

Research and Development

The information presented in this chapter covers R&D activities between 1963 and 2013.

R&D statistics are produced using a range of sources, all managed directly by Istat, including both surveys on enterprises, public and non-profit institutions and estimates based on administrative figures from universities.

The figures are presented in terms of expenditure by type, source of financing, type of research and institutional sector, in addition to staff by task, education level and institutional sector.

For Research and Development statistics, Istat has always focussed on collecting final data, leaving all or part of the responsibility for forecasts to other institutions (such as the National Research Council - Cnr or the Ministry of Education, University and Research).

The first survey was conducted by Istat in 1963, following the drafting of a document by the OECD (Organisation for Economic Cooperation and Development) on measuring R&D activities, setting out the methodology to be used, known as the Frascati manual after the meeting hosted by the Ministry of Education, University and Research in Frascati, in the provinces of Rome. This Manual has been revised several times, and the current adopted version dates back to 2002.

Following the editing of the Frascati manual, R&D statistics surveys rapidly became standard practice on an international level, firstly in Oecd countries and later in a significant number of other countries thanks to specific initiatives by Unesco (*United nations educational, scientific and cultural organisation*), including the publication of an Unesco manual setting forth the methodology for producing statistics on scientific and technological activities.

R&D statistics activities carried out by Eu Member States are currently disciplined by the Regulation Eu n.995/2012¹ Italy has published and transmitted R&D statistics to the Oecd since 1963.²

Since 1967 R&D surveys have been conducted on an annual basis, while before they were carried out every two years in 1963, 1965 and 1967.³

R&D surveys in public institutions

From 1963 to 1967, the R&D survey in public institutions was included in the wider survey on spending for scientific research in Italy, conducted on a biannual basis.

From 1967 to 1990, the survey was gradually extended and named *Indagine statistica sulla ricerca scientifica effettuata in Italia* (Statistical survey on scientific research in Italy).

In 1991 the first specific survey of the sector was conducted, entitled *Indagine statistica sulla ricerca scientifica e lo sviluppo sperimentale negli enti della Pubblica amministrazione* (Statistical survey on scientific research and experimental development in Public Institutions), which underwent several modifications in subsequent years due to the changes in the survey object.⁴

The public sector was initially divided into:

- General Government administrations;

¹ Commission Implementing Regulation (EU) No 995/2012 of 26 October 2012 laying down detailed rules for the implementation of Decision No 1608/2003/EC of the European Parliament and of the Council concerning the production and development of Community statistics on science and technology Text with EEA relevance(OJEU n.L.299 - 27 October 2012).

² Data on the main variables are available from the Oecd and Eurostat information systems in continuous time series from 1981 onwards.

³ As for the techniques to collect information, the questionnaires were previously paper made and transmitted/collected by mail. Since 2007 they have been available on line by means of a specific system named *Indata* and available on the Istat website. This has enabled respondents by means of a connected computer to either safely fill in the interactive forms or to download them and after the manual filling in to upload them in the system.

⁴ Over time, the survey's title was changed as follows: *Indagine statistica sulla ricerca e sviluppo negli enti e istituzioni in 1998* (Statistical survey on research and development in bodies and institutions), *Rilevazione statistica sulla R&S negli enti e nelle istituzioni pubbliche e private* (Statistical survey on R&D in public and private bodies and institutions) in 2001 and *Rilevazione statistica sulla R&S nelle istituzioni pubbliche* (Statistical survey on R&D in public institutions) in 2002.

- research bodies (Cnr and National Nuclear Energy Committee – Cnen, which transformed into the National Institution for New Technology, Energy and the Environment in 1982 – Enea);⁵
- other public institutions (including public research bodies);
- Universities.⁶

In 1991, the R&D survey was revised to cover the following types of institution:

- General Government administrations with specific reference to laboratories or institutions run by individual Ministries;
- research bodies as such, performing prevalently R&D activities for institutional purposes, such as the Cnr, Enea, National Institute of Nuclear Physics (Infn), etc.;
- other public institutions with a core activity other than research, such as scientific healthcare institutions, local health Authorities, etc.

In the same year, a specific questionnaire was introduced for public institutions and a distinction was made between *intra-muros* R&D expenses (i.e. within the institution in question) and *extra-muros* R&D expenses (outsourced to third parties). In order to produce harmonised results on a European and international level, since 1992 R&D statistics only refer to *intra-muros* expenses.

Later, since 2001, the method used to identify public institutions with R&D capacities has been further improved with a list of sources of useful information including the Statistics Archive of Public Institutions (equivalent to the S.13 sector in the European System of Accounts – Esa95), updated annually by Istat.

In 2002, non-profit institutions were included only in a separate *ad hoc* survey.

In relation to the technique used to collect information, the questionnaires were initially in paper format to be submitted by post. Since 2007, they have been available *online* through the *Indata* system on Istat website. This has allowed respondents with a computer and internet connection to fill out the computerised and interactive forms online, or download them and upload them after filling out all the information requested. This applies to all surveys on R&D (related to public and non-profit Institutions, as well as to enterprises in general).

Warnings for time series comparisons

- In 1991, the R&D survey was revised and the focus was laid on General Government administrations, research bodies performing R&D for prevalently institutional purposes and other public institutions performing R&D as a non-core activity.
- Until 1990, R&D spending included both *intra-muros* and *extra-muros* figures. From 1991 onwards only *intra-muros* expenses were covered; this led to a clear decrease of spending, especially in the period up to 1994.
- From 1967 to 1972, some public institutions were recorded more than once; in particular some research bodies (Cnr and Cnen) were counted together with universities. This influences the performance of the data relating to university funding of R&D public institutions.
- From 1979 to 1994, university financial contributions to R&D activities in public institutions is not shown, as unquantifiable.
- For the period between 1971 to 1978, the figures on R&D spending by institution type and sector include some research bodies (Cnr and Cnen) under the heading “Universities”.
- In 2002, private non-profit institutions were excluded and were covered by a separate *ad hoc* survey.
- Since 2003, in the absence of a legal basis, the disaggregation of public institutions into research bodies and other institutions has been no longer available, and the tables therefore show the total amount.

Estimates of university R&D activities

For the period between 1963 and 1967, R&D activities performed by universities were recorded as part of the Survey on spending for scientific research in Italy (see the paragraph on R&S in public institutions).

In 1968, annual estimates using administrative data were produced instead of carrying out a direct survey, in line with the *Manuale di Frascati* (Frascati Manual). In particular, from 1968 to 1978 the

⁵ In 2009 Enea became the Italian National agency for new technologies, Energy and sustainable economic development.

⁶ Up until 1967 R&D statistics on Universities were produced using the surveys of public institutions; in 1968, however, an estimate method was adopted using administrative data and periodical surveys of university professors’ research activities (see the paragraph below).

estimates were formulated using both the annual Istat survey on university budget and data from the State budget on university.

In 1979, Istat conducted a sample survey on the entire university system, with the aim of verifying the quality of estimates from previous years. The results of this survey were used until 1996 for formulating estimates of university R&D with additional input from administrative sources.

In 1996, Istat launched a new survey on university professors' research activities; since 1997 administrative records of teaching and non-teaching staff provided by the Ministry of Education, University and Research have been used.

Using the 1996 survey as base, a series of indicators were calculated on the average amount of time spent on research by university professors (also shown by geographic area, university size and professor's qualification level).

These indicators, together with the information taken from university staff records (including staff salaries and fees) and the results of the annual Istat survey on the final balances of universities, contributed to producing estimates of R&D spending and research activities by universities up 2004.

Since 2005, survey results from a new R&D survey of university professors were available for use. This led to the adoption of a new procedure for estimating spending and staff occupied in research activities, which involved the use of several different data taken from the university staff records held by the Ministry of Education, University and Research, the National Committee for Evaluating the University System (Cnvsu) and the final balances of the universities (drawn up using the principles set out in Law no. 168 dated 9 May 1989).

Warnings for time series comparisons

- The rise in estimated spending for 1997 and the decrease in 2005 are the result of the adoption of new estimation coefficients derived from the periodical surveys on university professors' research activities.
- For the period 1979-2004, it was not possible to measure how much of R&D University spending was funded by the university system itself.
- For the period 1997-2004, R&D University spending was not classified by type of research (basic or applied research, experimental development) and only became available again in 2005.
- Since 1998, it has not been possible to separate "technicians" from R&D support staff, as the administrative information on university non-teaching staff does not permit individual duties to be distinguished.
- Since 1998, the figures on education level have not been available, as the administrative records on teaching and non-teaching staff do not contain this information. Prior to this date the data was estimated using fixed coefficients based on the education level necessary to be hired by a university.

R&D surveys in enterprises

In the period 1963-1967, the biannual survey on spending for scientific research in Italy included a survey on R&D in enterprises along with public institutions. This aspect of the survey was progressively extended and modified until 1990.

In the first phase, some economic subjects - among which some ex-independent companies: *Ferrovie dello Stato* (Italian State Railways), *Poste* (Post Office), State Monopolies and the *Ente Nazionale Energia Elettrica – Enel* (National Electric Energy Institution) - which were later classified as enterprises, were included under public institutions. Partially State-owned companies and those belonging to *Istituto per la ricostruzione industriale - Iri* (Institution for Industrial Reconstruction), *Ente Nazionale Idrocarburi - Eni* (National Hydrocarbon Institution) and *Ente partecipazioni e finanziamento industrie manifatturiere - Efim* (Manufacturing Industry Shareholdings and Financing Institution), in addition to some minor enterprises, were also included.

Since 1968, public production enterprises were more fittingly classed as enterprises and assimilated with partially State-owned companies. The distinction between public and private enterprises continued to be applied by Istat in R&D statistics until 1994.

An important role was played in the development of the survey by the evolution of methods for correctly identifying the reference population, i.e. the range of enterprises capable of performing R&D activities. From 1979 onwards, Oecd and Unesco strongly recommended dividing the R&D classifications by institutional sector. This led to the introduction of specific classifications which, although they had a limited impact on R&S statistics for public institutions, which continued to be collected and disseminated in terms of scientific subject and socio-economic purpose, did have a considerable influence on R&D statistics for enterprises, which began to be recorded on the basis of the progresses made in the classification of Ateco (Italian version of Nace) economic activities, both regarding the products and services which were the object of the R&D activities.

The data were therefore made available in terms of:

- economic activity (according to the Ateco classification in force in the reference year);
- the end product of R&D activities in the respondent enterprises;
- scientific subject (only in the case of basic research laboratories).

In 1991, a specific survey on enterprises was conducted for the first time: *Indagine statistica sulla ricerca scientifica e lo sviluppo sperimentale nelle imprese* (Statistical survey on scientific research and experimental development in enterprises).⁷ A specific questionnaire was drawn up, further highlighting the division with public institutions and showing a strong break with the past, especially regarding enterprises, in its focus on information regarding the whole range of R&D activities rather than just quantitative data.

At the same time, enterprises and public institutions both saw the introduction of a division between *intra-muros* and *extra-muros* R&D spending; since 1992, only the former was used as reference in order to ensure harmonised results at European and international level.

In order to further improve the definition of the reference population, the survey was linked to the information in the *Archivio Statistico delle imprese Attive - ASIA* (Statistical Register of Active Enterprises) database and other Istat surveys on enterprises⁸ through a systematic *matching* approach between statistical and administrative sources.

The administrative sources used by Istat to identify enterprises with R&D potential include: the *Anagrafe Nazionale delle Ricerche* (National Research Registry), managed by the *Ministero dell'Istruzione, dell'Università e della Ricerca* (Ministry of Education, University and Research); the European Patent Office, which lists Italian enterprises applying for patents; the list of Italian enterprises participating in research projects funded by the European Commission framework programmes and, since 2007, the list of enterprises presenting the Italian Tax Authority with applications to use tax credits for R&D expenses.

It should be finally highlighted that since 2006 the Survey on R&D in enterprises has been conducted in collaboration with some Regional Statistics Offices acting as intermediaries, including Valle d'Aosta/Vallée d'Aoste, Veneto, Friuli-Venezia Giulia, Umbria and Sicilia, in addition to the independent provinces of Trento and Bolzano/Bozen.

Warnings for time series comparisons

- Until 1991, figures on R&D spending include both *intra-muros* and *extra-muros* expenses. Since 1992, the total only has included *intra-muros* spending; this results in a clear decrease of spending, especially until 1994.
- Since 1995, the distinction between private and partly State-owned enterprises became obsolete.
- The growing trend in R&D spending is due to the gradual rise in the scope of statistics in this field, with a clear acceleration in the years 2000 and 2007.

R&D in non-profit institutions

Istat conducted the first experimental survey on Research and Development activities in private non-profit institutions with reference to 2002 following the entry into force of Eu regulations on R&D statistics.

The survey and analysis unit was taken as the private non-profit institution, defined as an institution unit producing goods and services, even without legal personality, which does not distribute profits to its owners or shareholders; the survey covered *intra-muros* R&D spending and staff.

⁷ The survey was renamed *Indagine statistica sulla ricerca e sviluppo nelle imprese* (Statistical survey on research and development in enterprises) in 1998 and *Rilevazione statistica sulla R&S nelle imprese* (Statistical survey on R&D in enterprises) in 2001.

⁸ In particular, the Survey on Business Innovation, first launched in 1985, which later became the Community Innovation Survey in 1992.

The reference population for the pilot survey conducted by Istat was essentially composed of the institutions, which had declared research as either a primary or secondary activity on the first Istat census on non-profit institutions in 1999.

Later, in 2007, the criteria for identifying the reference population were changed, using information provided by the Italian Tax Authorities on research institutions requesting to participate in the *cinque per mille* option (half-percent tax donations from Italian *Imposta sul reddito delle persone fisiche* - Irpef, a tax on the income of natural persons. This procedure, introduced experimentally in Italy as part of the 2006 budget law and later extended, allows taxpayers to choose to donate half a percent of their income taxation to support socially useful activities (non-profit organisations, scientific or medical research). Non-profit research institutions therefore come under the categories of possible beneficiaries, in particular those operating in the medical and healthcare field.

These figures therefore allow the reference lists to be updated and improved, including institutions that requested to be included as beneficiaries in the *cinque per mille* list and excluding those without any evidence of R&D activities, as identified in the 1999 Census.

Warnings for time series comparisons

- The increase in R&D spending in 2006 is due to the transfer of some important research Centres from the public institutions to the non-profit sector, in compliance with sector classification methodologies adopted for National Accounts.