completion

1. Success

When a development project has been judged as being successful, the enterprise which carried out the project begins its exploitation and repays the commissioned sum to the Corporation in annual installments over a period not to exceed five years; it also pays the Corporation the agreed royalties. Approximately half of all royalties thus received will be in turn forwarded to the research organization which undertook the original research.

2. Failure

When the project is determined to be unsuccessful, the enterprise will cease work and repayment of the commissioned sum will not be required. The Corporation shall repossess the remaining related material, etc. from the enterprise for disposal.

(4) Exploitation

The technological opportunities gained by an enterprise as the result of a commissioned project will usually

be followed up by the same enterprise and legitimately incorporated into its regular operations. If the enterprise so wishes, the right of exploitation may be retained exclusively by the enterprise for a given period. As such a period of monopoly control draws to an end, the Corporation will invite other parties to undertake wider exploitation, subject to a specified license fee. Part of the fees thus obtained will be forwarded to the original research organization.

#### (5) Liaison

In addition to commissioning developmental projects, the Corporation performs the role of mediator between research organizations and industrial enterprises.

When a request for liaison on an engineering matter is received by the Corporation, it finds a suitable party to meet the requirements of the applicant and carries out the necessary mediation.

Especially, the Corporation conducts evaluations of patents invented in more than one hundred national research laboratories using outside evaluators. When an interested industrial enterprise is found, the Corporation negotiates a license with the company under the patents rights on behalf of the national research laboratories. If the mediation is successful, the Corporation obtains the intermediary fee.

#### (6) Business Report

The Corporation invites universities, research institutes, etc. to inform their industrial research results to the Corporation. The Corporation has filed and evaluated about 700 research results in the past ten years, and selected 104 as the commission projects.

Source of projects	Number of commissioned projects adopted
Universities and colleges	58
National or public research laboratories	24
Foundations or public corporations	11
Private enterprises	4
Private individuals	7
<b>Total</b>	<b>104</b>

When research results need further experiments on account of insufficiency of data or samples before its technical or commercial merits can be adequately assessed for the selection as a commission project, the Corporation may give money to the researcher for the further work.

The amount of the financial assistance to the commissioned projects is increasing year by year as shown below:

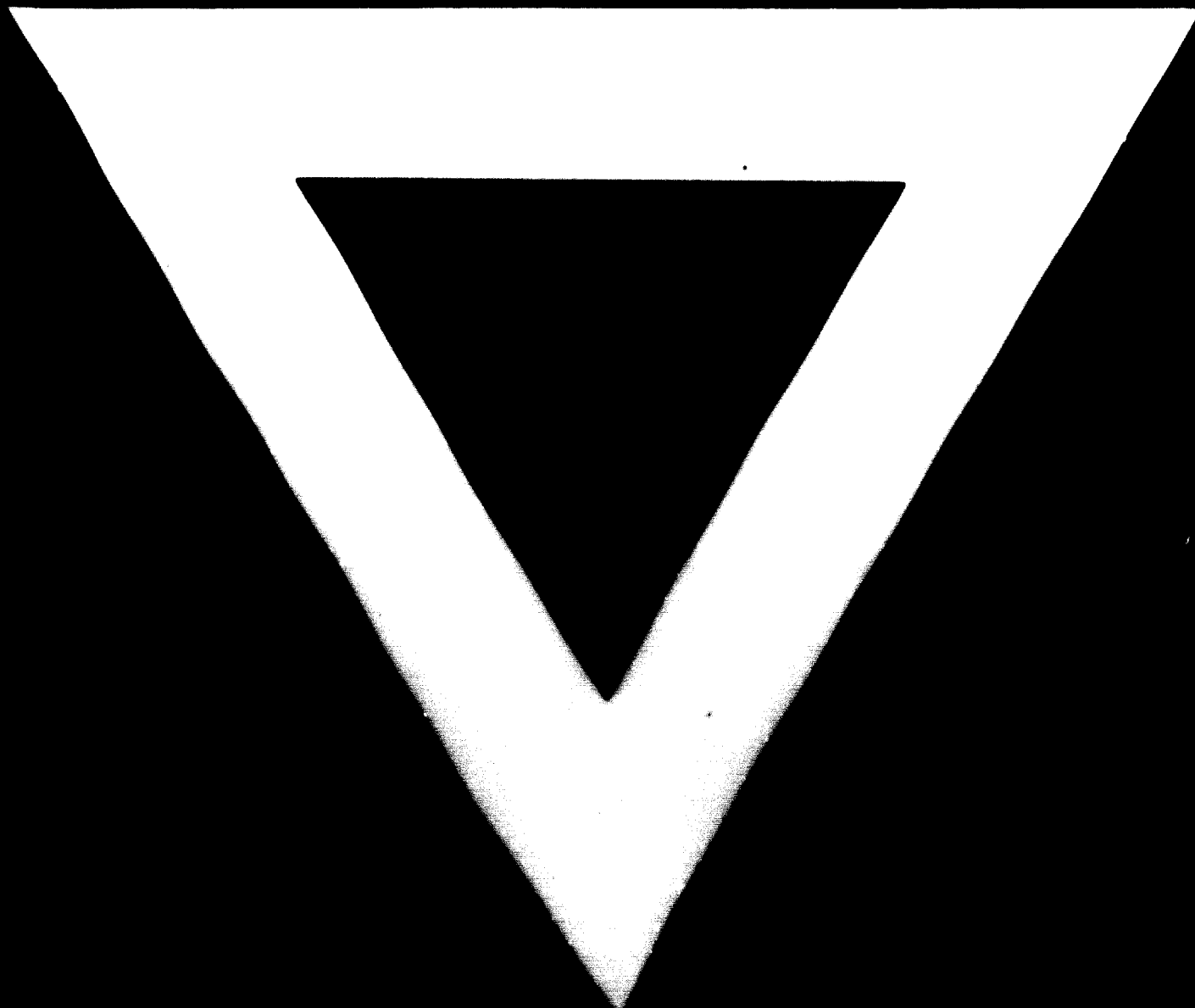
Fiscal year	Amount of Financial Assistance	Number of Commissioned Projects adopted
1961	¥ 350 million	10
'62	255	8
'63	724	9
'64	328	6
'65	768	10
'66	800	7
'67	850	7
'68	1,000	6
'69	1,200	11
'70	1,500	9
'71	1,600	10
'72	2,000	11
<b>Total</b>	<b>11,375</b>	<b>104</b>

Of the above total projects, 54 have been completed the development and the projects completed in success have been already commercialized ready to the commercial application. However, some are put off because of a change for the worse of the market estimated initially. Some successful projects were given loans from the Japan Development Bank to enlarge the plant and 12 projects won official commendation from the government, authoritative organizations and newspaper offices as an outstanding technology.

As the result of successful commercialization, total proceeds of sales amounted to ¥10,348 million by the end of the year 1971. Corresponding royalty was about ¥100 million.

Recently, the rate of royalty has largely been 2 to 3% of sales. In general, the enterprise who undertook the development has the exclusive right of commercialization for the period of 3 to 5 years. After the period, such a case may occur that the Corporation grants the right of commercialization to other enterprises. We have 10 enterprises of the kind. At present, the government owns about 2,500 patents and the public enterprises about 5,500. JRDC has these patents re-evaluated by many outside experts because of insufficiency of their utilization. About 1800 patents have already been completely evaluated. Of these patents, JRDC has recommended the exploitation of such patents to private enterprises that have been evaluated to be available for commercialization. 38 enterprises have carried out their commercialization through the Corporation's liaison services. By the way, commercialization by 85 enterprises is now under consideration.

When enterprises do not wish to commercialize a patent which both risks and rewards are high without financial assistance from outside the company, the Corporation will announce publicly that it is available for bids for the commission.



**23.7.74**