# Supplementary material for the evaluation of Innovation Fund Denmark

## (Report C)

Prepared for the Innovation Fund Denmark, January 2019

IRISgroup

For more information about the publication or in general about IRIS Group, please contact:

IRIS Group
Jorcks Passage 1B, 4. Sal
1162 København K

irisgroup@irisgroup.dk
irisgroup.dk

ISBN: 978-87-971295-2-4

# Content

# 1. Changes in the user base of IFD

The purpose of this section is to describe how companies that have received a grant from Innovation Fund Denmark (IFD) differs with respect to certain characteristics to companies that has participated in former, comparable programmes. Thus, this section compares companies that received a grant from IFD in 2015 or 2016 with companies that received a grant from five comparable programmes from 2011 to 2013 (see Box 1.1).

**Box 1.1 IFD Programmes from 2011 to 2013**

***Innovation Voucher***
The Innovation Voucher supports collaborative projects between a small or medium sized company and a knowledge institution. The objective of the Innovation Voucher scheme is to encourage more SMEs to collaborate with universities, research and technology institutions and education institutions

***Industrial PhD***
The Industrial PhD programme aims at increasing knowledge sharing between universities and private sector companies, promoting research with commercial perspectives, and taking advantage of competences and research facilities in private companies to increase the number of PhDs with knowledge about industrially focused research and innovation. For this purpose, the Industrial PhD student is employed in a company and enrolled at a university at the same time.

***The Danish National Advanced Technology Foundation***
The general objectives of the Danish National Advanced Technology Foundation is to enhance growth and strengthen employment by supporting strategic and advanced technological priorities within the fields of research and innovation

***The Danish Council for Strategic Research (CSR)***
The primary focus of the Danish Council for Strategic Research (CSR) is to promote excellent and relevant research that will be of benefit to future development and economic growth in Denmark.

***Strategic Platforms for Innovation and Research (SPIR)***
SPIR funds initiatives which seek to strengthen the link between strategic research and innovation and thereby promoting efficient knowledge dissemination and possibilities for fast application of new knowledge in connection with innovation in the private and public sectors

*Source: The Short-run Impact on Total Factor Productivity Growth, Ministry of Higher Education and Science, 2014.*

As a consequence of the establishment of the Innovation Fund Denmark the five programmes were either terminated or relocated to the Innovation Fund Denmark.

The two user groups (2011-13 and 2015-16) are compared with respect to company characteristics, such as average number of employees, age, and revenue (Section 1.1), sector distribution (Section 1.2), number of return-users (Section 1.3), and the distribution of grants by programmes (Section 1.4).

## 1.1 Company characteristics

Table 1.1 shows the average number of employees, age and revenue of companies that received grants in the period 2011-13 and 2015-16.

**Table 1.1 Average number of employees, age and revenue, 2011-13 and 2015-16 (2017-prices)**

| Period | No. of companies | Employees | Age (years) | Revenue (DKK million) |
|---|---|---|---|---|
| 2011-13 | 1,588 | 188 | 17 | 850 |
| 2015-16 | 1,139 | 217 | 15 | 867 |

*Source: Own calculations based on data from Statistics Denmark and Innovation Fund Denmark.*
*Note: Employees are measured in full-time equivalents. If a company have received a grant in two years with in the same period, it is counted twice.*

Table 1.1 shows that the average size of the recipients is higher in period 2015-16 compared to 2011-13. This applies to the average number of employees, which has increased from 188 to 217, as well as the average revenue, which has increased from DKK 850 to 867 million. The average age of the companies is 17 years in 2011-13 and 15 years in 2015-16.

Table 1.2. shows the educational distribution of the companies' employees by level of education in the period 2011-13 and 2015-16.

**Table 1.2. Average share of employees by educational level, 2011-13 and 2015-16**

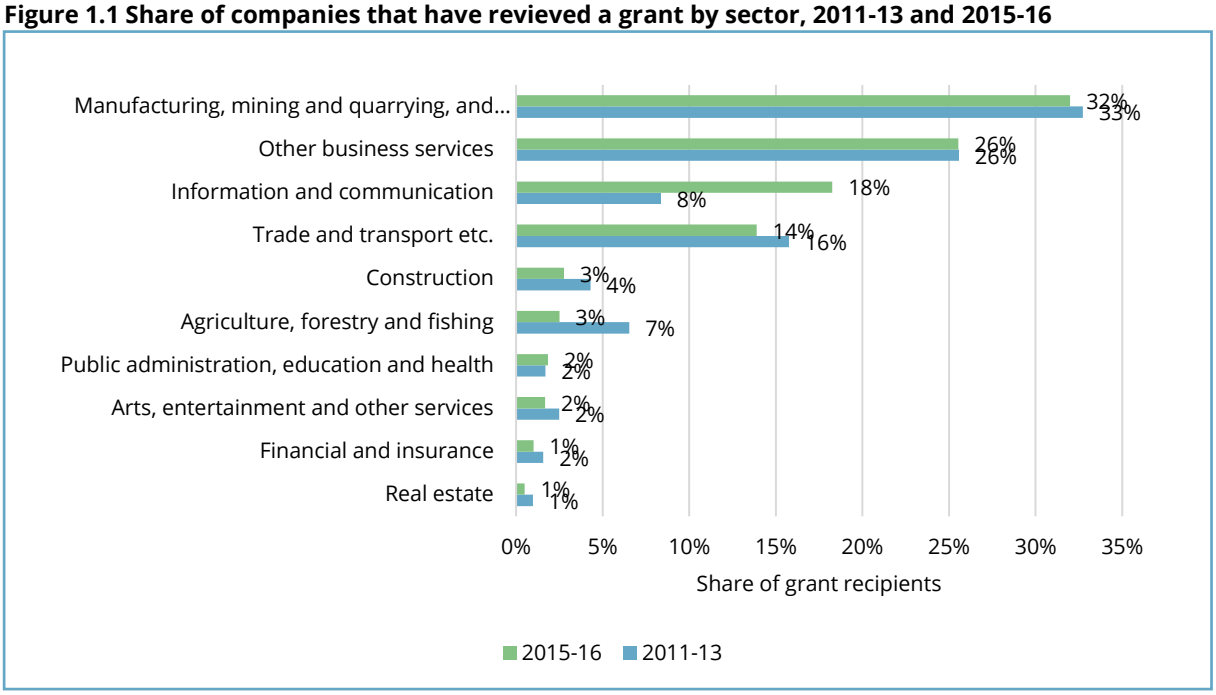
| Level of education | 2011-13 | 2015-16 |
|---|---|---|
| Long-cycle higher education & PhD | 20% | 27% |
| Medium-cycle higher education | 12% | 12% |
| Short-cycle higher education | 12% | 14% |
| Skilled | 30% | 22% |
| Unskilled | 27% | 25% |
| Total | 100% | 100% |
| Number of observations | 1,516 | 1,063 |

*Source: Own calculations based on data from Statistics Denmark and Innovation Fund Denmark.*
*Note: Employees are measured in persons. The average educational shares are calculated as unweighted averages. If a company have received a grant in two years with in the same period, it is counted twice.*

Considering the level of education of the companies' employees, Table 1.2. shows that the average recipient in period 2015-16 have a higher share of employees with a long-cycle higher education & PhD and short-cycle higher education compared to 2011-13. Conversely, the average recipient in 2011-13 have higher a share of skilled employees compared to 2015-16.

Figure 1.1 shows the distribution of companies that received grants by business sector in 2011-13 and 2015-16. The sectors are classified by the standard 10-grouping from the Danish Industrial Classification (DB07).[1]

**Figure 1.1 Share of companies that have revieved a grant by sector, 2011-13 and 2015-16**




*Source: Own calculations based on data from Statistics Denmark and Innovation Fund Denmark.*
*Note: Categorized by "Dansk Branchekode DB07, V3.0:2014-*

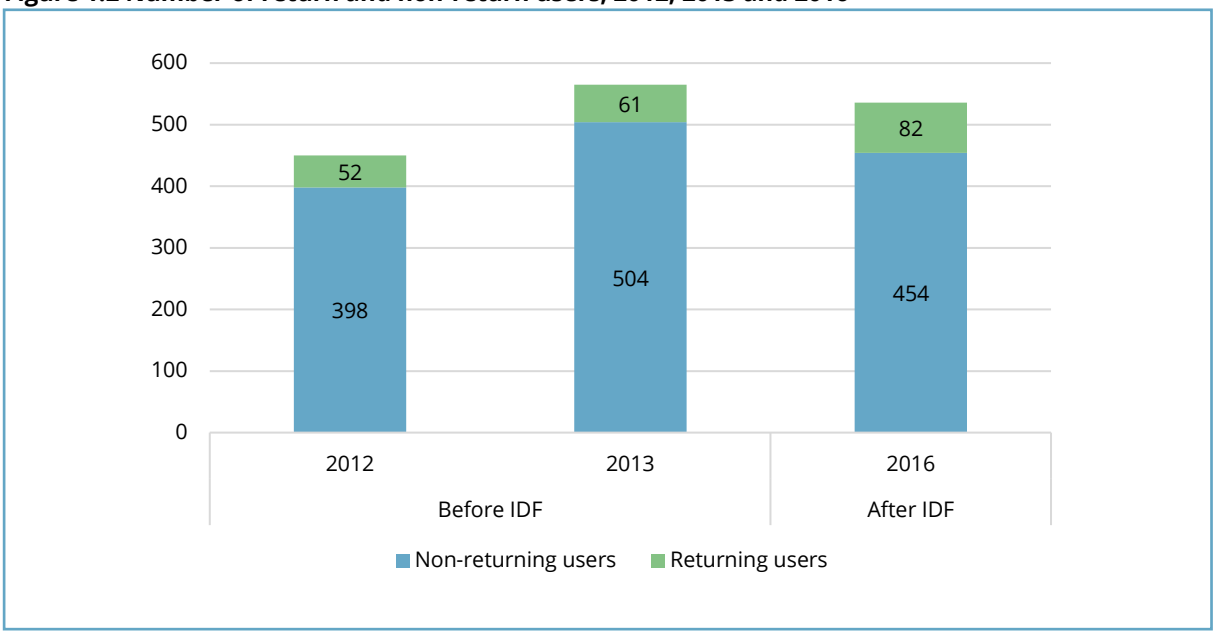
The difference in industry distribution between the two periods indicates a shift towards more knowledge-intensive industries. In 2011-13 there was a larger proportion of grant recipients from sectors such as Trade and transport etc., Construction, and Agriculture, forestry and fishing. In contrast, there was a larger proportion of grant recipients from the information and communication industry in 2015-16, increasing from 8 to 18 per cent.

Finally, the yearly number of return and non-return users in each period is analysed. Return users are defined as a company that has received a grant from one (or more) of the programme in two consecutive years in each period. The grants do not need to be from the same programme. Non-return users are on the other hand defined as a company that has not received a grant in two consecutive years in each period.

Provided, that the estimation of return and non-return user is contingent on information of their programme participation of the prior year, it is only possible to estimate return and non-return user for 2012, 2013 and 2016. Thus, Figure 1.2 shows the total number of companies that have received grants by year and by return and non-return users for 2012, 2013 and 2016.

[1] https://www.dst.dk/da/Statistik/dokumentation/nomenklaturer/dansk-branchekode-db07#.

**Figure 1.2 Number of return and non-return users, 2012, 2013 and 2016**




*Source: Own calculations based on data from Innovation Fund Denmark.*

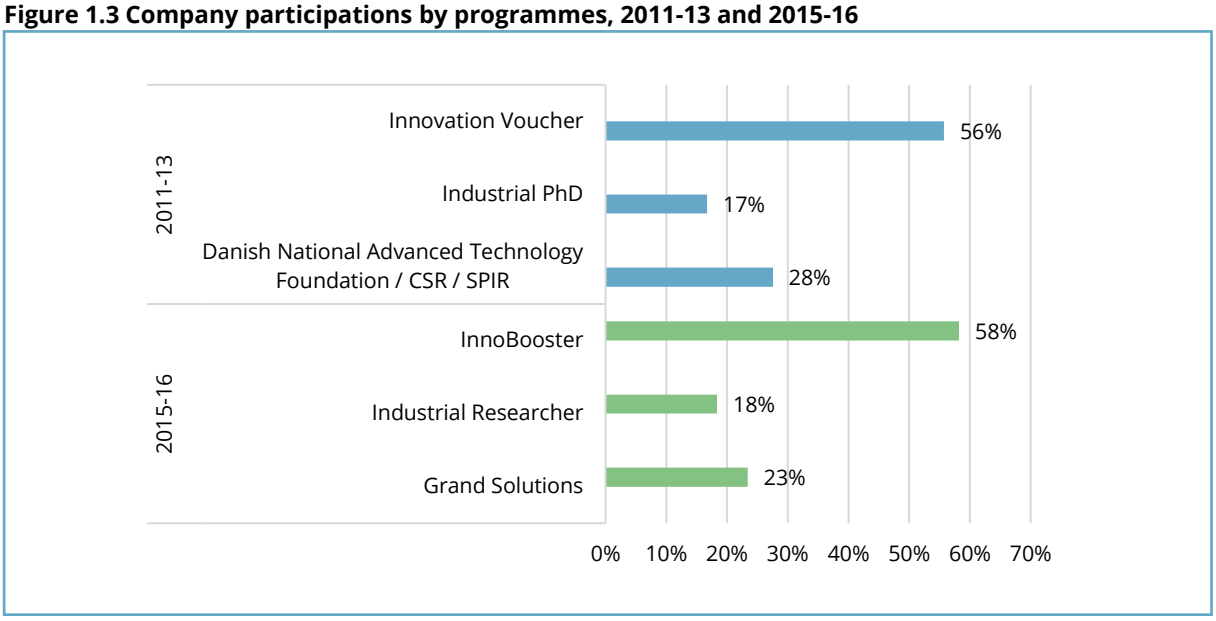
While the yearly number of grant recipients has been more or less at the same level, there has been a slightly increase in the share of returning users. In comparison to 2012 and 2013 where the shares of returning users were 12% and 11%, respectively, the share of returning grant recipients was 15% in 2016.

Out of the 1,057 unique companies that received one or more grants from IFD in 2015 or 2017, 212, or 20 per cent, had participated in one or more of the programmes in 2011-2013.

## 1.2 Company participation in programmes

Figure 1.3 shows the distribution of companies' participation in each period by programmes. When considering differences in the two periods, it is reasonable to compare Innovation Voucher to InnoBooster, Industrial PhD to Industrial Researcher and Danish National Advanced Technology Foundation, CSR and SPIR to Grand Solutions.

**Figure 1.3 Company participations by programmes, 2011-13 and 2015-16**




*Source: Own calculations based on data from Statistics Denmark and Innovation Fund Denmark.*

Figure 1.3 indicates that the initiation of IFD has not impacted the companies' participation in the different programmes. While the overall distribution pattern remains the same, a slight increase in the share of participations in the Industrial InnoBooster and Researcher programme is observed. As of 2016, 865 of the participations were in the InnoBooster, 273 in Industrial Researcher and 348 in Grand Solutions. However, it should be noted that Industrial Researcher includes Industrial PhD and Industrial PostDoc and are therefore not directly comparable to Industrial PhD in 2011-13.

# 2. Indicators from European Innovation Scoreboard

Based on the European Innovation Scoreboard (EIS) this section describes the companies that have received a grant from IFD from 2015 to 2016 with respect to employment in knowledge-intensive sectors (Section 2.1.) and in high-growth companies in innovative sectors (Section 2.2.).

## 2.1 Employment in knowledge-intensive sectors

Knowledge-intensive sectors are defined, according to EIS, as sectors where at least 33 per cent of employment has a tertiary education degree (ISCED 5-8). Following this definition, this section estimates the share of highly educated employees by the standard 36-grouping of business sectors for all private companies in Denmark for the period 2015 to 2016. Highly educated employees include employees with a bachelor's degree, master's degree or PhD.

A total of seven sectors are identified as knowledge-intensive. Table 2.1 reports the seven sectors and the share of highly educated employees for each sector.

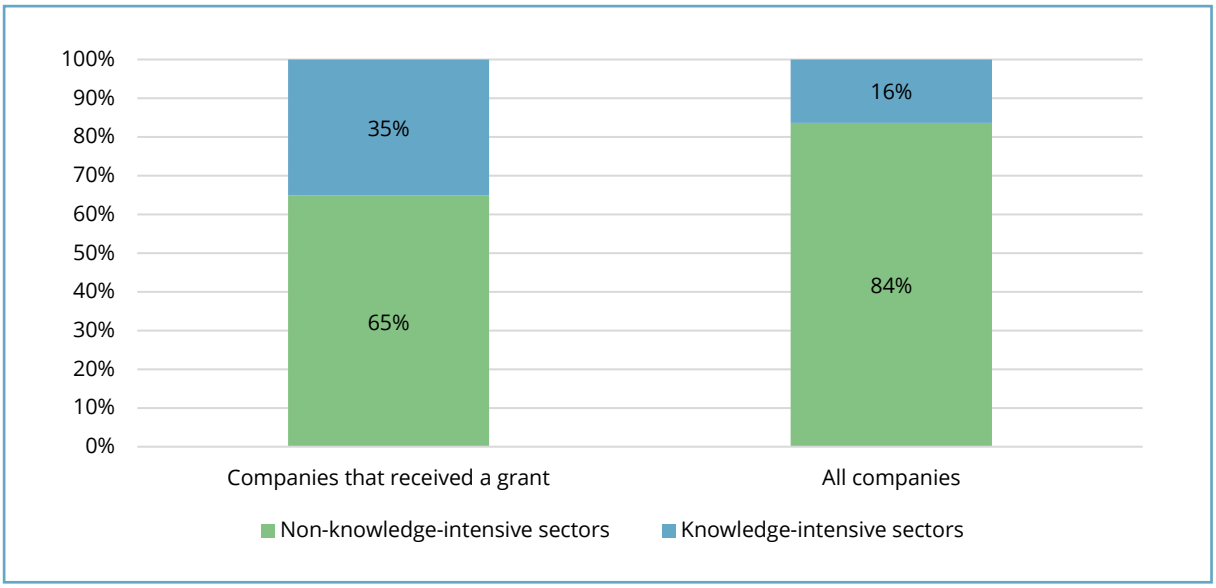
**Table 2.1 Knowledge-intensive sectors, share of highly educated employees, 2015 to 2016**

| Knowledge-intensive sectors | Share of highly educated employees |
|---|---|
| Consultancy etc. | 47% |
| Education | 43% |
| Electrical equipment | 34% |
| Human health services | 49% |
| IT and information service activities | 38% |
| Pharmaceuticals | 47% |
| Scientific research and development | 53% |

*Source: Own calculations based on data from Statistics Denmark.*
*Note: Employees are measured in no. of persons. Highly educated employees include employees with a bachelor's degree, master's degree or PhD. The sectors are categorized by the standard 36-grouping from the Danish Industrial Classification (DB07).*

In the following we compare the companies that have received a grant from IFD in 2015 or 2016 to the total number of companies with respect to employment share in knowledge-intensive sectors. Due to data confidentiality, it is not possible to show the employment share for the individual sectors. Thus, Figure 2.1 shows the total employment share of companies that have received grants compared and the total population of companies in Denmark by knowledge-intensive and non-intensive sectors from 2015 to 2016.

**Figure 2.1 Employment share by knowledge-intensive and non-knowledge-intensive sectors, 2015 to 2016**

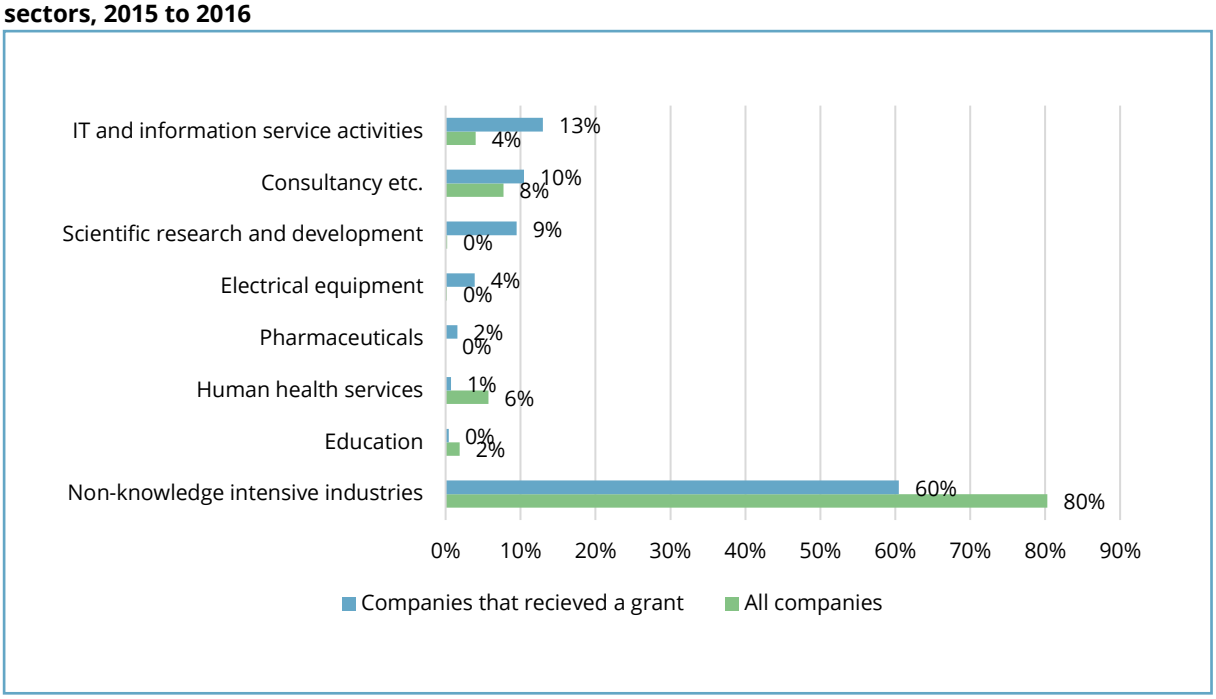



*Source: Based on data from Statistics Denmark and Innovation Fund Denmark.*
*Note: Employees are measured in full-time equivalents.*

According to the figure, 35 per cent of the total employment in companies that received a grant from IFD in 2015 or 2016 are in knowledge-intensive sectors. In comparison, only 16 per cent of the total employment in the same period were placed in knowledge-intensive sectors.

Figure 2.2 shows the sector distribution of companies that have received grants compared and the total population of companies in Denmark by knowledge-intensive and non-intensive sectors from 2015 to 2016.

**Figure 2.2 Sector distribution of companies by knowledge-intenive and non-knowledge-intensive sectors, 2015 to 2016**




*Source: Based on data from Statistics Denmark and Innovation Fund Denmark.*
*Note: The sectors are classified by the standard 36-grouping from the Danish Industrial Classification (DB07).*

Around 40 percent of the companies that received a grant from IFD in 2015 or 2016 are in knowledge-intensive sectors. The majority of which are in IT and information service activities (13 per cent), consultancy etc. (10 per cent), and scientific research and development (9 per cent). Correspondingly, 20 per cent of all companies in Denmark are in knowledge-intensive sectors, and primarily in IT and information service activities (4 per cent), consultancy etc. (8 per cent), and human health services (6 per cent).

## 2.2 Employment in high-growth companies

This section describes the employment in high-growth companies in innovative sectors for both companies that received a grant from IFD in 2015 or 2016, and for the total population of companies in the same period.

Following ESI definition of innovative sectors, we estimate the number of high-growth companies and their total share of employment in the innovative sectors.[2] High-growth companies are defined as companies with an absolute growth in revenue of 3 million DKK over the last three years, and with:

A) at least 5 to 9 employees (full-time equivalents) in the analysis year and an annual growth in revenue of 30 per cent or higher over the last three years, or
B) at least 10+ employees (full-time equivalents) in the analysis year and an annual growth rate in revenue of 20 per cent or higher over the last three years.

[2] EIS defines the 34 NACE industries as innovative. See European Innovation Scoreboard 2018 – Methodology report, p. 10, for a complete list of the industries.

From 2015 to 2016 a total 128 or 11 per cent of the companies that received a grant from IFD in the period were high-growth companies. Out of these 128 companies, 82 are in innovative sectors. In the same period the total number of high-growth companies in Denmark were 9,446, and of these a total of 3,630 are in innovative industries. Table 2.2 shows the share of high-growth companies and their share of total employment in innovative sectors by grant recipients.

**Table 2.2 High-growth companies in innovative sectors, 2015 to 2016**

| | Total employment in high-growth companies in innovative sectors | Share of employees in innovative industries | Number of high-growth companies In innovative sectors | Share of high-growth companies in innovative sector |
|---|---|---|---|---|
| Companies that received grants | 6,641 | 64% | 128 | 64% |
| All companies | 105,308 | 32% | 3,630 | 38% |

*Source: Based on data from Statistics Denmark and Innovation Fund Denmark.*
*Note: Employees are measured in full-time equivalents.*

The share of high-growth companies in innovative sectors is higher among the companies that received a grant from IFD compared to the total population. Approximate 64 per cent of the growth companies that received a grant from IFD are in innovative sectors, while the share the for total population of high-growth companies are 38 per cent. Correspondingly, the growth companies that received a grant from IFD constitutes a larger share, 64 per cent, of the total employment in innovative sectors, while the corresponding share is 32 per cent for all growth companies in Denmark.

# 3. Small-Advanced Economies Impact Initiative: Number of collaborations with public bodies

The Small Advanced Economies Initiative is a collaboration between Denmark, Finland, Ireland, Israel, New Zealand, Singapore, and Switzerland. These countries are considered advanced economies by International Monetary Fund standards and are of similar scale in terms of population with approximately 5 to 10 million inhabitants.

The publication "Broadening the Scope of Impact Defining" (2015) assesses and measures the impact of major public research programmes in the seven member-countries. The analysis in the report provides a common language for the concepts surrounding impact and impact assessment across countries, enabling improvements in future analyses of impact of major public research programmes.

Among other things, the report describes a variety of concrete impact measures to be considered. These are grouped under six pillars – economic, environmental, health, policy, human capacity, societal and international engagement. One of the impact measures described under pillar 4, i.e. policy, is the number of collaborations with government departments and other public bodies. The underlying idea of the impact measure is that policy decisions or changes to legislations, regulations or guidelines have been informed by research evidence through their involvement.

## 3.1 Number of public-private collaborations

Public-private collaborations are relevant for two of the four IFD programmes, namely Grand Solutions and Industrial Researcher. To proxy for the importance of research for public institutions knowledge development and decision-making, the number of projects with involvement of public institutions is considered. Public institutions are in this regard defined as ministries, agencies, capital regions and municipalities.

Table 3.1 presents the projects with public partners in the period 2015 to 2017.

**Table 3.1 Number of projects with public partners, 2015-17**

| *Number of public partners involved:* | Grand Solutions | Industrial Researcher | Total |
|---|---|---|---|
| 1 | 16 | 8 | 24 |
| 2 | 7 | 2 | 9 |
| 3 | 2 | 0 | 2 |
| 4 | 0 | 0 | 0 |
| 5 | 1 | 0 | 1 |
| Total | 26 | 10 | 36 |

*Source: InnovationDenmark database, 2015-17. Only approved projects considered.*
*Note: Public partners are defined as ministries, public agencies, capital regions and municipalities.*

Public institutions were involved in 36 projects approved during the period from 2015 to 2017. Of these, ¾ were Grand Solutions projects, while the remaining ¼ were related to the Industrial Researcher programme.

In 24 out of the 36 projects, only one public institution was involved in the project, while the remaining 12 projects had at least two public institutions involved. One Grand Solutions projects involved a total of five public institutions.

Municipalities and capital regions are more likely to be involved in public-private collaborations. Out of the 36 projects, 28 projects involved a municipality or one of the five capital regions. Ministries or public agencies were involved in the remaining 9 projects. The project with 5 public institutions included 3 municipalities and 2 ministries.

## 3.2 Number of collaborations with GTS institutes

The GTS network consists of seven independent, Danish, not-for-profit research and technology organisations (RTOs). They are called GTS institutes and together they form the "GTS network". Their purpose is to develop and gather insight and knowledge of new technological methods and make it applicable for businesses.

The GTS institutes also play an important role in the part of the innovation support system that concerns *collaborative research and innovation.* The GTS institutes are involved in a large number of R&D-projects with different groups of companies. They also participate as specialists and project managers in a number of projects with participation of both private businesses, universities and GTS institutes.

Table 3.2 presents the projects with GTS institute collaboration in the period 2015 to 2017.

**Table 3.2 Number of projects with GTS institutes, 2015-17**

| *Number of public partners involved:* | Grand Solutions | Industrial Researcher | Total |
|---|---|---|---|
| 1 | 40 | 13 | 53 |
| 2 | 3 | 1 | 4 |
| 3 | 1 | 0 | 1 |
| Total | 44 | 14 | 58 |

*Source: InnovationDenmark database, 2015-17. Only approved projects considered.*

It is more common for the GTS-institutes to be involved in approved IFD projects, compared to public institutions. During the period from 2015 to 2017, the seven GTS-institutes were involved in 58 projects, of which ¾ were Grand Solutions. Seven of the projects with participation from at least one GTS institution also involved a public institution (ministry/agency or municipality/capital region).

# 4. Co-financing of users in Grand Solutions-projects

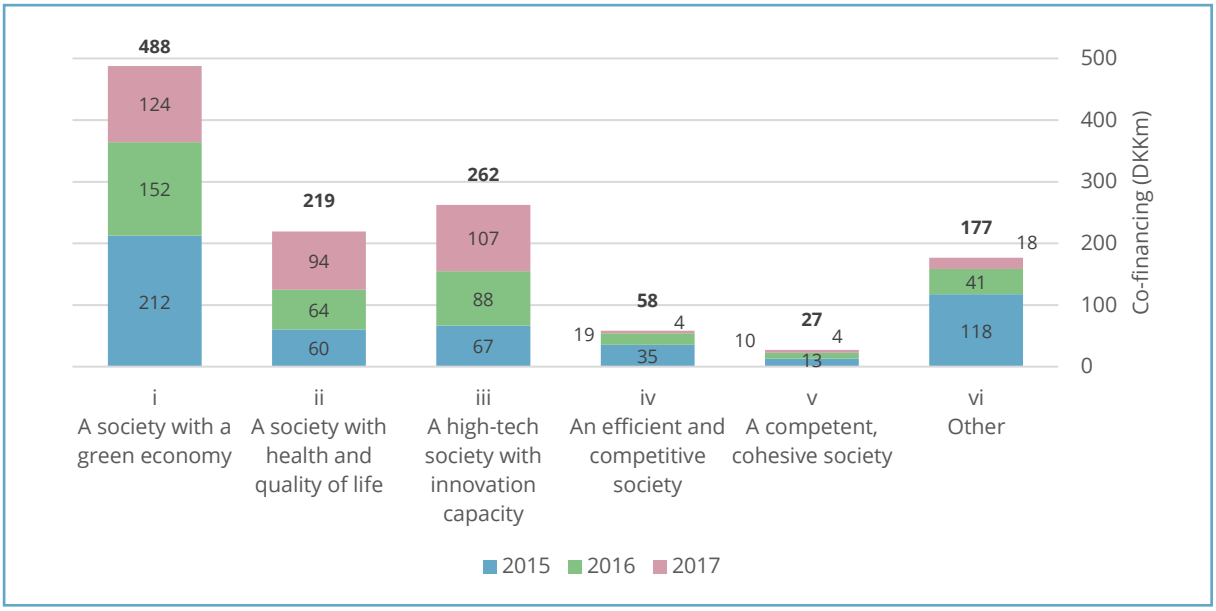
The recipients of Grand Solutions-grants are obligated to offer some co-financing in the implicated project. In the following, the co-financing of all users is shown distributed on the five visions and 14 themes of RE-SEARCH2020 – a strategic catalogue of promising research areas for Denmark, published by The Ministry of Science, Innovation and Higher Education in 2012. Then, the co-financing data is linked with company data from Statistics Denmark, in order to map the specific private company co-financing onto relevant back-ground data.

The data builds on the IFD database of grants, as well as data from Statistics Denmark. Please note that the first part of the analysis is focused on the period of 2015 to 2017, while the second part is focused on the period of 2015 to 2016. This is due to data constraints regarding the year 2017, which is not fully available at the time of this analysis.

## 4.1 Co-financing of all users in Grand Solutions-projects

Figure 4.1 below shows the co-financing of all participants distributed into the five RESEARCH2020 visions, as well as the co-financing that does not fit into any of the visions. The roman numerals refer to the order of the visions in the strategy and corresponds to the categorization of the themes in Figure 4.3, as each of the themes fit into a certain vision.

**Figure 4.1 Distribution of co-financing of all participants by RESEARCH2020 visions, DKK million, 2015-2017**



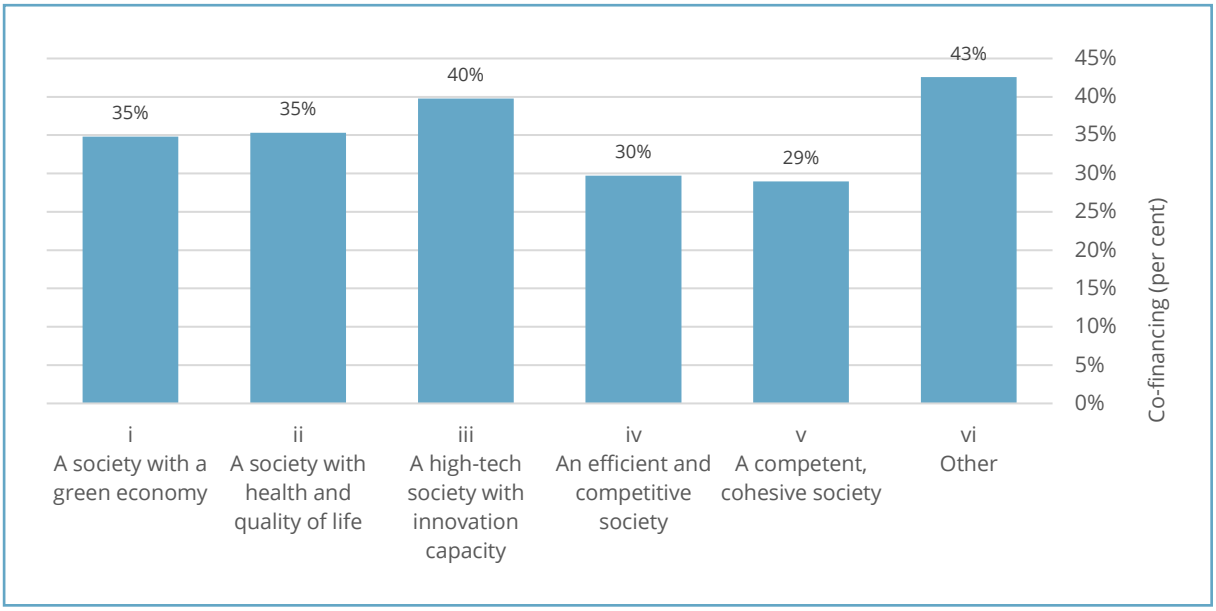

*Source: Own calculations based on data from Innovation Fund Denmark.*

The main takeaways from the figure are, that the total co-financing has decreased from DKK 505 million in 2015 to DKK 352 million in 2017. The decrease has been particularly large within the visions regarding a green economy (i) and the 'other' category (vi), as well as large relative to the 2015-level in the efficient and competitive society (iv) and competent and cohesive society visions (v). Meanwhile, co-financing has

particular increased within a society with health and quality of life (ii) and a high-tech society with innovation capacity (ii).

In Figure 4.2, it is shown what the co-financing in currency amounts to as a percentage of the total project financing.

**Figure 4.2 Percentage co-financing of all participants of total project financing by RESEARCH2020 visions, total of 2015-2017**




*Source: Own calculations based on data from Innovation Fund Denmark.*

Projects that do not fit into the five visions have a higher co-financing of all participants, measured as a percentage of total project financing. In the opposite end, projects concerning vision (iv) and (v) have a lower co-financing.

Table 4.1 shows how the percentages in Figure 4.2 have developed in the period 2015-2017.

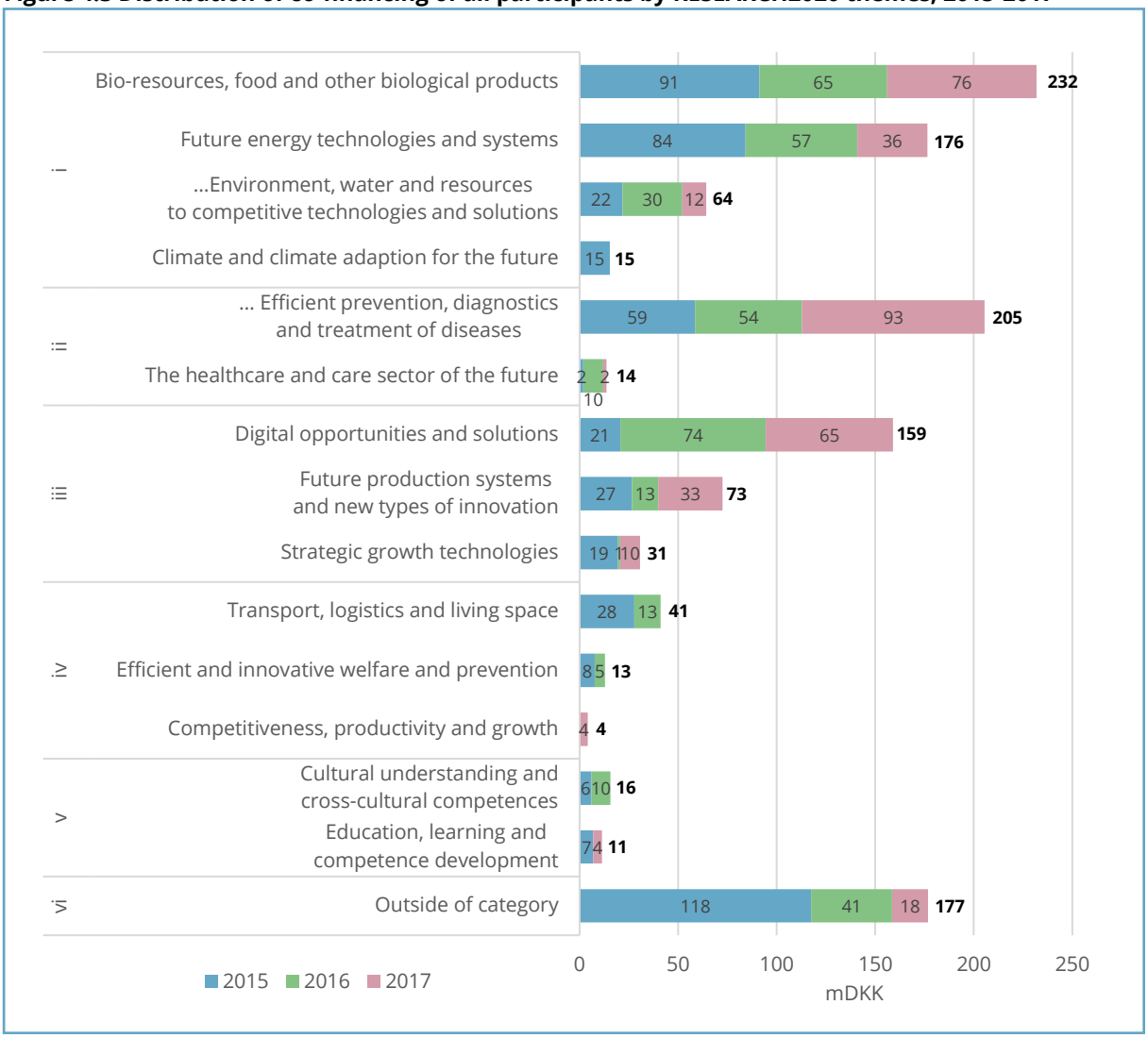
**Table 4.1 Percentage co-financing of all participants of total project financing by RESEARCH2020 visions, 2015-2017**

| Vision / Year | 2015 | 2016 | 2017 |
|---|---|---|---|
| i) A society with a green economy | 37% | 32% | 35% |
| ii) A society with health and quality of life | 33% | 30% | 42% |
| iii) A high-tech society with innovation capacity | 35% | 41% | 42% |
| iv) An efficient and competitive society | 29% | 28% | 42% |
| v) A competent, cohesive society | 30% | 27% | 32% |
| vi) Other | 43% | 41% | 42% |
| *Average* | *37%* | *34%* | *39%* |

There has been an increase in the co-financing among projects that fit vision (ii), (iii) and (iv), while the other visions have been relatively stable. The average of all co-financing decreased marginally from 2015 to 2016 but increased in 2017. The broken pattern suggests that this might be a random fluctuation.

The co-financing can be further broken down into the underlying themes of each RESEARCH2020 vision, as has been done in Figure 4.3.

**Figure 4.3 Distribution of co-financing of all participants by RESEARCH2020 themes, 2015-2017**

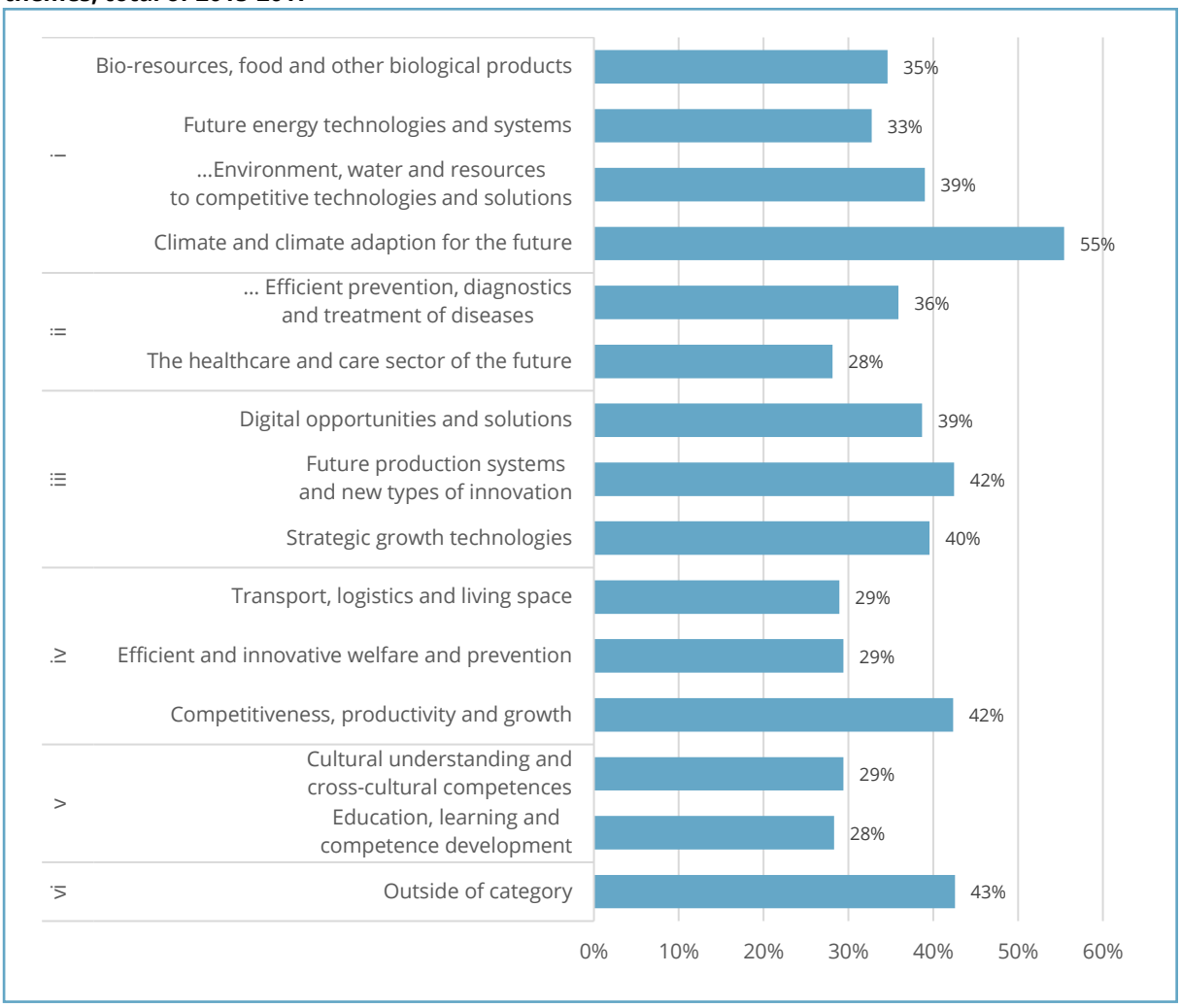



*Source: Own calculations based on data from Innovation Fund Denmark.*
*Note: The roman numerals refer to the RESEARCH2020 themes, shown in Figure 4.1.*

From the figure it is learned that the decrease in vision (i) is mainly a result of the decrease in future energy technologies and systems, although all themes have had a drop since 2015. Nearly all co-financing has seized within vision (iv), where transport, logistics and living space and efficient and innovative welfare and prevention has dropped to zero in 2017. Meanwhile, there has been an increase in co-financing within efficient prevention, diagnostics and treatment of diseases and digital opportunities and solutions, which has been driving the increase in (ii) and (iii), respectively.

Figure 4.4 shows how much the co-financing amounts to, as a percentage of the total project financing, once again distributed between the RESEARCH2020 themes.

**Figure 4.4 Percentage co-financing of all participants of total project financing by RESEARCH2020 themes, total of 2015-2017**




*Source: Own calculations based on data from Innovation Fund Denmark.*
*Note: The roman numerals refer to the RESEARCH2020 themes, shown in Figure 4.1.*

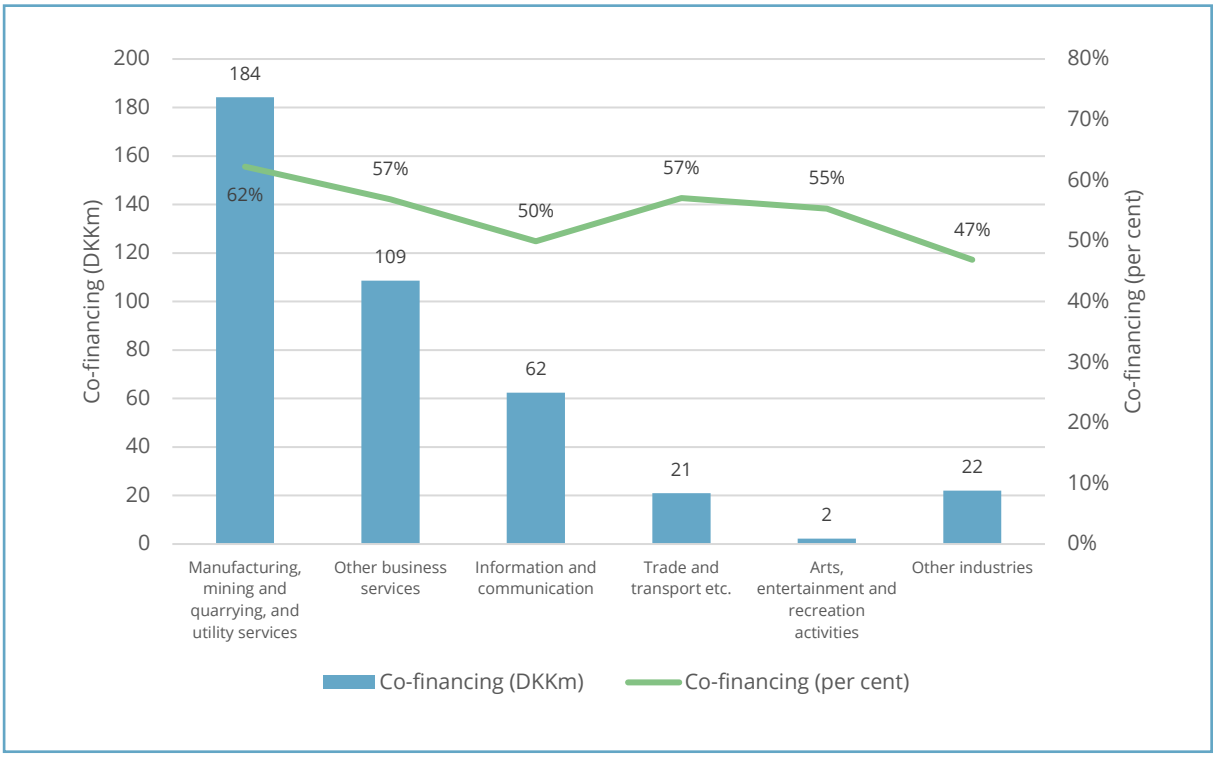
The figure shows that climate and climate adaption for the future, future production systems and new types of innovation, competitiveness, productivity and growth as well as projects outside of category have a higher co-financing relative to the project financing on average. Meanwhile, most of the smaller categories, in terms of the actual sum of co-financing, e.g. some themes within (ii), (iv) and (v) have a smaller share co-financed. The remaining themes typically fall between 33 per cent and 40 per cent. There are no changes to any of the themes in terms of co-financing percentage from 2015 to 2017, that do not risk being the result of insufficient data.

## 4.2 Co-financing of private companies in Grand Solutions-projects

Looking exclusively at private companies, DKK 429 million was contributed in co-financing in 2015 and 2016 for Grand Solutions-projects. These figures can be distributed into various background factors, which will provide an idea of the nature of the co-financing private companies.

Firstly, Figure 4.5 shows the co-financing distributed into various industries, based on the industry categorization DB07. The figure shows the co-financing in actual currency on the left axis and as a percentage of the total project costs on the right axis.

**Figure 4.5 Distribution of co-financing of companies by DB07-categorized industries, total of 2015-2016**

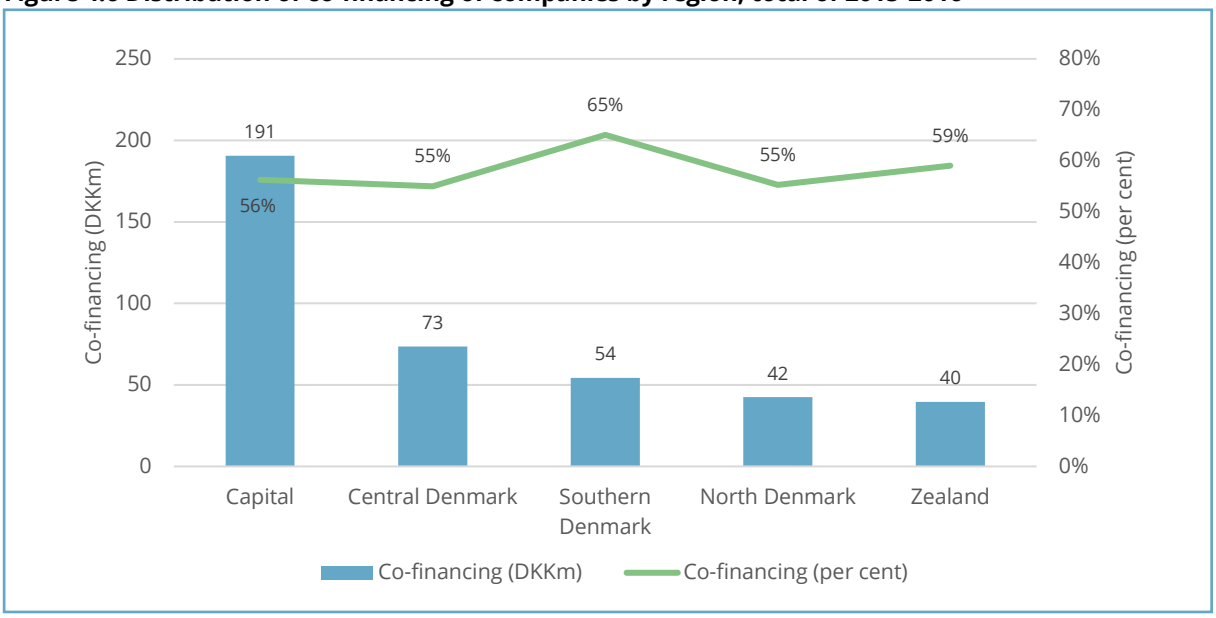



*Source: Own calculations based on data from Innovation Fund Denmark.*

As the figure shows, most of the co-financing, measured in actual currency, is provided by manufacturing, mining and quarrying, and utility services companies (45 per cent of the total co-financing of all sectors) and companies within other business services (28 per cent). Information and communication, trade and transport etc. and arts, entertainment and recreation activities companies have a combined portion of the total co-financing of all sectors of 21 per cent. As a percentage of total project costs, co-financing within manufacturing, mining and quarrying, and utility services is higher than the other categories, while information and communication and the 'other' category have a lower co-financing percentage. The average for the companies is 57 per cent.

Figure 4.6 shows the same measures as above but distributed by Danish region of origin for the implicated company.

**Figure 4.6 Distribution of co-financing of companies by region, total of 2015-2016**

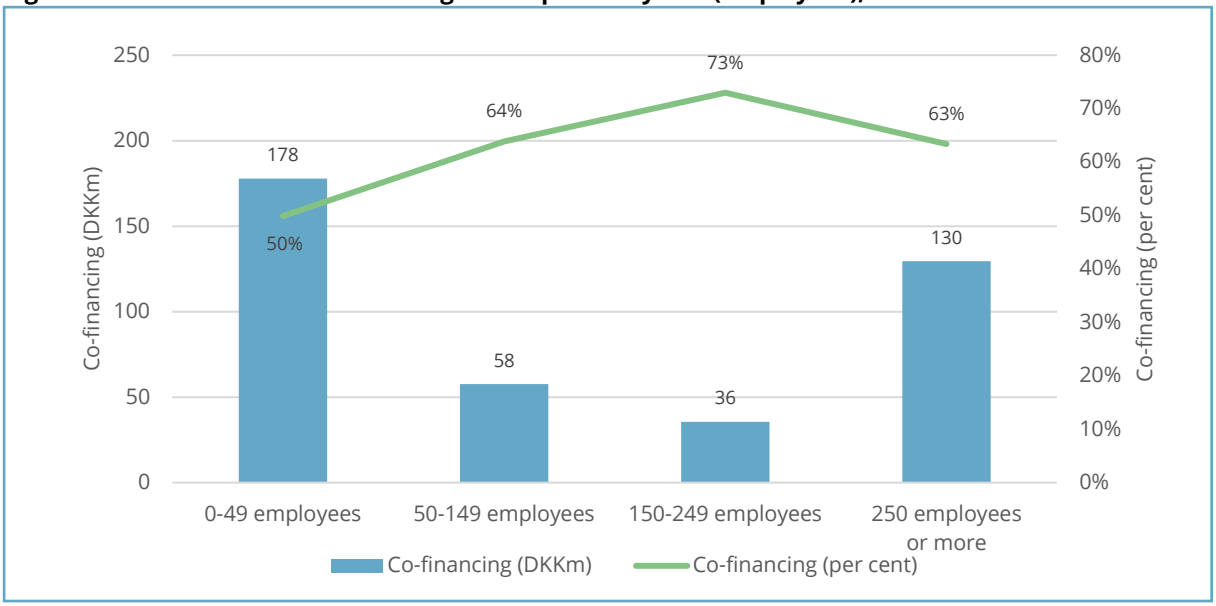



*Source: Own calculations based on data from Innovation Fund Denmark.*

While the Capital Region has the largest co-financing by far, its' share of the project costs is a little less than the average (56 per cent). Meanwhile, the Region of Southern Denmark has a higher level of 65 per cent. The remaining regions are around the average.

Finally, Figure 4.7 shows the distribution of co-financing by company size, measured by no. of employees.

**Figure 4.7 Distribution of co-financing of companies by size (employees), total of 2015-2016**




*Source: Own calculations based on data from Innovation Fund Denmark.*

The figure shows that larger companies often have a higher co-financing as a percentage of project costs than smaller companies. The group of the smallest companies (0-49 employees) co-finance approx. half of the project costs, while companies with more than 50 employees average a co-finance of 65 per cent, with companies with 150-249 employees co-financing a particularly high share of the project costs.

# 5. Growth capital for users of InnoBooster

InnoBooster is targeted start-ups, SMEs, and entrepreneurial researchers with a sound business idea and a potential for growth and offers grants to facilitate the further development of the business idea. Some of these companies may also at some point seek out other sources of finance to facilitate the continuous development and growth of the company. Depending on where along the investment chain the company is located, it seeks different types of finance.

In the following we focus on three programmes that operate at different stages of the investment chain and examines to what extent companies that have received a grant from InnoBooster also receives other types of finance. The three sources/programmes are the Danish innovation incubators, Danish venture funds and the Danish Growth Fund.

## 5.1 The Danish innovation incubators

The innovation incubator scheme consists of four individual incubators and is financed by the Ministry of Higher Education and Science. The four innovation incubators provides professional counselling, pre-seed and seed capital for entrepreneurs and new innovative companies and operate at the earliest stages of the investment chain, where venture funds and other private investors are reluctant to engage.[3] Thus, the main purpose of the innovation incubators is to support the creation of new and innovative companies by bridging the funding gap in the earliest and most risky stages of the venture market. Through a primary and secondary funding stage the innovation incubators can invest up to €800,000 (or DKK 6 million) per company.

From 2011 to 2017 the innovation incubators invested in 493 new innovative companies. Of these nearly 500 companies a total of 116 companies also received a grant from InnoBooster, equivalent of 24 per cent. Conversely, ca. 10 per cent of the 1,170 companies that received a grant from InnoBooster from 2015 to 2017 also received funding from an innovation incubator.

Table 5.1 shows the number of innovation incubator investments and InnoBooster grants over time.

**Table 5.1 Number of innovation incubat-or investments and InnoBooster grants, 2011-2017**

| Year of InnoBooster grant | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|
| 2015 | 3 | 4 | 4 | 13 | **17** | 5 | 4 |
| 2016 | 3 | 0 | 5 | 2 | 2 | **8** | 6 |
| 2017 | 2 | 3 | 1 | 3 | 8 | 8 | **15** |

*Source: Based on the InnovationDenmark database.*
*Note: Companies are registered once in the data and by the date of the first investment (innovation incubators) or grant (InnoBooster).*

61, or 53 per cent, of the companies received funding from the innovation incubators in the years prior to the year they received a grant from InnoBooster. The remaining 55 companies received funding in the same year or in the years following a grant from InnoBooster.

[3] *The innovation incubator will be phased out from 2019. Tasks will be transferred from the innovation incubators to the Innovation Fund Denmark and the Growth Fund.*

## 5.2 Danish Venture funds

Venture funds invest in new companies with a significant growth potential and a high-risk profile. Besides providing capital, venture funds is likely to take an active role in the strategic development of the company. Hence, venture funds often play an important role in the development of the company's business idea and the realization of the growth potential. The venture funds often operate in the early stages of the investment chains and after the innovation incubators.

In the following we consider new investments from Danish venture funds from 2011 to 2017. In 2017 the average investment amounted to approx. €800,000-930,000 (or DKK 6-7 million). The data are provided by the Danish Growth Fund and covers a total of 16 Danish venture funds.[4]

From 2011 to 2017 the Danish venture funds invested in a total of 99 companies, of which 19 also received an InnoBooster grant, equivalent to 19 per cent. This corresponds to 2 per cent of the total number of InnoBooster companies.

Table 5.2 shows the number of venture investments and InnoBooster grants over time.

**Table 5.2 Number of venture investments and InnoBooster grants , 2011-2017**

| Year of InnoBooster grant | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|
| 2015 | 1 | 1 | 2 | 1 | **3** | 2 | 2 |
| 2016 | 0 | 0 | 0 | 0 | 1 | **1** | 1 |
| 2017 | 0 | 1 | 0 | 0 | 1 | 2 | **0** |

*Source: The Danish Growth Fund.*
*Note: Companies are registered once in the data and by the date of the first investment (venture funds) or grant (InnoBooster).*

The venture investments are equally divided before and after the companies receives a grant from InnoBooster. Thus, ten of the companies received the investment prior to their engagement in InnoBooster, while the remaining nine companies received their investment in the same year or the years following InnoBooster.

## 5.3 The Danish Growth Fund

Since 2014 the Danish Growth Fund has operated a scheme, *Loans for entrepreneurs,* that offers finance to young, established companies that have products and customers, but whose short history and track record makes it difficult to obtain the necessary finance to realize their potential. Provided that the loans are offered to young and established companies, the scheme operate in the later stages of the investment chain compared to the innovation incubators and venture funds. The minimum amount offered are €133.300 (or DKK 1 million) and in order to be eligible for a loan the entrepreneur must secure a minimum of 50 per cent private co-financing.[5]

[4] The funds include ByFounders, CAPNOVA Invest Zealand, Dico, Energimidt Udvikling, Insero Horsens, Lundbeckfond Emerge & Ventures, NB Capital, NES Partners, Nordic Eye, North East Venture, NorthCap, Novo Seeds & Ventures, SEED Capital, Sunstone Capital, Vecta and the Danish Growth Fund. For further information, https://www.vf.dk/~/media/files/analyser/markedsanalyser/det%20danske%20marked%20for%20venturekapital%202018_endelig.pdf.
[5] The Danish Growth Fund, https://www.vf.dk/saadan-goer-vi/vaekstlaan-til-ivaerksaettere.aspx?sc_lang=en.

From 2014 to 2017 the Danish Growth Fund provided loans to 311 companies, 43 of these companies also received a grant from InnoBooster, equivalent to 14 per cent. Conversely, 4 per cent of the total number of companies that received a grant from InnoBooster also obtained a loan from the Danish Growth Fund.

Table 5.3 presents the number of loans for entrepreneurs and InnoBooster grants over time.

**Table 5.3 Number of loans for entreprenurs and InnoBooster grants , 2011-2017**

| Year of InnoBooster grant | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|
| 2015 | 1 | **2** | 7 | 7 |
| 2016 | 2 | 3 | **9** | 5 |
| 2017 | 1 | 1 | 1 | **4** |

*Source: The Danish Growth Fund.*

*Note: Companies are registered once in the data and by the data of the first loan (the Danish Growth Fund) or grant (InnoBooster).*

Due to the fact that *Loans for entrepreneurs* came in to operation in 2014, only 9, or 20 per cent, of the companies received a loan prior to their engagement in InnoBooster. Hence, 80 per cent of the companies received a loan in the same year or the years following InnoBooster.

# 6. Industrial PhD employment

Since 2014, the Industrial PhD programme has been managed by IFD. Prior to 2014, the programme was managed by the Danish Agency for Science, Technology and Innovation. The purpose of the Industrial PhD programme is to increase knowledge sharing between universities and private sector companies, promoting research with commercial perspectives, and taking advantage of competencies and research facilities in private companies to increase the number of PhDs with knowledge about industrially focused research and innovation.

For this purpose, the Industrial PhD student is employed in a company (referred to as PhD-company in the following) and enrolled at a university at the same time during the PhD-project. The student spends all his or her time on the project and shares his or her time equally between the company and the university while taking the degree. Since 2010, both private companies and public institutions (e.g. agencies and municipalities) have been able to participate in the Industrial PhD programme.

This section describes the employment of Industrial PhD graduates (IPhDs) three, five and eight years after they received their PhD (graduation year). Hence, the section compares the sector distribution of the companies in which the IPhDs are employed when they graduate, to that three, five and eight years later. Furthermore, the number of IPhDs who have shifted from the private to the public sector during the periods is also reported.

The analysis is based on person level data from the IFD that cover the IPhDs, who graduated from 2006 to 2016. The data contains information on the PhD-company in which the IPhDs was employed during their PhD-project and the graduation year.

By combining the IFD data with register data from Statistics Denmark on company characteristics and employer-employee link for each individual IPhDs in the period, a total of 815 IPhDs from the IFD data were identified in the register data. Table 6.1 shows the distribution of the 815 IPhDs by graduation year.

**Table 6.1 Number of Industrial PhDs by graduation year, 2006 to 2016**

| Graduation year | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Industrial PhD's | 37 | 41 | 51 | 67 | 62 | 74 | 62 | 106 | 94 | 129 | 92 |

*Source: Own calculations based on data from Statistics Denmark and Innovation Fund Denmark.*
*Note: n=815.*

It should be noted that the IPhDs can be employed in more than one company per year. Hence, some IPhDs may appear more than once, as they have been employed in different sectors in the same year.

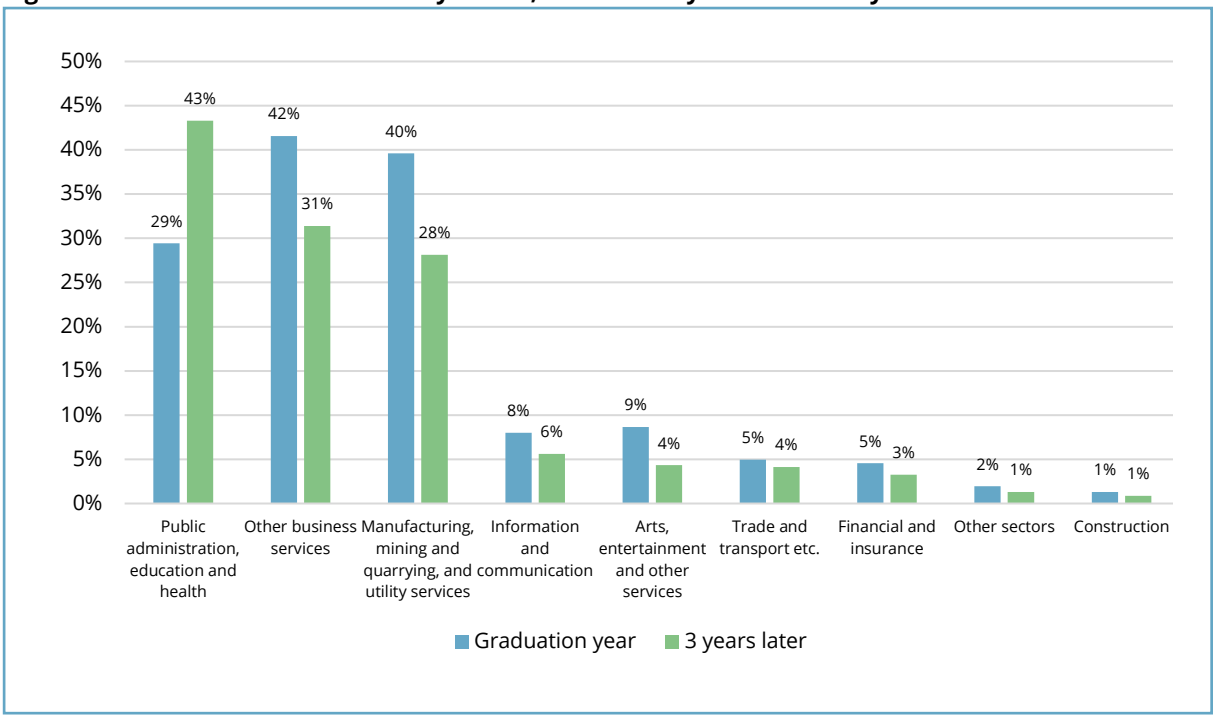
## 6.1 IPhDs' employment three years after graduation

This section compares the employment of IPhDs at the year they graduate with that three years later. Based on the total IPhD population, a total of 462 IPhDs are identified in the register data in both the graduation year ($t_0$) and three years later ($t_3$).

Of the 462 IPhDs, 148 (32 per cent), were still employed in the PhD-company three years after graduating. On average, each IPhD was employed at 2.7 companies during this period.

Figure 6.1 shows the IPhDs' employment by sector in the year of their graduation and three years later. The employment is shown as the share of IPhDs in each sector. Please note, that each IPhD can be employed in more than one company, and therefore also in more than one sector per year. Hence, the shares for each year does not sum to 100 per cent.

**Figure 6.1 Share of Industrial PhDs by sector, Graduation year and three years later**




*Source: Own calculations based on data from Statistics Denmark and Innovation Fund Denmark.*
*Note: The sectors shown are the standard 10-grouoping from the Danish Industrial Classification. The following sectors are included in Other sectors due to data confidentiality: Agriculture, forestry and fishing and Real estate.*

According to Figure 6.1, 43 per cent, or 200, of the IPhDs are employed in the sector related to public administration, education and health three years after they graduated, up from 29 per cent compared to the graduation year. The increased employment among the IPhDs in public administration, education and health are offset by a decrease in the remaining sectors, especially in other business services and manufacturing and quarrying and utility services, where the share of IPhDs has decreased with 11 and 12 percentage points, respectively.

Table 6.2 shows the number of IPhDs employed in the public sector three years after they graduated by their employment status in the graduation year. The public sector is defined as companies registered as public companies in Statistics Denmark's business register.[6]

**Table 6.2 IPhD employed in the public sector, three years**

| | Graduation year Public sector | Graduation year Private sector | Total |
|---|---|---|---|
| Industrial PhDs employed in the public sector three years after graduation | 111 | 96 | **207** |

*Source: Own calculations based on data from Statistics Denmark and Innovation Fund Denmark.*

The table shows that out of the 207 IPhDs who were employed in the public sector three years after they graduated, 96 were employed in the private sector at the time of graduation. The remaining 111 IPhDs were also employed in the public sector the year they graduated.

[6] In Statistics Denmark's Business register (Generel firmastatistik) companies are registered as private or public by the variable *jur_funkkode.*

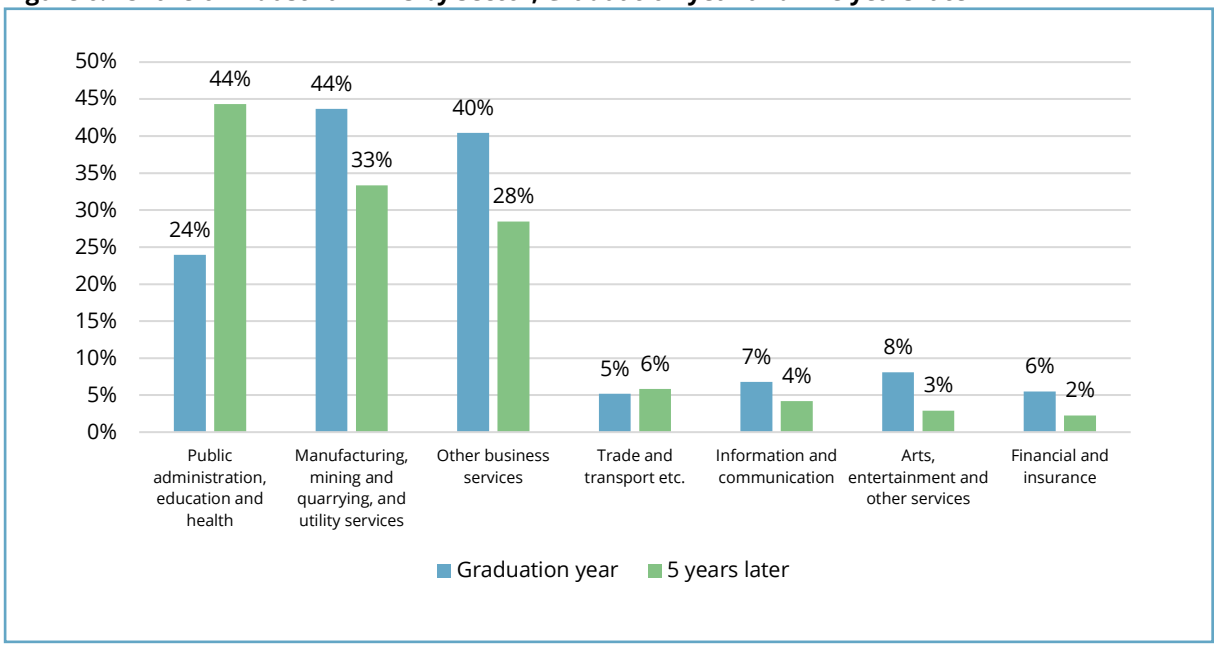
## 6.2 IPhDs' employment five years after graduation

This section compares the employment of IPhDs at the year they graduate with that five later. Based on the total IPhD population, a total of 309 IPhDs are identified in the register data in both the graduation year ($t_0$) and five years later ($t_5$).

Of the 309 IPhDs 78 or 25 per cent, were still employed in the PhD-company five years after they graduated. On average each IPhD are employed at 3.2 companies during this period.

Figure 6.2 shows the IPhDs' employment by sector in the year of their graduation and five years later. The employment is shown as the share of IPhDs in each sector. Please note, that each IPhD can be employed in more than one company, and therefore also in more than one sector per year. Hence, the shares for each year does not sum to 100 per cent.

**Figure 6.2 Share of Industrial PhDs by sector, Graduation year and five years later**




*Source: Own calculations based on data from Statistics Denmark and Innovation Fund Denmark.*
*Note: The sectors shown are the standard 10-grouoping from the Danish Industrial Classification. The following sectors are excluded due to data confidentiality: Agriculture, forestry and fishing, Real estate, and Construction.*

According to Figure 6.2, 44 per cent, or 137, of the IPhDs are employed in the sector related to public administration, education and health five years after they graduated, up from 24 per cent compared to the graduation year. The increased employment among the IPhDs in public administration, education and health are offset by a decrease in the remaining sectors, especially in other business services and manufacturing and quarrying and utility services, where the share of IPhDs has decreased with 12 and 11 percentage points.

Table 6.3 IPhD Public and private sector employment, Graduation year and five years later shows the number of IPhDs employed in the public sector five years after they graduated by their employment status in the graduation year.

**Table 6.3 IPhD Public and private sector employment, Graduation year and five years later**

| | Graduation year Public sector | Graduation year Private sector | Total |
|---|---|---|---|
| Industrial PhDs employed in the public sector five years after graduation | 63 | 82 | **145** |

*Source: Own calculations based on data from Statistics Denmark and Innovation Fund Denmark.*

The table shows that out of the 145 IPhDs who were employed in the public sector five years after they graduated, 82 were employed in the private sector at the time of graduation. The remaining 63 IPhDs were also employed in the public sector the year they graduated.

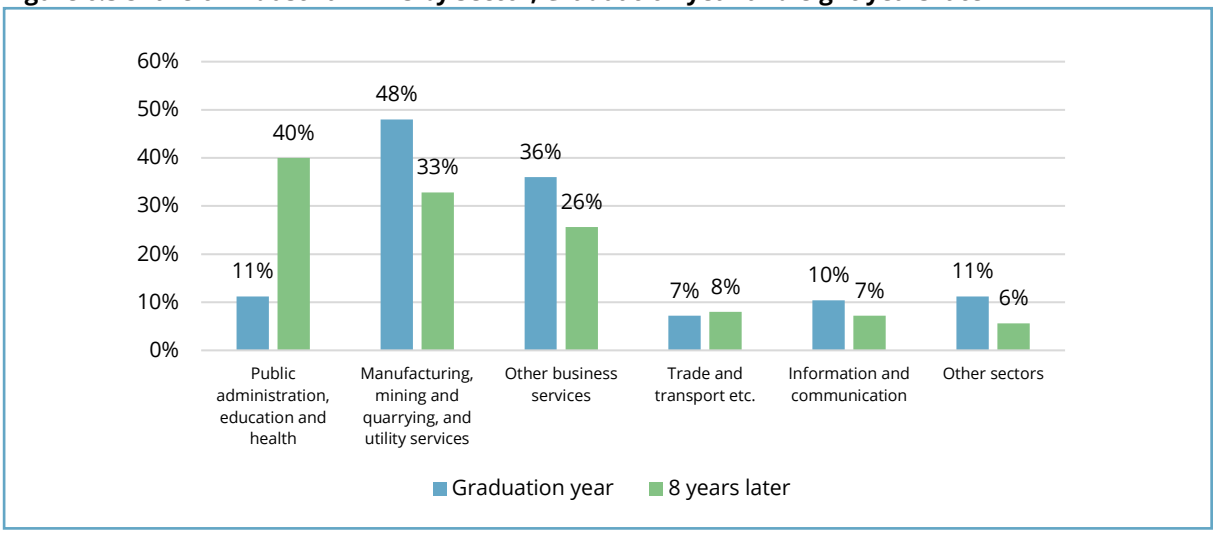
## 6.3 IPhDs' employment eight years after graduation

This section compares the employment of IPhDs at the year they graduate with that eight later. Based on the total IPhD population, a total of 125 IPhDs have been identified in the register data in both the graduation year ($t_0$) and eight years later ($t_8$).

Of the 125 IPhDs, 27 (22 per cent), were still employed in the PhD-company eight years after they graduated. On average each IPhD have been employed at 3.6 companies during this period.

Figure 6.3 shows the IPhDs' employment by sector in the year of their graduation and eight years later. The employment is shown as the share of IPhDs in each sector. Please note, that each IPhD can be employed in more than one company, and therefore also in more than one sector per year. Hence, the shares for each year does not sum to 100 per cent.

**Figure 6.3 Share of Industrial PhDs by sector, Graduation year and eight years later**




*Source: Own calculations based on data from Statistics Denmark and Innovation Fund Denmark.*

*Note: The sectors shown are the standard 10-grouoping from the Danish Industrial Classification. The following sectors are included in Other sectors due to data confidentiality: Agriculture, forestry and fishing, Finance and insurance and Arts, entertainment and other services.*

According to the figure, 40 per cent, or 50, of the IPhDs are employed in the sector related to public administration, education and health eight years after they graduated, up from 11 per cent compared to the graduation year. The increased employment among the IPhDs in public administration, education and health are offset by a decrease in the remaining sectors, especially in other business services and manufacturing and quarrying and utility services, where the shares of IPhDs has decreased with 10 and 15 percentage points, respectively.

Table 6.4 shows the number of IPhDs employed in the public sector eight years after they graduated by their employment status in the graduation year.

**Table 6.4 IPhD Public and private sector employment, Graduation year and eight years later**

| | Graduation year Public sector | Graduation year Private sector | Total |
|---|---|---|---|
| Industrial PhDs employed in the public sector five years after graduation | 14 | 41 | **55** |

*Source: Own calculations based on data from Statistics Denmark and Innovation Fund Denmark.*

The table shows that out of the 55 IPhDs that were employed in the public sector eight years after they graduated, 41 were employed in the private sector at the time of graduation. The remaining 14 IPhDs were also employed in the public sector the year they graduated.

**IRIS GROUP**

JORCKS PASSAGE 1B, 4. SAL | DK-1162 KØBENHAVN K
IRISGROUP@IRISGROUP.DK | WWW.IRISGROUP.DK