

**Documentation of statistics for  
Business Enterprise Research and Development (BERD) 2015**

## 1 Introduction

The purpose of the R&D statistics of the business sector is, among other things, to analyse the scope of research and experimental development undertaken within the business sector. This is carried out by estimating the resources used in the area, measured in R&D-expenditure and R&D-personnel broken down on industry, size class and the regional level. The R&D-activities can be seen as the input to the national innovation system. Data are collected, enabling comparisons over time. The survey is conducted in accordance with OECDs guidelines for R&D statistics as described in the Frascati Manual. This implies that Danish data are comparable with the data of other OECD- and EU-countries. Furthermore, the 2006 figures can be compared to the data reported over the last 10 years, and thereby it is possible to document trends over time. Further information about sources and methods are available at <http://www.dst.dk/fui>

## 2 Statistical presentation

The purpose of the R&D statistics is to present the scope of research and experimental development undertaken within the Danish business sector. The aim is to secure detailed statistical information on the R&D activities.

### 2.1 Data description

The total intramural expenditure is often used as an economic indicator to gauge the national innovation systems. The R&D expenditures are used as input to the "3 per cent objective", the EU goal of spending 3 per cent of GDP on R&D. 2 per cent in the business enterprise sector and 1 per cent in the Government-, Higher Education, and Private-Non-Profit sectors. R&D expenditure is also an indicator used for the Innovation Union Scoreboard (IUS). Besides R&D expenditure information on R&D activities are published as numbers of R&D personnel (in HC and FTE) and broken down on Regions, size class and industry.

The following indicators are measured:

- intramural R&D-expenditure
- Extramural R&D-expenditure
- Number of employees engaged in research and development (both headcounts and fulltime equivalents)

The statistics are broken down on industry (Nace rev.2), size class and regions.

### 2.2 Classification system

Industry (NACE rev.2), Size class based on number of employees (in FTE).

### 2.3 Sector coverage

The statistics covers all R&D performing units in the business enterprise sector or enterprises from other sectors acting under market conditions. Also enterprises from the enterprise sector not acting under market conditions are allocated to the Private-Non-Profit sector.

## **2.4 Statistical concepts and definitions**

Research and Development: 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. There are three types of R&D: 1) Basic research is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any particular application or use in view. 2) Applied research is original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective. 3) Experimental development is systematic work, drawing on existing knowledge gained from research and/or practical experience, which is directed to producing new materials, products or devices, to installing new processes, systems and services, or to improving substantially those already produced or installed.

R&D-Active: An R&D-active is defined as an enterprise with either intramural R&D, extramural R&D, a R&D department, purchased or licensed patents or other intellectual property right (IPR) or applied for patents.

## **2.5 Statistical unit**

The statistical unit is the enterprise.

## **2.6 Statistical population**

The survey frame is based on an extract from the National Business Register.

## **2.7 Reference area**

The survey covers Denmark.

## **2.8 Time coverage**

The statistics covers activities for the entire reference year.

## **2.9 Base period**

Not relevant for these statistics.

## **2.10 Unit of measure**

R&D-expenditures are in 1000 DKK. R&D-personnel in headcount (HC) and full time equivalents (FTE).

## **2.11 Reference period**

The statistics is compiled annually.

## **2.12 Frequency of dissemination**

The statistics is published annually.

## **2.13 Legal acts and other agreements**

From 2007 the statistics is mandatory and produced in accordance with section 8 of the Act on Statistics Denmark (Consolidated act No 599 of 22 June 2000. Up to and including the year 2006 the survey was voluntary. Data is collected in accordance with Decision No 1608/2003/EC of the European Parliament and of the Council of 22 July 2003 concerning the production and development of Community statistics on science and technology and Commission Regulation (EC) No 995/2012 implementing Decision No 1608/2003/EC of the European Parliament and of the Council as regards statistics on science and technology.

## **2.14 Cost and burden**

- The estimated response burden for the reference year 2015 is 6 billion DKK. Including the CIS data collection.

## **2.15 Comment**

More information can be found on <http://www.dst.dk/fui>

## **3 Statistical processing**

The statistics is based on a survey sample of approx. 5.000 units weighted to a frame of approx 18.000 enterprises. The statistics is compiled in one joined questionnaire which covers both the R&D domain and the innovation statistics. An extensive validation process of the data is carried out. One part of the validations is integrated in the data collection in the dynamic web-questionnaire, another part is carried out after the data collection using micro- and macro validation techniques.

### **3.1 Source data**

The statistics are compiled on the basis of questionnaires. Questionnaires are web-based (since 2011) and close to 100 per cent of the responses comes from this media. The sample is of 5.000 enterprises from most size classes and all NACE-industries in the Danish enterprise sector. The sample is based on a frame of 18.000 units.

### **3.2 Frequency of data collection**

Yearly.

### **3.3 Data collection**

It is mandatory to reply to the statistics using the web-based questionnaire from <http://www.virk.dk>

### **3.4 Data validation**

An extensive validation process of the data is carried out. One part of the validations is integrated in the data collection in the dynamic web-questionnaire, another part is carried out after the data collection using micro- and macro validation techniques. The individual reports from the enterprises are compared to former years reports and the registered information on number of employees and turnover. Outlier detection is also used as a validation process.

### **3.5 Data compilation**

The validated data is compared to the initial sample. non-response from enterprises of a certain size are imputed with "last known data" (cold deck imputation). If data from former surveys is not available for the specific record then nearest neighbor (hot deck, donor imputation) is used.

### **3.6 Adjustment**

Not relevant for these statistics.

## **4 Relevance**

Statistics have users in ministry of science, business organizations, researchers, business and students.

Statistics are used in publications on research and in international comparisons. R&D statistics is describing the knowledge society. Part of the EU's Innovations Union Scoreboard.

Micro data is available for research through Research Service at Statistics Denmark.

### **4.1 User Needs**

- Users: Ministries, public authorities, business organizations, researchers, students, private business enterprises and the media.
- Fields of application: The statistics are included in the collection of knowledge for the Knowledge Society. Data are made available for purposes of research.

### **4.2 User Satisfaction**

Not compiled for this statistical domain.

### **4.3 Data completeness rate**

The statistics is complete according to the Commission Regulation and the guidelines from the Frascati Manual.

## 5 Accuracy and reliability

To minimize errors from the questionnaires are supported with guidelines and instructions. However some data reports are not error-free and may reflect misinterpretations from the respondents which can lead to certain errors.

Coefficients of variance (CV) have been compiled for a range of central indicators:

### *2014 (preliminary data)*

- Total R&D intramural expenditures: 0,9
- Total R&D FTE:: 1,2

### *2013 (preliminary data)*

- Total R&D intramural expenditures: 0,9
- Total R&D FTE:: 1,2

### *2012 (preliminary data)*

- Total R&D intramural expenditures: 1,0
- Total R&D FTE:: 1,4

### *2011*

- Total R&D intramural expenditures: 1,0
- Total R&D FTE: 1,3

### *2010*

- Total R&D intramural expenditures: 1,4
- Total R&D FTE: 1,2
- Total R&D extramural expenditures: 4,5

### *2009*

- Total R&D intramural expenditures: 1,0
- Total R&D FTE: 1,2

### *2008*

- Total R&D intramural expenditures: 1,1
- Total R&D FTE: 1,1

### *2007*

- Total R&D intramural expenditures: 1,4
- Total R&D FTE: 1,4

## 5.1 Overall accuracy

As the survey is based on a sample, uncertainty is attached to all the figures in form of random variation.

## 5.2 Sampling error

Estimate of CV

- expenditures R&D 0,9 pct.
- number of FTE concerning R&D 1.3 pct.

## 5.3 Non-sampling error

Under construction.

## 5.4 Quality management

Statistics Denmark follows the recommendations on organisation and management of quality given in the Code of Practice for European Statistics (CoP) and the implementation guidelines given in the Quality Assurance Framework of the European Statistical System (QAF). A Working Group on Quality and a central quality assurance function have been established to continuously carry through control of products and processes.

## 5.5 Quality assurance

Statistics Denmark follows the principles in the Code of Practice for European Statistics (CoP) and uses the Quality Assurance Framework of the European Statistical System (QAF) for the implementation of the principles. This involves continuous decentralized and central control of products and processes based on documentation following international standards. The central quality assurance function reports to the Working Group on Quality. Reports include suggestions for improvement that are assessed, decided and subsequently implemented.

## 5.6 Quality assessment

As part of the general quality assessment a quality manual has been published for the statistical domains of Business Enterprise R&D and innovation Statistics. The manual - which is only in Danish - can be downloaded at <http://www.dst.dk/fui>. From the reference year 2009 the a panel has been incorporated in the survey design to secure increased robustness. From 2009 the latest published statistics is regarded as not final - this is to secure that experiences and information from the following reference year are used to validate the data. The survey has - as all surveys based on samples - uncertainty attached to all the figures in form of random variation.

## 5.7 Data revision - policy

Statistics Denmark revises published figures in accordance with the [Revision Policy for Statistics Denmark](#). The common procedures and principles of the Revision Policy are for some statistics supplemented by a specific revision practice.

## 5.8 Data revision practice

The 2015 statistics is published as preliminary numbers. The reference years 2007-2014 are produced as final statistics. At the publication of the 2016 statistics the 2015 statistics will be published as final data.

## **6 Timeliness and punctuality**

The statistics is published no later than 12 months after the end of the reference year. No differences between planned and actual dates of publication

### **6.1 Timeliness and time lag - final results**

We aim at publishing the statistics not later than 12 months after the year of reference. 2015(final figures) and 2016 (preliminary) will be published November 2017

### **6.2 Punctuality**

The statistics is published as scheduled.

## **7 Comparability**

The statistics is compiled according to the guidelines of the Frascati Manual and the EU Regulation. The statistics is comparable with R&D statistics for other countries. There are no other comparable Danish R&D-statistics, but the Danish statistics is comparable to the R&D statistics from other EU-member states and OECD-countries. The statistics is from 2007-2013 comparable.

### **7.1 Comparability - geographical**

The statistics is compiled according to the guidelines of the Frascati Manual and the Regulation. The statistics is comparable with R&D statistics for other countries. The sample is drawn on a regional level and statistics on regional level is comparable.

### **7.2 Comparability over time**

The statistics are comparable from the years 1997 to 2006. When taking over the responsibility of collection of R&D statistics, Statistics Denmark have introduced changes in the methodology, of which one is the change to compulsory survey. The R&D statistics for 2007 is therefore not directly comparable with former years.

### **7.3 Coherence - cross domain**

There are no other comparable Danish statistics. The results can be compared to other EU countries, since there is a harmonized methodological foundation.

### **7.4 Coherence - internal**

There is a high degree of internal coherence in the data due to the routings of the web-based questionnaire and the intense validation process.



## **8 Accessibility and clarity**

The statistics are published in Focus On Statistics Denmark (Nyt fra Danmarks Statistik) and are available from Statistics Denmark's website at <http://www.dst.dk/fui> and from the database StatBank Denmark (<http://www.dst.dk/statistikbanken>). The statistics can also be found at the Eurostat databases (under the STI-domain). For the years 2012-2014 Statistics Denmark published a more extensive publication concerning R&D and innovation: "Innovation og Forskning 2014" (Innovation and research 2012). The publication is available (Danish only) on <http://www.dst.dk>

### **8.1 Release calendar**

The publication date appears in the release calendar. The date is confirmed in the weeks before.

### **8.2 Release calendar access**

The Release Calendar can be accessed on our English website: [Release Calendar](#).

### **8.3 User access**

Statistics are always published at 8:00 a.m. at the day announced in the release calendar. No one outside of Statistics Denmark can access the statistics before they are published.

### **8.4 News release**

When the statistics is released a Focus on-article is published on Statistics Denmark's website - <http://www.dst.dk>. The articles can be downloaded from <http://www.dst.dk/fui>

### **8.5 Publications**

The Business Enterprises' R&D statistics is a part of the publication "Innovation og forskning". The 2016 publication was released in april 2016 and is in Danish only. The BERD is also represented in the Statistical Yearbook.

### **8.6 On-line database**

The most used databases are the following:

- Intramural R&D expenditure: [FORSK01](#)
- Extrantramural R&D expenditure: [FORSK02](#)
- R&D personnel: [FORSK03](#)

### **8.7 Micro-data access**

Data are stored electronically, and can be used for providing tables as well as for research purposes.

### **8.8 Other**

Statistics Denmark's website (<http://www.dst.dk>) and on the Eurostat database.

### **8.9 Confidentiality - policy**

Micro data is confidential and can not be published in an un-anonymized form. More information on: [Confidentiality](#)

### **8.10 Confidentiality - data treatment**

Confidentiality is not an issue because of the used publication level. However the data transmitted to Eurostat demand some anonymization processes to secure the enterprises' confidentiality

### **8.11 Documentation on methodology**

See: <http://www.dst.dk/FUI>\* where documents on the used methodology can be found.

### **8.12 Quality documentation**

Results from the quality evaluation of products and selected processes are available in detail for each statistics and in summary reports for the Working Group on Quality.

## **9 Contact**

The administrative placement of these statistics are in the division of Business Dynamics. The person responsible is Jens Brodersen, tel. +45 39 17 30 57 e-mail: [jbr@dst.dk](mailto:jbr@dst.dk)

### **9.1 Contact organisation**

Statistics Denmark

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Business Dynamics, Business Statistics

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