STATISTICS DENMARK

# Documentation of statistics for Innovation in the private sector 2022

*Statistics Denmark*
*Sankt Kjelds Plads 11*
*DK 2100 København Ø*

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# 1 Introduction

The purpose of the innovation survey is to examine the scope, the nature and the effect of innovation in the business sector including the innovation activities. Data will be collected enabling comparisons over time. The survey is conducted in accordance with the EU and OECD guidelines for innovation statistics described in the Oslo Manual. Danish data are thereby comparable with data from other EU countries. From the reference year 2007 statistics are compiled on a yearly basis.

# 2 Statistical presentation

Innovation in the enterprise sector is a yearly statistics on resources used for R&D and share of innovative enterprises. The statistics is distributed by sector, size class and region.

## 2.1 Data description

The aim of the statistics is to analyze the scope, type and effect of business enterprise innovation, including shedding light on the innovation activities.

It contains one part concerning the inputs, e.g. activities and resources used, a second part concerning the process (conditions and knowledge sharing) and a third part concerning the output.

The most important indicators are:

- Expenses for internal R&D
- Expenses for purchase of R&D
- Expenses for running cost for innovation, exclusive of R&D
- Purchase of material , equipment and software
- Purchase of external rights -Purchase of other external knowledge
- Purchase of consultancy

Per cent of innovators by type of innovation: - Product innovation -Process innovation - Innovation total

Share of enterprises with and without cooperation on innovation activities

## 2.2 Classification system

- Danish Industrial Classification 2007
- size class of enterprise, based on number of full-time equivalents by the following size classes:
- Below 10 full-time employees
- 10-49 full-time employees
- 50-249 full-time employees
- 250(+) full-time employees Geografically the statistics is distributed by regions.

## 2.3 Sector coverage

Enterprises in the private business sector.

## 2.4 Statistical concepts and definitions

Innovative: An innovative enterprise is an enterprise, which have introduced product and/or process innovation

Product innovative: A product innovative enterprise is an enterprise, which have introduced goods or services that are new or significantly changed. The products must be new to the enterprise, but may have been developed or introduced by others earlier.

Process innovative: A process-innovative enterprise is an enterprise, which have introduced new or significantly changed production methods, routines, methods concerning logistics, distribution, accounting and other administrative functions, organization of external relations, responsibilities or human resources, or methods for promotion of products, packaging, pricing, product exposure or customer relations.. The process must be new to the enterprise, but may have been developed or used by others earlier.

PP-innovative: A PP-innovative enterprise is an enterprise, which have introduces new or significantly changed products (product innovative) and/or processes (process innovative). From 2018 this concept is identical with the concept of innovative enterprises.

Organizational innovative: An organizational innovative enterprise is an enterprise, which have introduced new or significantly changed methods for organizing the working place, knowledge management or external relations, including new organizations introduced as a result of a strategic management decision. The concept does not include new organization which are mainly the result of a fusion or taking over of an enterprise. From the 2018 survey this concept is omitted.

## 2.5 Statistical unit

Enterprises (economic units).

## 2.6 Statistical population

The frame population is drawn from the Business Register, and consists of a population of 18,639 enterprises in 2020.

## 2.7 Reference area

Denmark.

## 2.8 Time coverage

The statistics cover 2007 and onwards.

## 2.9 Base period

Not relevant for these statistics.

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### 2.10 Unit of measure

A range of units of measurement are used: number of enterprises, per cent (e.g. percentage of turnover originating from newly developed products), qualitative measures (e.g. the degree to which clients, customers, suppliers, universities etc.) influence the innovation activities), DKK (in thousands).

### 2.11 Reference period

01-01-2018 - 31-12-2022

### 2.12 Frequency of dissemination

Yearly

### 2.13 Legal acts and other agreements

Section 8 of the Act on Statistics Denmark (Consolidated act No 599 of 22 June 2000).

Data are 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 innovation.

### 2.14 Cost and burden

The estimated response burden for the reference year 2016 is 6 million DKK. Including the R&D data collection.

### 2.15 Comment

Other information, .g. questionnaires, tables etc., can be found on Statistics Denmarks' theme page concerning research and development (R&D) and innovation, see Danmarks Statistik.

## 3 Statistical processing

Data for this statistics are collected via questionnaires for app. 3,600 respondents among a population of app. 20,000 enterprises. The material is validated already during the response from the enterprise, and afterwards followed by computer-aided validation and manual validation. Imputations and calibrated weighting is also a part of the treatment of data.

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### 3.1 Source data

The statistics are compiled on the basis of questionnaires collected from app. 3600 enterprises drawn as a sample from a population of app. 20,000 enterprises. The statistics are collected as one part of a single questionnaire, that also covers enterprises' research and development (R&D). The enterprises are sampled depending on the number of full-time equivalents and type of activity (NACE). All enterprises with 100 or more full-time equivalents are included in the sample, and the likeliness of being chosen for the sample decreases in line with decrease in number of full-time equivalents. The probability of selection is higher within types of activities that are more R&D-intensive than within activities where R&D is less frequent. The enterprises in the sample are randomly selected. From the reference year 2009 the sample is designed as a 'rolling panel', which reduces the measurement uncertainty of the statistics.

### 3.2 Frequency of data collection

Yearly.

### 3.3 Data collection

The statistics are collected via http://www.virk.dk as an electronic questionnaire.

### 3.4 Data validation

A comprehensive validation of the data is carried out: In the electronic questionnaire validation is performed on a range of the variables, e.g. on totals. If the total entered by the respondent does not match the calculated total, the respondent will be presented to this, and has the opportunity to correct the total or one or more of the components. The same applies if a calculation in the questionnaire has to sum up to 100 per cent, and this is not the case. If the levels of some of the key data typed in by the respondent are much higher or lower than the previous year, the respondent will be notified, and has the opportunity to correct if necessary. This applies e.g. to R&D-full-time equivalents and R&D expenses. After the data collection the data are mechanically validated and to some extent corrected. The ICT-programs that checks the data for errors also forms lists of likely or de facto errors. The types of errors that are identified as those having the greatest influence on the quality of the statistics are listed together with identification numbers of the respondents. This list is checked manually. Finally outlier tests are carried out for key variables/combinations of these. A minor part of the data collected is compared to other sources with the aim of assessing whether the response is likely correct or should be corrected. This applies to e.g. the number of R&D full-time equivalents, which is compared to the total number of full-time equivalents in the enterprise, which comes from The Central Business Register. The total expenditure for innovation, including expenses for own R&D are compared to the total turnover of the enterprise, which also comes from The Central Business Register. Also public accounts from the enterprises are used as a supplying source of information.

### 3.5 Data compilation

The final, corrected data material is compared to the original sample. Enterprises above a certain size, that have not responded to the questionnaire, will have their response imputed, either by using the data collected from the respondent in the previous year, or via cold-deck. A calibrated weighting is carried out.

### 3.6 Adjustment

Not relevant for these statistics.

## 4 Relevance

The statistics is used by ministries, business organizations, researchers, the media, private enterprises and students. It is used for research, publications from ministries and for international comparison. Indicators based on the statistics is part of the documentation of the knowledge society. Indicators based on the statistics are included in the EU Innovation Union Scoreboard, which is part of the Europe2020 strategy.

### 4.1 User Needs

- Users: Ministries, business organizations, researchers, the media, private companies, researchers and students
- Fields of application: For research, ministerial publications, international comparisons. The statistics are included in the documentation of the knowledge society. Data are made available for the purpose of research.

### 4.2 User Satisfaction

No systematic information on user satisfaction is collected for this statistics. Primary users are represented in the Contact Group for statistics on Research, Development and Innovation.

### 4.3 Data completeness rate

The statistics completely matches the specifications of the EU-regulation and comes up to existing guidelines as the Oslo- and Frascati manuals concerning statistics on R&D and innovation.

## 5 Accuracy and reliability

Errors in the data reports and problems for companies with determining exact amounts that are used on innovation, and when it is innovation and innovation activities.

Coefficients of variation (CV) for central indicators in 2016 (preliminary data) are under processing.

For 2016: - Share of enterprises with innovation: 2.0 - Innovation expenditure, other innovation expenditure: 2.5

## 5.1 Overall accuracy

As the survey is based on a sample, uncertainty is attached to all the figures in the form of random variation. This applies, in particular, to the results broken down according to the most detailed industry, region and size figures, where the figures should only be regarded as normative.

From 2009 and onwards a rolling panel is used for the sample in order to decrease the uncertainty. From 2009 and onwards the statistics is first published as preliminary data, in order to be able to use the data from the subsequent survey in a possible correction. When the preliminary data are published, the previous year's data are published as final data. As part of the general quality control, a quality handbook has been published for the statistics on R&D and innovation. See [Danmarks Statistik[(https://www.dst.dk/pukora/epub/upload/17627/fuierhverv.pdf)

## 5.2 Sampling error

The calculated coefficients of variation (CV) for key indicators in 2013 (preliminary data): - Share of enterprises with innovation: 1,8 - Innovation expenses, running costs (excl. R&D): 3,9

For 2012: - Share of enterprises with innovation: 1.9 - Innovation expenses, other running costs (excl. R&D): 6.6

For 2014: - Share of enterprises with innovation: 1.9 - Innovation expenses, other running costs (excl. R&D): 4.2

For 2015: - Share of enterprises with innovation: 1.8 - Innovation expenses, other running costs (excl. R&D): 7.5

For 2016: - Share of enterprises with innovation: 2.0 - Innovation expenses, other running costs (excl. R&D): 2.5

For 2020 Being processed

The relatively high CV for innovation expenses are due to the fact that few enterprises have these types of expenses, which means that a large share of the enterprises in the survey will have expenses of 0 DKK, whereas very few enterprises have considerable expenses. Thereby the dispersion of the material will be substantial, and the CV high. Nearly half of the enterprises in the survey have been innovative in one form or another, which is reflected in a relatively low CV.

## 5.3 Non-sampling error

Non-response is one of the sources of uncertainty, together with lack of coverage, e.g. when enterprises with high influence on the statistics are not included in the sample, e.g. as a result of changes in the basic registers.

## 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

Under preparation.

### 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 2016 statistics are published as preliminary data in March 2018.

## 6 Timeliness and punctuality

Normally the statistics is published less than a year after the end of the reference period. The statistics for 2022 is published 15 months after the end of the reference period.

### 6.1 Timeliness and time lag - final results

- Data for 2009 was published 13th of April 2011.
- Data for 2010 was published 27th of February 2012
- Preliminary data for the reference year 2011 and final data for 2010 was published was published February 2013
- Preliminary data for the reference year 2012 and final data for 2011 was published was published December 2013
- Preliminary data for the reference year 2013 and final data for 2012 was published was published December 2014
- Preliminary data for the reference year 2014 and final data for 2013 was published was published November 2015
- Preliminary data for the reference year 2015 and final data for 2014 was published was published November 2016
- Preliminary data for the reference year 2016 and final data for 2015 was published was published March 2018
- Preliminary data for the reference year 2020-2022 was published was published 14. December 2023

### 6.2 Punctuality

The statistics for 2020-2022 was published as planned

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## 7 Comparability

The statistics is comparable from 2007 and onwards. Data is delivered to Eurostat, the statistical office of the EU, and to OECD, who are both publishing aggregated data in their databases.

The statistics is compiled according to an EU-regulation, describing in details which variables to deliver and for which size classes, types of activities etc. The Danish statistics is therefore comparable with the similar statistics of other EU-countries, provided that they follow the regulation.

The statistics is to a certain degree comparable with the statistics on innovation in the public sector.

### 7.1 Comparability - geographical

Delivery of data to Eurostat follows the rules laid down in the regulation, which means that the data cover the types of activities and size classes of enterprises, which are defines by the regulation. Thereby the statistics is comparable to the similar statistics of other EU countries.

### 7.2 Comparability over time

The statistics is comparable for 2007 and onwards. When taking over the responsibility of collection of innovation data, Statistics Denmark have introduced changes in the methodology, of which one is the change to a compulsory survey. The innovation statistics from 2007 and forward are therefore not directly comparable with former years. By the end of April 2009 an account was published on http://www.dst.dk/fui, describing the consequences of the changed methodology.

### 7.3 Coherence - cross domain

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

### 7.4 Coherence - internal

The data are to a large extent consistent, partly as a consequence of the electronic questionnaire guiding the respondents, and partly as a reflection of validation and correction.

## 8 Accessibility and clarity

The statistics is published yearly in Nyt fra Danmarks Statistik (News from Statistics Denmark). In Statistikbanken data on innovation in enterprises are published in the tables INN21, INN22, INN23, INN24 and INN25. Furthermore data is included in the publication "Innovation og forskning" on the theme page of the statistics.

### 8.1 Release calendar

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

## 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.

## 8.2 Release calendar access

The Release Calender can be accessed on our English website: Release Calender.

## 8.4 News release

The statistics are published in Nyt fra Danmarks Statistik (News from Statistics Denmark).

## 8.5 Publications

The statistics is included in the publication "Innovation og forskning".

## 8.6 On-line database

· INN21: Erhvervslivets innovationsudgifter efter branche, størrelsesgruppe, region og udgiftstype · INN22: Innovative virksomheder efter branche, størrelsesgruppe, region og innovationstype · INN23: Produktinnovative virksomheder efter branche, størrelsesgruppe, region og type af produktinnovation
· INN24: Procesinnovative virksomheder efter branche, størrelsesgruppe, region og procesinnovation · INN25: Virksomheder efter branche og størrelsesgruppe, region og samarbejdsemne

## 8.7 Micro-data access

Data are stored electronically, and micro-data can be used for research purposes. More detailed tables than those published can be provided.

## 8.8 Other

Tables are accessible on Eurostat and OECD's homepages and databases, through which international comparisons can be made. From 2013 and onwards Statistics Denmark has published more extensive publications concerning R&D and Innovation: "Innovation og forskning". See Statistics Denmark

## 8.9 Confidentiality - policy

Statistics Denmark's policy concerning discretion.

## 8.10 Confidentiality - data treatment

In general there is no need for discretion on the existing level of dissemination.

### 8.11 Documentation on methodology

None.

### 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 is in the division of Science, Technology and Culture. The contact person is Anne-Sofie Dam Bjørkman, tel.: + 45 2037 5460, and e-mail: ASD@dst.dk.