



Economic Footprint of the Life Science Industry in Denmark

The Ministry of Industry, Business and Financial Affairs 2023



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Foreword

The life science industry in Denmark is a cornerstone of our economy. The industry is research-intensive, sustainable, innovative, highly productive and growing – internationally as well as at home. It includes both large global companies and very new startups. And most importantly, it stands on a foundation of top-class health research, willingness to invest, technological know-how and, not least, skilled employees. This is why the life science industry is one of Denmark's biggest export successes.

Around one fifth of all Danish merchandise exports come from life science. But international competition is increasing, which is why this year's analysis focuses particularly on the Danish life science industry in an international context.

This year's analysis presents record-high key figures for the life science industry, indicating that the Danish life science industry has scaled new heights in regard to exports, employment, value added, tax payments, foreign direct investment and much more. We should be pleased with this. We should also remember that life science companies not only contribute significantly to the Danish economy, but also to better patient treatment and a future-proof healthcare system.

But the analysis also shows that Denmark lags behind comparable countries in other areas. For the first time, this year's analysis delves into the growth layer within life science and the transition from research to commercialisation. There is room for improvement here, and it is absolutely crucial that we realise this potential if we are to generate more new growth. All of this will put the Danish life science industry in a strong position going forward.

The government has therefore set aside DKK 400 million in 2024–2027 for a new life science strategy, which we will introduce in the spring of 2024. The strategy must continue to support good framework conditions while ensuring that we realise the huge potential of this industry. Among other things, this requires us to strengthen the entire growth layer within life science and translate all this great research into new startups that can evolve for the benefit of patients, the healthcare system and the Danish economy.

Happy reading

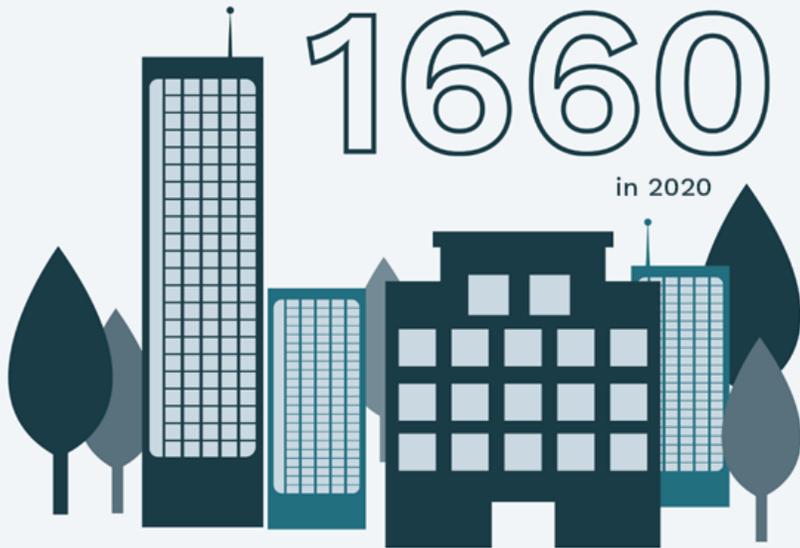
The Minister for Industry, Business and Financial Affairs

Summary of the main results of the analysis

The analysis is based on the latest available data from Statistics Denmark, Danmarks Nationalbank, the Danish Patent and Trademark Office and Eurostat. Data on the companies' turnover, tax, employment and foreign comparisons are from 2020, while data for foreign direct investment and exports are from 2022.

THE LIFE SCIENCE INDUSTRY IN DENMARK

NUMBER OF COMPANIES



GROWTH IN EMPLOYMENT

Denmark has the highest growth in life science employment among European life science nations in the period 2011–2020.



NUMBER OF COMPANIES

+25%

Increase 2008–2020.
Denmark has over 50,000 full-time life science employees in 2020.

EDUCATION

35%



are unskilled or skilled in 2020.



FINANCIAL KEY FIGURES



Exports have more than tripled since 2008, representing 19.7 per cent of Danish merchandise exports.



VALUE ADDED

in the life science industry in Denmark is greater than in selected European countries in the period 2011–2020.



Looking at the contribution to corporation tax alone, the life science industry's share of total corporation tax was 16 per cent in 2020.

INNOVATION

FROM RESEARCH TO STARTUP

Denmark lags behind other leading life science nations in regard to the number of life science startups per 1,000 publications.



A RESEARCH-INTENSIVE INDUSTRY

Own research and development in the life science industry makes up:

37%

of total R&D in Denmark (2020)

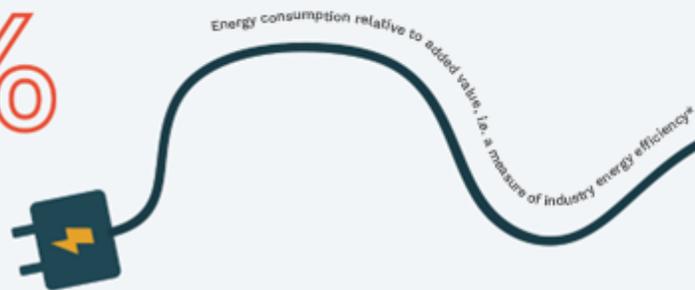


ENERGY INTENSITY*

has fallen by:

65%

from 2009 to 2020.



MOST CLINICAL TRIALS

Denmark performs the highest number of clinical trials in the EU per million residents.



The life science industry in Denmark

This section discusses Denmark's 1,660 life science companies, their employees and the employees' level of education.

Life science companies are defined in this report as all companies that work in parts of the value chain within medical devices as well as pharmaceuticals and biotechnological preparations. In other words, companies that work with research, development, advisory services, manufacturing and/or sales.

Some companies manufacture/sell products that fall within industries defined as medical devices as well as pharmaceuticals and biotech. Novo Nordisk is an example of this. Novo Nordisk mainly manufactures pharmaceutical preparations, but they also manufacture equipment that is used in connection with healthcare treatment. Novo Nordisk is therefore included with a main emphasis on pharmaceuticals and biotech and with a lesser emphasis on medical devices.

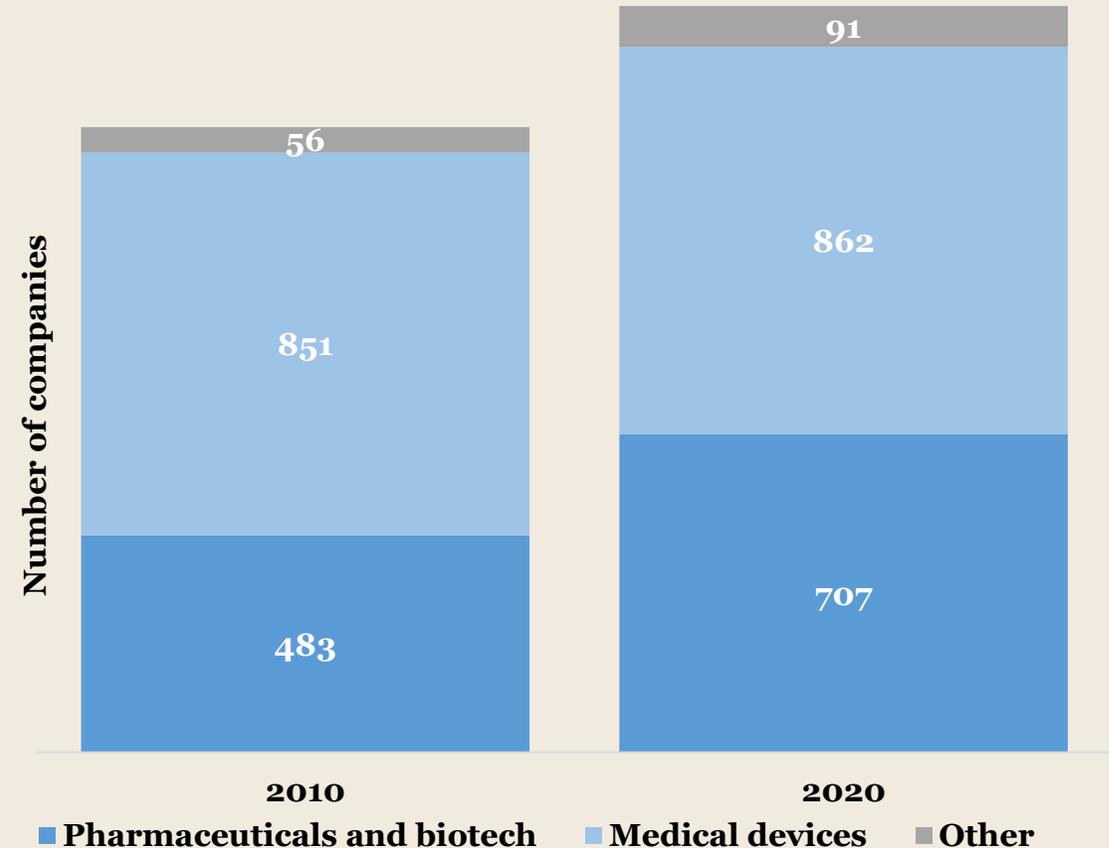


The companies

In 2020, there were a total of 1,660 companies in the life science industry in Denmark. This is an increase of over 270 companies since 2010, with 72 new companies arriving onto the scene between 2018 and 2020 alone.

The increase since 2010 has primarily occurred within the pharmaceutical and biotech sectors (approximately 46 per cent), while the number of medical device companies has remained stable during this period.

Number of companies within life science in Denmark, 2020

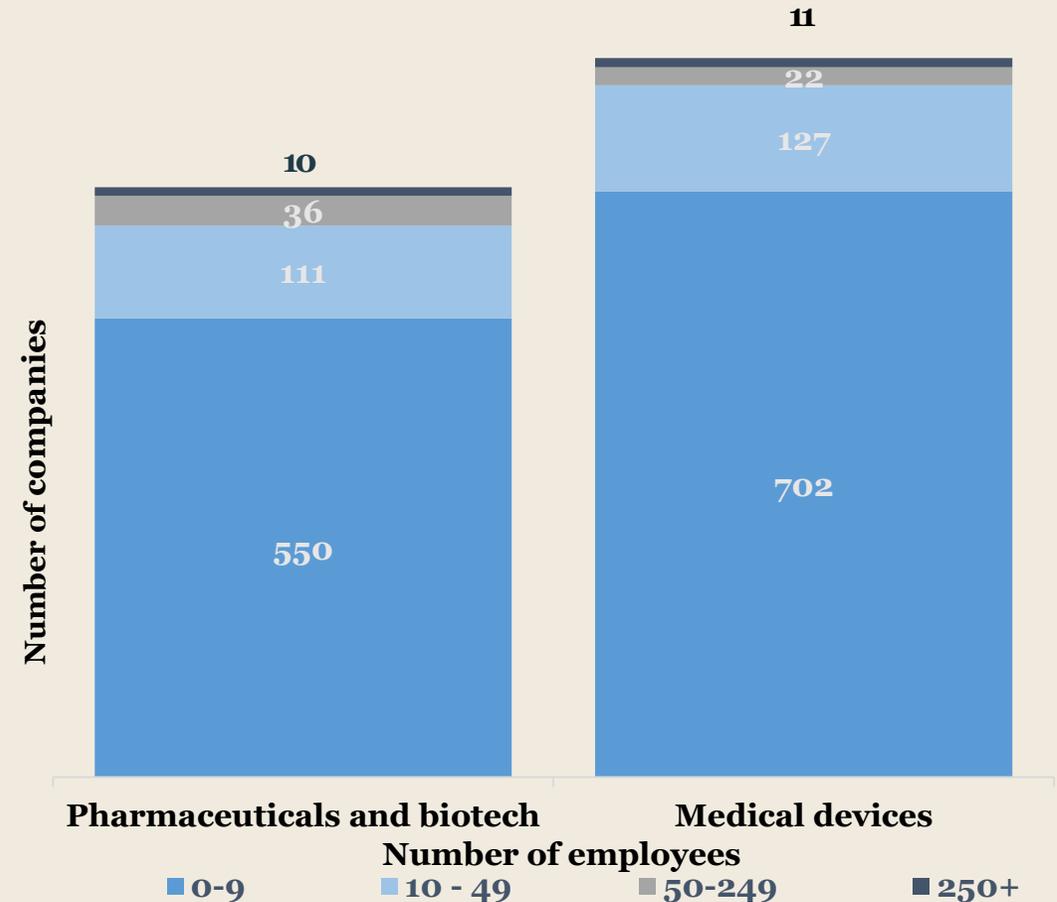


The companies

There are more companies in the medical device industry than in the pharmaceutical and biotech industry. In both sectors, the majority of companies are micro-companies with 9 or fewer employees. Both industries had approximately 10 companies in Denmark with over 250 employees in 2020. This includes large companies such as Novo Nordisk, Lundbeck and Coloplast.

Despite the fact that pharmaceutical and biotech have the fewest number of companies, the industry's full-time equivalents totalled **33,964** in 2020, which represented 67 per cent of total man-years in the life science industry.

Number of life science companies, distributed across number of employees, 2020

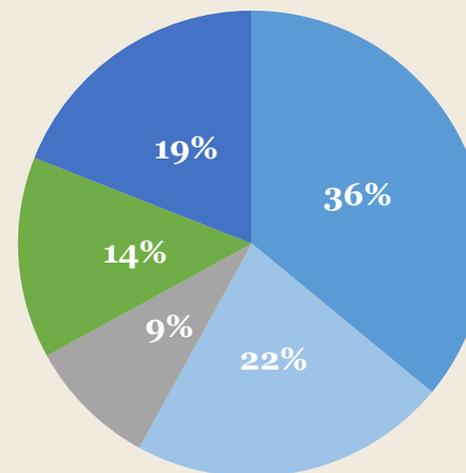


The companies

Approximately six out of ten life science companies are located in the Capital Region, a significantly greater proportion than the private business sector in general, where just over 36 per cent of companies are located in the metropolitan area.

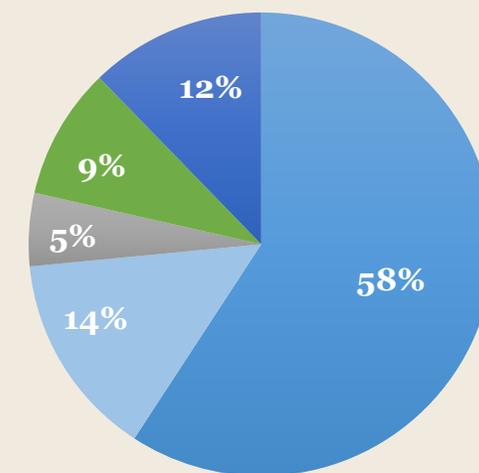
Pharmaceutical and biotech companies are particularly likely to be located in the Capital Region (around 70 per cent), while approximately 48 per cent of medical device companies are located in the Capital Region with a further 20 per cent found in the Central Denmark Region.

Regional distribution, 2020, companies in the private business sector, per cent



- Capital Region
- North Denmark
- Southern Denmark
- Central Denmark
- Zealand

Regional distribution, 2020, life science, per cent

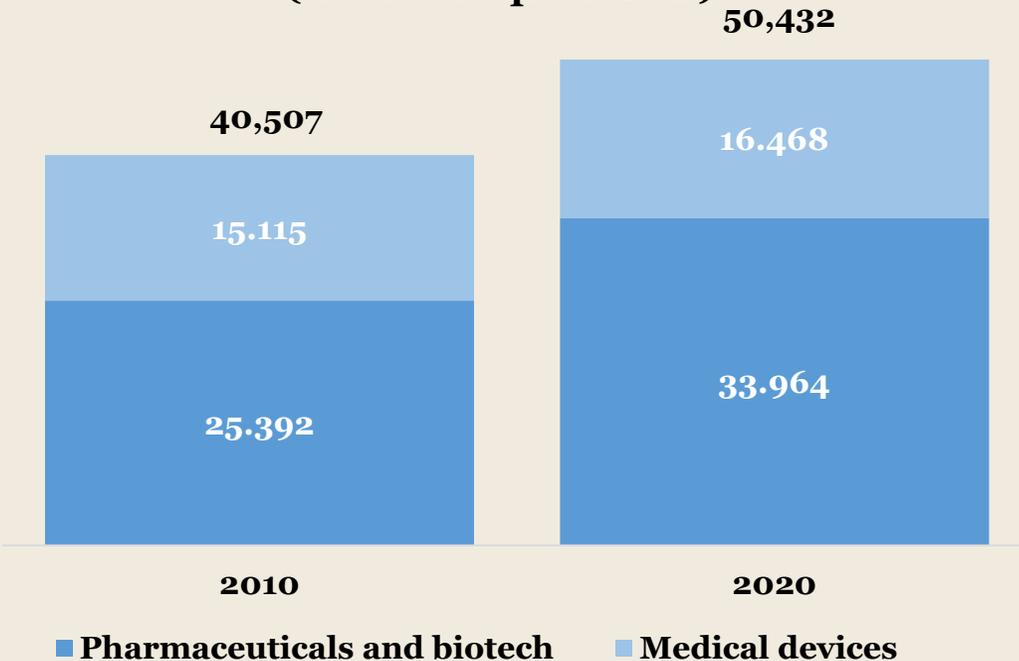


- Capital Region
- North Denmark
- Southern Denmark
- Central Denmark
- Zealand

Employment in the Danish life science industry

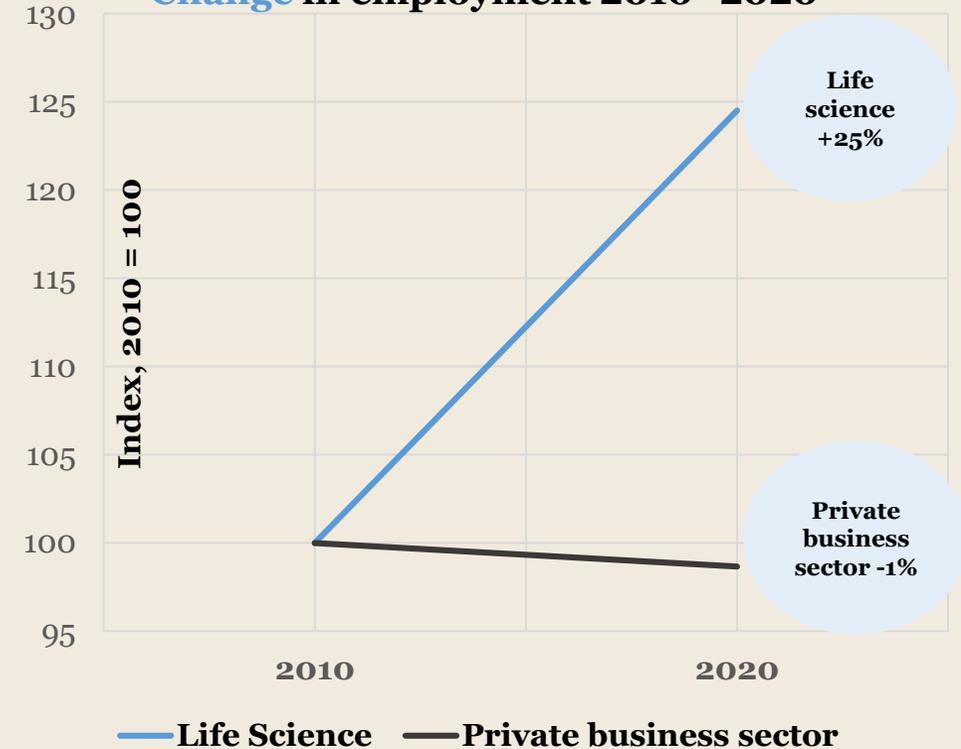
The life science industry was responsible for 50,432 man-years in 2020. This corresponds to 3.9 per cent of the total number of full-time equivalents in the entire Danish economy, which amounts to almost 1.3 million man-years in 2020.

Number of employees from 2010–2020 (full-time equivalents)



Employment in the life science industry has grown by 25 per cent between 2010 and 2020. In comparison, employment in the private business sector fell by 1 per cent during this period.

Change in employment 2010–2020



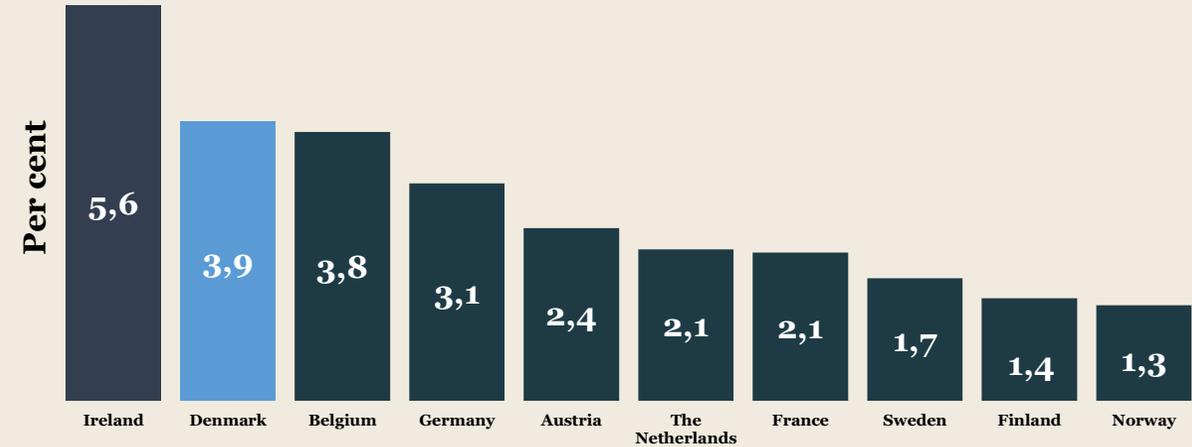
Source: Ministry of Industry, Business and Financial Affairs 2023 based on Statistics Denmark
 Note: Employment is calculated based on the number of full-time equivalents, i.e. the number of full-time employees.
 The private business sector is defined as the private business sector excluding agriculture, forestry and fishing, raw material extraction and financing and insurance.

Employment in the life science industry in Europe

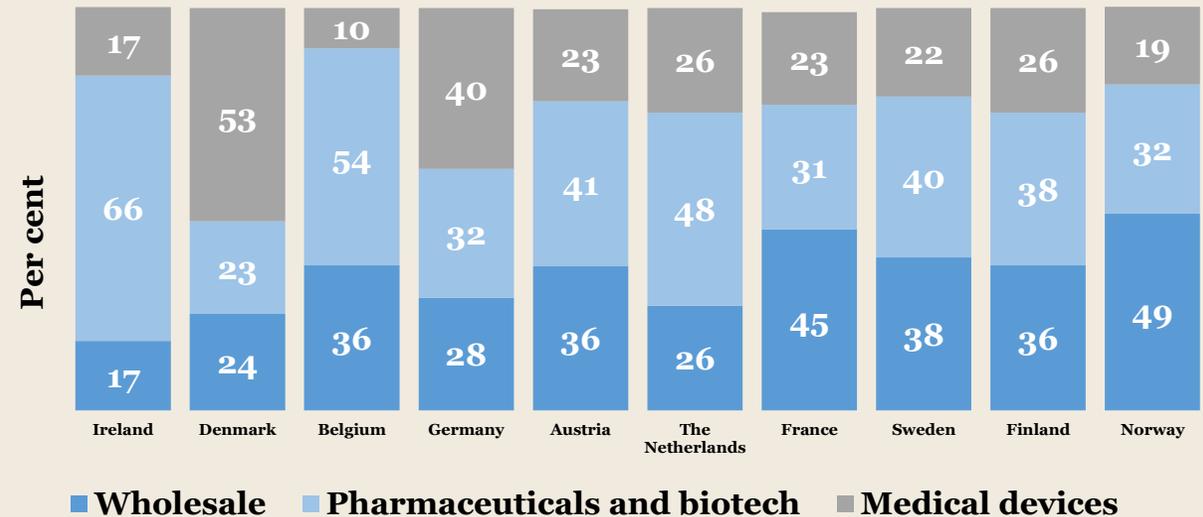
In 2020, the number of employees in the life science industry was 3.9 per cent of total employment in Denmark. Denmark employs a relatively large proportion in the life science industry compared with neighbouring countries.

Only Ireland has a higher employment rate than that in Denmark. Ireland employs a particularly large proportion of people in the medical device industry compared with the other countries, including many in the manufacturing of medical devices and dental instruments and associated equipment. Denmark as a country employs the largest share in pharmaceuticals and biotech.

Employment in the life science industry in selected European countries as a proportion of national employment, 2020



Distribution of employees across sectors, 2020



Source: Ministry of Industry, Business and Financial Affairs 2023 based on Eurostat and Statistics Denmark.
 Note: Employment is calculated in the number of man-years. Eurostat has not calculated the number of man-years for EU28, which is why it has not been included. There are few observations for the UK, which is why it is also not included. The pharmaceutical and biotech employment for Ireland is also higher than indicated in the figure above, as the employment figures for the research and experimental development in biotechnology industry are not indicated for Ireland by Eurostat.

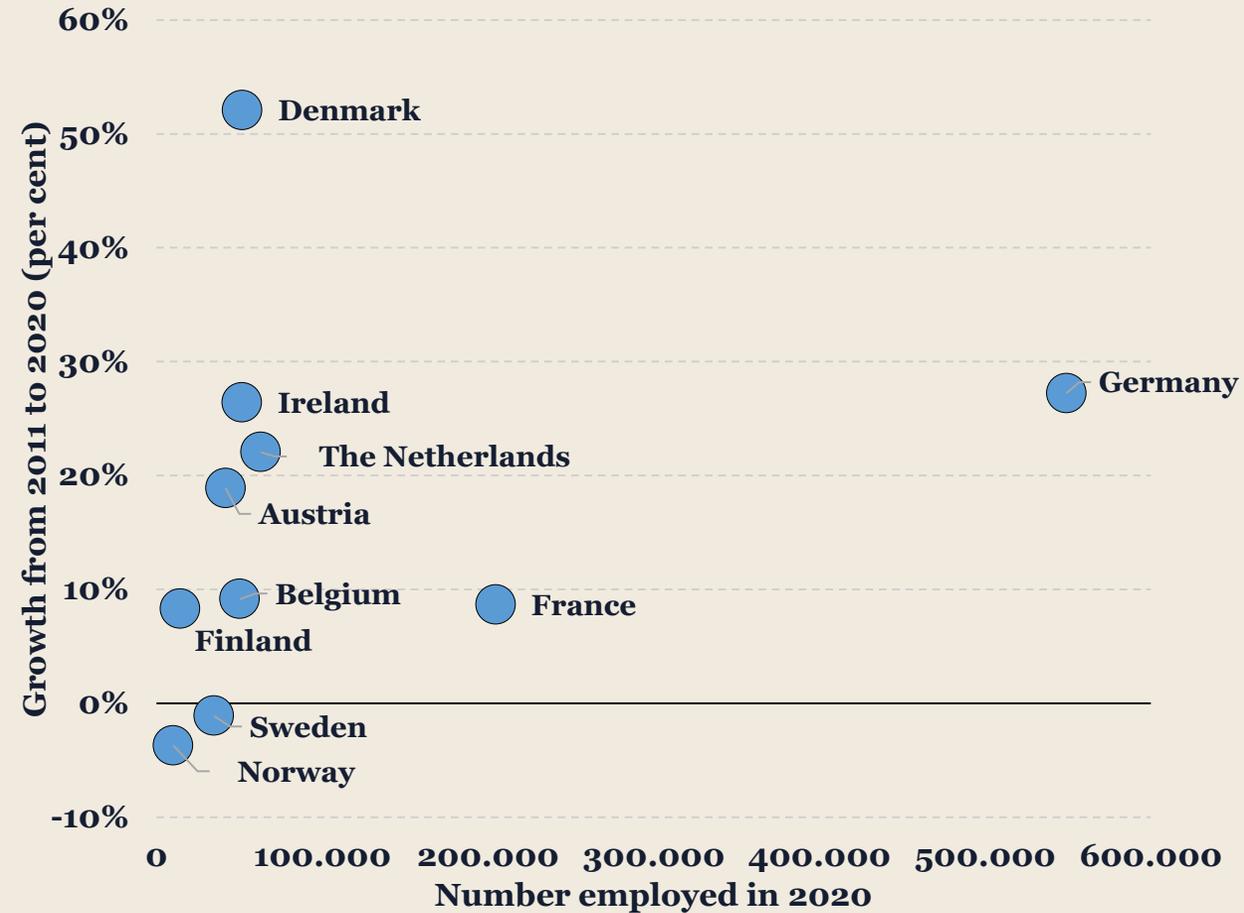
Employment in the life science industry in Europe

The figure shows the number of people employed in selected EU countries in 2020 compared with the growth in employment from 2011 to 2020.

With a growth of 52 per cent since 2011, Denmark had by far the largest growth in employment during this period, while the number of employees is roughly in line with several European countries.

Germany and France stand out with significantly more people employed in the life science industry than the other European countries included in the survey. Sweden and Norway are the only countries to have experienced a decline in employment during this period.

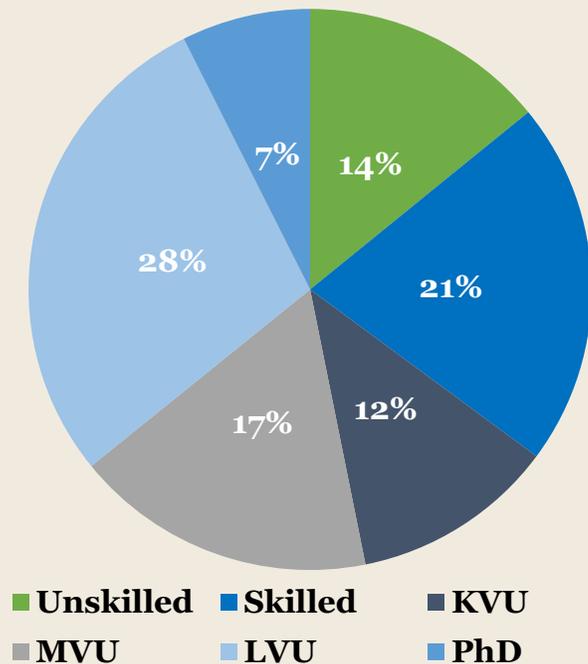
Number of employees in the life science industry and growth in this from 2011–2020, selected countries



Employees in the life science industry in 2020

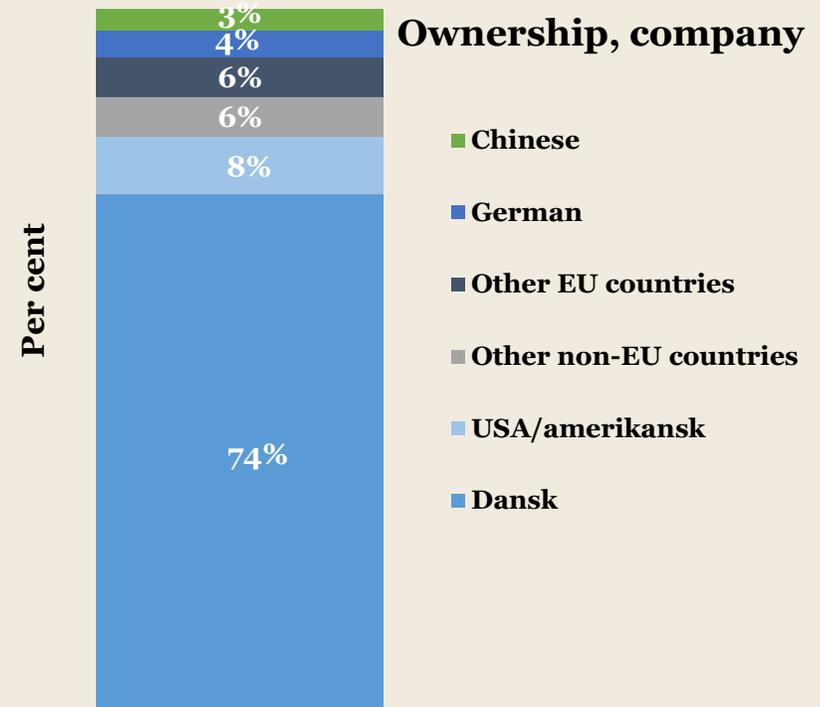
Around 20,000 employees – 35 per cent – in the Danish life science industry are either skilled or unskilled, and around 28 per cent have completed a higher education programme.

Educational representation, per cent



Almost three out of four employees in the Danish life science industry are employed by Danish-owned companies.

Proportion of company employees distributed according to ownership, 2020



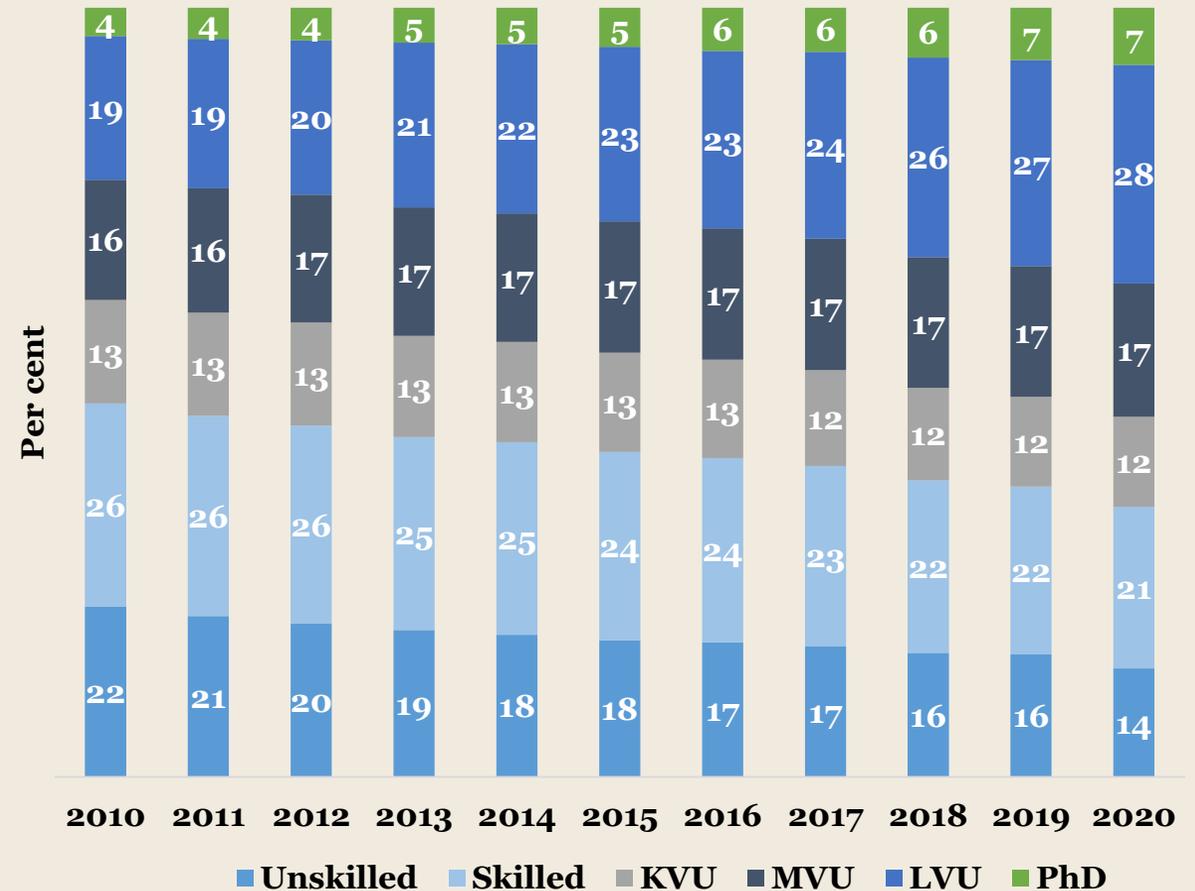
Source: Ministry of Industry, Business and Financial Affairs 2023 based on Statistics Denmark
 Note: Employment is calculated based on the number of man-years, i.e. the number of full-time employees.
 KVVU indicates a short higher education programme. MVU indicates a medium-length higher education programme. LVU indicates a higher education at university level.
 Data in the left-hand chart cannot be compared with previous publications, or with data in the rest of the analysis. This is due to an alternative delimitation method.

More university graduates in the life science industry

Employees in the life science industry have been in education for longer than those in the rest of the Danish business sector. In the life science industry, 35 per cent of employees in 2020 have undertaken a higher education at university level or a PhD.

Between 2010 and 2020, the proportion of skilled and unskilled workers fell in both the life science industry and the Danish business sector. The proportion of skilled and unskilled workers in life science fell by 27 per cent, compared with 8 per cent in the Danish business sector in general.

Educational distribution of employees in the life science industry, 2010–2020, per cent



Source: Ministry of Industry, Business and Financial Affairs 2023 based on Statistics Denmark

Note: KVV indicates a short higher education programme. MVU indicates a medium-length higher education programme. LVU indicates a higher education at university level. The Danish business sector covers companies in the private business sector excluding agriculture, raw material extraction and the financial sector, i.e. all companies in the industries C–N excluding K.

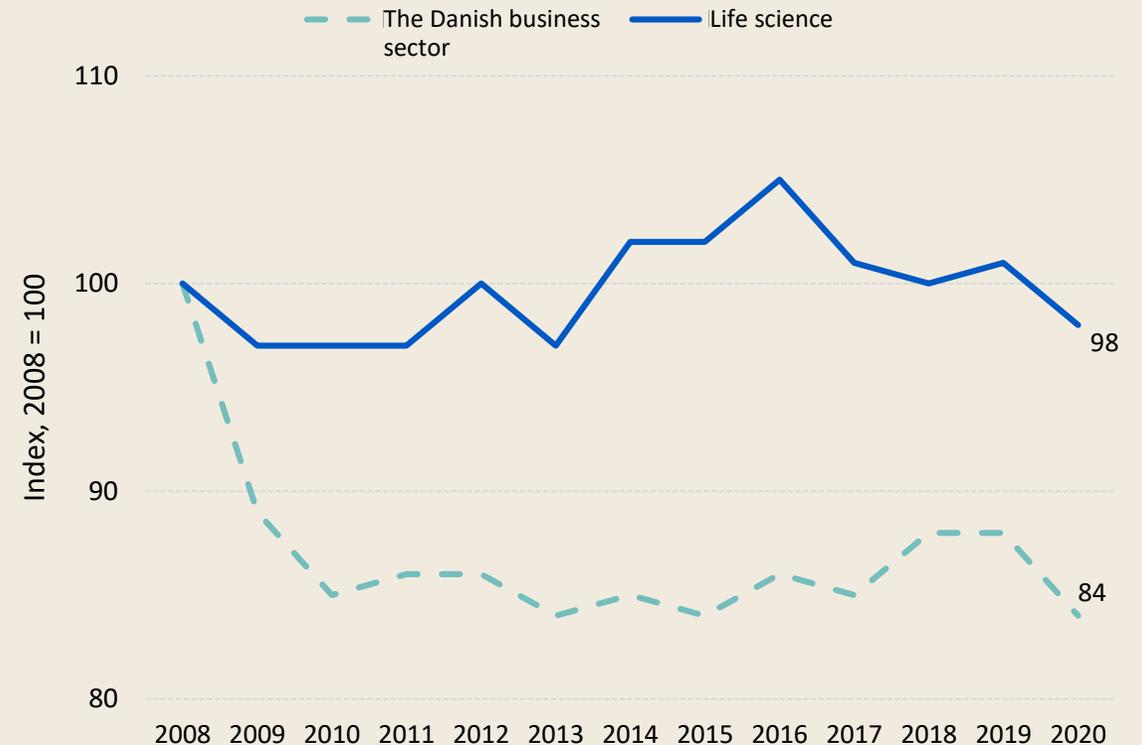
Data in the figure cannot be compared with previous publications, or with data in the rest of the analysis. This is due to an alternative delimitation method.

The number of skilled workers in the life science industry remains stable

Despite the fact that there are fewer skilled workers in the life science industry proportionally in 2020 compared with 2008, the number of skilled workers has remained stable. In 2020, around 11,000 skilled workers were employed in the life science industry, which is roughly the same as in 2008. For context, the number of skilled workers in the business sector in general fell by 16 percentage points during the same period, corresponding to about 70,000 skilled workers.

This result indicates that the life science industry continues to be a driving force for Danish production jobs.

Development in the number of skilled workers from 2008 to 2020

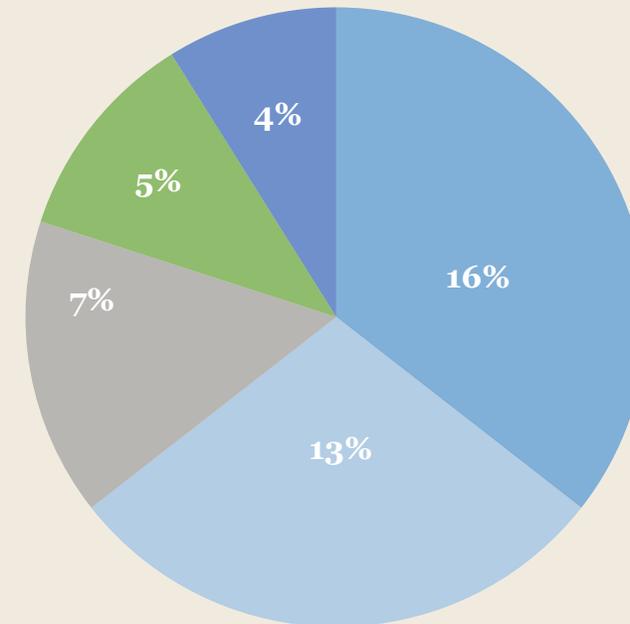


Skilled workers in the life science industry have both technical and administrative training

A large proportion of skilled workers in the life science industry have a background in office or retail training. A wide range of technical education programmes are also represented, such as electricians, machinists, industrial operators and so on.

Skilled workers in the life science industry are thus a varied group with both technical and administrative backgrounds.

Top 5 educational programmes among skilled workers in the life science industry, 2020



- Office training, general and with specialisation
- Retail training
- Industrial operator
- Electrician
- Industrial engineer training

Financial key figures

This section covers the Danish life science industry's merchandise exports, turnover, productivity, tax payments, and so on.

For example, did you know that Danish life science contributed DKK 27 billion in tax payments in 2020? This amount has more than doubled since 2008.

The final section in this chapter deals with investment income and investments. Read more about the methodology for these calculations in the section on definitions at the end of the report.



Turnover

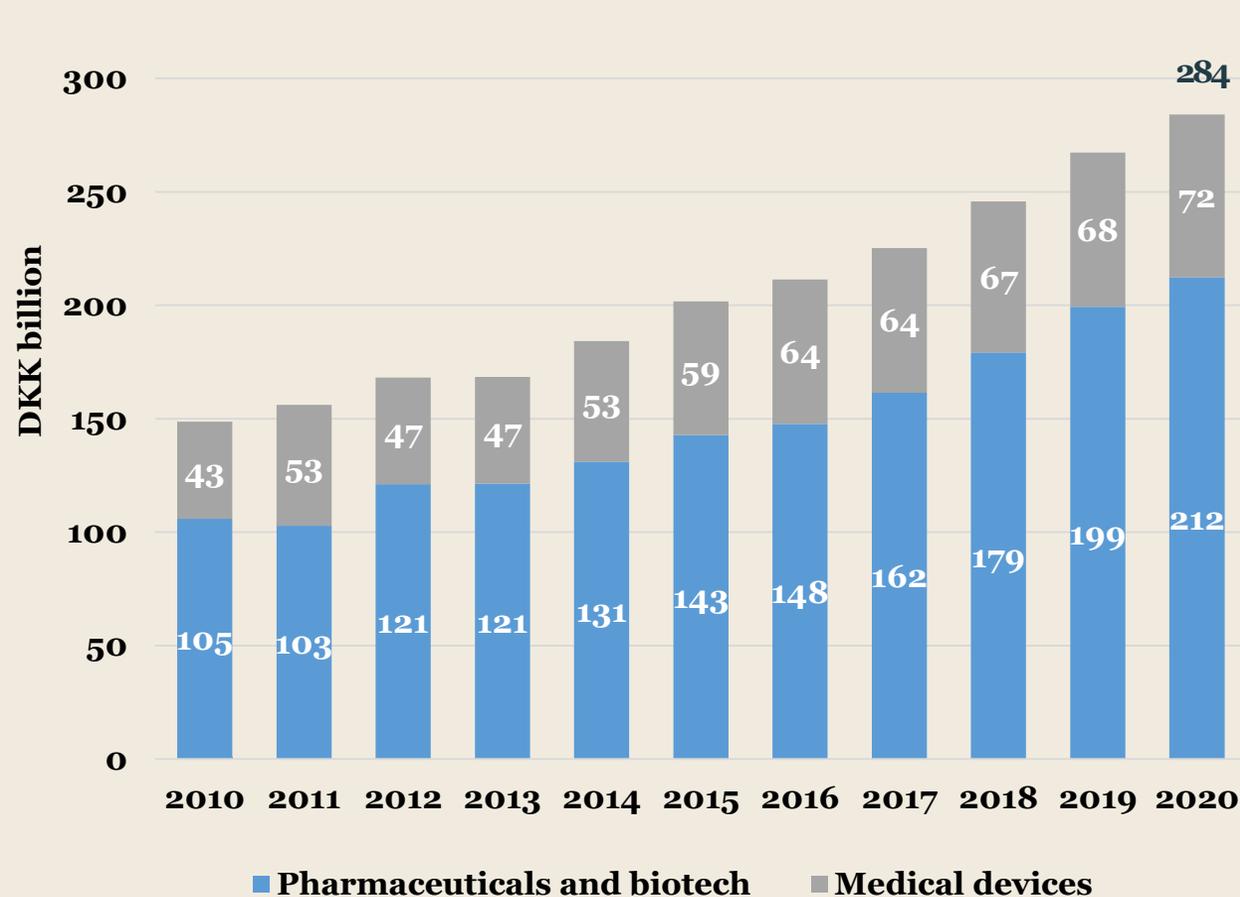
Turnover indicates the industry's total income from sales of goods and services as well as return on investments.

In 2020, the life science industry's turnover was DKK 284 billion, of which pharmaceutical and biotech companies accounted for DKK 212 billion. This means that turnover in life science in Denmark now amounts to just under 6.8 per cent of turnover in the entire Danish economy.

In the period 2010 to 2020, the life science industry's turnover grew by an average of 8.4 per cent. For comparison, the average annual growth in the private business sector as a whole was 2.6 per cent during the same period.

The high growth rates are particularly driven by the turnover within pharmaceuticals and biotech, which has more than doubled during this period.

Turnover in the Danish life science industry, DKK billion, 2010–2020

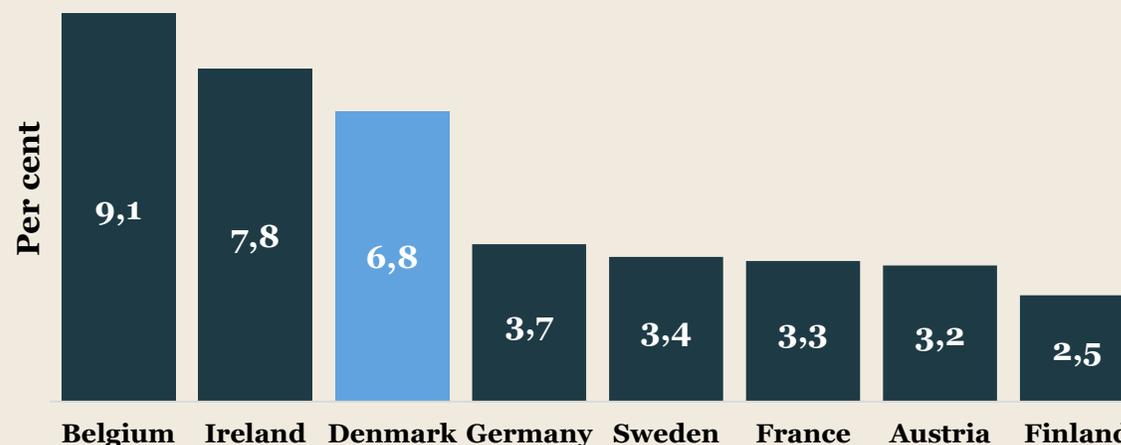


Turnover in the life science industry in Europe

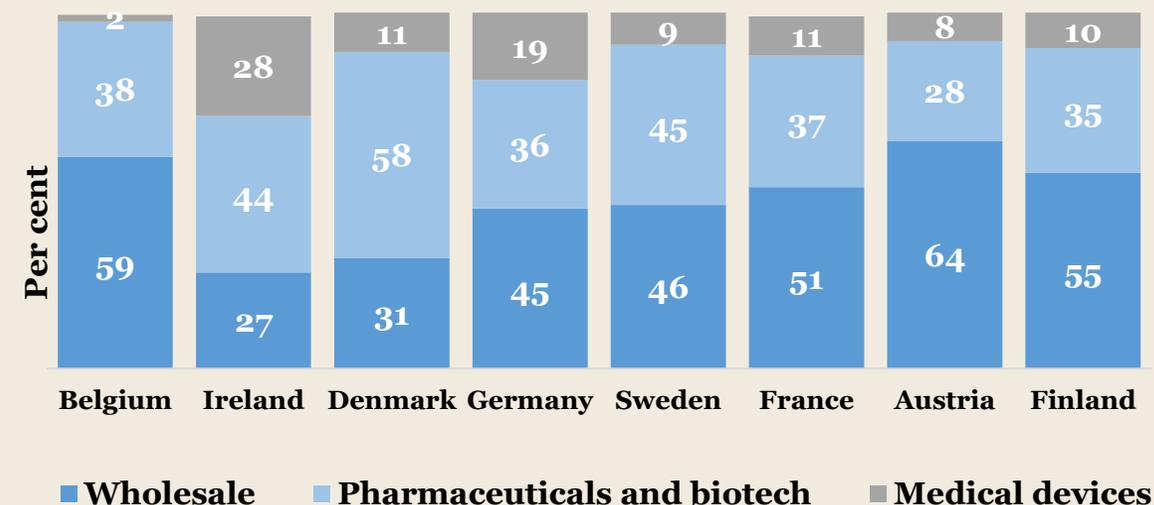
In 2020, the turnover in the life science industry was just over 6.8 per cent of the total turnover in Denmark. This share of turnover in Denmark is only surpassed by Belgium and Ireland. In Belgium, life science turnover was approximately 9.1 per cent of the total company turnover in 2020.

The Irish turnover of 7.8 per cent in 2020 stands out in particular as being driven by the turnover in the manufacture of both medical devices as well as pharmaceuticals and biotechnological preparations, whereas, for example, Belgium's turnover in life science is largely driven by wholesale trading in life science products. The Danish turnover stems mainly from pharmaceuticals and biotech.

Turnover in the life science industry in selected European countries as a proportion of total turnover, 2020



Distribution of turnover by sector, 2020



Turnover in the life science industry in Europe

The figure shows the turnover in the life science industry in selected EU countries in 2020 compared with the growth in turnover from 2011 to 2020.

It is clear that Denmark, with a growth of 103 per cent since 2011, and Belgium, are among the countries that have experienced the largest growth in turnover during the period.

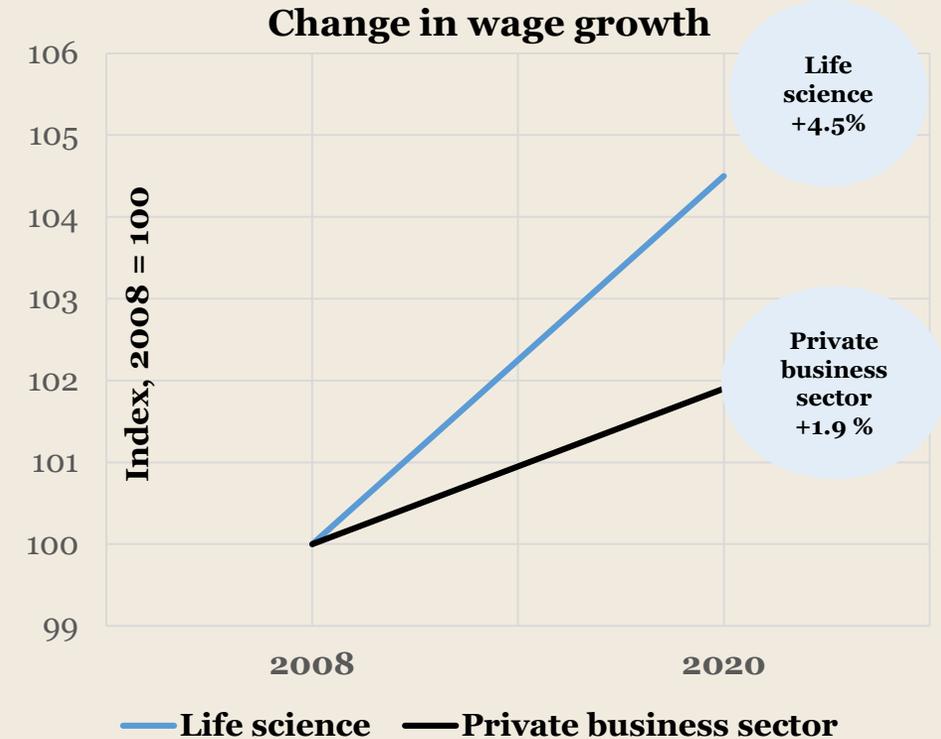
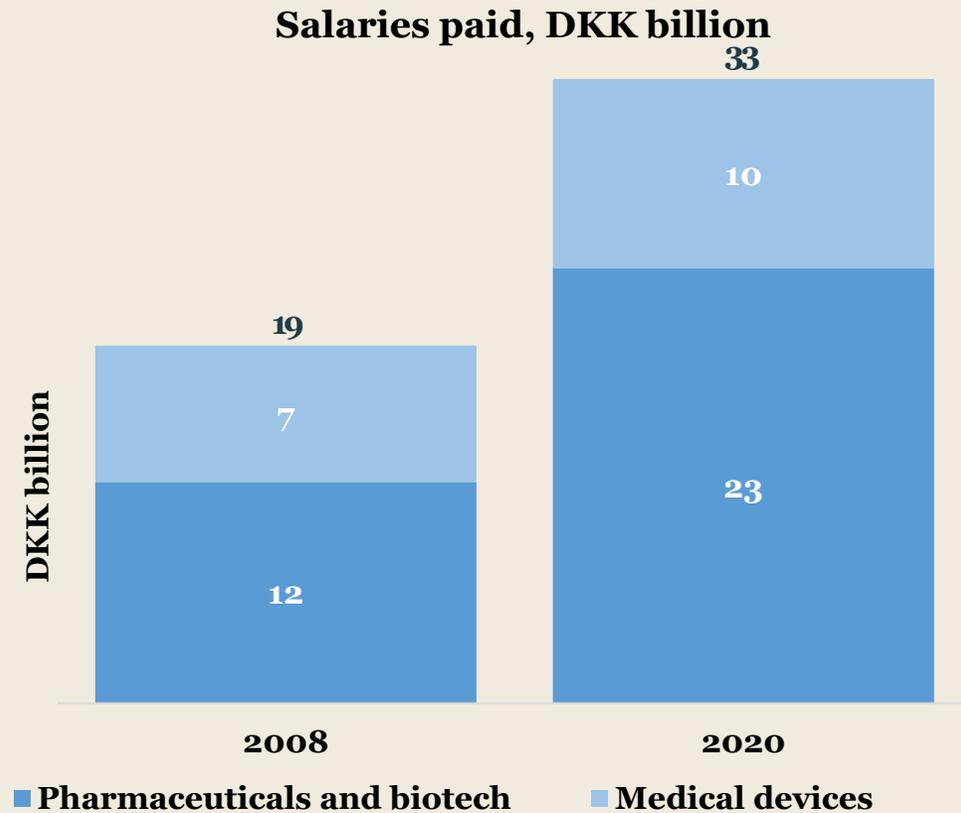
At the same time, Belgium is the country in which this turnover makes up the largest share of the overall turnover in 2020.

Share of national turnover from the life science industry and growth from 2011 to 2020, selected countries



Salaries

In 2020, the life science industry paid salaries worth DKK 33 billion.



The average annual wage growth in the life science industry was 4.5 per cent between 2008 and 2020. That is more than twice as high as the growth in private sector wages.

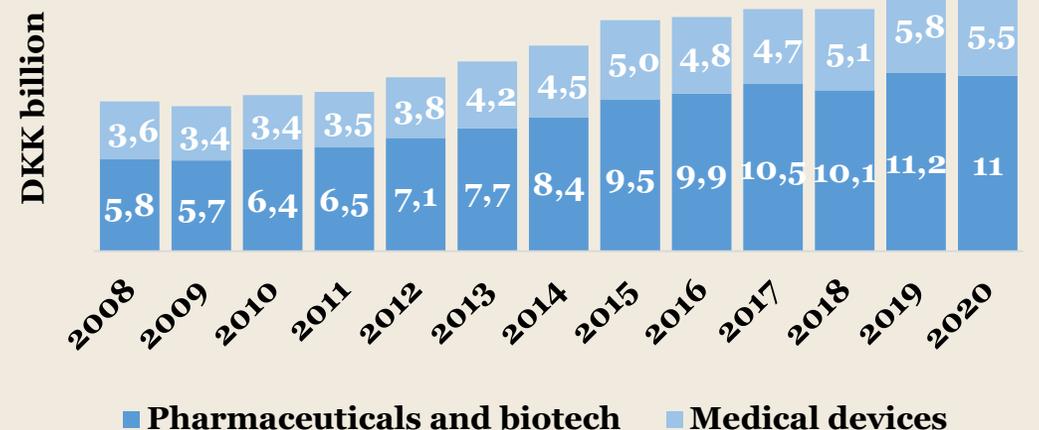
Tax payments

The life science industry contributed DKK 27 billion in 2020 to public finances in the form of corporation taxes and personal taxes. Of this DKK 27 billion, DKK 16.5 billion stems from the personal taxes of life science company employees, i.e. income tax and labour market contributions. The remaining DKK 10.5 billion derives from the life science companies' corporation tax payments.

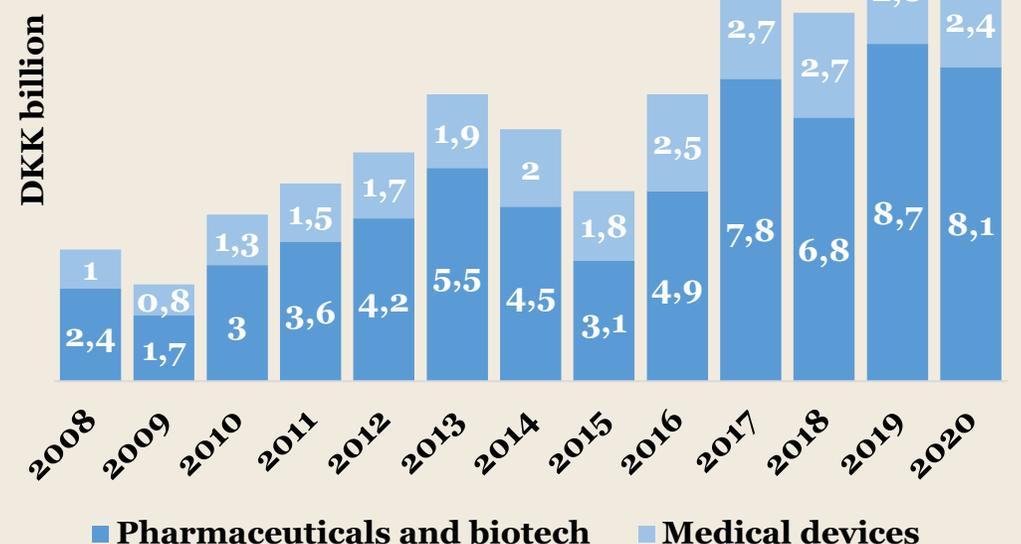
The tax revenue from companies and employees in the life science industry has more than doubled since 2008.

One of the key reasons for the decrease in corporation tax between 2019 and 2020 is a decrease in the number of companies with a positive taxable income. According to Statistics Denmark, this is mainly due to the fact that the taxable income of a few large companies was lower than expected. A secondary reason is poorer financial performance due to COVID-19.

Personal tax in the life science industry, 2008–2020



Corporation tax in the life science industry, DKK billion, 2008–2020



Source: Ministry of Industry, Business and Financial Affairs 2023 based on Statistics Denmark
 Note: Personal tax is defined as state tax (bottom-bracket tax and top-bracket tax), municipal tax, health contribution and labour market contribution, i.e. income tax plus labour market contribution.

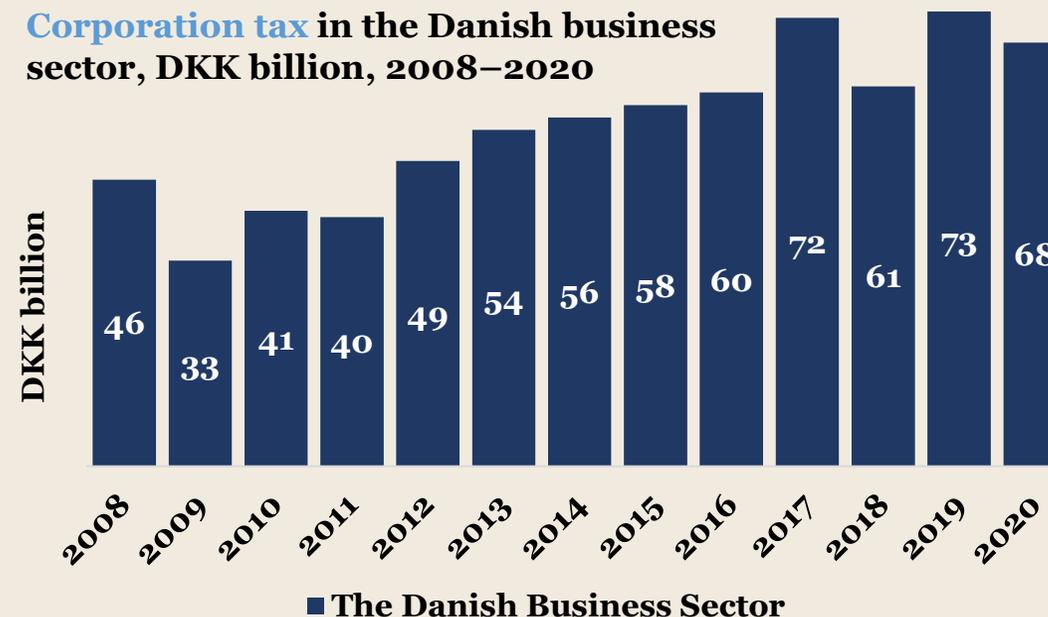
Tax payments

Corporation tax payments in Denmark in 2020 totalled approximately DKK 68 billion, a decrease of approximately DKK 5 billion compared with 2019.

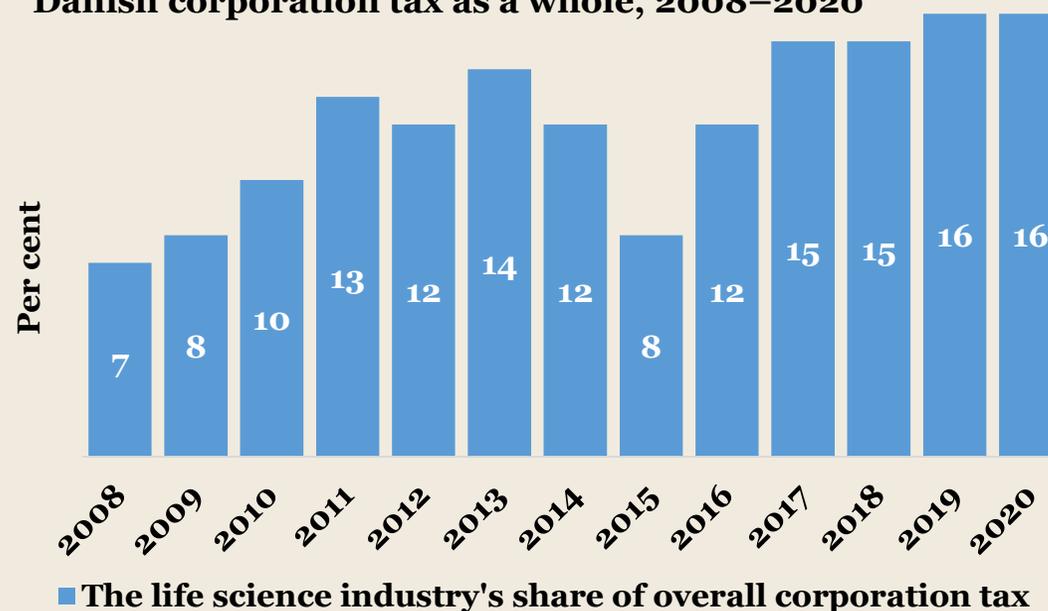
The life science industry's contribution to overall corporation tax payments rose substantially from 7 per cent in 2008 to 16 per cent in 2020. This substantial increase is due to an increasing trend in corporation tax paid by life science companies during this period compared with Danish trade and industry in general.

Essentially, this increase is attributable to increasing turnover and profits for Danish life science companies, which typically contribute more to the state treasury than the average Danish company.

Corporation tax in the Danish business sector, DKK billion, 2008–2020



Corporation tax for life science as a proportion of Danish corporation tax as a whole, 2008–2020

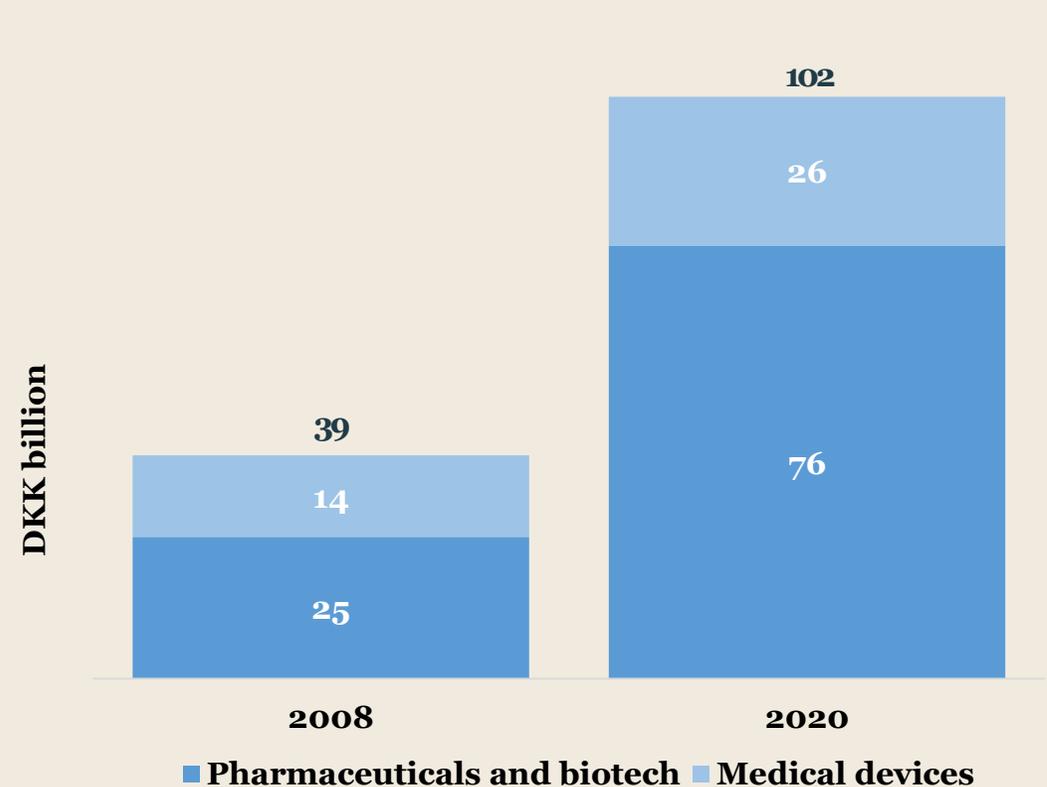


Value added

Value added is a company's turnover less its consumption.

In 2008, the life science companies created value worth approximately DKK 40 billion. In 2020, this figure had risen to almost DKK 102 billion, meaning that they more than doubled value added during the period 2008–2020. The life science industry has experienced an average annual growth rate in value added of 12.5 per cent, more than four times as high as the figure for the private business sector, which is 2.7 per cent. This growth can mainly be attributed to the large pharmaceutical companies.

Value added in Danish life science, 2008–2020

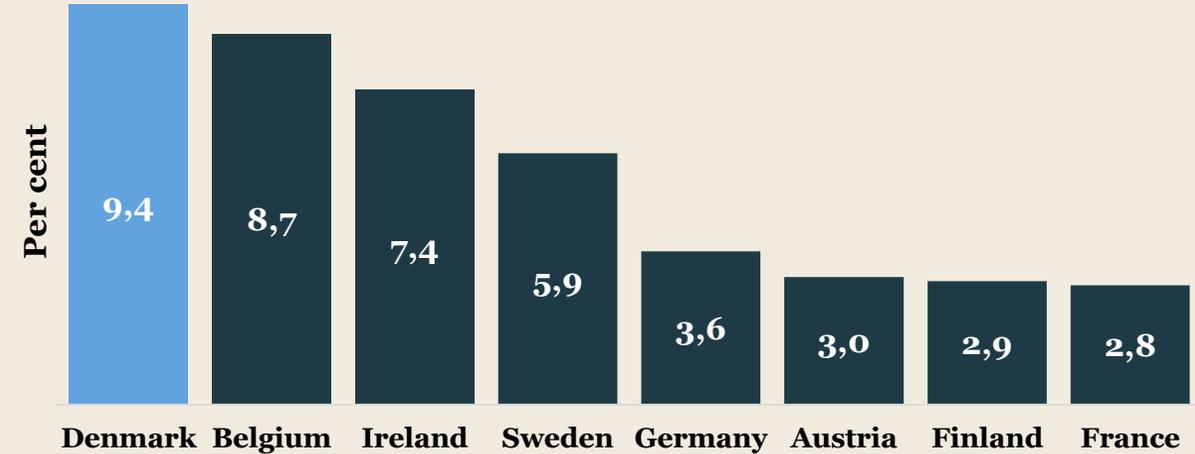


The value added in the life science industry in Europe

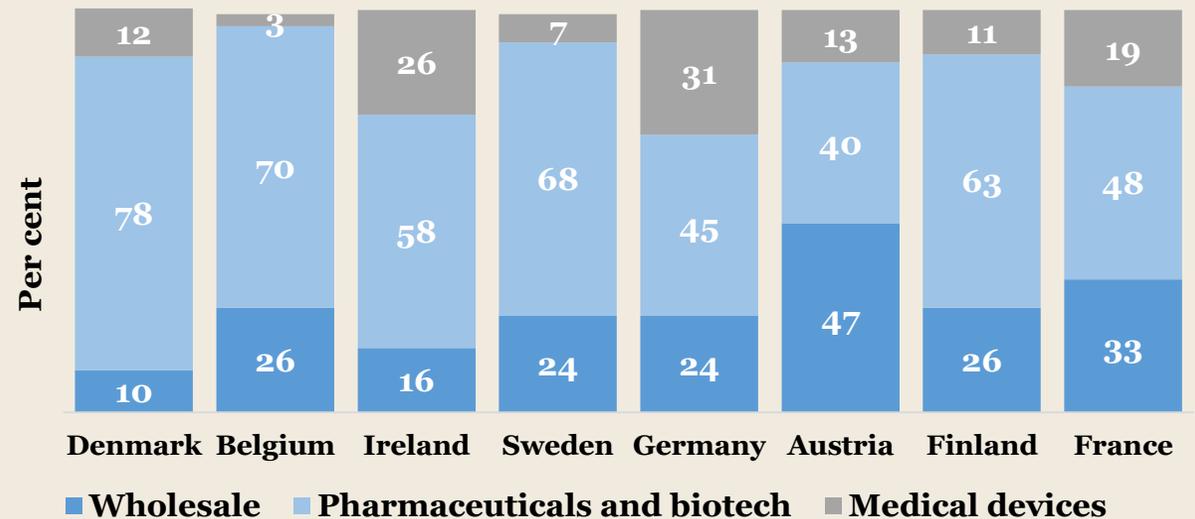
Denmark and Belgium are the two countries where value added from the life science industry adds the most to the economy.

In Denmark, Belgium, Sweden and Finland the value added from pharmaceuticals and biotech is particularly significant. In Germany and Ireland, the value added from the medical device industry is also a significant factor.

Value added in the life science industry in selected European countries as a proportion of national value added, 2020



Distribution of value added by sector, 2020

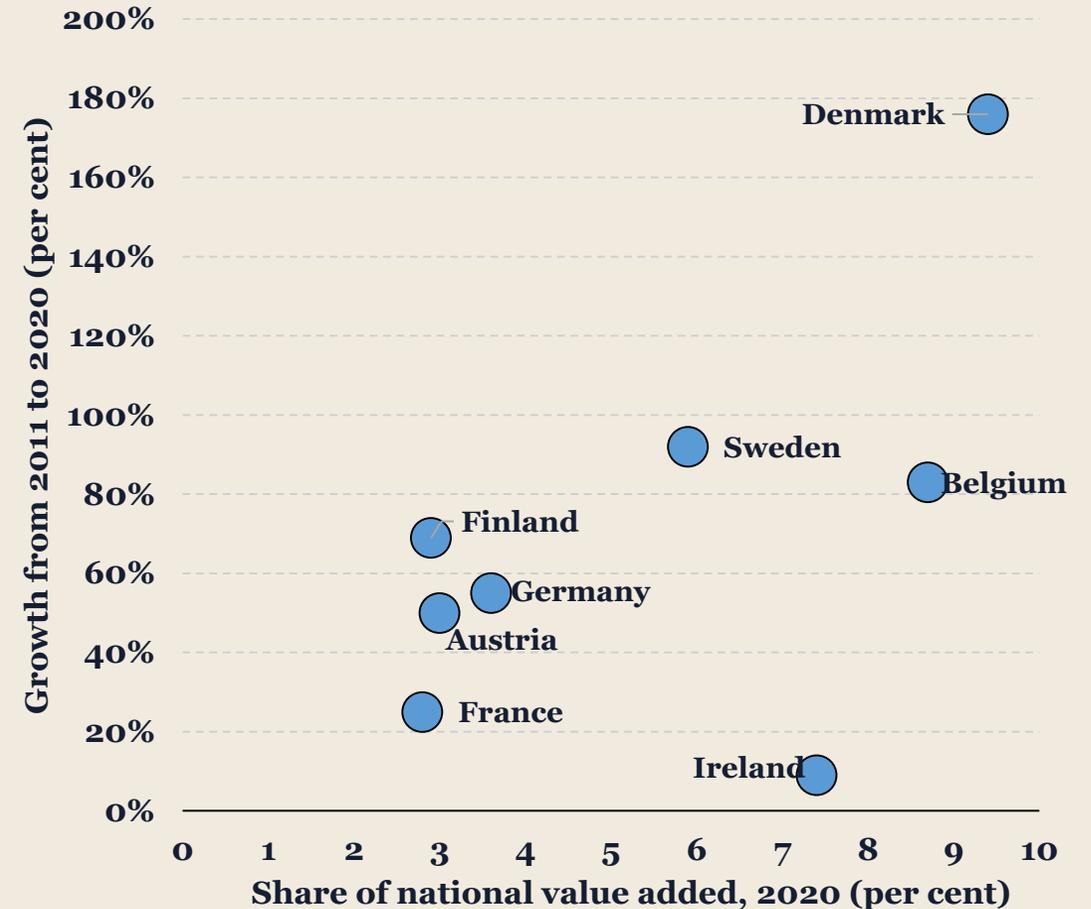


The value added in the life science industry in Europe

The figure shows the value added in the life science industry in selected EU countries in 2020 compared with the development in value added from 2011 to 2020.

Here it becomes clear that the value added from the life science industry has a significant impact on Denmark, Ireland and Belgium, but that Denmark is the country that has experienced the largest growth by far.

Share of national value added from the life science industry and growth from 2011 to 2020, selected countries



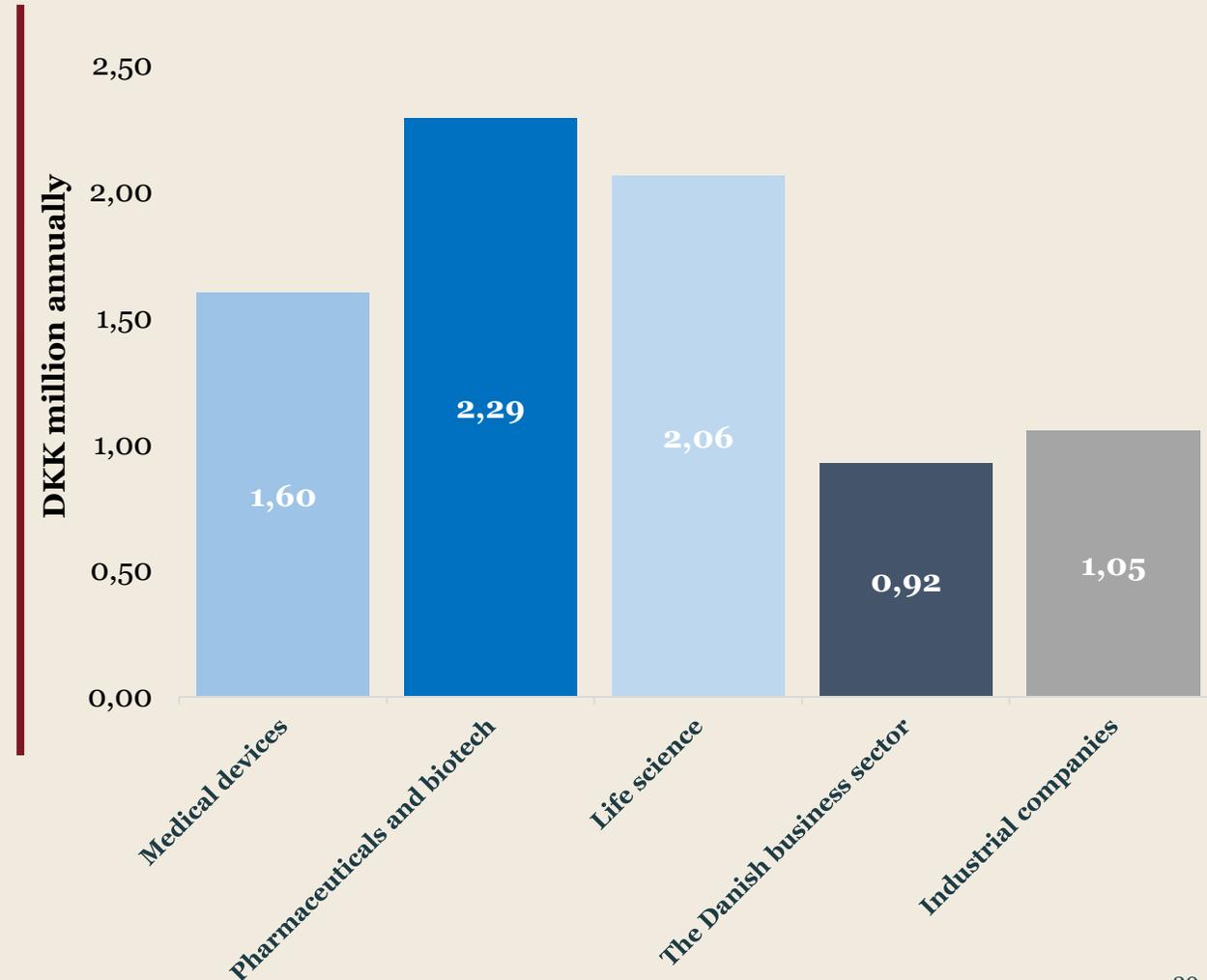
Productivity

Productivity is a measure of the ability of companies or industry to create value in relation to the inputs involved in production.

Productivity can be calculated in different ways. In this analysis, we measure it as value added in relation to labour input measured as the number of full-time equivalents, i.e. value added per full-time equivalent. So if the productivity of the life science industry is DKK 2.06 million, this means that each employee in the industry creates annual value of DKK 2.06 million.

The life science industry is thus a highly productive industry with higher productivity than in the rest of the Danish business sector and the combined industrial companies, which have a productivity of DKK 0.92 and 1.05 million respectively.

Productivity in the life science industry in Denmark, DKK million, 2020



Productivity in life science has grown significantly

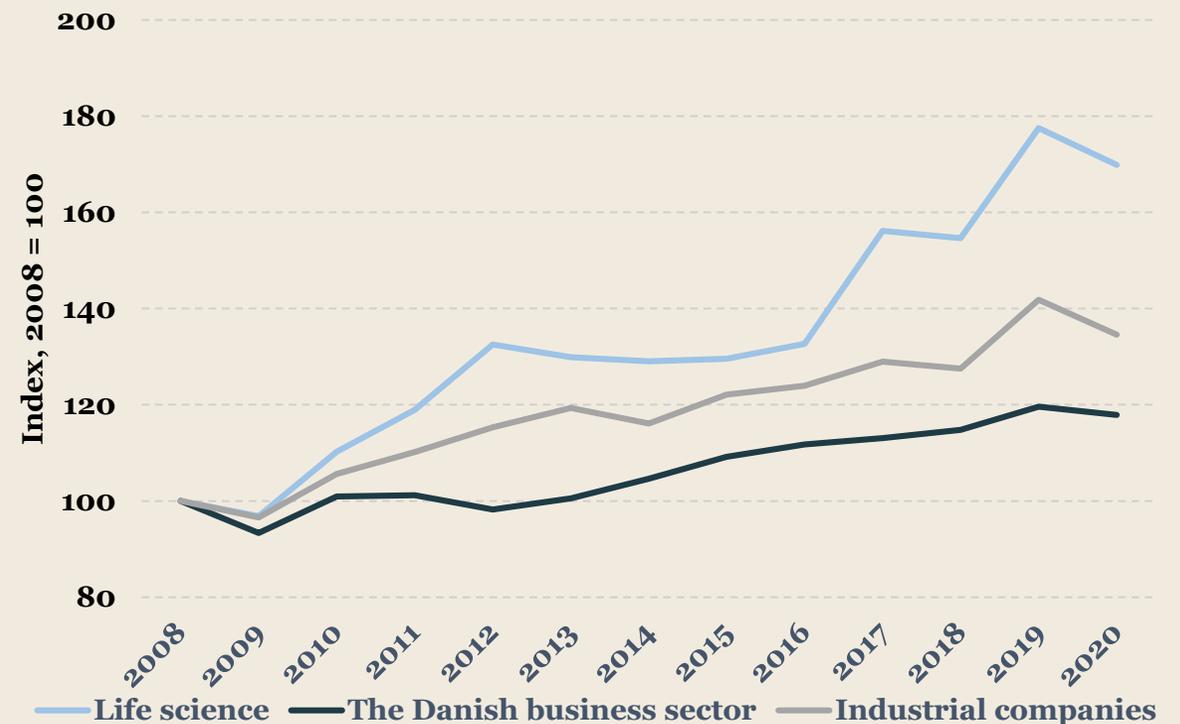
The figure shows the development in productivity at fixed prices for the life science industry, the industrial companies and the Danish business sector.

The development in fixed prices shows the real development when general price development within the sector is disregarded.

Productivity in the life science industry has grown significantly in the period 2008–2020 compared with industrial companies and the Danish business sector in general.

Disregarding price developments, productivity in the life science industry has thus grown by 70 per cent in the period 2008–2020. In the same period, productivity in the Danish business sector grew by 18 per cent.

Productivity growth 2008–2020, fixed prices



Productivity in selected countries

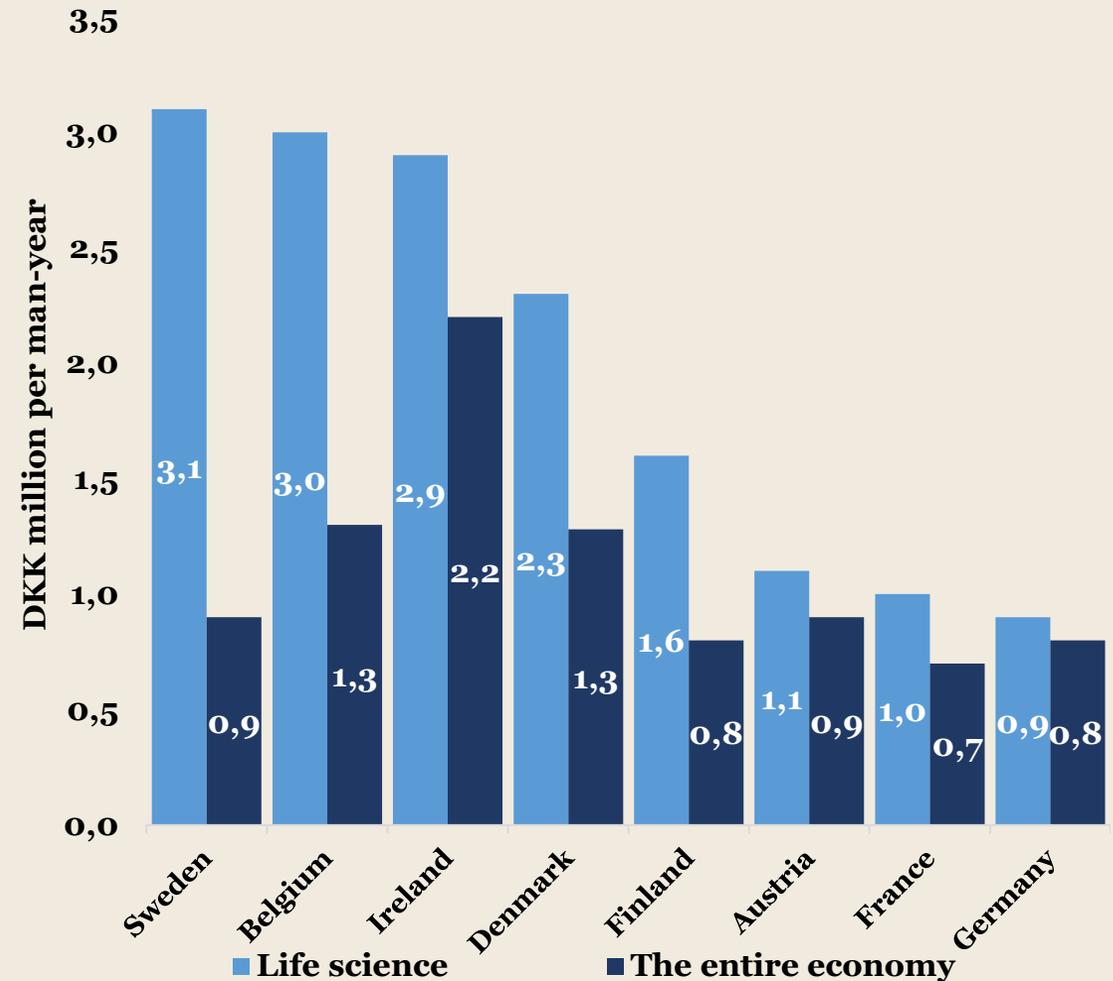
The figure shows the productivity of the life science industry compared to the productivity of the overall economy in 2020.

Across the various countries, the life science industry generally experiences a high level of productivity compared to the productivity of the rest of the economy.

The life science industry in Denmark is relatively productive compared to the other EU countries. However, Sweden's life science industry is the most productive at DKK 3.1 million per full-time equivalent.

The productivity figures, like the other figures in the international comparison, are not directly comparable with the productivity figures that appear at the beginning of the publication. This is because the European industry definition is not as precise as the one that can be applied to Danish data.

Productivity in life science and the economy as a whole, 2020



Source: Ministry of Industry, Business and Financial Affairs 2023 based on Statistics Denmark

Note: Productivity in life science is established by dividing the total value added in life science by the total number of man-years employed in life science. The total level of productivity is also calculated by dividing the total value added of the economy by its total number of man-years.

There is a lot of missing information in NL, NO, UK and EU27 for productivity, which is why these countries are omitted.

Productivity in the life science industry in Europe

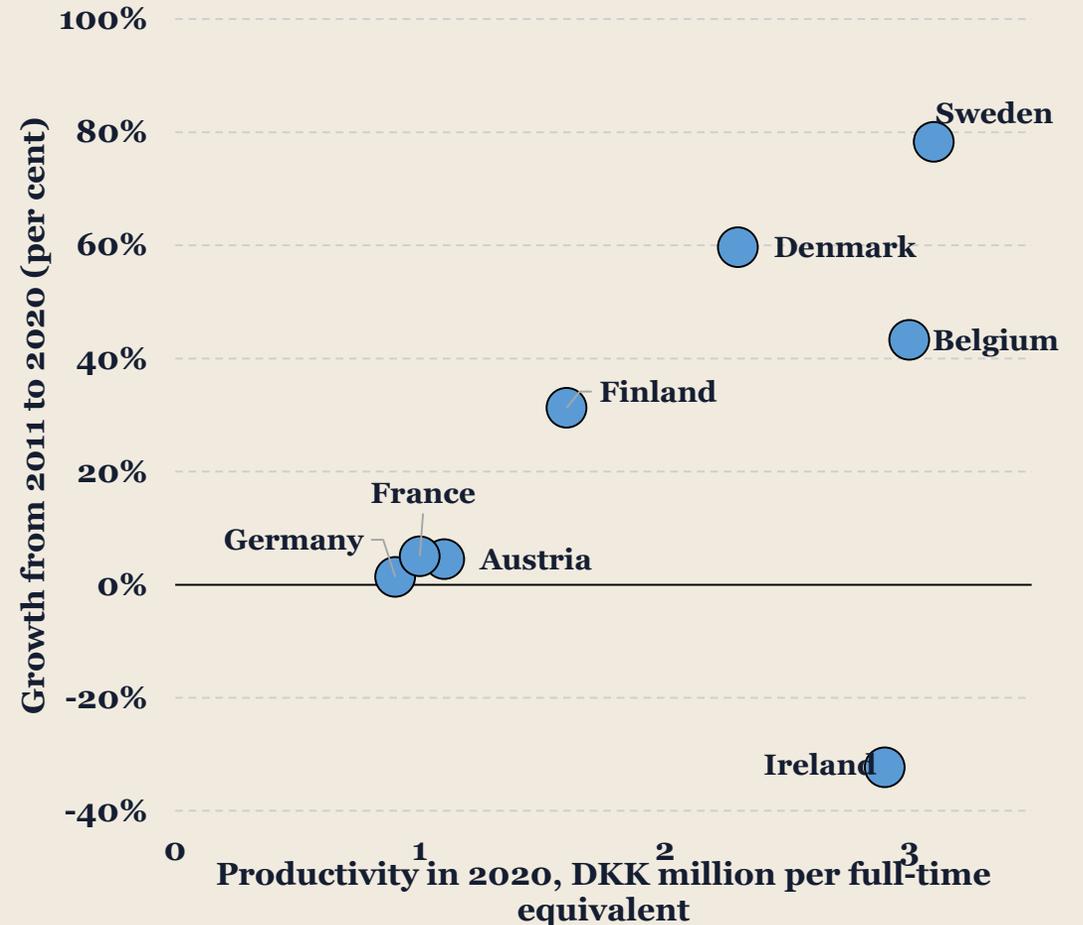
The figure shows the productivity in the life science industry in selected EU countries in 2020 compared with the development in productivity from 2011 to 2020.

It clearly shows that Denmark, Sweden and Belgium are the countries with the greatest growth in productivity during the period. However, Ireland, Sweden and Belgium are the countries with the highest productivity.

The high productivity in Ireland may be due to the fact that Ireland has attracted intellectual property rights from multinational companies to Irish subsidiaries for a period of time due to favourable tax conditions. This has increased Ireland's calculated trade and thereby the value added, which has created an "artificially" high productivity.

The relatively large drop in productivity for Ireland of over 30 per cent during this period may be due to the transfer of assets in multinational companies.

Productivity in the life science industry and growth of this industry from 2011–2020, selected countries



Exports

The life science industry has extensive exports, and Danish exports of life science products have increased in the period 2008–2022.

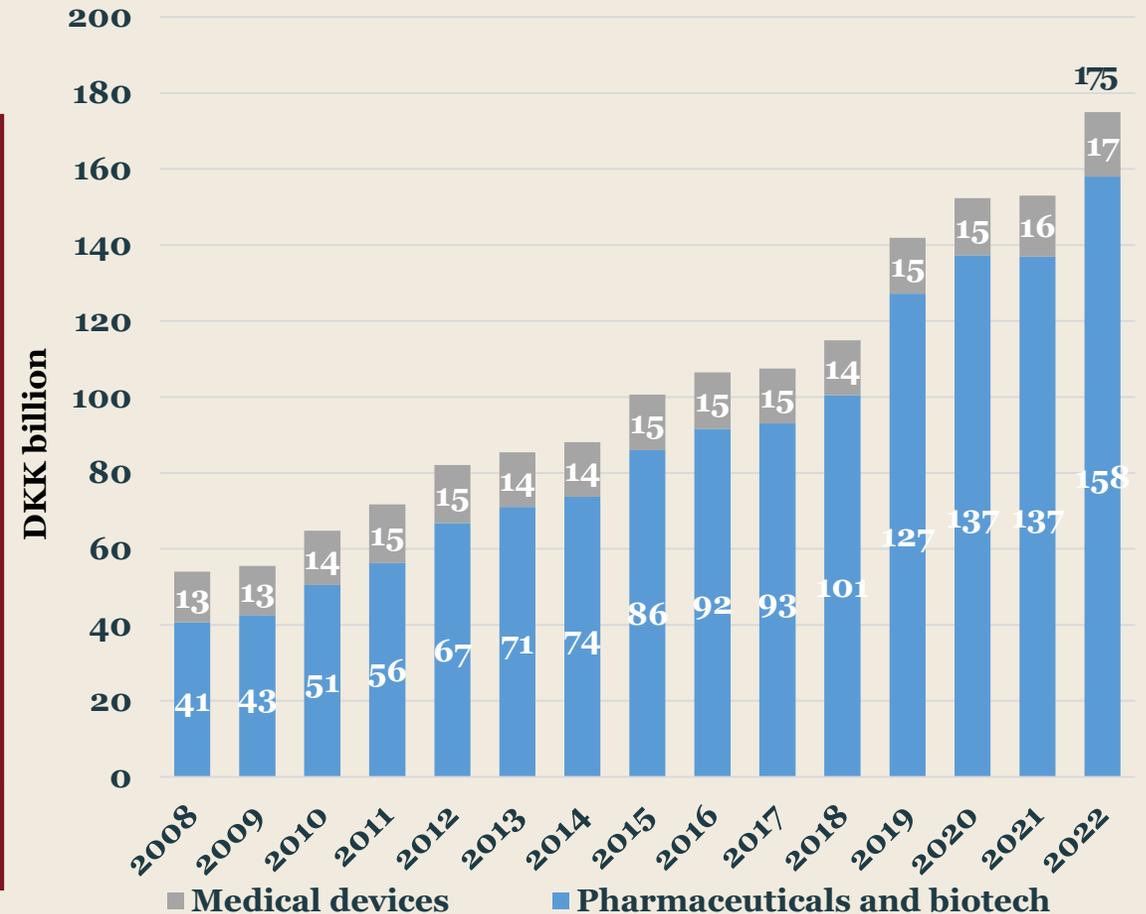
In today's prices, exports have gone from DKK 54 billion in 2008 to DKK 175 billion in 2022.

With an average annual growth rate of more than 8.5 per cent, the life science industry thus has managed to more than double the export of goods in the period 2008–2022.

The growth in exports has mainly taken place in pharmaceuticals and biotech, where exports have increased by as much as 385 per cent during the period.

Despite the COVID-19 pandemic in 2020–2022, the life science industry has nevertheless managed to increase exports, evidence of an industry that is extremely robust in terms of economic conditions.

Exports from Danish life science, 2008–2022



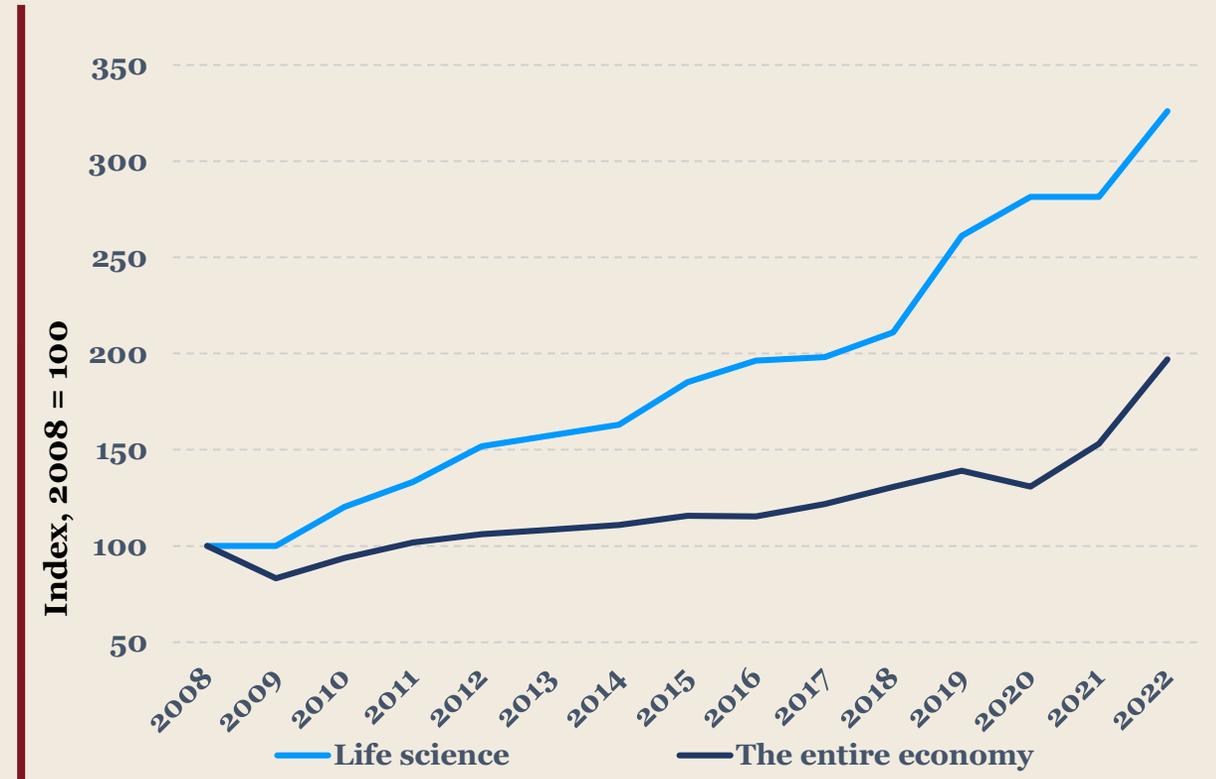
Exports compared to the rest of the economy

In 2008, life science exports accounted for 5.5 per cent of total Danish merchandise exports. This number has increased to 19.7 per cent in 2022.

Throughout the period, growth in exports from the Danish life science industry has been significantly higher than growth in total Danish exports. Exports from life science alone have more than tripled, while exports for the economy as a whole, including the life science industry, have grown by just under 100 per cent.

The COVID-19 crisis had a negative effect on total Danish goods exports in 2020, while exports for the life science industry maintained their previous high level.

Growth in Danish exports, life science and the economy as a whole, 2008–2022



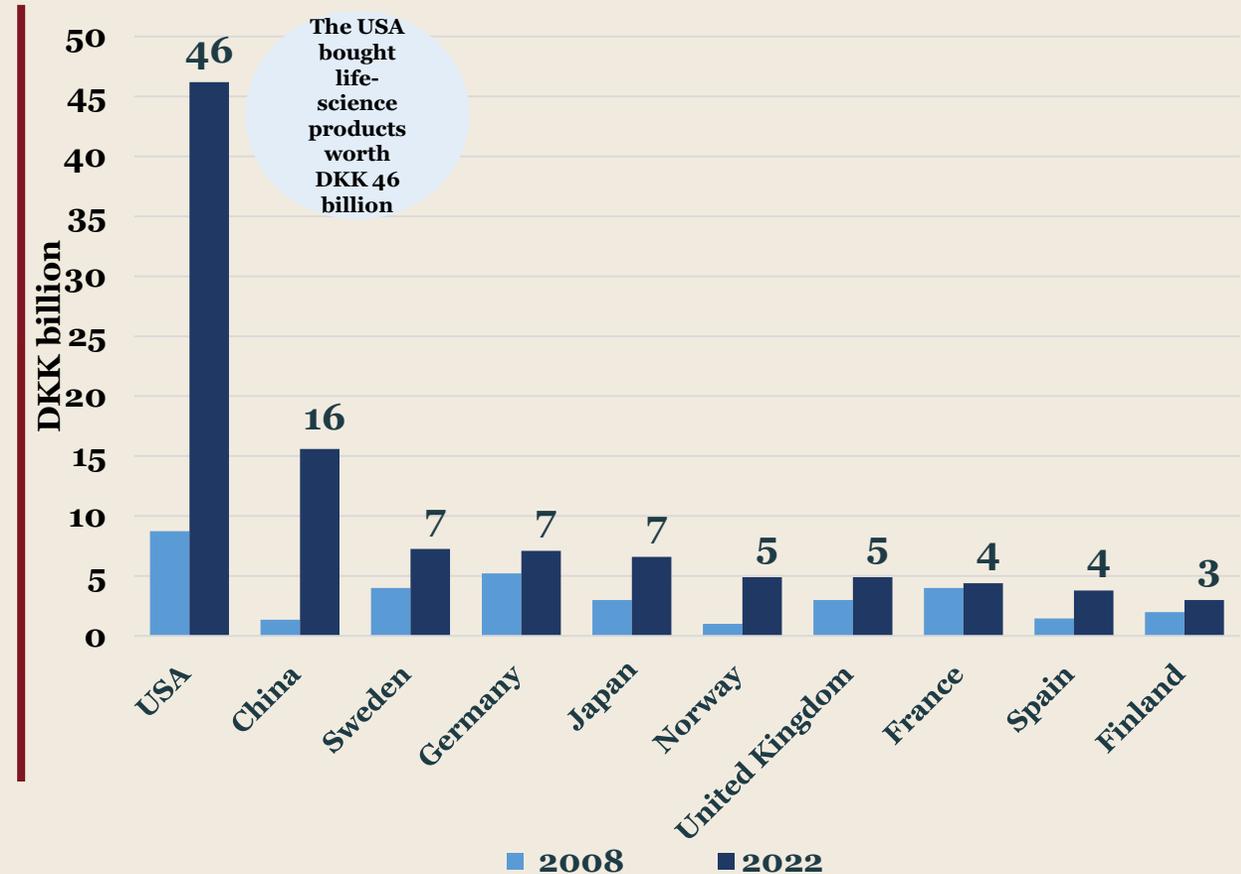
Top 10 buyers of Danish life science exports

The figure shows the top ten buyers of Danish merchandise exports of life science products in 2008 and 2022. The USA is still by far the biggest buyer of Danish life science products, buying products worth a full DKK 46 billion in 2022. This equates to 26 per cent of all Danish life science product exports in 2022 and over half of all Danish exports to the USA. Exports to the USA were DKK 9 billion in 2008, meaning they have increased almost fivefold in 14 years.

Exports to China have also grown significantly. During the past 14 years, with growth of DKK 15 billion (from DKK 1 billion in 2008 to DKK 16 billion in 2022), China has grown from being a very insignificant market for Danish life science to the second largest Danish life science export market.

In 2022, the top 10 buyer countries imported life science products worth a combined DKK 104 billion, corresponding to 59 per cent of all Danish goods exports of life science products in 2022.

Top 10 buyers of merchandise exports from Danish life science, 2008 and 2022



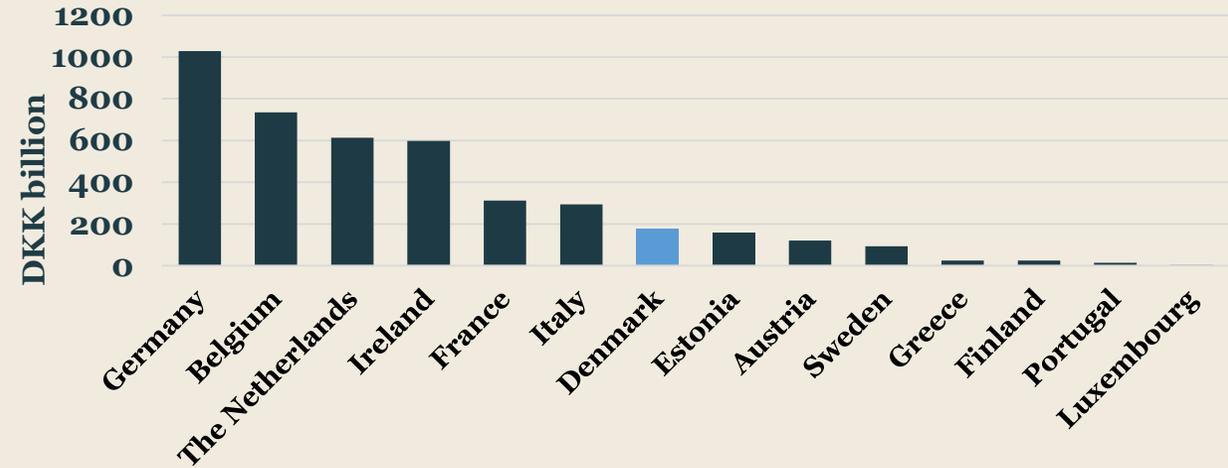
Exports in selected EU countries

Looking at selected EU countries, Germany is in the lead with exports of over DKK 1,000 billion in 2022. Denmark is the seventh largest life science nation among selected EU countries measured in terms of exports in absolute figures.

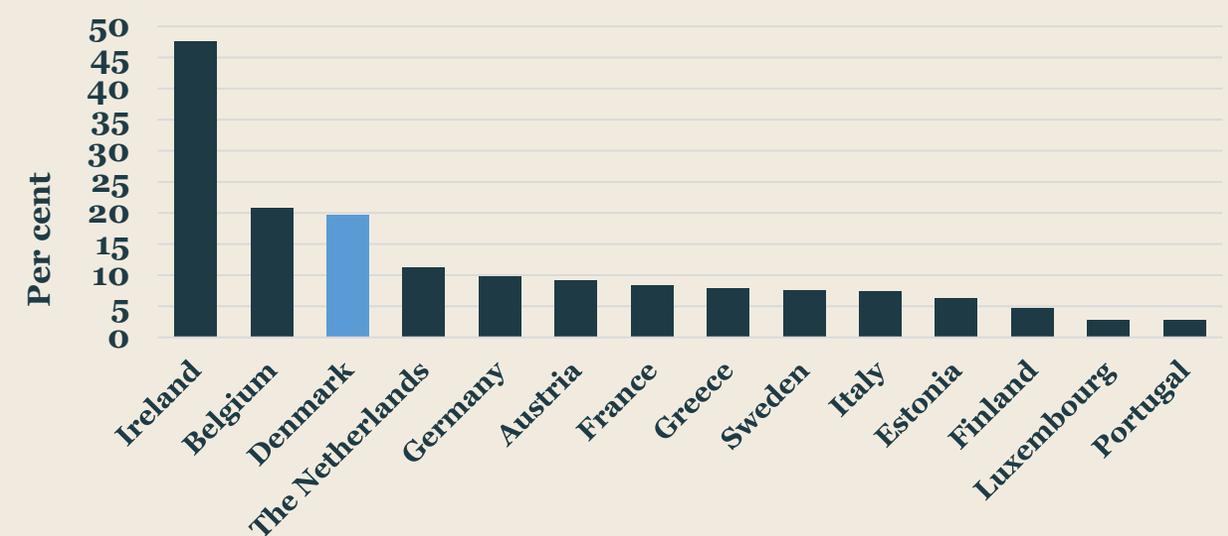
Looking at the share of total merchandise exports, life science exports make up a relatively large share of total merchandise exports in Denmark compared with the other selected EU countries.

In Ireland and Belgium, the export of life science products accounts for more of the total exports of goods than in Denmark.

The merchandise exports of life science products in selected EU countries, 2022



The life science industry's share of total merchandise exports in selected EU countries, 2022

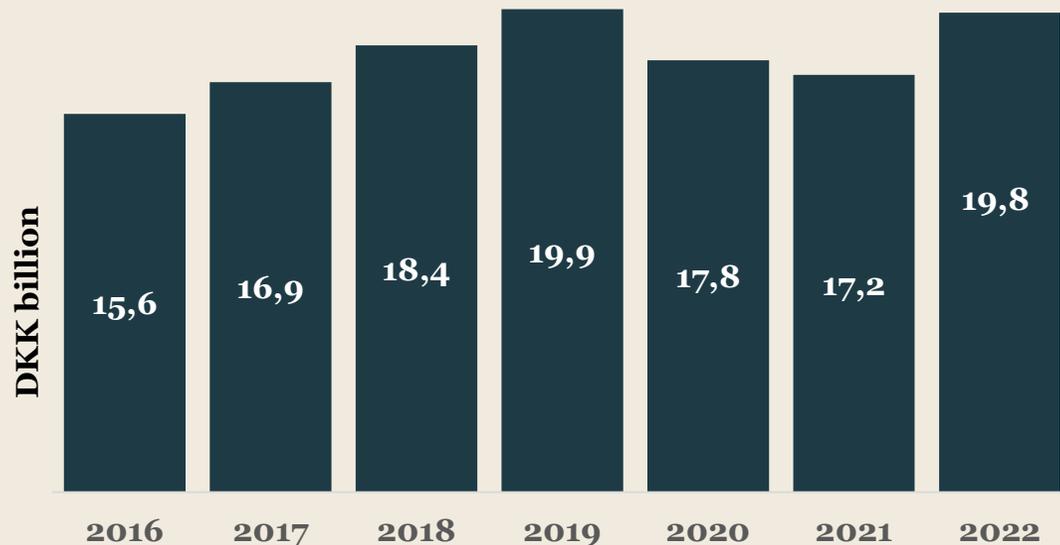


Net investment income

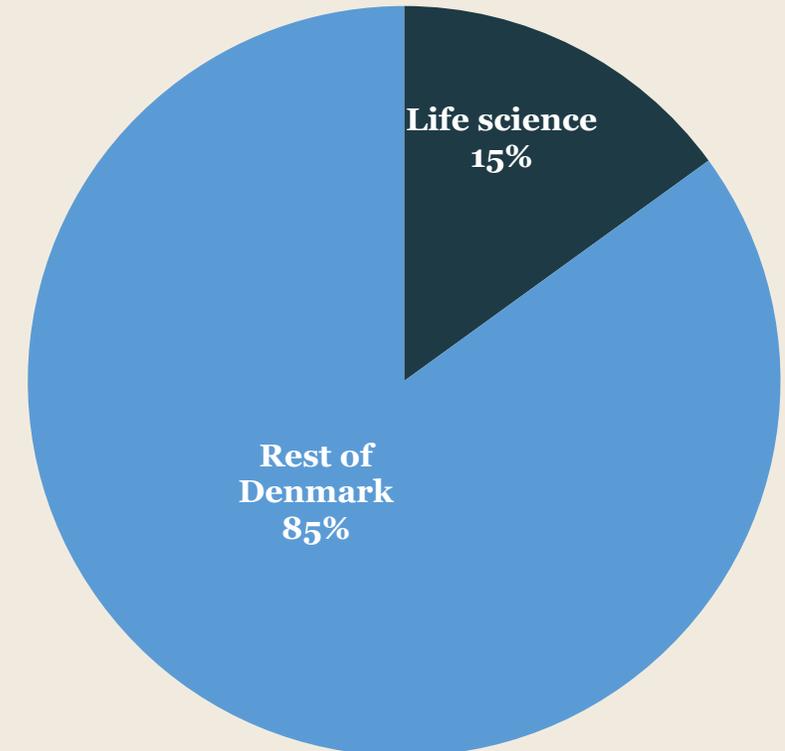
Net investment income consists of the income that Danish companies bring home from investments abroad, less the income that foreign companies withdraw from Denmark.

In 2022, the life science industry's net investment income from abroad was DKK 19.8 billion.

Net investment income from abroad



Share of total Danish net investment income, per cent



In 2022, the life science industry was responsible for 15 per cent of all Danish net investment income.

Source: Ministry of Industry, Business and Financial Affairs 2023 based on special extracts from Danmarks Nationalbank and Statistics Denmark
Note: The figure for net investment income deviates from previous announcements due to revisions.
Overall, Denmark's relatively high investment income can be attributed to the fact that Denmark's investment assets abroad contain more risk than our liabilities. Therefore, in most years, the assets provide a greater return than the liabilities. Source: Danmarks Nationalbank, Quarterly overview, 4th quarter 2011.

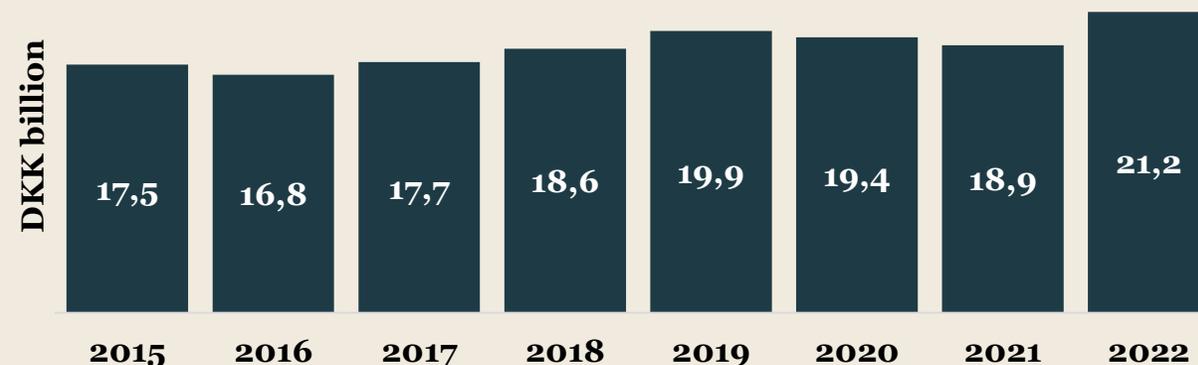
Investment income

Over the past eight years, the Danish life science industry has generated an investment income from abroad averaging DKK 17.8 billion per year.

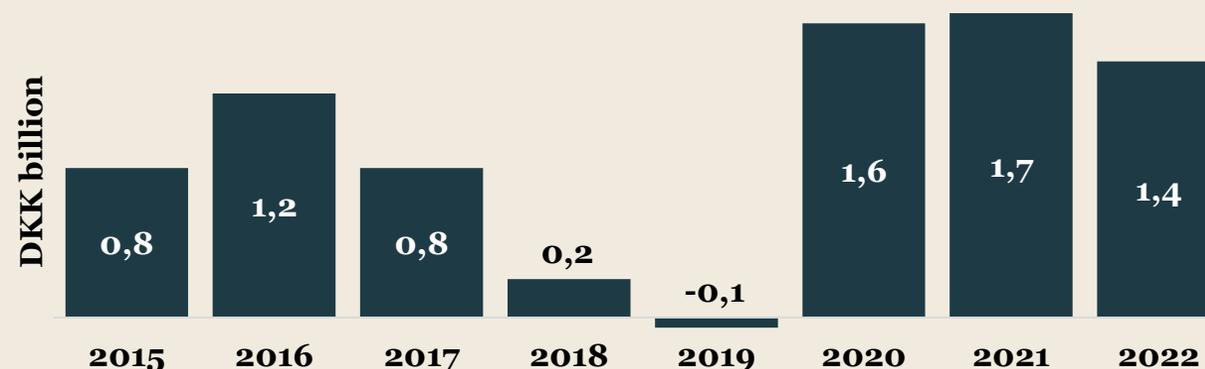
This exceeds the amount that foreign life science companies have withdrawn from Denmark. Net investment income has thus contributed positively to gross national income (GNI)*.

Investment income from abroad was relatively consistent from 2015–2022. Foreign investment income from life science in Denmark rose substantially in 2020, which explains the decline in net investment income in 2020. The large increase in 2020 is due to the fact that a significant amount was distributed abroad in 2020 in connection with intra-group trading in patent rights.

Investment income from abroad in Danish life science, DKK billion



Foreign investment income from life science in Denmark, DKK billion



Source: Ministry of Industry, Business and Financial Affairs 2023 based on special extracts from Danmarks Nationalbank and Statistics Denmark

Note: The figure for investment income deviates from previous announcements due to revisions.

*GDP only includes products that are produced within the country's borders, i.e. the amount of income generated in the country. GNI, on the other hand, covers the value of the total income available to the country's inhabitants, regardless of whether the income is generated domestically or abroad.

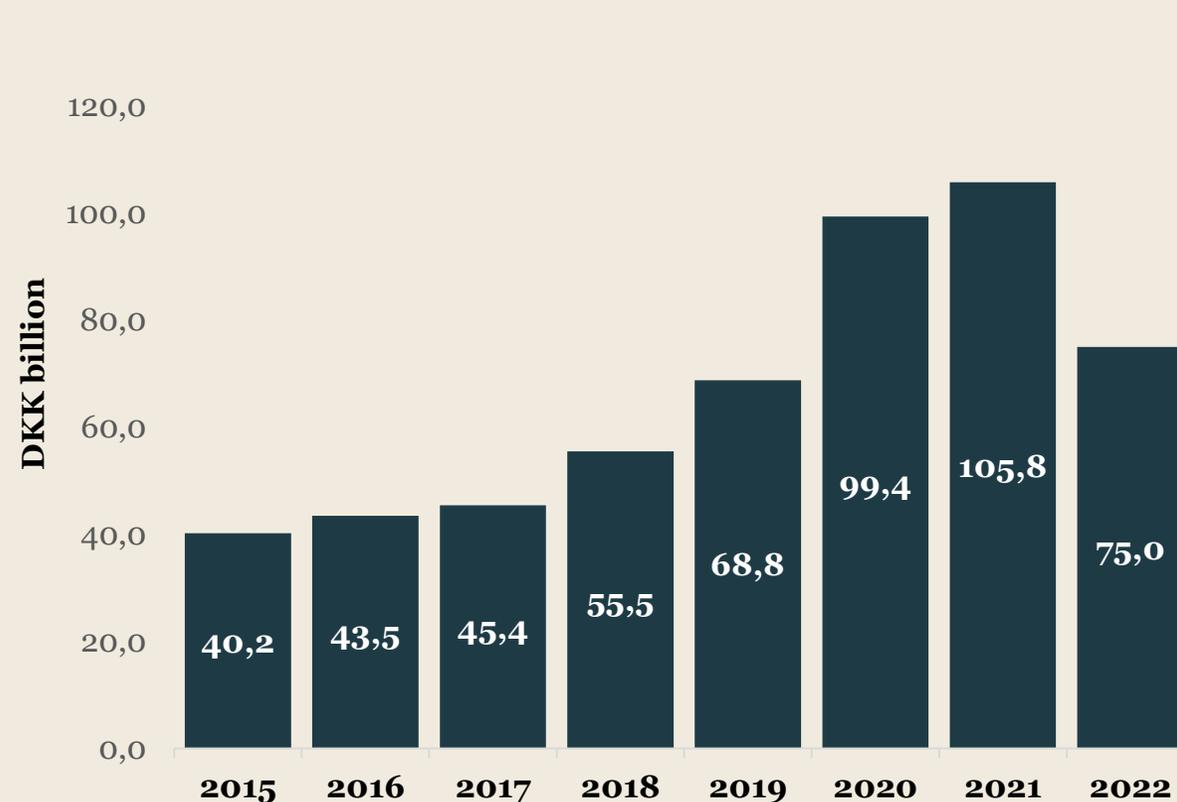
Life science investments abroad

In 2022 the Danish life science industry owned assets abroad worth DKK 75 billion consisting of direct investments, i.e. in subsidiaries, investments and so on.

Part of the substantial change in life science industry investments abroad from 2020 to 2022 may be attributable to an adjustment in the number of companies covered by the life science category.

However, investments abroad fell by almost DKK 31 billion from 2021 to 2022. This decrease was primarily due to an increase in charges for corporate loans from 2021 to 2022. This item has increased as Danish life science companies have paid off these loans rather than increasing their foreign investment.

Life science industry investments abroad, DKK billion

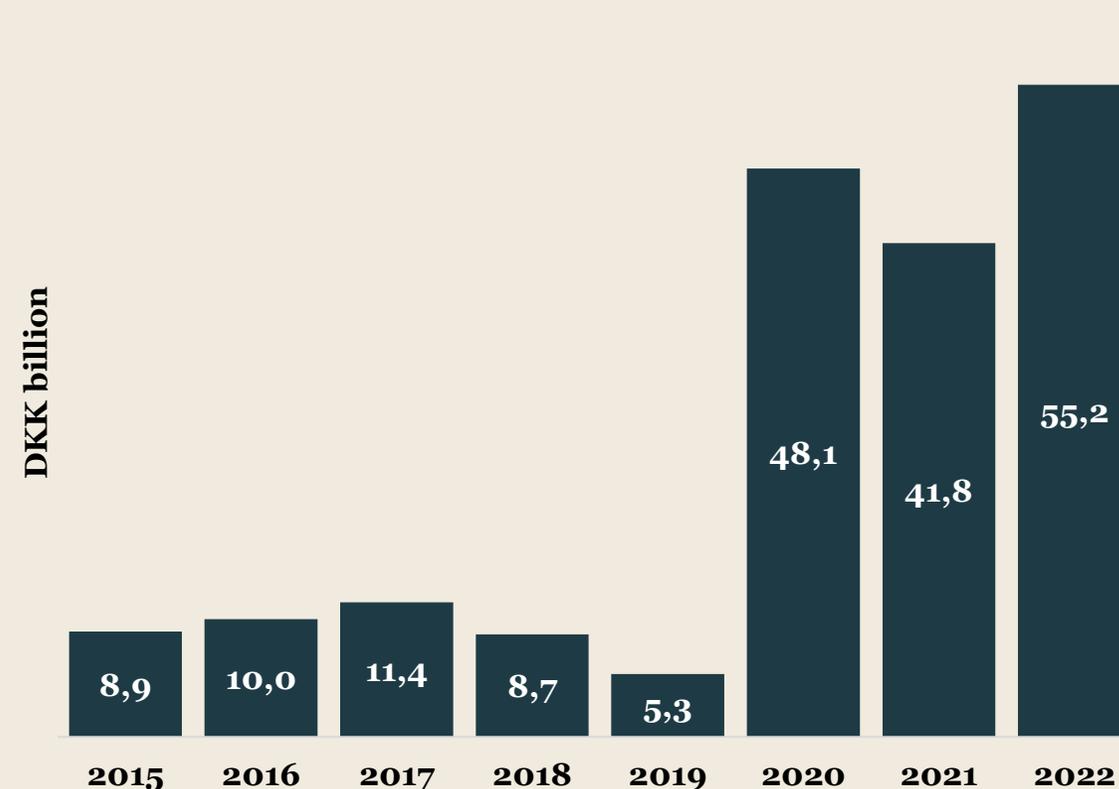


Foreign direct investment in Danish life science

Foreign direct investment in Danish life science has increased by approximately DKK 7 billion from 2020 to 2022. However, foreign direct investment in Danish life science decreased considerably in 2021, but has increased by 32 per cent from 2021 to 2022.

Part of the substantial change in foreign life science industry investments from 2020 to 2022 may be attributable to an adjustment in the number of companies covered by the life science category. In addition, a large part of the reason for the significant increases in 2020–2022 may be attributable to one particular foreign investment in a Danish life science company.

Foreign direct investment in Danish life science, DKK billion



Source: Ministry of Industry, Business and Financial Affairs 2023 based on special extracts from Danmarks Nationalbank and own calculations

Note: The figures are calculated as the portfolio of investments at the end of the year.

The figure for investments deviates substantially from previous announcements due to revisions. Substantial changes in "foreign investment" are due to an adjustment to the term "International investment position" ("Kapitalbalance" in Danish), due to an expansion in the number of life science companies, which came into effect from 2020, cf. Danmarks Nationalbank and Statistics Denmark.

Innovation in the life science industry

The final chapter of this analysis covers the innovation in the Danish life science industry.

This can be expressed by the amount of national life science publications, the number of clinical trials, patents or the number of life science startups. The life science industry's environmental footprint is also highlighted.

Did you know that, while the value added in Danish life science has doubled during this period, total energy consumption has decreased? Danish life science has thus become more energy efficient.



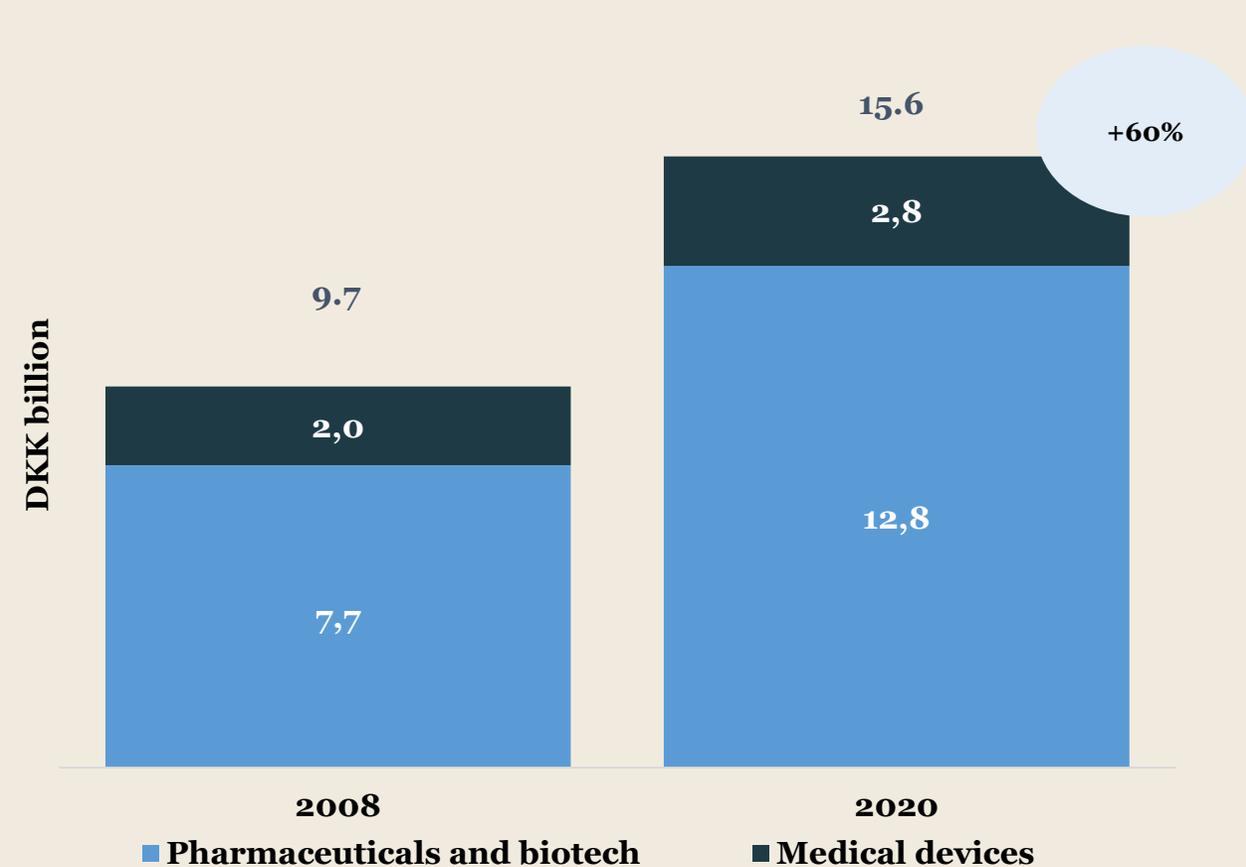
Own research and development

Research and development contribute to promoting growth and thus also to strengthening the competitiveness of the companies. In 2020, the innovative companies* in the life science industry invested almost DKK 16 billion in their own research and development (R&D). As a result, investments in R&D have increased by over 60 per cent since 2008.

In 2020, the innovative life science companies accounted for 37 per cent of the business sector's total investments in own R&D of around DKK 42.5 billion.

The life science industry is characterised by spending a large part of its turnover on research and development. In 2020, the life science industry spent just over 6.5 per cent of turnover on its own research and development. In the same year, companies in the Danish economy as a whole spent 1 per cent of turnover on research and development.

Life science industry investments in own research and development



Source: Ministry of Industry, Business and Financial Affairs 2023 based on Statistics Denmark

Note: *Innovative companies covers those companies that have indicated in Statistics Denmark's R&D survey that they have activities within research and development. The definition of research and development work (R&D) covers work carried out on a systematic basis to increase existing knowledge and the utilisation of this knowledge to devise new areas of application.

The figures for research and development are only directly comparable from 2007–2016 and 2017–2020, cf. Statistics Denmark, which is why the increase from 2008 to 2019 should be interpreted with caution.

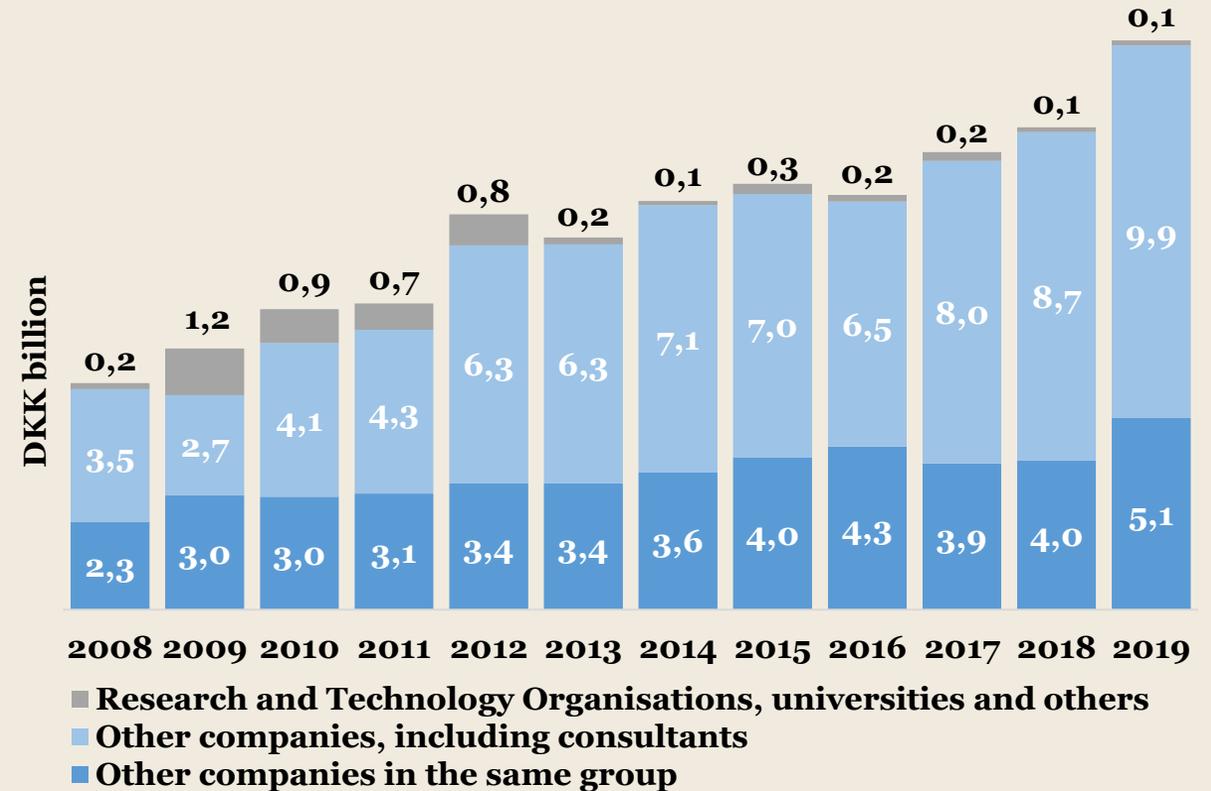
Purchased research and development

In addition to the research and development work carried out internally by life science companies, another important source of new knowledge is the R&D services that the companies commission externally. This is known as "purchased R&D".

The life science industry's expenditure on purchased R&D has more than doubled in the period from 2008 to 2019, and since last year alone expenditure has grown by more than DKK 2 billion. In 2019, the life science industry had expenses for purchased R&D totalling DKK 15.1 billion. This is almost two-thirds of the total expenditure on purchased R&D in the entire economy, which was just over DKK 22 billion in 2019.

It should be noted that the figure for own R&D cannot be added together with purchased R&D, as there is an overlap between the two figures. This is because R&D activities purchased from a subsidiary statistically count as both own R&D and purchased R&D.

Purchased research and development in the Danish life science industry



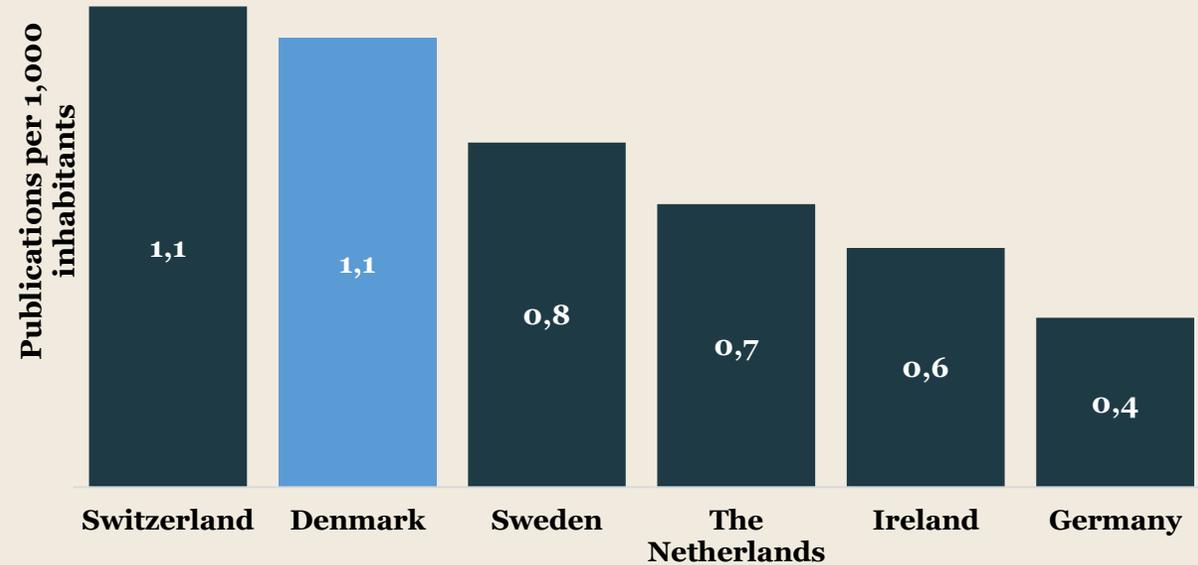
Publications

Scientific publications often mark the beginning of what will become patent applications, new companies and ultimate growth in the life science industry in Denmark.

The figure shows the number of publications within selected life science countries. The number is relative to the size of the country's population to provide a relative comparison. From this, we can see that only Switzerland has a higher number of scientific publications than Denmark per 1,000 inhabitants. This signals that, thanks to the large amount of research, Denmark is in a good position to create further growth in the life science industry.

Each year from 2015–2022, Denmark has been second only to Switzerland on this indicator. The number of publications per 1,000 inhabitants has also increased generally during the same period for all countries, with Sweden experiencing the largest percentage increase.

Publications within life science areas per 1,000 inhabitants in selected countries, 2022

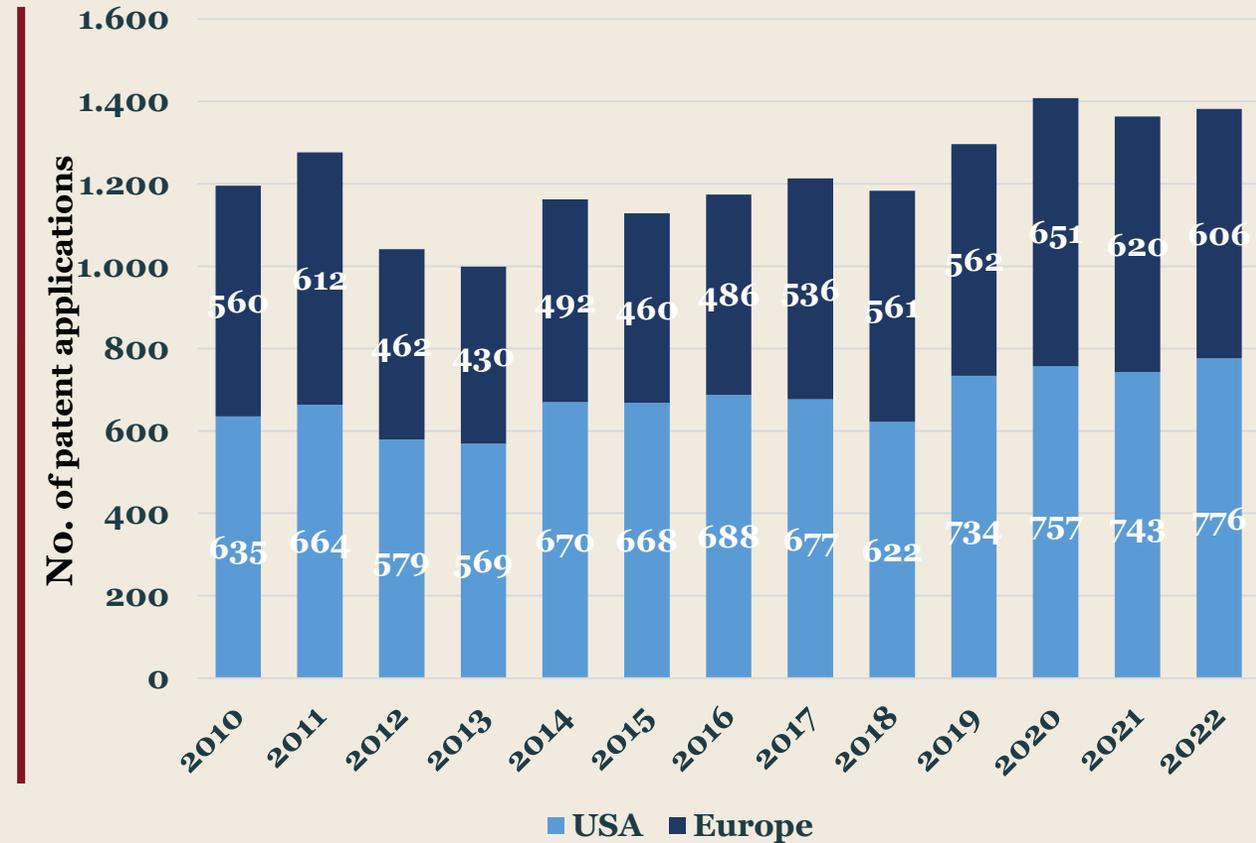


Patent applications

The figure shows the number of patent applications for the Danish life science industry for the United States Patent and Trademark Office (USPTO) and the European Patent Office (EPO) respectively.

Throughout the period 2010–2022, the life science industry has been at a stable level of around 1,200–1,400 patent applications per year. It should also be noted that, throughout the period, Danish companies submit more patent applications to USPTO than EPO, emphasising the fact that the USA is an important buyer of Danish life science products.

Patent applications for the Danish life science industry in the USA (USPTO) and Europe (EPO) respectively



International patent applications and applications by type of technology

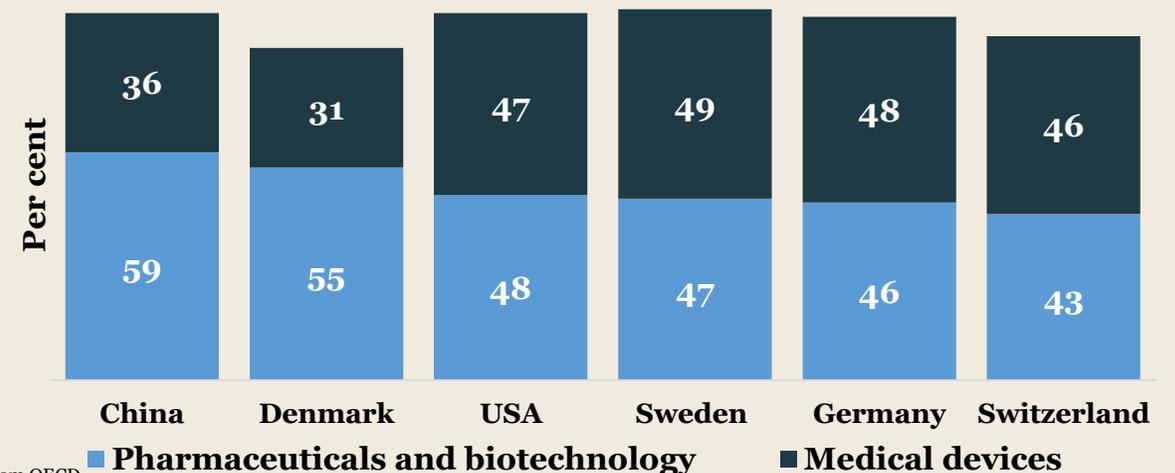
In 2022, the life science industry in Denmark submitted fewer patent applications to the US and European patent offices per million inhabitants than the USA, Germany, China and Switzerland. The industry had more patent applications than Sweden, however.

The Danish life science industry's patent applications for Europe and the USA related to the medical device, pharmaceuticals and biotech sectors in 2022. In 2022, Denmark had a significantly higher proportion of patent applications in pharmaceuticals and biotech than Switzerland, Germany, Sweden and the USA. In contrast, Denmark has the lowest proportion of medical device patent applications when compared to the selected countries.

Number of patent applications to the USA (USPTO) and Europe (EPO) per million inhabitants in selected countries, 2022



Proportion of patent applications submitted to the USA (USPTO) and Europe (EPO) in 2022 by technology class* in selected countries



Source: Ministry of Industry, Business and Financial Affairs 2023 based on figures from the Danish Patent and Trademark Office and population figures from OECD.

Note: The percentage figures for the proportion of patent applications distributed by technology class do not add up to 100 per cent, as the Danish Patent and Trademark Office also includes "Food chemistry" in their calculations, which cannot with any certainty be classified as life science.

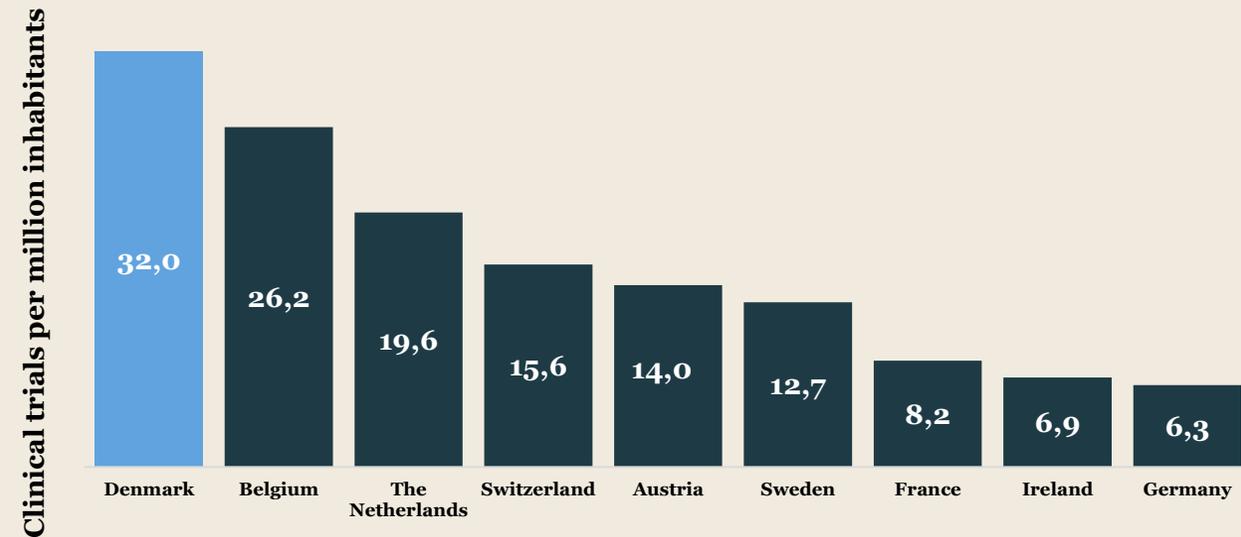
* Technology classes are defined as "Pharmaceuticals and biotechnology", "Medical devices" and "Food chemistry". However, "Food chemistry" does not appear as a technology class in the chart, as it cannot be classified as life science technology with any certainty.

Clinical trials

A clinical trial is conducted to find out how a drug works, what side effects it has and how it is metabolised in the body. The drugs under investigation may be both novel pharmaceuticals and well-known pharmaceuticals that are already on the market in Denmark.

Denmark is in the lead when we look at the number of clinical trials per million inhabitants. **188** clinical trials were conducted in Denmark in 2022.

Number of clinical trials in selected countries per million inhabitants, 2022



Danish life science startups in an international context

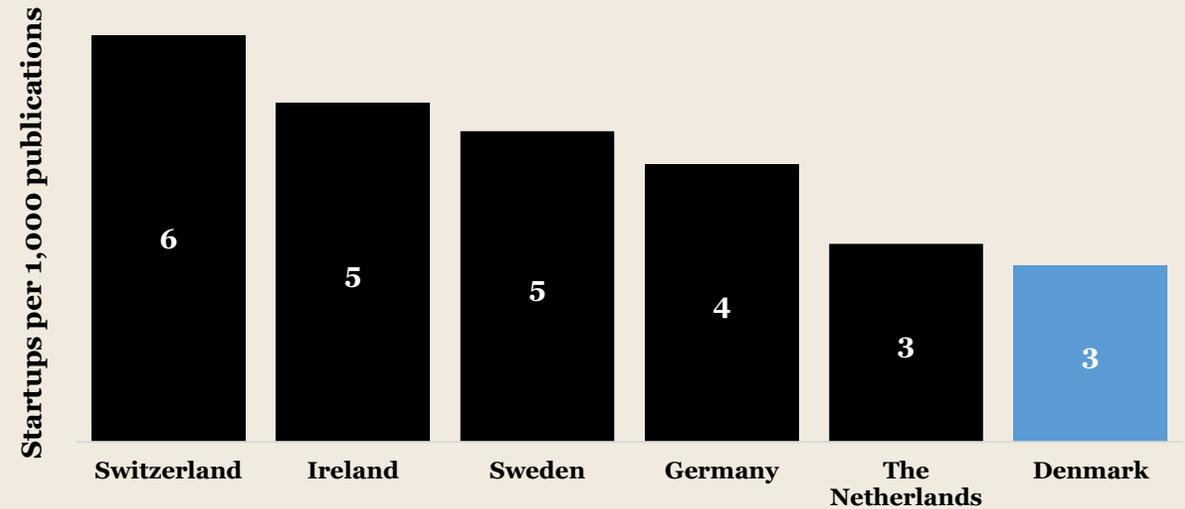
An important link in the food chain for the Danish life science industry is the number of successful startups.

Compared with selected leading life science countries, we can see that the number of life science startups in Denmark is lower than in the other selected countries. This may indicate that the transition from research to new companies is challenging.

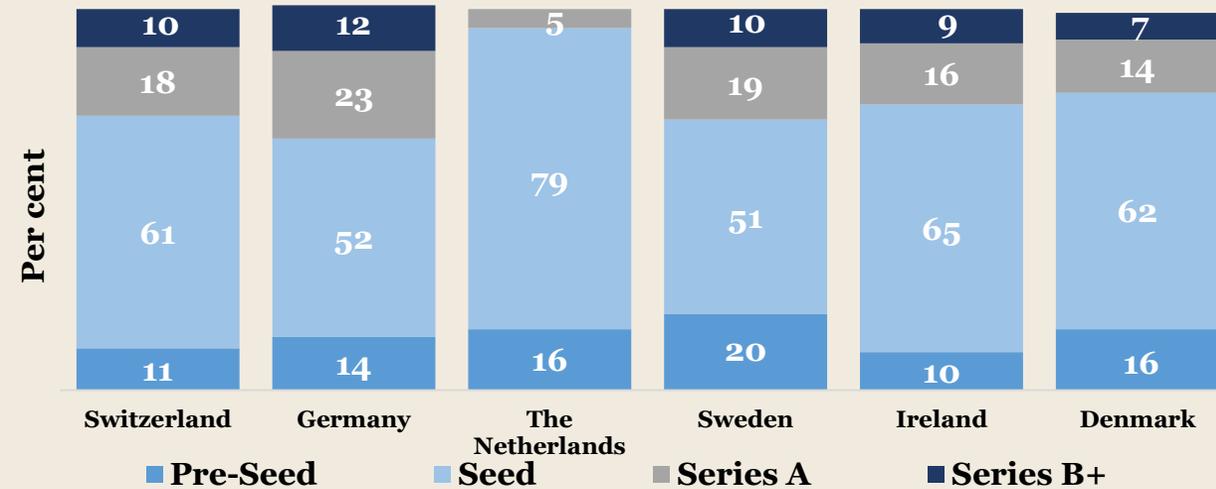
The lower figure groups life science startups in different funding stages. "Pre-Seed" indicates that the company has not yet received its first major capital investment. "Seed" means one round of funding, and subsequent larger rounds of funding are often referred to as "Series A", "Series B", and so on.

The figure may indicate that the process of raising capital investment goes more slowly in Sweden, Denmark and the Netherlands than in other countries.

Number of life science startups in selected countries per 1,000 life science publications in selected countries, 2021



The distribution of life science startups in selected countries by different financing stages, 2021



Source: Ministry of Industry, Business and Financial Affairs and ADC 2023 based on Crunchbase and Scopus.

Note: The figures cover companies with start-ups from 2008 onwards.

Reservations are made for errors in data from Crunchbase due to collection by a third party which may have used web scraping, sorting algorithms, etc. Data are also updated continuously, and hence future data will most likely be modified.

This is because data is updated retroactively. The USA is generally at a higher level than the rest of the selected countries, but is excluded due to a lack of data.

Note: Startups are only included for which the most recent stage was "Pre-Seed", "Seed" or "Series A-F".

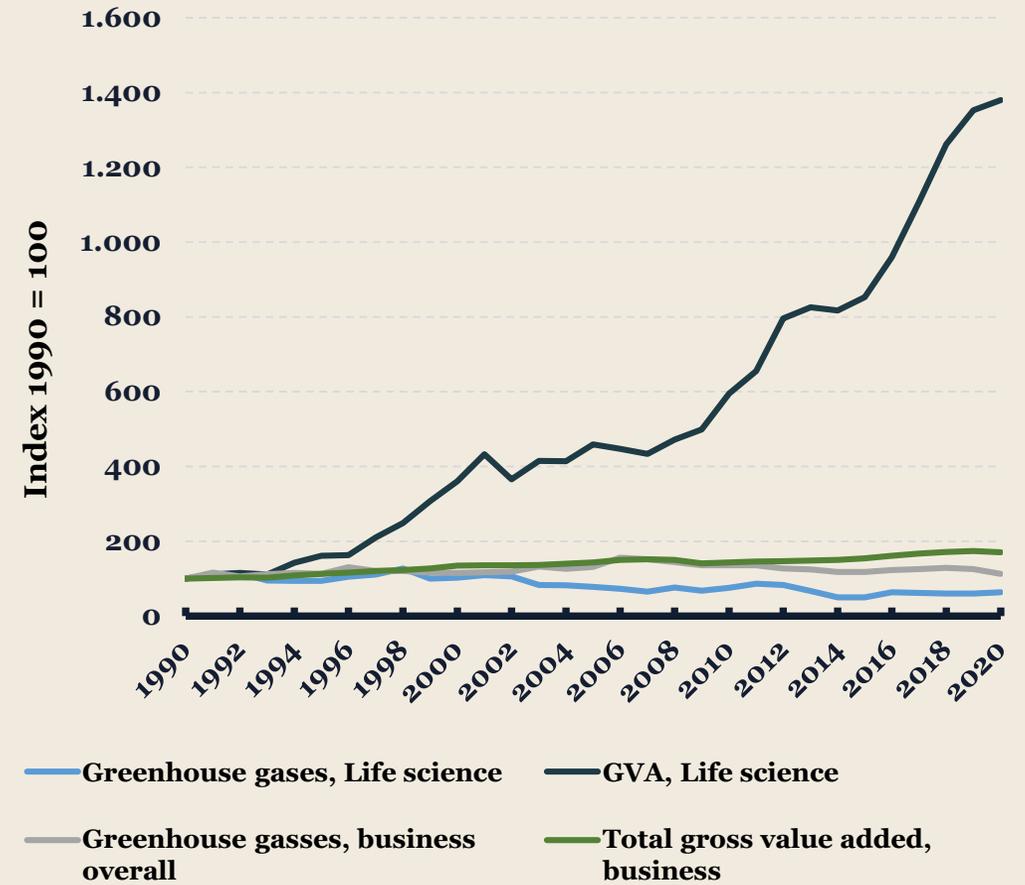
An energy-efficient life science industry

In the period 1990–2020, the life science industry experienced strong economic growth measured by gross value added. During the same period, the life science industry succeeded in reducing their absolute greenhouse gas emissions, while this statistic rose for the Danish business sector.

Gross value added in the life science industry thus increased almost fourteenfold since 1990, while greenhouse gas emissions dropped by almost 40 per cent.*

For the private business sector, greenhouse gases have risen by 12 per cent, while gross value added has risen by 71 per cent since 1990.

Development in **gross value added (GVA)** compared with greenhouse gas **emissions**, life science and the Danish business sector relative to 1990



Source: Ministry of Industry, Business and Financial Affairs 2023 based on the green national accounts and the national financial accounts from Statistics Denmark.
Note: Only the following industries have been included here: *Pharmaceutical industry* (210000) and *Manufacture of medical instruments, etc.* (320010). This means that, in particular, many medical device companies are not included. This is due to a rough industry division in the green national accounts. The figure is thus not comparable with figures for emissions published in connection with the climate partnerships.

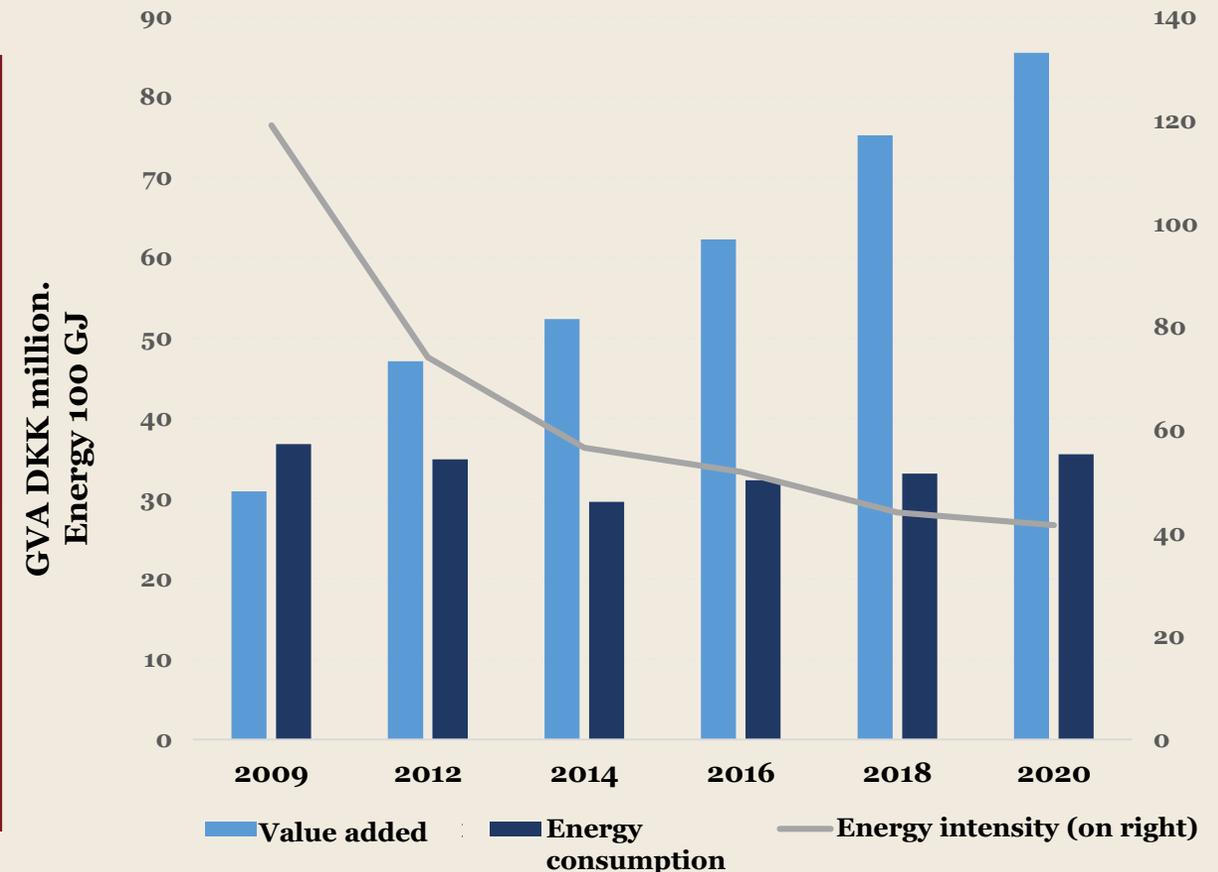
Declining energy consumption in the life science industry is due to more energy-efficient production

A decrease in energy consumption in a particular sector can be driven either by a decrease in production or by an increase in production energy efficiency.

To assess how energy efficient any given production is, the term "energy intensity" is often used. Energy intensity is defined as energy consumption in relation to value added at a given production. In this case, having low energy intensity is a good thing.

In the period 2009–2020, the value added in the life science industry more than doubled. When the total energy consumption dropped in the same period, it was due to an effort to improve energy efficiency which led to a decrease in energy intensity in the life science industry of over 65 per cent from 2009 to 2020.

Value added, energy consumption and energy intensity in life science, 2009–2020



Source: Ministry of Industry, Business and Financial Affairs 2023 based on Industry's Energy Consumption and Company Statistics from Statistics Denmark
Note: The data set covers a very detailed classification of energy consumption for companies with at least 20 employees in the industrial sector. Among other things, the classification covers electricity, gas, coal and oil. In this context, it should be noted that the consumption of, for example, coal and oil only reflects the direct use in production in the industry. The consumption of coal and oil in the production of electricity at the energy companies is thus not reflected in the consumption of coal and oil in the data set. In addition, the data set only contains information about companies in the industrial sector and of a certain size, which is why this sub-analysis only includes life science companies which are manufacturing companies and relatively large. This sub-analysis does not cover all life science companies. However, the sub-analysis can still provide a good indication of the climate footprint in the life science industry compared with other industries.
Note that value added is calculated in current prices. The overall decrease in intensity should thus be seen in the context of annual inflation of around 1.5% from 2009 to 2020.

Definitions and methodology

This section explains how a life science company has been defined and provides information about selected data sources.



Data sources for delimitation of life science companies

1. Industrial classification codes

The calculation of key figures for the life science industry includes all companies that are part of the 8 different industries (see next slide).

2. Member lists

A number of companies have been identified on the basis of membership lists from non-governmental organisations in life science.

3. Product codes

The product codes are used to identify the life science companies that export life science products and that do not necessarily have the correct industrial classification code. However, many of these companies also export goods that are not life science and/or have small overall exports.

In order to avoid including companies that are not really life science companies, it is thus a condition that the life science export share must be greater than 50 per cent. In addition, it is stipulated that the total export in relation to turnover must be greater than 25 per cent, as the method is otherwise not robust. At the same time, all companies that are outside industries A–N have been removed, i.e. all public companies. By collecting product codes, member lists and industrial classification codes, we identified 1,660 life science companies in 2020.

Weighting of life science companies

Figures for the life science industry can be compared internationally using 4-digit industrial classification codes. In order to be able to compare internationally, companies with an emphasis on one code are included under the industry to which they belong. Novo Nordisk is an exception, however. They are mainly part of 212000, but also fit partly under 325000, which is their secondary industry.

Companies located in industries 464610 and 464620 are indistinguishable from each other internationally. They are therefore included with a total weighting of 1 and are distributed across "Medical device" and "Pharmaceutical and biotech" based on their sales.

Companies outside the eight industries are delimited based on membership lists and product codes and are assigned a medical device and pharmaceutical weighting which assumes a value between 0 and 1.

$$\begin{aligned} \text{Medical device weighting} &= \frac{\text{Medical device exports}}{\text{Total exports}} \\ \text{Pharmaceuticals weighting} &= \frac{\text{Pharmaceuticals and biotech exports}}{\text{Total exports}} \end{aligned}$$

Correlation between company statistics and the national accounts

All financial key figures in the section on the life science industry in Denmark are based on company statistics.

The company statistics are a "first-hand report" directly from the companies and therefore provide faster access to the figures than the accounting statistics on which the national accounts are based. The company statistics can generally be approximated to the national financial accounts, but this requires a number of corrections.

For example, the total value added of the private business sector, which is indicated in the company statistics, can be approximated to the gross value added (GVA) from the national accounts. However, a number of corrections have been made. Of these, the most important is the R&D correction, i.e. funds spent on own research and development, which are not counted as value added in the company statistics. The other corrections depend on the industry in question, but in the industry it includes, for example, software produced at own expense, production output for own consumption and fringe benefits.

In the calculation of the life science industry's value added, we must, as a minimum, add own research and development to the value added calculated in the company statistics. The value created abroad is also added to this. The difference between GVA and gross domestic product (GDP) must be found in product taxes. If the product taxes are added to GVA, an indication of GDP is obtained.

Investment income and foreign direct investment

The Danish life science industry does not only create value through production that takes place in Denmark. When Danish life science companies produce through subsidiaries abroad or receive return on investment outside the country's borders, they can subsequently move the money back to Denmark, benefiting Danish prosperity and investments in Denmark. Data on investment income and foreign direct investment come from a special extract from Danmarks Nationalbank.

Net investment income consists of the income that Danish companies bring home from investments abroad, less the income that foreign companies withdraw from Denmark.

Foreign direct investment consists of foreign direct investment in Danish life science and the life science industry's investments abroad, e.g. in the form of the establishment of subsidiaries, major investments, etc. Danish life science companies invest abroad with the expectation of generating a return. The investments abroad therefore create a basis for future investment income, which can contribute to Danish prosperity and future investments in Denmark.

Net wages refers to the wages paid to Danish employees abroad, less wages for foreign employees in Denmark.

Industrial classification codes in the life science industry

	DB07 industrial classification code	Description of industry
Medical devices	26.60.10	Manufacture of hearing aids and related components
	26.60.90	Manufacture of irradiation equipment and electro-medical and electrotherapeutic equipment
	32.50.00	Manufacture of medical and dental instruments and related equipment
	46.46.20	Wholesale of medical devices and hospital products
Pharmaceuticals and biotech	21.10.00	Production of pharmaceutical raw materials
	21.20.00	Production of pharmaceutical preparations
	46.46.10	Wholesale of medical products and nursing requisites
	72.11.00	Research and experimental development in biotechnology