

**Documentation of statistics for
Business Enterprise Research and Development (BERD) 2018**

1 Introduction

The purpose of the R&D statistics of the business sector is 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 previous 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)

Additional variables in odd years - R&D personnel head counts and full time equivalent distributed by sex - intramural R&D expenditure By source of funds - extramural R&D expenditure By source of funds - R&D expenditures distributed - by area - by Field of Science (from 2017 and following years) - by type of R & D - by product groups - income from R&D service from 2015

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).

Size class of enterprise, based on number of full-time equivalents by the following size classes:

- 10-49 full-time employees
- 50-249 full-time employees
- 250(+) full-time employees

Type of enterprise

- Without R&D in foreign affiliates
- With R&D in foreign affiliates

Type of staff

- Researchers
- Technicians
- Other R&D-personnel

Geographically the statistics is distributed by regions.

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. For 2018 the survey frame is consistent with the CIS-survey, NACE Rev. 2 sections B, C, D, E, H, J and K and in the NACE Rev. 2 divisions 46, 71, 72 and 73, with more than 10 employees. This is a more narrow population than in unequal years where the whole economy has to be covered.

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

Yearly.

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 2016 is 6 billion DKK. Including the CIS data collection. The samples for 2017 and 2018 are smaller and the questionnaires less extensive hence the response burden are reduced 2017: 5 million DKK and 2018 : 4 million DKK.

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. 3.000 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 3.000 enterprises from most size classes and all NACE-industries in the Danish enterprise sector. The sample is based on a frame of 9.000 units. Annex for the population

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. The assumption is that the intensive users are confident to the extend that they are seeking further details from data.

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 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:

2018 (preliminary data)

- Total R&D intramural expenditures: 1,3
- Total R&D FTE:: 1,6

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

2009

- 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 for 2018

- expenditures R&D 1,3 pct.
- number of FTE concerning R&D 1,6 pct.

5.3 Non-sampling error

R & D statistics cover a complex area, characterized by concepts that can be defined and defined in theory, but in practice it may be difficult to make a clear separation, for example. between R & D activities and other innovation activities. To address understanding problems for the reporting of the concepts of research, development work and innovation activities, targeted efforts have been made to guide the reporting. It should be mentioned that compared to reducing the significance of measurement errors, it is considered an advantage to compare the individual companies' reports for R & D and innovation activities. At the same time, Statistics Denmark has implemented a rolling panel in the sample, which reduces some of the fluctuations that may occur in R & D and innovation statistics, as the participating companies report data for several consecutive years.

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 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 2018 statistics is published as preliminary numbers. The reference years 2007-2018 are produced as final statistics. At the publication of the 2019 statistics the 2018 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. Statistics with reference year 2018 is delayed until February 2020.

6.1 Timeliness and time lag - final results

We aim at publishing the statistics not later than 12 months after the year of reference.

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 2007-2016 comparable. There was a break in time series from 2016 to 2017.

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. A break in times series from 2016 to 2017 have to be encountered because the concept of R&D are more precise due to the revision of Frascati Manual 2015. In this year the structure of the survey have been changed from one annual survey concerning R&D and Innovation into two biannual surveys unequal years on R&D and even years on innovation (CIS).

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 2012-2020 Statistics Denmark published a more extensive publication concerning R&D and innovation: "Innovation og Forskning 2020" (Innovation and research 2020). 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. Theme publications etc. may be published at other times of the day. The National Statistician can decide that such publications may be released before their official publication time, e.g. to the media and other stakeholders.

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 2019 publication was released in April 2019 and is in Danish only. The BERD is also represented in the Statistical Yearbook.

8.6 On-line database

The statistics are published in the StatBank under [Research and development](#) in the following tables:

- [FORSK01](#): Enterprises expenses for own R&D by industry, sizeclass and region
- [CFABNP](#): Research and Development costs in per cent of GDP
- [FOUUDLo3](#): R&D full-time employees by type of enterprise and type of staff

Discontinued tables

- [FORSK02](#): Enterprise expenses for own R&D by industry, sizeclass, region and type of supplier

8.7 Micro-data access

Researchers and other analysts from authorized research institutions, can be granted access to the underlying micro data by contacting [Research Services](#).

8.8 Other

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

8.9 Confidentiality - policy

[Data Confidentiality Policy](#) for Statistics Denmark.

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 Science, Technology and Culture. The person responsible is Jens Brodersen, tel. +45 39 17 30 57 e-mail: jbr@dst.dk

9.1 Contact organisation

Statistics Denmark

9.2 Contact organisation unit

Science, Technology and Culture, Business Statistics

9.3 Contact name

Jens Brodersen

9.4 Contact person function

Responsible for the statistics

9.5 Contact mail address

Sejrøgade 11, 2100 Copenhagen

9.6 Contact email address

jbr@dst.dk

9.7 Contact phone number

+45 3917 3057

9.8 Contact fax number

+45 39 17 39 99