

Research and Development expenditure and personnel

Methodological references

Research and experimental development (R&D) is one of the key factors of economic growth, competitiveness and employment. To initiate relevant R&D and S&T policies, it is therefore important to have at our disposal reliable indicators.

R&D activity can be analysed through several indicators that are principally classified among R&D input and R&D output indicators. From this *domain*, R&D expenditure and personnel are the basic R&D input indicators.

Two manuals, regularly revised, provide the basic methodological recommendations and guidelines for R&D statistics. The first one, the so-called Frascati Manual, covers the measurement of the whole scientific and technological activities at the national level (*Proposed Standard Practice for Surveys of Research and Experimental Development – Frascati Manual*, OECD, 2002). The second one, the “Regional Manual”, focuses on R&D statistics and innovation methodologies at the regional level (*The Regional Dimension of R&D and Innovation Statistics – Regional Manual*, Eurostat, 1996).

Data available in the “R&D” *domain* are collected through surveys or other means by country and provided to Eurostat. In principle, the R&D data in this database are collected in line with these recommendations. The definitions that follow are mainly derived from these manuals.

1. What is research and experimental development (R&D)?

Research and experimental development (R&D) comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society and the use of this stock of knowledge to devise new applications (*Frascati Manual*, § 57).

This term covers three activities: basic research, applied research, and experimental development.

2. Research and development input indicators

The basic R&D indicators are the R&D expenditure and R&D personnel. Both of them are available at the national and regional level (basic indicators only).

At the national level

- *Intramural expenditures*

Intramural expenditures are all expenditures for R&D performed within a statistical unit or sector of the economy, whatever the source of funds. Expenditures made outside the statistical unit or sector but in support of intramural R&D (e.g. purchase of supplies for R&D) are included. Both current and capital expenditures are included.

- *R&D personnel*

All persons employed directly on R&D should be counted, as well as those providing direct services such as R&D managers, administrators, and clerical staff.

In accordance with international recommendations, figures for R&D personnel are indicated not only in full-time equivalent but also in head count.

At the regional level

For the purposes of regional statistics, the R&D definitions have been adapted to the region (see *The Regional Dimension of R&D and Innovation Statistics — Regional Manual, Eurostat, 1996, Part C: First-Priority Indicators*).

Intramural expenditure on R&D at the regional level (Regional Manual, § 134)

Regional intramural expenditures are all expenditures for R&D performed within a statistical unit or a sector in a region, whatever the source of funds.

R&D personnel at the regional level (Regional Manual, § 151)

All persons employed *directly* on R&D in a region should be counted, as well as those providing *direct* services such as R&D managers, administrators and clerical staff. Those providing an *indirect* service, such as canteen and security staff, should be excluded, even though their wages and salaries are included as an overhead cost in the measurement of R&D expenditure.

3. Institutional classifications

R&D data are built up using the guidelines laid out in the *Proposed standard practice for surveys of research and experimental development — Frascati Manual, OECD, 2003*.

Internal expenditure and R&D personnel are broken down by institutional sector, i.e. the sector in which the R&D is performed. There are four main sectors: business enterprise, government, higher education and private non-profit institutions.

The business enterprise sector (BES)

With regard to R&D, the business enterprise sector includes (*Frascati Manual*):

All firms, organisations and institutions whose primary activity is the market production of goods or services (other than higher education) for sale to the general public at an economically significant price;

The private non-profit institutes mainly serving them.

The government sector (GOV)

In the field of R&D, the government sector includes (*Frascati Manual*):

All departments, offices and other bodies, which furnish but normally do not sell to the community those common services, other than higher education, which cannot otherwise be conveniently and economically provided and administer the state and the economic and social policy of the community. (Public enterprises are included in the business enterprise sector);

Non-profit institutes (NPIs) controlled and mainly financed by government.

The higher education sector (HES)

This sector is composed of (*Frascati Manual*):

All universities, colleges of technology and other institutes of post-secondary education, whatever their source of finance or legal status. It also includes all research institutes, experimental stations and clinics operating under the direct control of or administered by or associated with higher education establishments.

The private non-profit sector (PNP)

The fields covered by this sector include (*Frascati Manual*):

Non-market, private non-profit institutions serving households (i.e. the general public);
Private individuals or households.

With the exception of Portugal, the PNP sector accounts for less than 3% of total R&D expenditure or personnel. For that reason, there are no tables compiled for the PNP. For some countries, the PNP is included in the GOV. This information can be found in the section “National methodological changes”.

4. Functional classifications

R&D personnel by occupation are broken down into

- researchers
- technicians/ equivalent staff
- other supporting staff

R&D personnel by qualification are broken down into

- PhD holders (ISCED 6)
- other University degrees and other tertiary diplomas (ISCED 5A and 5B)
- other qualifications

Researchers by citizenship are broken down to:

- National citizenship
- Citizenship of the EU Member States
- Citizenship of other European countries
- Citizenship of North-America
- Citizenship of Central and South America
- Citizenship of Asia
- Citizenship of Africa
- Other citizenship

Researchers by age are broken down into

- 0-24
- 25-34
- 35-44
- 45-54
- 55-64
- 65-MAX

R&D expenditure and personnel by major field of science are broken down into

- natural sciences
- engineering and technology
- medical sciences
- agricultural sciences
- social sciences
- humanities

R&D expenditure and personnel by type of size class are broken down into

- 0 employees
- 1-9 employees
- 10-49 employees
- 50-249 employees
- 250-499 employees
- More than 500 employees

R&D expenditure by source of funds are broken down into

- business enterprise sector
- government sector
- private non-profit sector
- higher education sector
- abroad
 - Foreign business enterprises
 - Other national governments
 - Higher education
 - PNP
 - European commission
 - International organisations
 - N.E.C.

R&D expenditure by type of R & D are broken down into

- basic research
- applied research
- experimental development

Two kinds of data series are available for R&D expenditure by type of R & D: Current intramural costs on R&D and Total intramural expenditure on R&D.

R&D expenditure by type of costs are broken down into

- current costs (labour costs and other costs)
- capital expenditure

R&D expenditure by socio-economic objective (SEO) is to be broken down in accordance to the nomenclature for the analysis and comparison of scientific programmes and budgets (NABS) at chapter level.

R&D expenditure in Business enterprise sector by economic activity (NACE Rev. 1.1) are broken down into the NACE Rev. 1.1 divisions, groups, classes and aggregates as proposed in the Frascati manual (more detail information in Frascati manual, page 57)

Two kinds of data series are available for R&D expenditure by economic activity: by industry and by product fields (both are based on the NACE classification).

5. R&D statistics and European regions

The collection of regional statistics was encouraged from the 90s in the European countries because regional statistics became of greater interest for political decision-makers, academic institutions, etc. The methodological recommendations are compiled in the Regional Manual (see bibliography) and all along the years, the methods used in order to break down R&D data at the regional level are improved. At present most of the data for both R&D input statistics are available at NUTS 2 level

The specificity of data regionalisation

The regionalisation of data is not an easy exercise, from a methodological point of view. This development of regional statistics is confronted with one major problem, namely the identification of the (territorial) places where R&D is actually carried out. It primarily concerns the reporting units that are made up of several entities located in different regions. The business enterprise and government sectors are most likely to be affected by that problem. Meanwhile, the higher education and particularly the non-profit sectors are less confronted with these multi-regional aspects. In these last two sectors, the entities composing the reporting units are, for the most part, located in the same territorial area as the headquarters. The user should have in mind those aspects when using and analysing regional data.

The classification of European regions

The economic territory of each Member State of the EU has been divided according to a five-level hierarchical classification (three regional levels and two local levels) named *Nomenclature of Territorial Units for Statistics* (NUTS). With regards to the criteria applied for the classification of a geographical entity into a NUTS level, it happens that a country might be classified at several NUTS levels. For instance SE is classified at both NUTS 0 and NUTS 1 level whereas MT is classified at NUTS 0, NUTS 1 and NUTS 2 level.

For instance, following countries are classified as NUTS 2 for the whole territory (NUTS 0 = NUTS 2):

- Cyprus
- Denmark
- Estonia
- Luxembourg
- Latvia
- Malta
- Slovenia
- Iceland

NUTS serves as a reference for the collection, development and harmonisation of Community regional statistics, for the socio-economic analysis of the regions and for the drawing up of Community regional policies. The NUTS should be the territorial classification for R&D and innovation statistics at the regional level.

Data on R&D expenditure and personnel are regionalised to the NUTS 2 level.