

Indicators of Science and Technology

I. Notes to users

1. The sources of materials are given chart by chart. However, unless otherwise specified, sources for “II. Indicators of S&T in Japan” are based on Report on the Survey of Research and Development published by the Statistical Bureau of the Ministry of Internal Affairs and Communications and include figures in the field of social science.
2. Exchange rates for selected countries are based on IMF exchange rates to the Japanese yen, unless otherwise specified.
3. There may be cases where components do not add up because figures have been rounded off.
4. Symbols used in the statistical tables are as follows.
 - 「0」 Less than a unit
 - 「—」 Figure not available
 - 「×」 Confidential figure
 - 「△」 Negative
5. Data for Germany before 1999 are for former West Germany, unless otherwise specified.
6. Report on the Survey of Research and Development published by the Statistical Bureau of the Ministry of Internal Affairs and Communications and cited in this book began to cover the software industry starting with the FY 1996 survey and the wholesale industry starting with the FY 2001 survey.
7. The data for each country is different in methods of collecting data or scope of focus do in fact exist, and therefore attention is necessary when making comparisons in some cases.

II. Definitions

1. R&D performing institutions

(1) Business enterprises

The business enterprises are those to prescribe in companies law with a capital of ten million yen or more assume the following industries defined in the Japan Standard Industrial Classification (Revision March of 2002) a main business and the special corporations, and the incorporated administrative agencies (excluding those which are included in non-profit institutions and public organizations, or universities and colleges) in the following industries defined in the Japan Standard Industrial Classification (Revision March of 2002): "Agriculture", "Forestry", "Fisheries", "Mining", "Construction", "Manufacturing", "Electricity, gas, heat supply and water", "Information and communications", "Transport", "Wholesale and retail trade – general merchandise wholesale trade, textile and apparel wholesale trade, food and beverages wholesale trade, building materials wholesale trade, mineral and metals wholesale trade, machinery and equipment wholesale trade and other wholesale trade", "Finance and insurance – banking, credit card and installment finance institutions, non-deposit money corporations engaged in the provision of finance, credit and investment, securities and futures commodity transaction dealers and commodity investors, financial auxiliaries and insurance service institutions including insurance agents and brokers", and "Services, n.e.c. – professional services, n.e.c., scientific and development research institutions and other business services"

"Special corporations" are the corporations which were mentioned in the attached table (list) of the Cabinet Order of Registration for Incorporated Administrative Agencies (Cabinet Order No.28 of 1964), and their production activity subjects are classified as "Industries" in the input-output tables.

"Incorporated Administrative Agencies" are the corporations whose production activity subjects had been classified as "Industries" in the input-output tables among all the corporations which became Incorporated Administrative Agencies by the "Program for Readjustment and Rationalization of the Special Corporations" (Resolution of the Cabinet Council December 19 of 2001).

These special corporations/incorporated administrative agencies have been moved to the category of non-profit organizations/public institutions starting with the 2012 Report on the Survey of Research and Development, while this category has changed from companies and other similar organizations to companies. In this document, the charts indicating timetables that include surveys in 2011 or before continue to use companies and other similar organizations, while data of survey results since 2012 use the term companies.

(2) Non-profit institutions and public organizations

"Non-profit institutions and public organization" are the research institutions, special corporations and incorporated administrative agencies (excluding those which are included in universities and colleges) established by the central or local governments and conduct R&D in the fields of social sciences and humanities, or natural sciences and engineering.

(3) Universities and colleges

The universities and colleges include: faculties of universities and facilities (including postgraduate courses), junior colleges, technical colleges, and research institutes attached to universities, all of which are prescribed in the "School Education Law" (Law No. 26 of 1947); Inter-university Research Institute which is prescribed in the "National University Corporations Law" (Law No. 112 of 2003) and Institute of National Colleges of Technology.

2. Research and Development (R&D)

R&D refers to systematic studies and creative efforts in science and technology which are undertaken for the acquisition of new knowledge of materials, functions, natural phenomena, etc., and for the new application of the storage of knowledge.

Development and technical improvements on the product or production process on R&D activities in the business enterprises and the non-profit institutions and public organizations are also included in the category of R&D. Distinction between R&D activities and non-R&D activities is as follow:

(R&D activities)

- ① Essential activities conducted in research units, i.e., planning designing, data collection, experiments, tests, inspection, analysis, reporting, etc. are required for R&D performance. Such activities for R&D as construction of machinery and instruments and equipment, rearing of animals and plants, and study of reference documents are included.
- ② Above-mentioned activities as well as designing, construction of pilot plants and prototype models and experiments by using them undertaken in non-research units such as factories.
- ③ Clerical and financial work related to R&D performance.

Research units may pay their own-funds outside the organization for above-mentioned R&D activities to be

conducted.

(Non-R&D Activities)

The following activities undertaken at research units or production units are not considered as R&D activities.

- ① Quality control and routine examination for the standardization of production processes; tests, experiments, measurements and analyses on products and half-finished products, soil, atmosphere, etc.
- ② Designing of machinery and facilities for commercial production purposes, beyond the process of R&D activities using pilot plants or prototype models.
- ③ Routine topographical mapping, exploration of underground resources.
- ④ General data collection on geological and oceanographic surveys and astronomical observations.
- ⑤ Patent and litigation work.
- ⑥ Seminars and training for general workers.

3. Persons employed in R&D

"Persons employed in R&D" consist of the following four categories. And as a rule in this survey used for "Ratio of persons engaged in R&D", enter the figure obtained by multiplying "Head-counts" by the hourly ratio of those who engaged in R&D as number of persons employed in R&D of business enterprises and non-profit institutions and public organizations.

- (1) **Researchers:** Persons who hold a university degree or its equivalent, and perform research activities in their own specific area of study.

Of the researchers, those who are mainly engaged in R&D activities within the organization are called regular researchers and those who have regular work outside of the organization are called external non-regular researchers.

Unless otherwise specified, numbers include both regular researchers and external non-regular researchers.

- (2) **Assistant research workers:** Persons who assist and work under the supervision of researchers.
- (3) **Technicians:** Persons who perform scientific and technical services required to R&D activities under the supervision of researchers and assistant research workers.
- (4) **Clerical and other supporting personnel:** Persons who are engaged in secretarial, financial and miscellaneous work related to R&D activities.

4. Expenditure on R&D

- (1) **Intramural expenditure on R&D**

Intramural expenditure on R&D refers to the total of expenses spent for R&D activities within the statistical units (business enterprise, non-profit institution and public organization, university and college). This consist of labour costs, cost of materials, expenditures on (or depreciation of) tangible fixed assets, lease fees, and other expenses. The intramural expenditure can be categorized from two angles: either disbursement or cost. In this report, disbursement is used. Disbursement refers to labour costs, materials, expenditures on tangible fixed assets, lease fees and other expenses spent on R&D activities. Cost means excluding the expenditures on tangible fixed assets from the disbursement, and adding in the depreciation expenses on tangible fixed assets.

By source of funds, this category includes money received from other organizations and spent intramurally for R&D purposes. However, R&D funds paid outside for the sake of entrusted research or joint research either from own-funds or received-funds are excluded.

(2) Expenditure on R&D by sector of type of cost

- ① **Labor costs:** Necessary expenses for employing all persons engaged in R&D (basic payments plus family allowances, overtime payments, bonuses and special premiums, and other allowances, before deduction of income taxes and social security contributions payable by workers, retirement payment, social security premiums borne by employers, etc.).
 - ② **Materials:** Expenses for raw, processed and auxiliary materials, parts, and experiments, solely for R&D purposes.
 - ③ **Expenditure on tangible fixed assets:** Purchases of tangible fixed assets necessary for R&D; i.e., land, buildings, construction and installation, ships, planes, etc. Also included are machinery, instruments, equipment, tools, vehicles, etc., with a durable period of one year or longer, and a purchasing value of 100,000 yen or more.
 - ④ **Lease fees:** The amount paid based on lease contracts for R&D purposes (but excluding land and buildings rent, short-term leases, charters, etc.).
 - ⑤ **Other expenses:** Total of other expenses for R&D purposes not classified above: books, fuel, light and water charges, travels, communications, premiums, office supplies, consumption goods, printing, etc. Also included are machinery, instruments, equipment, tools, vehicles, etc., with a durable period of less than one year, and a purchasing value of less than 100,000 yen.
 - ⑥ **Depreciation expenses on tangible fixed assets:** Amount of depreciation expense of tangible fixed assets used for R&D spent in the year.
- (3) R&D expenditures funded by the institution: Research undertaken at the expense of the organization, regardless of research site.
- (4) Expenditure on R&D by type of activity: Expenditure on natural science R&D of the intramural expenditure on R&D (disbursement) which is classified into basic research, applied research, and development.
- ① **Basic research:** Theoretical or experimental research undertaken to formulate hypotheses and theories, or to acquire new knowledge concerning phenomena and observable facts, without any particular application or use in view.
 - ② **Applied research:** Research undertaken to determine possible uses of basic research with a specific practical aim or objective, or to explore a new form of application different from the existing method.
 - ③ **Development:** The use of results gained from basic and applied research, or practical experience, that seeks to introduce new materials, equipment, products, systems and processes, as well as to improve those already in use.

5. Scope of “government” in selected countries

International comparison of the scope of “government” in selected countries is as follows.

Country \ Item	R&D expenditures used by	R&D expenditures paid by
Japan	National and public research institutions, public corporations and incorporated administrative agencies focused on R&D	Central and local governments
United States	Federal research institutions, federally funded R&D centers (FFRDCs)	Federal, state and local governments
Germany	Federal-, state-, and local-government-owned research institutions	Federal and state governments
France	State-owned research institutions	State
United Kingdom	Research institutions owned by national or local governments	National and local governments

6. Accounting years in selected countries

United States: The US fiscal year starts on October 1 in the last year and ends on September 30.

Germany, France: Starts on January 1 and ends on December 31.

United Kingdom: The UK fiscal year starts on April 5 and ends on April 4 the following year.

7. United States statistical date

Excludes most or all of capital expenditure for research and development expenditure in the United States.

8. EU statistical data

With regard to the EU statistical data used in this book, EU-15 denotes data for the 15 countries which joined the EU before April 30, 2004 (Belgium, Denmark, Germany, Ireland, Greece, Spain, France, Italy, Luxembourg, the Netherlands, Austria, Portugal, Finland, Sweden and the United Kingdom) and EU-28 denotes data for all EU member countries as of August 2013 (Bulgaria, Czech Republic, Estonia, Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Romania, Slovenia, Slovakia, Croatia plus the above 15 countries).

III. Contact

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