# Untap the Startup Potential

## A comparative review of the Danish life science Startup Ecosystem

March 2022

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This study is commissioned by BioInnovation Institute (BII) and Novo Nordisk Fonden.

The findings and opinions contained in the study are solely those of DAMVAD Analytics.

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# Introduction

Over the last decade, the Danish life science industry has developed rapidly in terms of export and growth to become one of the biggest strongholds for Denmark. Research shows the importance of fostering a strong Danish ecosystem for research, development, and commercialization of new viable life science companies. The private Danish and international investments in R&D in Danish life science are continuously growing, and the number of life science startups that are seeking patents is proportionally high.

Denmark, however, competes with a number of other strong, established, and leading life science hot spots that, too, perform very well in terms of commercialization of innovative ideas. As a result, it is essential to continuously strengthen the Danish life science startup ecosystem to continue attracting investments and developing new startups.

This study, commissioned by BioInnovation Institute and Novo Nordisk Fonden, examines the state of the Danish life science startup ecosystem, its results and role, and the potential for future development.

The study analyses three important questions:

1. Which results are created in Danish life science research, patents, startups, and capital investments compared to other leading life science regions on the international scene?
2. What characterizes the Danish life science startup ecosystem, and how does the Danish system measure up to other leading life science regions in terms of strengths and weaknesses?
3. How does the Danish life science startup ecosystem create additional value when converting ideas into concrete solutions and new businesses, and how big is the potential for further development towards 2030?

# Executive Summary

## The Danish life science startup system is doing relatively well

The Danish life science startup ecosystem shows good progress. In particular, the system has in recent years experienced significant increases in both the number of life science-related publications, the total amount of startup funding, the number of clinical trials, and the number of investors.

When compared to the four leading life science regions of the world, however, Denmark is still behind on several parameters. The other regions tend to score higher when it comes to local universities' position on university rankings, scientific productivity and quality, patenting activity, number of new life science companies created, and access to startup funding.

It should, however, be kept in mind that Denmark also has both a smaller population and a smaller domestic investor base than some of the other regions.

## Denmark has much to learn from the best life science startup regions

The Danish life science startup ecosystem has many strengths to build on.

Danish strengths include a strong academic environment led by a top 50 university, an established life science industry, a highly digitalized society, an environment with high ease of doing business, and a workforce that is highly skilled and can attract talent

But there are many reasons why the other life science regions are still ahead.

The best life science regions have for decades undergone long-term and holistic reforms.

International reforms include larger government R&D funding, more dedicated space for innovative activities, large investments in talent attraction, tax reliefs on VC funds and R&D expenditures for SMEs, and focus on HEI's innovation capacity.

## A Danish ecosystem on track with the best holds enormous potential

There is a lot to gain if the Danish life science startup system could improve by learning from the best competitors.

We predict large increases in R&D investments, which in turn lead to increases in clinical research, productivity, and salaries, eventually increasing the size of the ecosystem.

Early 2022, almost 3,800 FTEs were employed in Danish life science startups. If Denmark can improve on its early ecosystem such that research commercialization matches the best, the ecosystem could employ an additional 9,500 FTEs by 2030.

Danish startup success in life science is all about creating the right synergies and establishing the best conditions for connected growth through the value chain from excellent research to high-growth startups.

## *The Danish life science startup ecosystem shows good progress….*

11% growth in publications between 2015-2020

Denmark is home to 1 of the world's top 50 universities

338 patent applications from universities between 2015-2020

137 new startups between 2015-2021

Over 600% increase in startup funding between 2015-2021

50% growth in clinical trials between 2010-2020, and DK now leading in Scandinavia

90% life science productivity increase between 2010-2019

Growth from 16 to 62 unique investors in startup deals between 2015-2021

Denmark ranked 4th in world in terms of talent attraction and retention in 2021

## *…but there is enourmous potential if Denmark comes on track with the best*

Top 5% publications from Singapore are more than 26% more cited than top 5% Danish publications

Oxbridge-London is home to 4 of the world's top 50 universities

Publications from Massachusetts are more than 3x as likely to result in patent application as Danish

Almost 3x as many new startups in Switzerland as in Denmark between 2015-2021

More than 18x as much startup financing in Massachusetts as in Denmark in 2021

Switzerland ranked 1st in world in terms of talent attraction and retention in 2021

There is be a potential of up to 9,500 additional jobs by 2030 if Denmark improves its ability to translate research into startups

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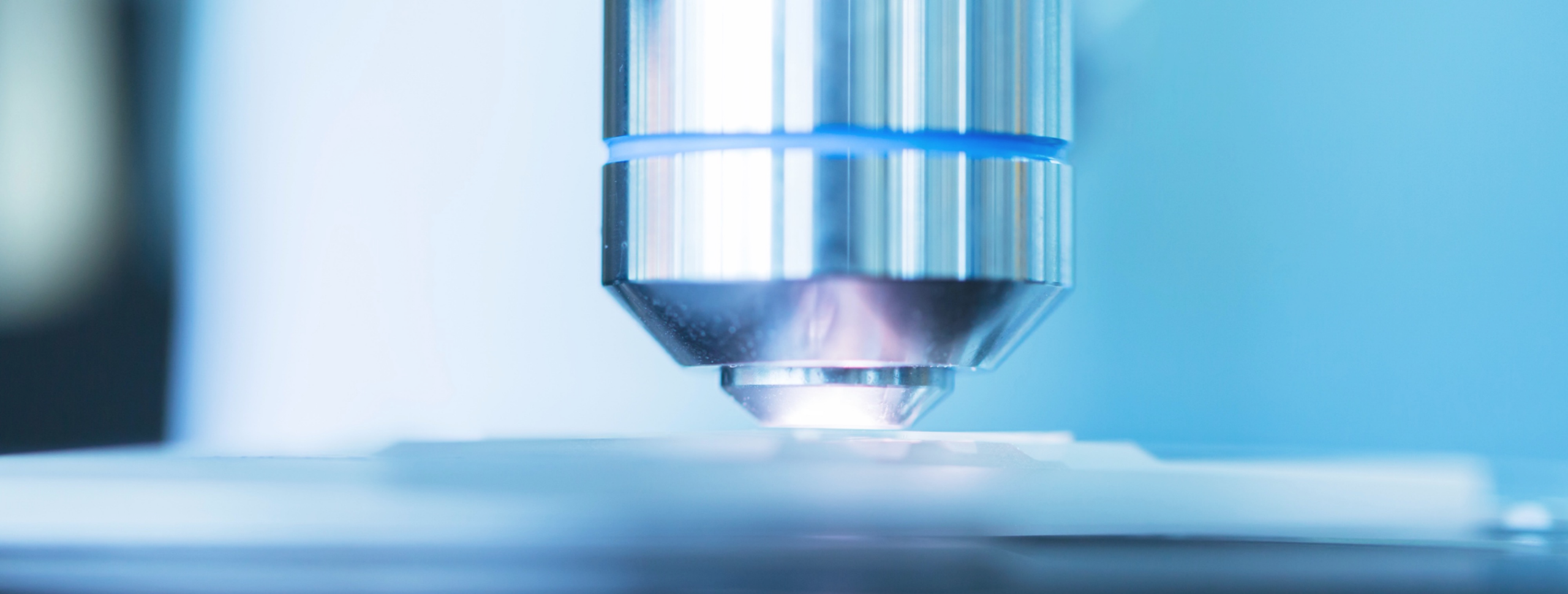


# Part 1
# The results of five life science startup systems

# Summary of Part 1

The first part of this study outlines the relative performance of the Danish life science startup system in terms of turning ideas into solutions. The results created by the Danish startup ecosystem are compared with those of Greater Boston (Massachusetts) and Oxbridge-London, Switzerland, and Singapore. The comparative study finds results in four main areas all pointing to the relative strength of the Danish life science startup system from research to startups.

## 1. Research

First, the study shows that the Oxbridge-London, Greater Boston, and Switzerland regions not only produce more life science publications but also have higher publication volumes per capita than Denmark. Denmark has higher publication growth rates than the two big life science regions, but not as high as Switzerland. Also, the Danish life science publications are below the average quality of the other four regions.

## 2. Patenting

Denmark has fewer patent filings than Massachusetts, the UK, and Switzerland as well as the lowest university patenting activity in life science of all the regions, including Singapore. Life science publications from Danish universities are less likely to be turned into patents than in any of the other four regions.

## 3. Startups

Since 2015, a total of 137 life science startups have been founded in Denmark. In comparison, the two big life science regions, Massachusetts and Oxbridge-London fostered a total of 1,026 and 993 new startups, respectively. Also, Switzerland and Singapore are more effective in fostering new life science startups. When measuring the startup rate relative to university publications, Denmark still underperforms. A publication in Massachusetts is more than three times as likely as in Denmark to create a startup.

## 4. Funding

All life science regions experienced large increases in funding, especially between 2020 and 2021. Massachusetts is generally the most capital-heavy life science region and has also experienced very high growth in funding. Between 2015 and 2021, Denmark experienced the highest growth in funding of almost 650 pct. This is good but coming from a lower level.

With a much larger share of later-stage funding, the Massachusetts region provides more startups with the necessary capital to grow. 24 pct of all startup deals in Massachusetts between 2015-2021 were series B deals. In the other regions, only 9-10 pct were at this stage.

# Key results

## For the early life science ecosystem in Denmark

More than **34,000** publications have been created between 2015-2020

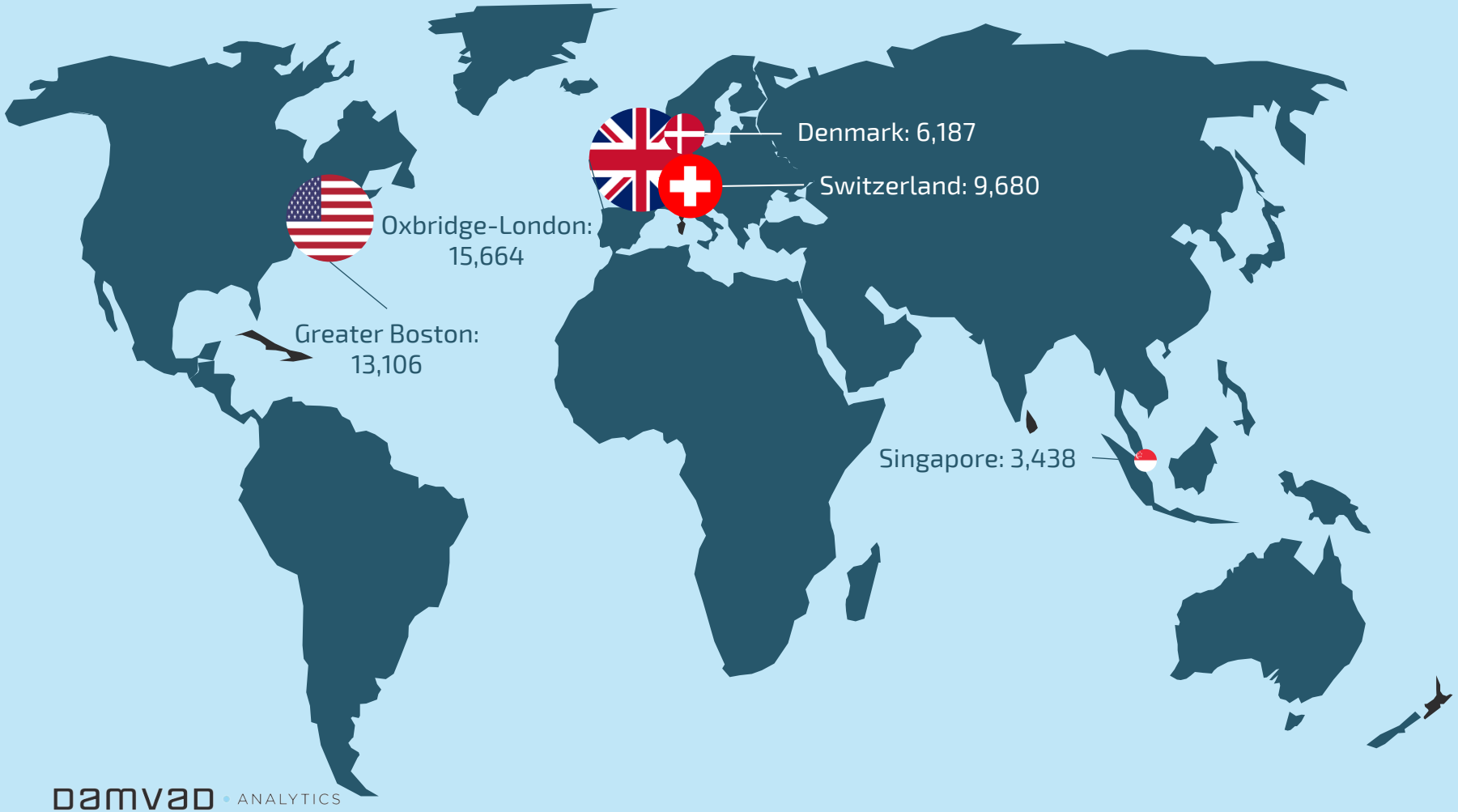
**338** university patents have been filed between 2015-2020

**137** new life science startups have been created between 2015-2021

Leading to new deals of over **1 billion USD** between 2015-2021

# Oxbridge-London, Greater Boston and Switzerland produce more publications

## Number of life science related publications in 2020



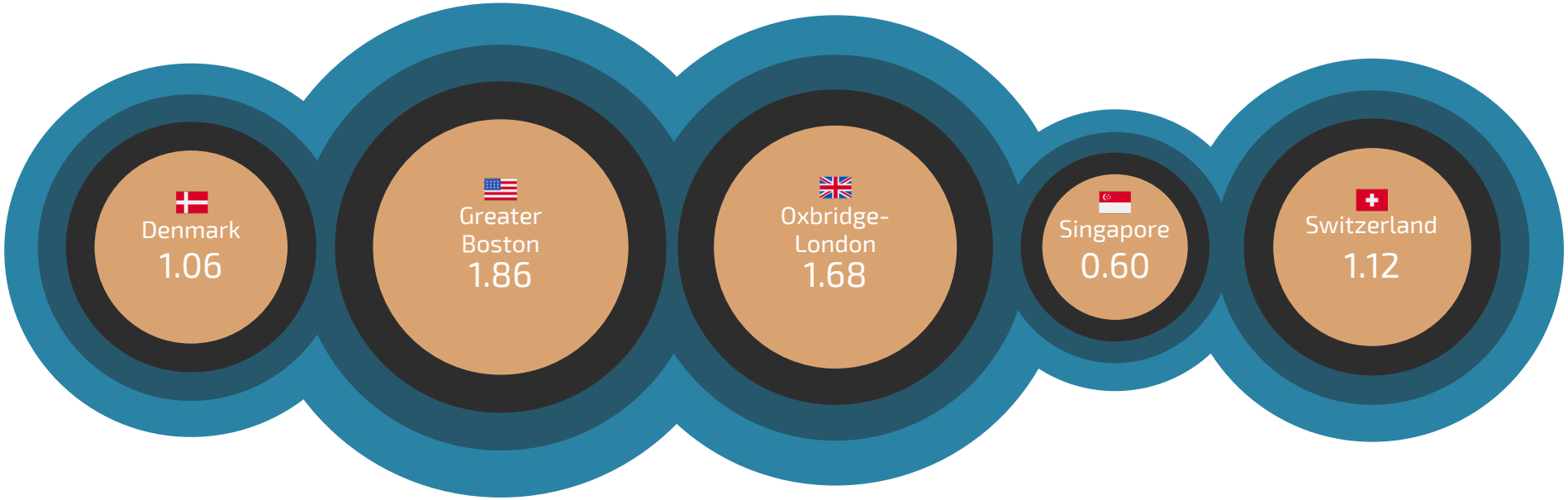

It is only natural that the two large life science regions Oxbridge-London and the Greater Boston area lie well ahead of Denmark and the other smaller regions when it comes to sheer publication volumes.

However, it is noteworthy that Denmark even lies well behind Switzerland on the total amount of life science publications produced.

**Sources:** Scopus Elsevier

# Higher publication volumes per capita in Greater Boston, Oxbridge-London and Switzerland

## Life science publications per 1000 persons, 2020

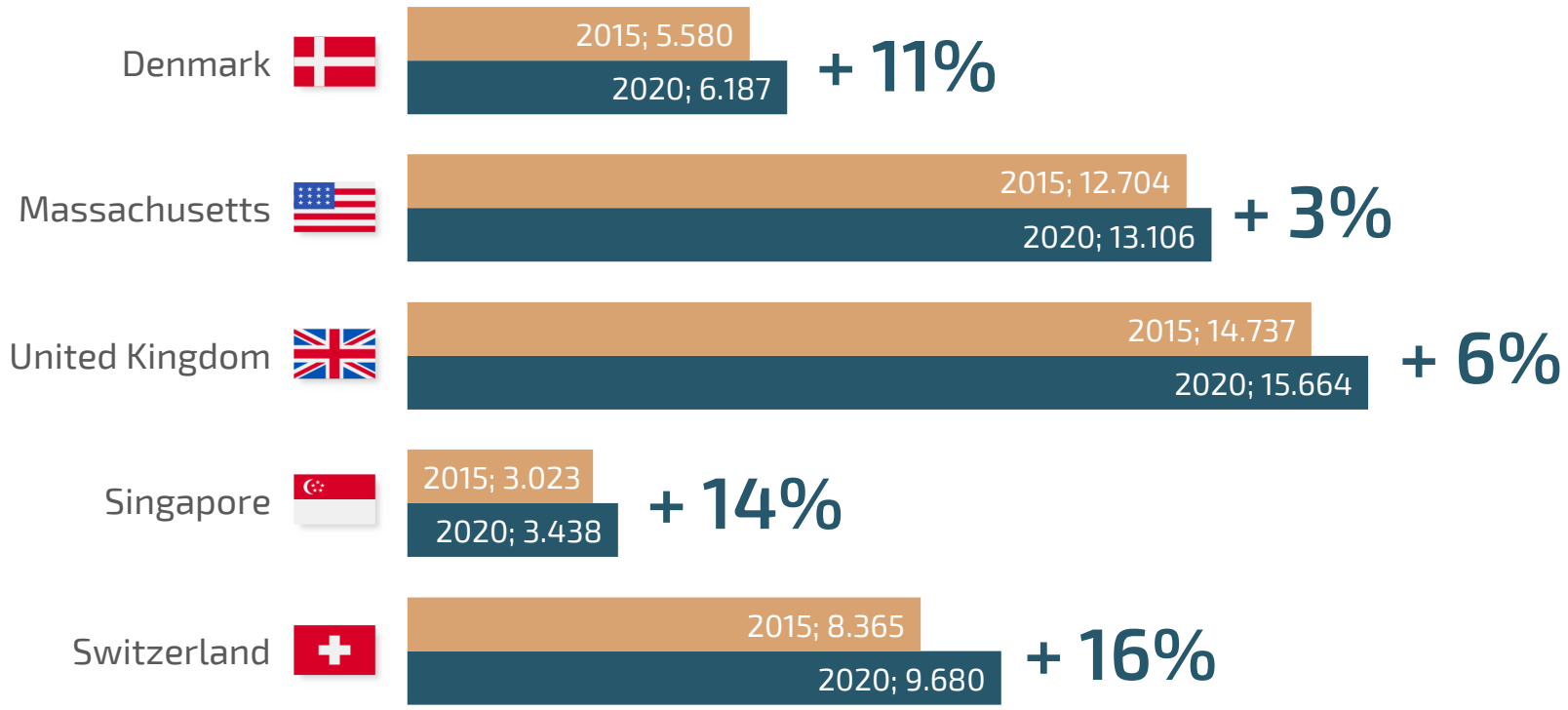



**Compared to the dense Boston, Oxbridge-London, and Switzerland regions, publications per capita is still lower in Denmark.**

**Sources:** Scopus Elsevier, World Bank

# Fastest growth in the smaller life science regions

Number of life science related publications in 2015 and 2020.




**Denmark together with the two other smaller life science regions show larger growth in publication volumes from 2015 to 2020.**

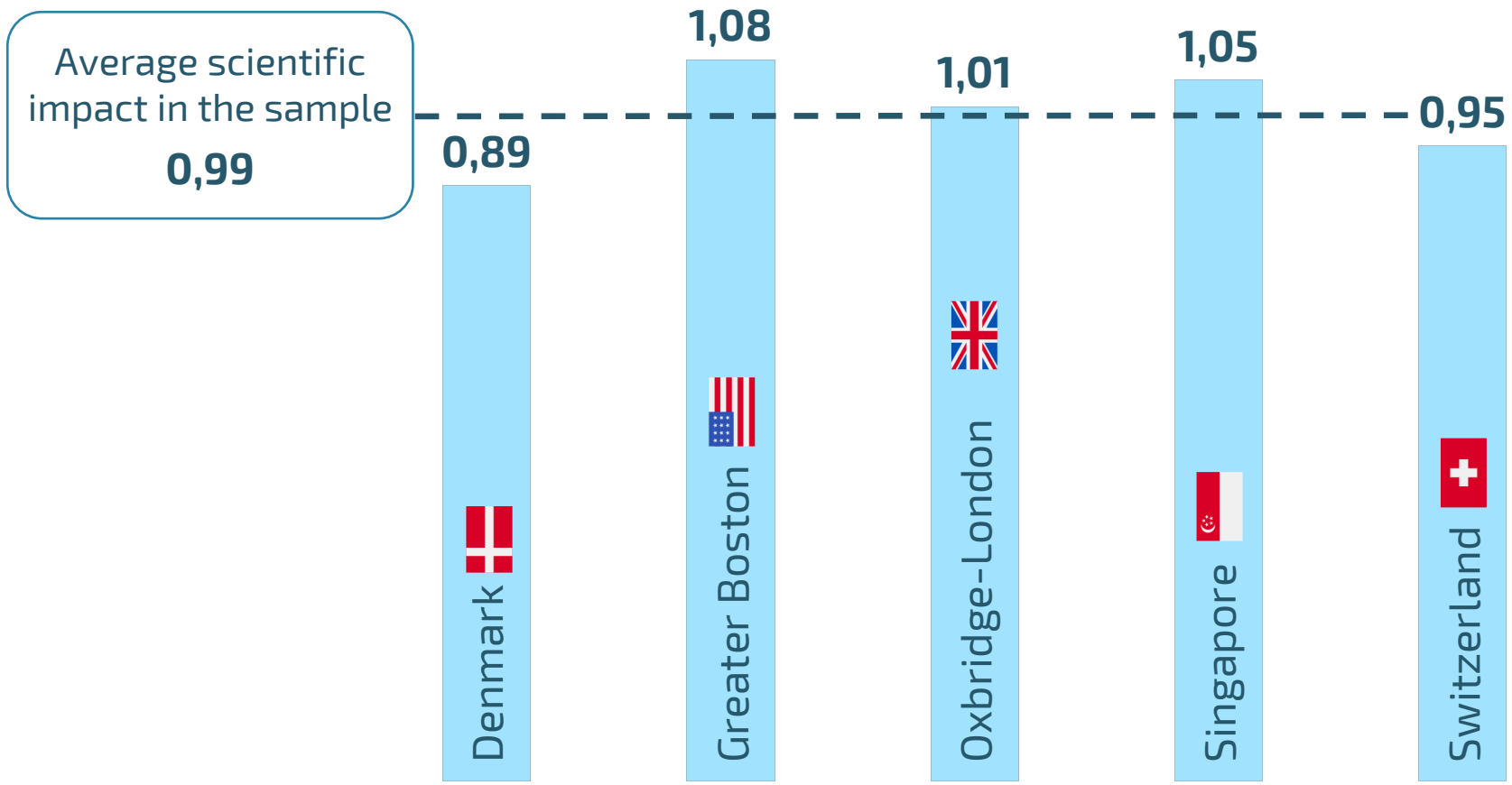
**Even in absolute terms, publications from Denmark have increased more than in Massachusetts, but of course from a much lower level.**

**It is again noteworthy that Switzerland has the highest life science publication growth rate.**

Sources: Scopus Elsevier

# Danish life science publications are of high quality but still fall behind the other regions

## Relative citation impact, average 2015-2020



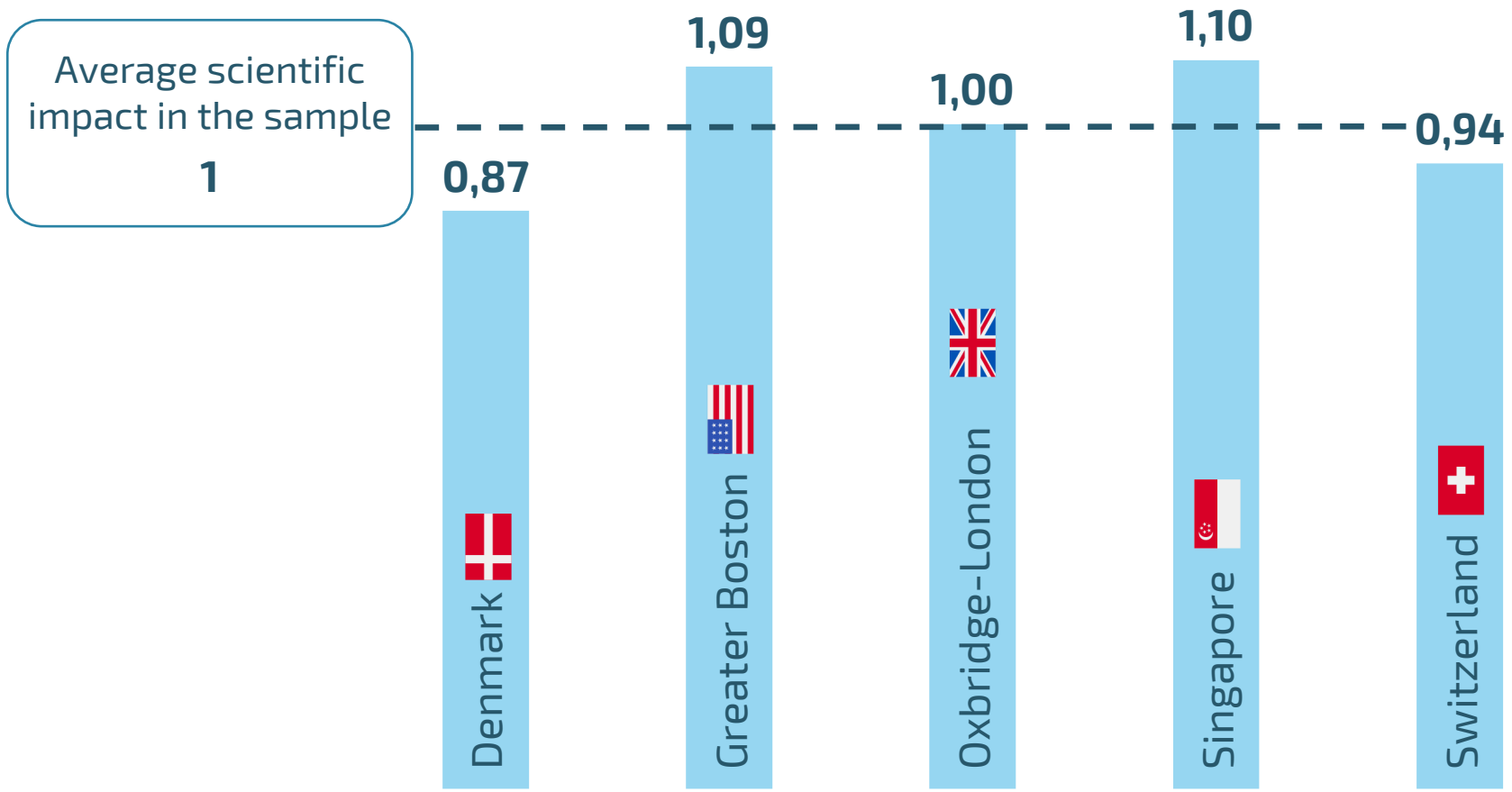

The Danish life science publications are of high quality but are still below average falling behind the other four regions when measured by their relative citation impact.

Danish life science publications receive on average 11 pct fewer citations than the average and around 20 pct fewer citations than publications from Greater Boston.

Sources: Scopus Elsevier

# Scientific Impact for top 5% publications

## Relative citation impact, average 2015-2020




When considering the top 5 pct publications in terms of citations, Danish publications also are behind those of the other life science regions.

Among the most cited publications from Denmark, the average scientific impact is 13 pct less than the average.

Sources: Scopus Elsevier

# QS University rankings (top 50)

| | Pharmacy & Pharmacology | Biology | Computer Science | Chemistry | Physics |
|---|---|---|---|---|---|
| Denmark | 15th (Copenhagen) | 21st (Copenhagen) | | | |
| Massachusetts | 3rd (Harvard) | 1st (Harvard)<br>2nd (MIT) | 1st (MIT)<br>7th (Harvard) | 1st (MIT)<br>3rd (Harvard) | 1st (MIT)<br>3rd (Harvard) |
| Oxbridge-London | 1st (Oxford)<br>7th (UCL)<br>4th (Cambridge)<br>26th (Imperial) | 3rd (Cambridge)<br>13th (Imperial)<br>5th (Oxford)<br>15th (UCL) | 6th (Oxford)<br>16th (Imperial)<br>8th (Cambridge)<br>23rd (UCL) | 4th (Cambridge)<br>12th (Imperial)<br>6th (Oxford)<br>39th (UCL) | 4th (Cambridge)<br>11th (Imperial)<br>5th (Oxford)<br>31st (UCL) |
| Singapore | 12th (NUS) | 17th (NUS)<br>33rd (Nanyang) | 4th (NUS)<br>12th (Nanyang) | 7th (NUS)<br>8th (Nanyang) | 15th (NUS)<br>20th (Nanyang) |
| Switzerland | 21st (ETH Zürich)<br>40th (Basel)<br>33rd (Geneva) | 6th (ETH Zürich)<br>49th (Zürich)<br>25th (EPFL) | 9th (EPFL)<br>10th (ETH Zürich) | 9th (ETH Zürich)<br>10th (EPFL) | 9th (ETH Zürich)<br>14th (EPFL) |

Note: For each of the three subjects, universities that appear in the World Top 50 have been included. Universities appearing in the World Top 10 have been highlighted.

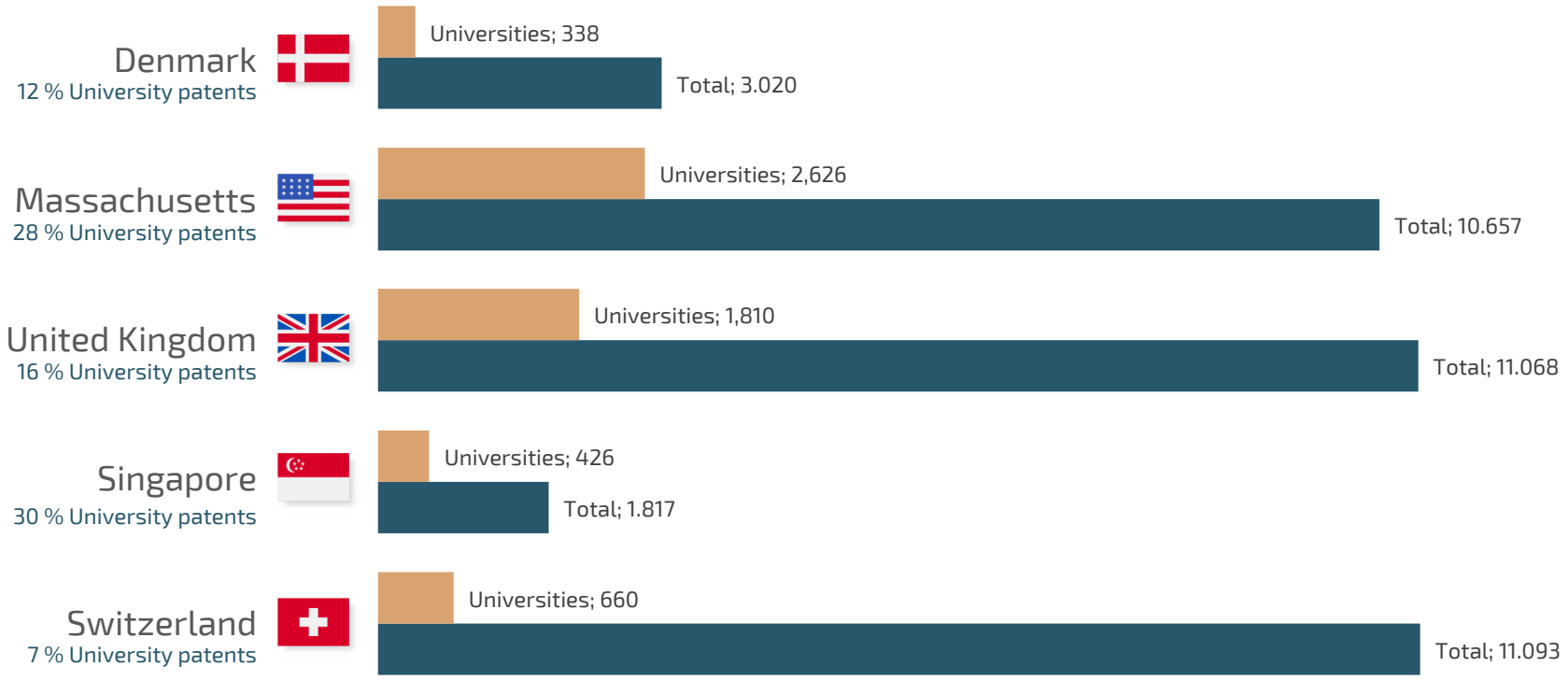
Publications and scientific impact should be considered in the context of the university environment.

Although Denmark with the University of Copenhagen scores quite well in some life science-relevant disciplines, the other regions generally score significantly better and often have more than just one top-tier university.

Sources: QS University Rankings (2021)

# Denmark has a relatively low patenting level

## Life science patent volumes (total and university patents), 2015-2020




Counts are based on patent families (one patent family covers all patents that are considered to cover a single invention). The earliest filing year of the patent family is used as filing year.
*Note that the regional samples differ in the cases of Massachusetts and United Kingdom. The patent data covers a larger region and thus these numbers might be somewhat inflated.

**Denmark has more total patent filings than Singapore but far fewer than Massachusetts, UK, and Switzerland.**

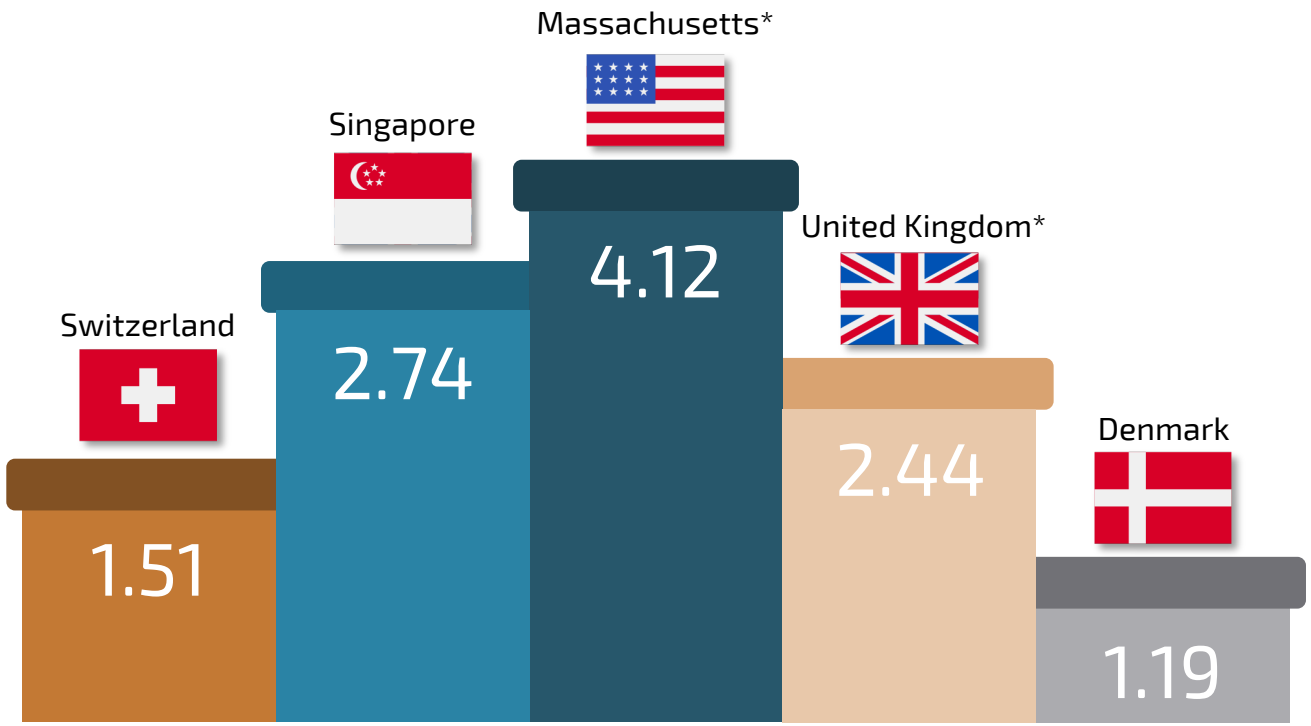
**Danish life science actors filed a total of 3,020 patents in the years 2015–2020 thereof 338 through the universities.**

**Denmark has the lowest university patenting activity in life science of the five regions.**

**Sources:** European Patent Office

# Life science research in Denmark is less likely to result in patent applications

## Share of life science patent applications from universities per 100 life science scientific publications, 2015-2019*.




*Note that the regional samples differ in the cases of Massachusetts and United Kingdom. The patent data covers a larger region and thus these numbers might be somewhat inflated. Note also that the year 2020 has been excluded here due to few patent registrations as a result of data delay.

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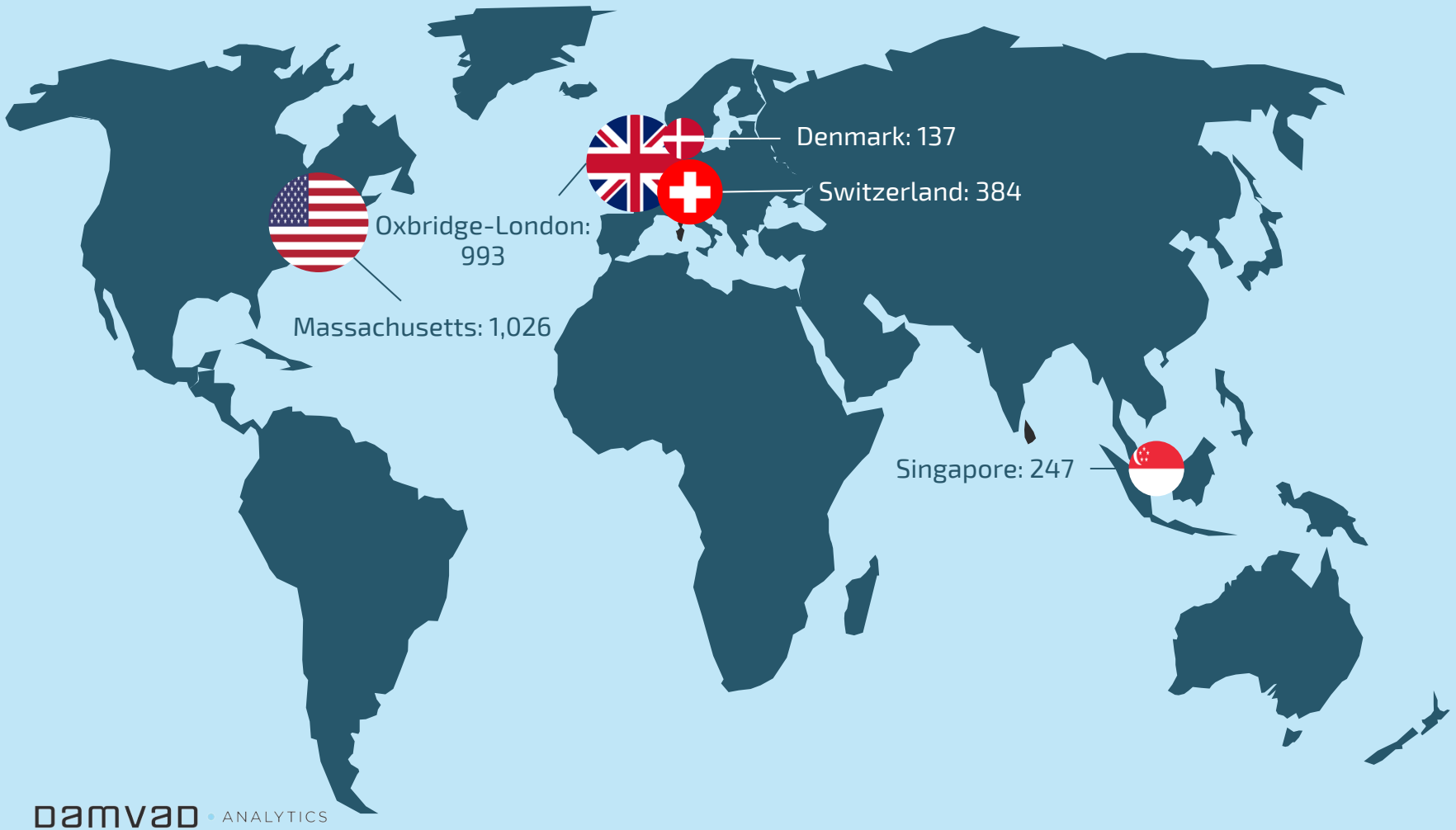
**Life science publications from Danish universities are less likely to turn into patent applications when measured by patenting relative to publication activity. Universities in Massachusetts produce 4 times as many applications per scientific publication as Danish universities do.**

**This could point to Denmark having lower funding for patenting activities, less of a focus on commercialization, or less efficient licencing processes. In a recent report, the tech transfer infrastructure was found to be one of the main barriers to translating science into companies.**

**Sources:** Scopus, European Patent Office, McKinsey & Company: "Nordic Biotech: assessing and unleashing the innovation engine" (2021).

# Denmark fosters fewer life science startups

## Life science startups founded from 2015-2021




During the years 2015-2021, 137 life science startups were founded in Denmark.

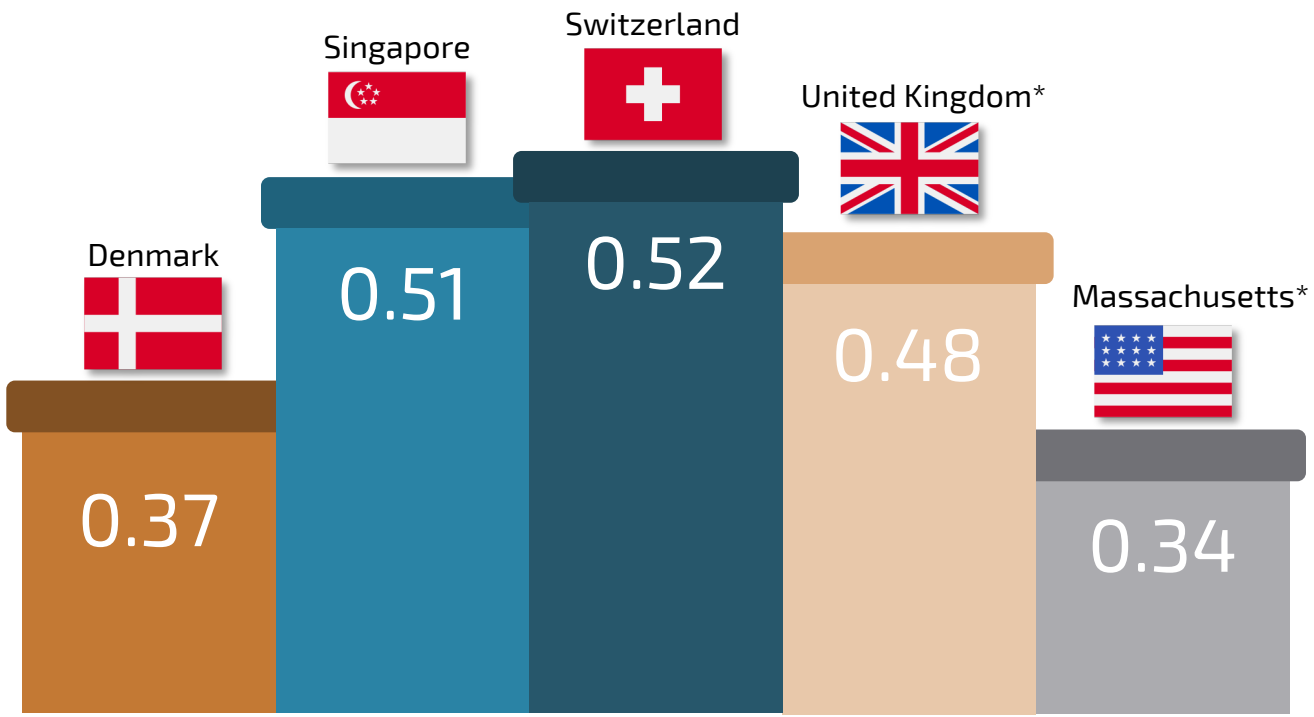
In comparison, the two big life science regions, Massachusetts and Oxbridge-London fostered a total of 1,026 and 993 new startups, respectively.

Also, Switzerland and Singapore are more effective than Denmark in fostering new life science startups.

Sources: Crunchbase

# Switzerland leads the translation of patent applications to startups

Number of life science startups per life science patent applications from universities, 2015-2019*.



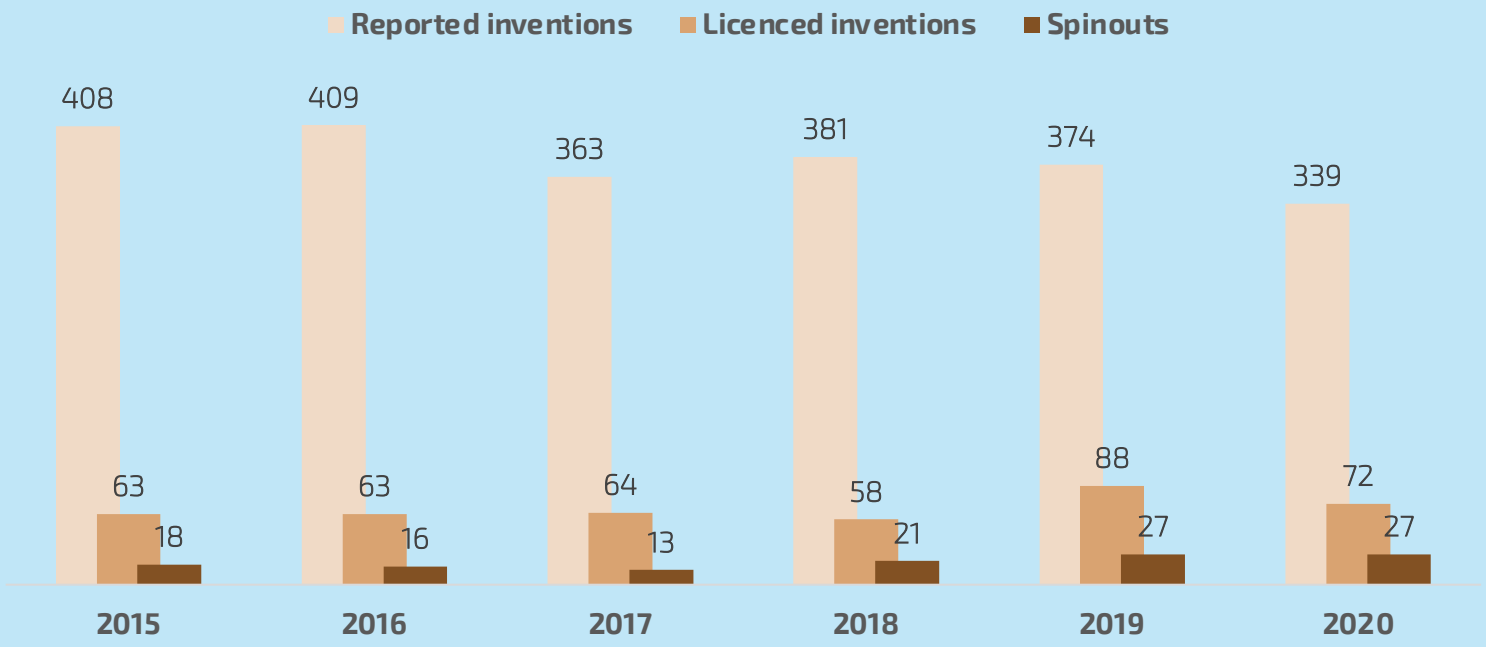

*Note that the regional samples differ in the cases of Massachusetts and United Kingdom. The patent data covers a larger region and thus these numbers might be somewhat inflated. Note also that the year 2020 has been excluded here due to few patent registrations as a result of data delay.

With 0.52 startups per patent application, Switzerland is best at translating patent applications into startups. Singapore and the UK have almost just as effective conversion rates.

Denmark and Massachusetts both have significantly lower conversion rates of only 0.37 and 0.34, respectively.

# Case: University spinouts

## Translation of inventions into licensing and spinouts at Danish universities (2015-2020)




Source: Ministry of Higher Education and Science. Note: Includes inventions and spinouts from all disciplines / industries.

The figure presents data for conversion specifically at Danish universities.

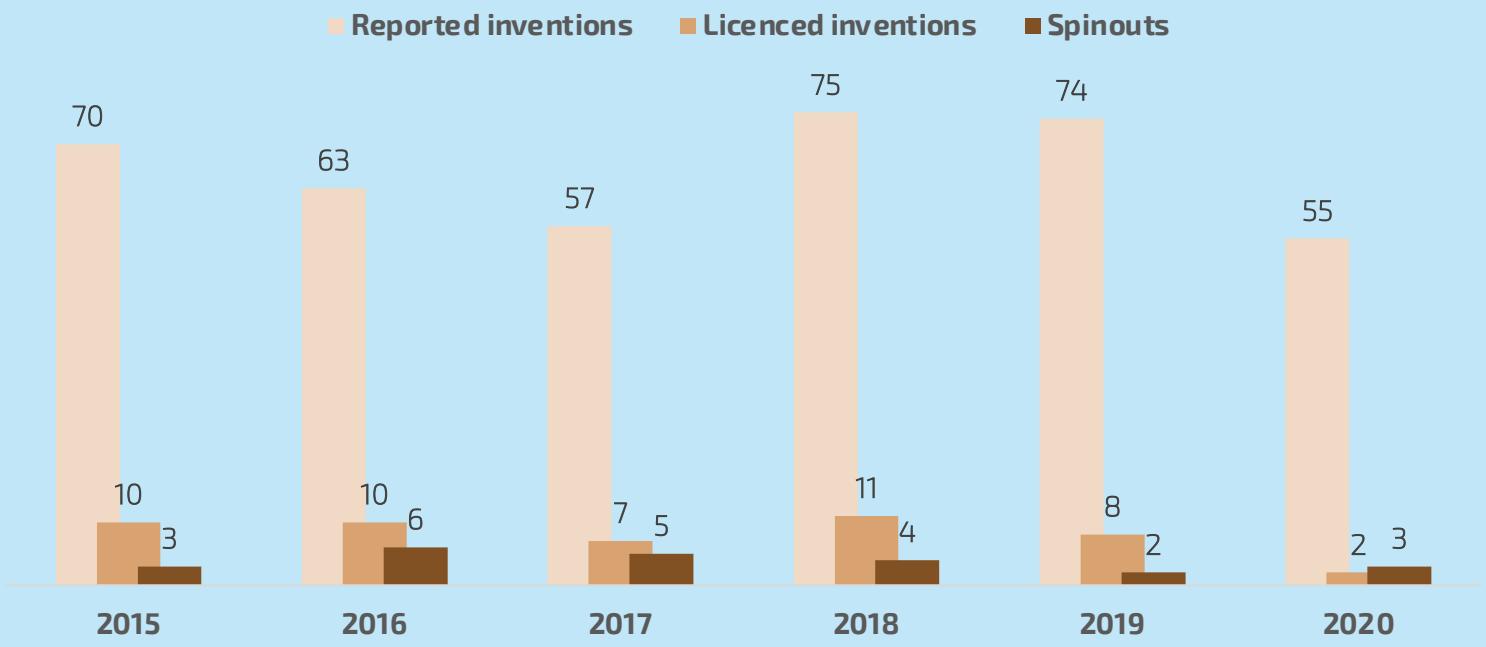
Researchers at Danish universities submitted a total of 2,274 claims for inventions in the years 2015-2020.

408 licensing agreements were made, leading to 122 spinouts being founded. This corresponds to a conversion rate of only 5 pct.

The conversion rate did however grow over the period from 4 pct to 8 pct.

# Case: Hospital spinouts

## Translation of inventions into licensing and spinouts at Danish hospitals (2015-2020)



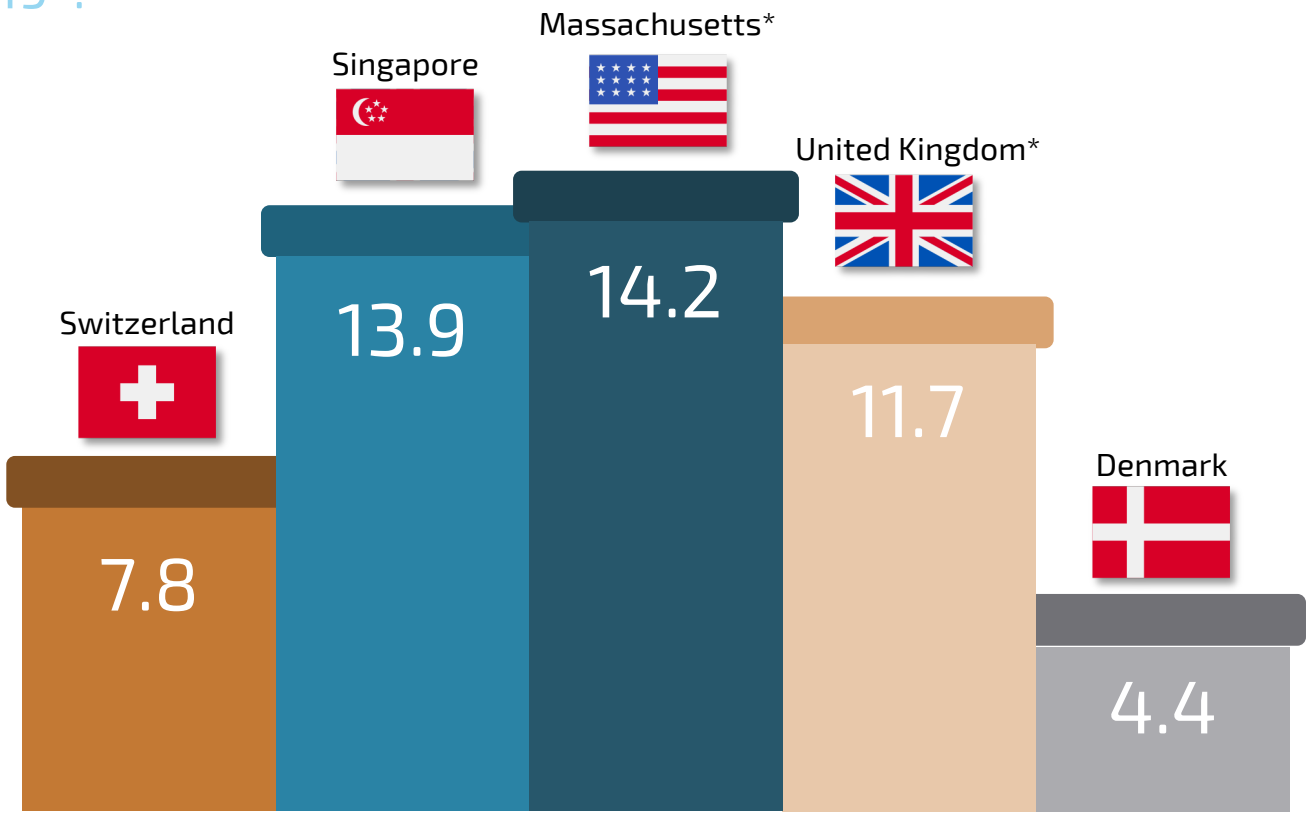

Source: Ministry of Higher Education and Science. Note: Includes inventions and spinouts from all disciplines / industries.

Translation data from Danish hospitals show a similar story to the universities.

During the period 2015-2020, 394 claims for inventions were submitted at the hospitals. As a result, 48 licensing agreements were made, leading to 23 spinouts. This corresponds to a translation rate of 6 pct.

# In total, Massachusetts is more than 3 times as good at research translation as Denmark

Number of life science startups per 1,000 life science publications, 2015-2019*.




*Note that the regional samples differ in the cases of Massachusetts and United Kingdom. The patent data covers a larger region and thus these numbers might be somewhat inflated. Note also that the year 2020 has been excluded here due to few patent registrations as a result of data delay.

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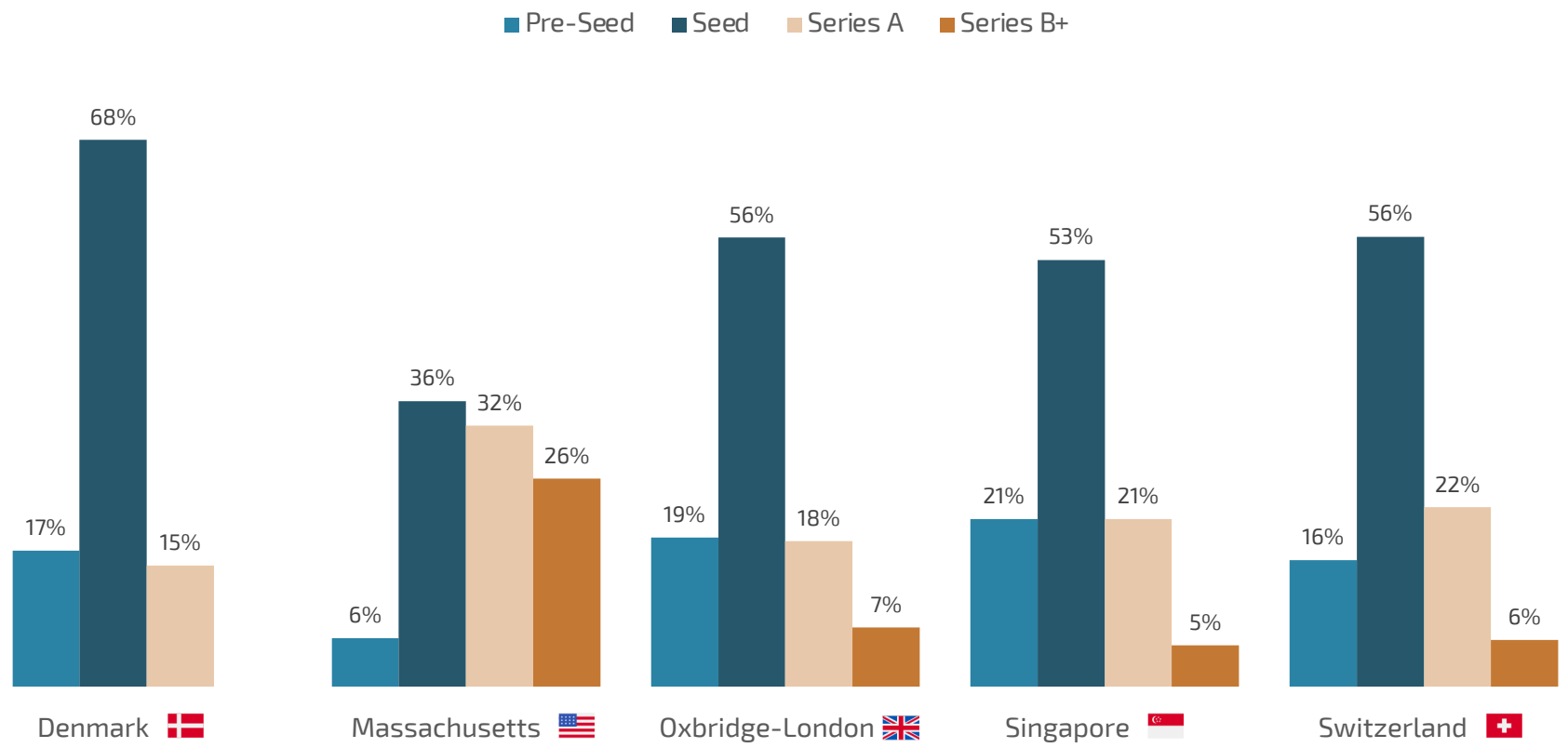
Of the five hubs, Denmark is the least efficient at translating publications into startups.

Massachusetts is more than 3 times as efficient as Denmark. When taking into account the difference in the scientific impact of publications, Massachusetts still converts publications of a given quality into startups at a rate of 2.6 higher than Denmark.

# Massachusetts is heavier on later-stage startups

## Distribution of last funding type, companies founded 2015-2021



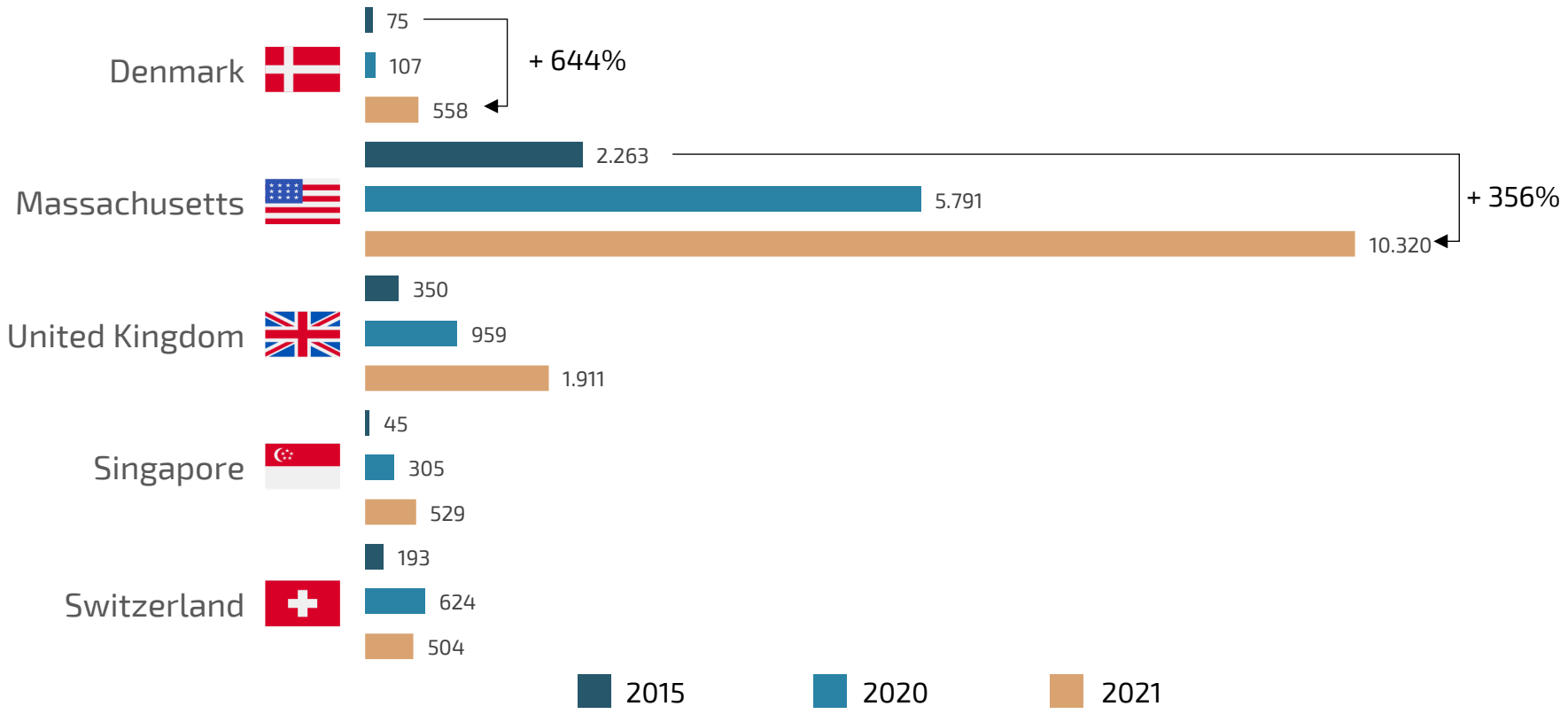

A larger share of startups in Massachusetts had series B funding, indicating both faster growth and more available capital.

26 pct of the Massachusetts-based startups founded between 2015-2021 have already reached a series B or higher funding round. For the other regions, this is not as common.

Sources: Crunchbase

# Life science financing activity sees big increases

## Total amount of startup financing deals (million USD), 2015, 2020 and 2021




Note: Only deals in pre-seed, seed, series A, and series B are included in these figures.

Almost all life science regions experienced significant increases in funding, especially between 2020 and 2021.

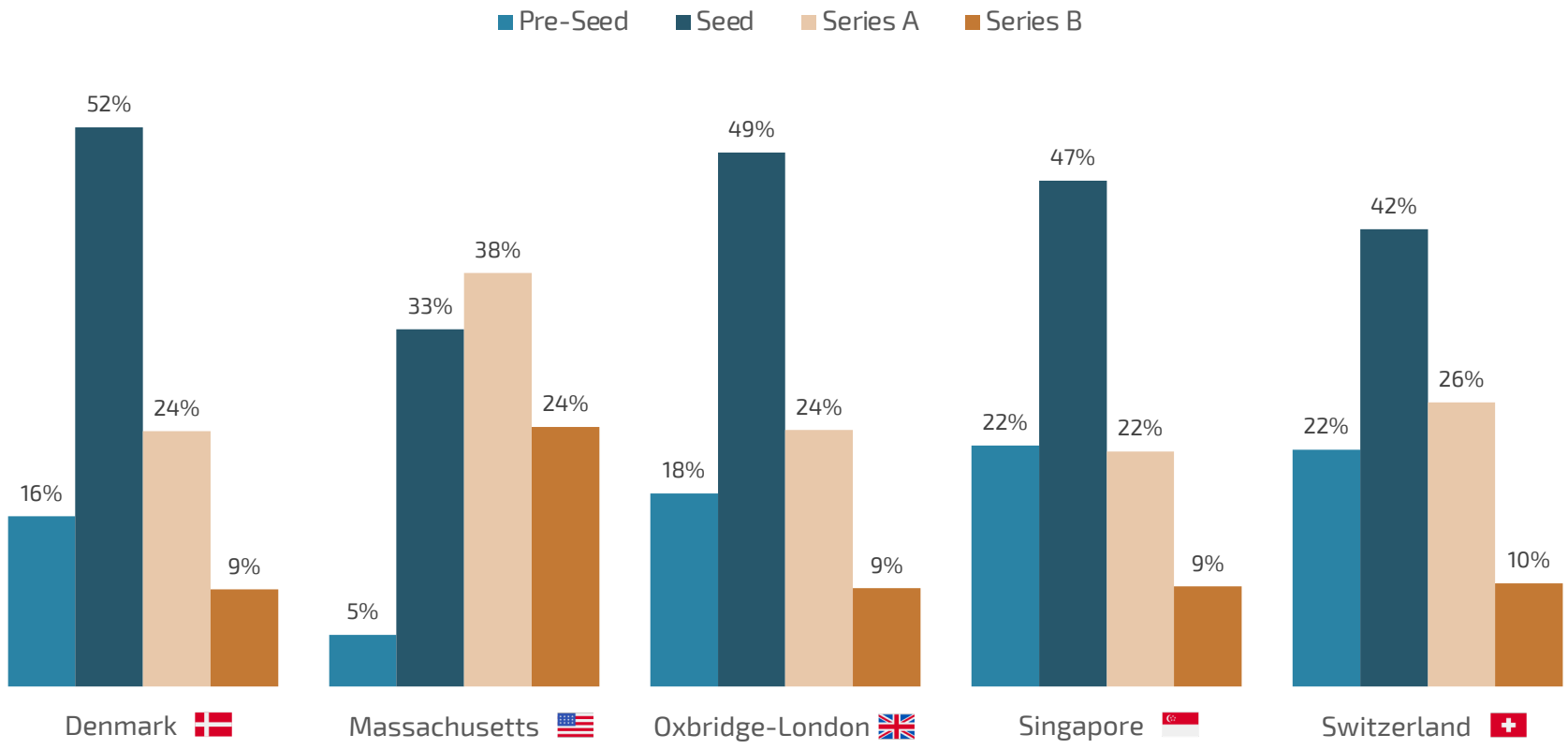
Massachusetts is generally the most capital-heavy life science region and has also experienced very high growth in funding.

Between 2015 and 2021, Denmark experienced the highest growth in funding of almost 650 pct. This is important but the growth comes from a low starting point.

Sources: Crunchbase

# Massachusetts also strong on later-stage funding

## Distribution of deal stage, based on number of deals 2015-2021




Note: Only deals in pre-seed, seed, series A, and series B are included in these figures.
Note also that compared to the figure on page 22, this figure includes all deals in years 2015-2021, while the figure on page 22 only includes startups founded between 2015-2021.

**With a large share of later-stage funding, the Massachusetts region provides more startups with the necessary capital to grow.**

**24 pct of all startup deals in Massachusetts between 2015-2021 were series B deals. In the other regions, only 9-10 pct were at this stage.**

**Denmark is on par with the other life science regions when it comes to providing later-stage funding as a share of total funding.**

Sources: Crunchbase

# Part 2

# Comparative review of five life science startup ecosystems

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# Summary of Part 2

In this second section, we carry out a comparative review of the systems and structures affecting a life science regions' startup success. Based on learnings from the other regions, we examine four fundamental elements of the Danish ecosystem, namely:

a. The general startup environment
b. The framework conditions
c. The knowledge environment
d. The funding environment

Performance across the four elements is essential for the system's ability to foster and develop new life science startups. The comparative review of the five life science startup systems shows that while the Danish life science startup system has several strengths to build on, there are many reasons why the development is moving faster in the other life science regions.

The best life science regions have for decades undergone long-term and holistic reforms, including larger government R&D funding, more dedicated space for innovative activities, large investments in talent attraction, tax reliefs on VC funds and R&D expenditures for SMEs as well as a much stronger focus on the innovation capacity of universities.

# Summary of Part 2

The comparative review of the international ecosystems shows that Denmark has much to learn from the reforming capacity of each of the other four international life science regions.

The most important reform lessons to learn from **Massachusetts** are:

- Long-sighted and focused investments in life science infrastructure and facilities for decades
- Grants dedicated to innovative life science research
- Grants dedicated to special workforce development initiatives
- Tax incentives for companies committed to creating job growth
- Dedicated commercial space set aside for "innovation space"
- Tax credits for education, R&D, and workforce training

The most important reform lessons to learn from **Oxbridge-London** are:

- Long-term and focused investments in building a strong life science ecosystem
- Special focus on attracting, developing, and rewarding the best talent
- Special focus on creating incentives for innovation
- Hosting events and providing researchers with management training and regulatory advisory
- Establishing the Francis Crick Institute providing the largest biomedical lab in Europe specializing in translational medicine

The most important reform lessons to learn from **Switzerland** are:

- Long-term life science focus through the Research and Innovation Promotion Act (2013). Funds for basic research and young scientists
- Focused support for projects in biology and medicine as well as applied research and development
- Support for coaching, training, and tech transfer to startups
- Low average tax rate and zero tax on capital gains
- Cantonal tax exemptions for newly established companies
- Tax benefits for holding companies
- Reduced tax for companies with primarily foreign-generated profits
- Reduced federal and cantonal tax rates for principal companies
- Reduced tax rates on IP related income

The most important reform lessons to learn from **Singapore** are:

- A long-term and holistic biomedical science strategy
- Sponsored headhunting and recruitment of the world's top scientists and highly qualified clinical scientists
- Publicly funded research institutes and a biomedical science park
- Scholarships for Singaporean scientists at leading global universities
- Government venture capital for industrial projects
- Joint ventures with large multinational companies

# Features and strengths of the Massachusetts ecosystem

## Historical features

**A pioneering university for tech transfer**
MIT has a long history of consulting and interaction with industry. Already by the 1960s, spinoffs were happening, and faculty members were helping co-found startups.

**Availability of industrial space near MIT**
As a result of a failed NASA project in 1969, cheap space was available for industrial use in what today is known as Kendall Square. Due to the proximity to MIT, this became an attractive location for biotech spinouts from the university needing lab space.

**Fuelled by tech revolution**
In the 1990s, the location became attractive for tech startups due to increased hardware space needs. The founding of the Cambridge Innovation Center in 1999 further fuelled entrepreneurship in the area. This also attracted venture capital firms. Following the move of Novartis to Kendall Square in 2003, many Big Pharma companies (e.g. Pfizer and AstraZeneca) followed suit.

**Active real estate planning**
During the past two decades, a heavy focus on real estate planning has contributed to "making it happen". New restaurants and housing have turned the formerly industrial space into a liveable and dynamic neighbourhood for researchers and professionals.

## Initiatives

**The Life Sciences Initiative (2008)**
1 billion USD over a 10-year period allocated for:

- Investments in life science infrastructure and facilities
- Grants for innovative research
- Grants for workforce development initiatives
- Tax incentives for companies committed to creating job growth in the state

The Massachusetts Life Sciences Center (MLSC) was founded to administer the initiatives.

**Innovation space requirement (2013)**
In the city of Cambridge, 5 pct of all new commercial space is required to be set aside for "innovation space".

**Renewal of Life Sciences Initiative (2018)**
623 million USD over a 5-year period allocated for:

- Bond authorization for investments in research, facilities, and education
- Tax credits in education, R&D, and workforce training

## Current strengths

**Significant critical mass**
The Massachusetts life science hub is in many ways close to being the ideal hub: it has a strong critical mass of both top universities (Harvard and MIT), hospitals, established companies, talent, and VC funding.

**Strong incentives for startups and VC**
Through the life sciences initiatives, as well as general tax initiatives, both startups and investors are heavily incentivized. For example, the Tax Incentive Program of MLSC offers 10 different tax incentives to life science companies that commit to hiring and retaining jobs in Massachusetts, and the Angel Investor Tax Credit offers a credit of up to 30 pct for investments into startups with less than 20 FTEs. The state further offers various funding programs and tax credits for investments, R&D expenditures, and workforce training expenditures.

**Additional sources of funding**
In addition to venture capital and state funding, NIH also offers funding to hospitals and companies. In 2019, the Boston area received over $2.7 billion in funding, 10 pct of which went into private biotech enterprises.

# Features and strengths of the Oxbridge-London ecosystem

## Historical features

**Historically strong universities**
The universities of Oxford and Cambridge have historically been some of the most leading globally. With London further being home to other influential universities like Imperial College London, UCL, and King's College, the London region has a long history of being a centre for advancement in medicine and biology.

**An ambitious and holistic life science strategy**
In 2011, the Department for Business Innovation and Skills published an extensive 10-year strategy for UK life science targeting many aspects of the industry.

**Increasing regional collaboration**
In 2014, the city of London launched the organization MedCity in order to promote and increase collaboration between the universities of London as well as with Oxford and Cambridge.

**Agile reaction to new challenges**
Already by 2017, a new "Life Sciences Industrial Strategy" was proposed by Professor Sir John Bell with recommendations for new initiatives, including a new focus on the importance of data awareness and adoption of innovative technologies. The recommendations were rapidly translated into the Life Sciences Sector Deal.

## Initiatives

**Strategy for UK Life Science (2011)**
The strategy was focused around three key principles:
1) Building a life science ecosystem
2) Attracting, developing, and rewarding the best talent
3) Creating incentives for innovation

Besides targeted investments in the development of research, initiatives also targeted commercialization by hosting events and providing researchers with management training and regulatory advisory.

**Europe's largest biomedical lab (2016)**
An important addition to the life sciences infrastructure was the £500 million Francis Crick Institute that opened in 2016. The lab is the largest biomedical lab in Europe and specializes in translational medicine.

**Life Sciences Sector Deal (2017)**
The initiatives of the strategy are based on five main foundations:
1) Ideas (R&D investments and tax credits)
2) People (Upskilling in STEM fields)
3) Infrastructure (physical and digital)
4) Business environment (improving possibilities for innovative and high-potential businesses)
5) Places (strengthen local areas)

## Current strengths

**A digital and forward-looking mindset**
Although historically strong in medicine and biology, Oxbridge-London is today just as strong within digital health, MedTech as well as data & AI. Regulation is also continuously updated to fit upcoming trends and opportunities.

**Critical mass of world-class research**
Oxbridge-London benefits from having four strong universities within all five relevant academic disciplines (see Part 1). The universities of Oxford and Cambridge are consistently in the global top 10, while Imperial and UCL are in the top 40. Oxbridge-London is also the hub with the largest publication volume.

**Incentives for risk-taking, R&D, and talent attraction**
The UK has implemented a number of schemes that incentivize the startup ecosystem. The EIS and Seed EIS give tax reliefs of up to 50 pct for investments in small early-stage companies, and the R&D tax credit offers SMEs an additional 130 pct relief on R&D expenditures. Employee share plans, such as SIP, further allow employees to receive or purchase shares of their company on a very tax-favoured basis, relating employee talent or effort even more to reward.

# Features and strengths of the Switzerland ecosystem

## Historical features

**Multiple separate hubs**

Basel is known as the hometown of two of the five largest pharma companies (Roche and Novartis) and is sometimes considered part of the BioValley, which includes nearby cities in Germany and France. Zürich is home to the University of Zürich as well as ETH Zürich. Here, research centres and university spinouts are situated close to one another, generating a cluster effect. In Lausanne, an active strategy to turn the local cantonal engineering school into a federal institute resulted in the establishment of EPFL, which today is a leading university in the sciences.

**Patient capital**

Historically, many Swiss companies have relied on substantial shareholding held by foundations or families. It is argued that such stability and long-termism was what enabled Roche to continue growing over time.

**Subsidiarity and liberal economy**

Swiss politics are traditionally based on the two pillars of subsidiarity and liberal economy. This implies that the government is active only in areas where it is constitutionally authorized to do so.

**Transfer of R&D support to Confederation**

Under the Research and Innovation Promotion Act in 2013, the Confederation became responsible for supporting research and innovation through the Swiss National Science Foundation (SNSF) and the Commission for Technology and Innovation (CTI).

## Initiatives

**Research and Innovation Promotion Act (2013)**

- SNSF is mandated to fund basic research and promote young scientists in Switzerland. In 2013, SNSF supported projects in biology and medicine by grants totalling approx. USD 160 million (out of USD 400 million total funds).
- "CTI Life Sciences" sponsors projects in applied research and development.
- CTI offers coaching, training, and tech transfer support to promising start-ups and SMEs.

**General tax initiatives in cantons**

In addition to the generally low average tax rate and the zero tax on capital gains, a number of other tax incentives exist that vary between the cantons:

- Cantonal tax exemptions for newly established companies that are economically important for the region
- Tax benefits for holding companies
- Substantially reduced tax rates for companies with primarily foreign-generated profits
- Reduced federal and cantonal tax rates for principal companies
- Reduced tax rates on IP related income

## Current strengths

**1st in world for talent attraction and innovation**

In 2021, Switzerland was ranked 1st in the world for talent attraction and retention for the 8th consecutive year. The country further ranked 1st in the 2021 Global Innovation index.

**Patent culture**

In 2020, Switzerland also ranked 1st in Europe in terms of number of patent applications per capita. Out of the hubs, Switzerland also has the highest translation of patent applications to startups (see Part 1).

**High relative importance of life science industry**

Chemical-pharmaceutical products are the most important exported good in Switzerland. As of 2020, they accounted for 52 pct of the country's total exports. With such importance, the industry attracts a high degree of attention and plays a very central role in the economy.

**Mature stock exchange ecosystem**

Switzerland's capital markets have a long track record of investment in healthcare, and life sciences companies have raised more money in Switzerland than anywhere else in Europe. As a result, the country's stock exchange ecosystem around IPOs is mature and well-developed.

# Features and strengths of the Singapore ecosystem

## Historical features

**A burning platform**

Since its separation from Malaysia in 1965, the Singaporean government has been highly aware of its fragility as a city-state. Following a recession in 1986 in particular, the government moved quickly to implement a new ambitious strategy to make Singapore an "international business centre" by attracting companies to establish regional headquarters in the state.

**From manufacturing to R&D**

Having already attracted large foreign pharmaceutical companies by 2000, an extensive biomedical sciences strategy was developed in order to diversify the economy beyond manufacturing.

**A campus for cross-disciplinary collaboration**

In 2003, the Biopolis was officially launched. This provided a space where the gap between academic and industrial research could be bridged by bringing together key research institutes, biotechnology and pharmaceutical companies, and national governance bodies.

## Initiatives

**Biomedical sciences strategy (2000)**

- Sponsored headhunting of the world's top scientists
- Publicly funded research institutes and a biomedical science park
- Scholarship programmes for Singaporean scientists at leading global universities.
- Government venture capital for industrial projects
- Tax incentives and IP frameworks
- Joint ventures with large multinational companies

**Translation and Clinical Research programme (2005)**

- Recruitment of highly qualified clinical scientists from abroad
- Research on relevant diseases for Singapore & Asia, integrating basic, translational, and clinical scientists
- Creation of two medical centres bringing together large hospitals and medical schools

## Current strengths

**Universities strong in all five disciplines**

NUS and Nanyang are more or less represented in the world's top 50 in all of the five relevant disciplines. The Singaporean universities are particularly strong in chemistry and computer science.

**High impact and translation of research**

As illustrated in Part 1, Singapore produces the fewest publications of the five hubs. However, their top 5% publications are more impactful than in any of the other hubs. Further, Singapore has the second-highest conversion rate of publications into patents.

**Expansion into MedTech**

Although initially focused on biomedical sciences, MedTech has been a growing industry during the past decade. This was especially kick-started by the development of the Medtech Hub in 2012-13 and is supported by having top universities within computer science.

**High in talent attraction**

Singapore scores 2nd globally in talent attraction and retention after Switzerland.

**Many tax incentives**

As a result of the outlined initiatives as well as the strategy of attracting multinationals, companies enjoy a low corporate tax rate and multiple tax incentives for engaging in R&D and innovation.

# Prerequisites for life science startup success

> *Denmark needs to be more attractive for talents and investments. It is all about creating incentives for risk taking and for coming to Denmark*

The attractiveness of starting up and developing companies depends on many factors in combination. The figure below summarises a number of the most important factors highlighted in the comparative review.

| | Startup stage | Later stage |
|---|---|---|
| **Startup environment** | • Commercialization mindset<br>• Mature life science companies<br>• Patent culture<br>• Incubators and lab space | • Ease of movement<br>• Large market geography |
| **Framework conditions** | • Political support & attention<br>• Appropriate legislation and incentives | • Up-to-date regulation<br>• Digitalization environment |
| **Knowledge** | • Strong universities & research<br>• Meeting hubs & networks<br>• A large talent pool | • Commercialization experience<br>• Talent attraction |
| **Funding** | • Number of VC funds<br>• Multiple sources of public funding | • Large-deal VC funds<br>• Mature IPO ecosystem |

# How the Danish life science startup ecosystem performs

## Incentives and disincentives

Below, we provide a summary of the most important factors that affect the Danish startup success either positively or negatively. On the following pages we dive deeper into each pillar.

| Incentives | | Disincentives |
|---|---|---|
| • Attractive & easy to do business<br>• Established local life science industry<br>• Programs for lab space and incubation | **Startup environment** | • Not always a commercial focus of research<br>• Local mindset in a global market<br>• Programs are in place but more lab space is needed |
| • Programs for ensuring residentship are in place<br>• Scientist program makes recruiting talent easier<br>• Extension of the R&D taxation credit | **Framework conditions** | • Incentive structures not competitive<br>• Complicated tax system<br>• Not up-to-date legislation in tech & digital |
| • Strong academic environment<br>• Relatively high general talent attraction | **Knowledge system** | • Difficult to attract the right talent<br>• Few knowledge hubs for professionals<br>• Weak health-tech interaction and interdisciplinarity |
| • Increasing amounts of capital available<br>• Higher degree of investor diversity<br>• Other sources of financing available | **Funding structures** | • Not sufficient capital for later-stage companies<br>• The IPO system is still immature<br>• Limited public funding initiatives |

# Startup environment

## Need for more lab space and educational initiatives to help realizing ideas

### What Denmark does well

- Denmark is generally known for being **an attractive location for doing business**. With a highly skilled workforce, a high level of stability, and an increasingly entrepreneurial mindset, Denmark scores 4th globally in terms of ease of doing business.
- With large international companies like Novo Nordisk, Lundbeck, and Chr. Hansen, Denmark has an **established life science industry** that participates in R&D and upskilling of workers.
- Denmark has **a high degree of digitalization**, and the Danish population has a digital mindset. In 2021, Denmark scored 4th globally for digital competitiveness. This is a clear strength for being leading in health tech and innovative solutions.
- **Programs are established to facilitate lab space** and benches to incubate companies.

### Improvement potentials

- A point of critique is that although initiatives exist for facilitating lab space, **there is a need for even more space for scientists** to develop their ideas and have the IPR on the data generated. It is argued that the market alone cannot solve the issue as a supply deficit will also result in a demand deficit.
- Denmark has increasingly become entrepreneurial within the past decade, but it is argued that **1) the Danish mindset is still local in a global market**, and **2) the commercialization of research is not always the focus** (see Part 1). Based on the findings from the other leading hubs, the issue could to some extent be handled by offering the appropriate educational programs as well as legal and commercial advice for researchers and entrepreneurs.

*"Denmark has everything to start off and become successful, and BII has a key role in this. But there is still not enough safe space to collect data [labs]."*

*"There's an inherent risk that we'll be too local in our mindset. We need to think more global. Create the local framework to ensure global success."*

*"We are not educated enough in patents. We should generally speaking patent more of the good ideas before publishing."*

*"We need to make it easier for foreign talents to integrate and create a positive incentive structure to come and work."*

*"We need more lab space. The market is not capable of solving the problems itself."*

# Framework conditions

## The right incentive structures could enable more investments and risk-taking

### What Denmark does well

- Denmark has a **startup visa scheme for non-EU/EEA entrepreneurs** that provides founders with a work and residence permit if the business has clear growth potential.
- **The scientist taxation program makes recruiting international talent easier** by offering a lower income tax rate for 7 years, making the net salaries offered in Denmark more competitive.
- Denmark offers a **tax credit for R&D**. During COVID-19, the tax credit was temporarily increased from an additional 1.5 pct to 30 pct. While the plan initially was to reduce it back to 8 pct starting from 2023, it was recently decided to extend the tax credit on the additional 30 pct permanently.

### Improvement potentials

- Compared to the other hubs, the **Danish incentives for R&D, risk-taking, talent attraction, and investments in startups are not as attractive**. The UK, for example, provides a significantly higher R&D tax credit for SMEs, a higher tax relief of investments in startups, and warrant/stock option programs that heavily incentivize committed efforts by employees.
- It is argued that **the Danish tax system is too complicated** and difficult to navigate. For example, warrant/stock options exist, but due to the administrative burden that follows, they do not form an attractive alternative.
- Although Denmark is quite digitalized, the **lack of continuous legislative updating** can make it difficult for visionary digital health technologies to create meaningful business models.

*"For Danish health tech, the largest potential clients are the hospitals. Their role and their possibilities to buy and adapt to new technology is limited. This is a challenge for the startups."*

*"The UK is ahead on the rules concerning warrants and R&D tax credits. Denmark is doing well in terms of starting companies. All it takes is a NemID."*

*"The incentives could clearly be improved in Denmark by simplifying rules concerning stock options."*

*"The tax legislation is a bit cumbersome in terms of stock options and cooperation with foreigners."*

# Knowledge system

## Attracting the right talent is key for strengthening and developing the ecosystem

### What Denmark does well

- With the University of Copenhagen, Denmark has a top university within both pharmacy / pharmacology and biology. In addition, a number of other universities in Denmark contribute to **a strong academic environment**.
- In 2021, **Denmark ranked 4th globally for talent attraction**. This indicates that Denmark in general is good at attracting skilled people to the Danish workforce.

### Improvement potentials

- Part 1 shows how Denmark is the worst of the hubs at commercializing knowledge. An important element of commercialization is to have experienced people in the workforce. Although Denmark scores relatively well in terms of talent attraction, a criticism is that **Denmark does not attract the "right people"** (i.e. CEOs, CTOs, and CMOs who have "done it before"). Incentives could be improved (see Framework Conditions) to target these talents more.
- It is suggested that there is a **lack of space for knowledge exchange and interaction** in Denmark. For health tech in particular, Denmark could benefit from more professional interaction and academic interdisciplinarity between health and tech.

*"Talent attraction is key. In health tech you need talents with experience. People who have grown within health tech are rare in Denmark."*

*"The talent pool is important. Talent is one of the most important resources."*

*"If the ecosystem is able to attract the right talent, all other challenges will over time be solved as the ecosystem recycles talent knowhow."*

*"If I should rank the inputs in the ecosystem I would put talent on top. Talent constitute the entire chain."*

# Funding structures

## Without later-stage funding and structures, companies are limited in their growth

### What Denmark does well

- As presented in Part 1, Denmark has seen **a significant increase in both the amount of venture capital as well as the number of startup investors**. Compared to the other hubs, Denmark performs fairly well in terms of available capital per startup with 7.3 million USD per company. This is a relevant size for funding early-stage companies.
- **Other sources of financing also exist**. For example, Vækstfonden offers both grants and loans for startups on a competitive basis.

### Improvement potentials

- It is argued that **the current funding size is still not sufficient for growing later-stage startups**. In Massachusetts, for example, the available venture capital per startup is more than 4 times as large as in Denmark (29.3 million USD per company). Part 1 shows how the share of Series B deals is correspondingly much larger in Massachusetts.
- Another criticism is that **the ecosystem around IPOs is not as mature in Denmark**, which limits the long-term funding potential of startups. This could be developed actively with more specialized lawyers, investment bankers, and corporate developers.
- Although some initiatives exist, **the public funding initiatives do not match the initiatives observed in other hubs**.

*"I would prefer to do an IPO in Copenhagen, but it has never been good business to be nationalistic. The US simply has much more capital, and they are willing to take more risk."*

*"The size of the fund is key. It is almost impossible to get the same fund size as in the US."*

*"We depend on local investors, but over time we could benefit from attracting more foreign investors."*

*"The IPOs are simply just bigger in the US. There is no reason to do a listing in Copenhagen. The market is less mature and there is less capital."*

# Part 3
# Derived effects and future potentials

# Summary of Part 3

This final part of the study analyses the derived effects of developing and supporting a life science startup ecosystem. We initially present a conceptual model of the “resource recycling” mechanisms of the life science ecosystem. The model is then substantiated by data showing increases in productivity, salary, knowhow, and attractiveness as a result of investments into the ecosystem. We conclude by discussing the future potential of the Danish life science startup ecosystem.

The study shows that there is a lot to gain if the Danish life science startup system could get on track with the best international competitors. We predict large increases in R&D investments, which in turn lead to increases in clinical research, productivity, and salaries, eventually increasing the size of the ecosystem. By January 2022, almost 3,800 FTEs were employed in Danish life science startups. If Denmark is able to improve on its ecosystem such that research commercialization matches the best, the ecosystem could employ an additional 9,500 FTEs by 2030.

Danish startup success in life science is all about creating the right synergies and establishing the best conditions for connected growth through the value chain from excellent research to high-growth startups.

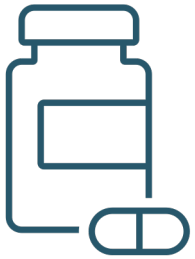
# Why life science generally has great potential

## Overall trends driving the market

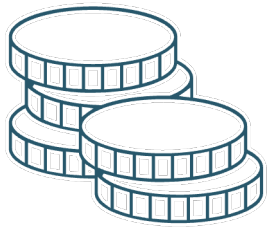
People live longer

The baby-boom generation retires: A larger share of older population

Chronic illness is on the rise



Income increase

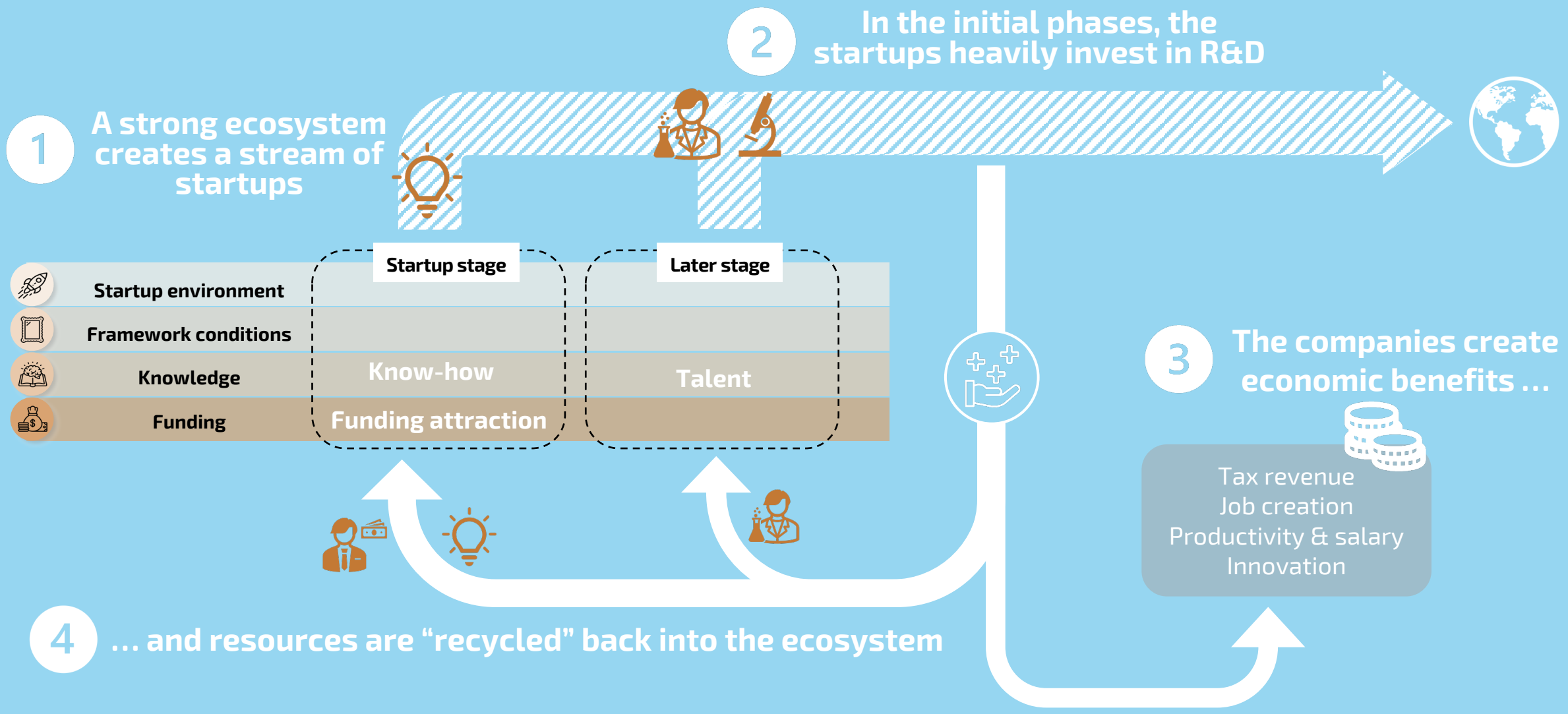


Sources: The 2021 Ageing Report: Economic and Budgetary Projections for the EU Member States (2019-2070), Tackling chronic disease in Europe - Strategies, interventions and challenges (2010). Global Burden of Disease (GBD): News release Latest global disease estimates reveal perfect storm of rising chronic diseases and public health failures fuelling COVID-19 pandemic

**Demand for new life science products and services will continue to grow as demographic changes and income increase. This will put pressure on the healthcare systems.**

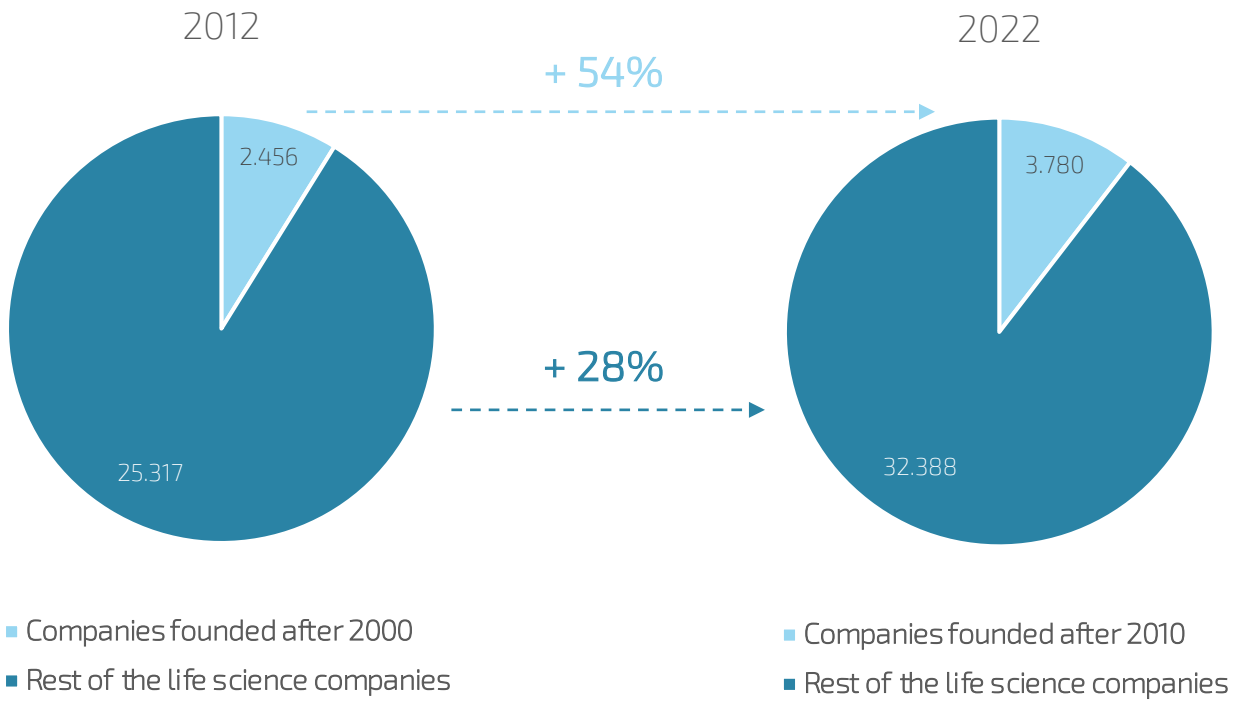
**New and innovative treatments and ways of supplying health services are needed to ease the pressure.**

# Direct and derived benefits are created in the ecosystem



# The Danish startup ecosystem is growing at a higher rate than rest of life science industry

**Number of FTEs in life science in Denmark (startups as a share of industry)**




Source: CVR.

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1

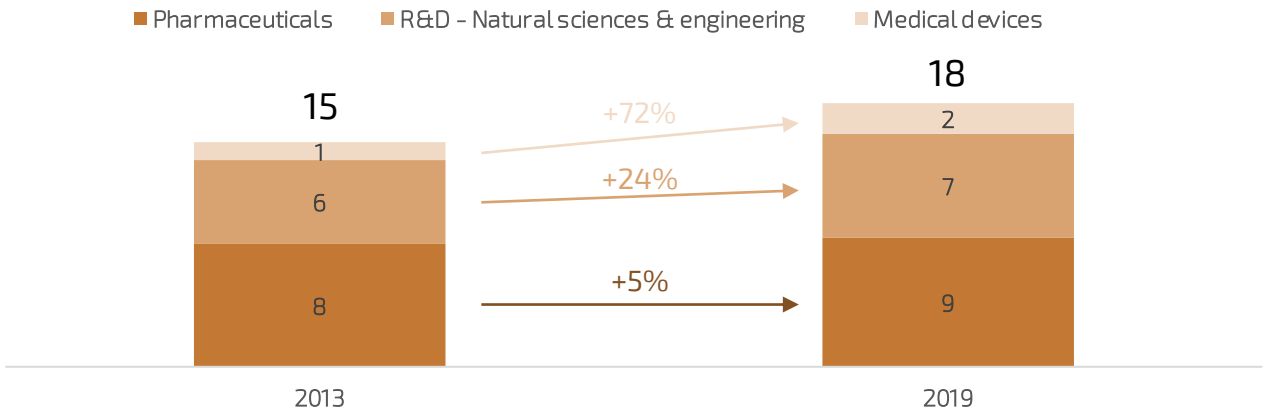
**A strong ecosystem creates a stream of startups**

During the past 10 years, the Danish life science startup ecosystem has experienced high growth. While the rest of the Danish life science industry grew by 28 pct from 2012 to 2022, the startup ecosystem grew by 54 pct.

In 2022, startups employed 3,780 FTEs, making them accountable for 10 pct of all life science employment in Denmark.

# Ecosystem growth is fueled by R&D investments

Business expenditures on R&D in DK life science (Bn DKK)




Return on R&D investments
(Small and medium sized companies in Denmark)

1 DKK increase in private R&D investments

Productivity increases such that output is increased by 1.12 DKK

Source: Eurostat.

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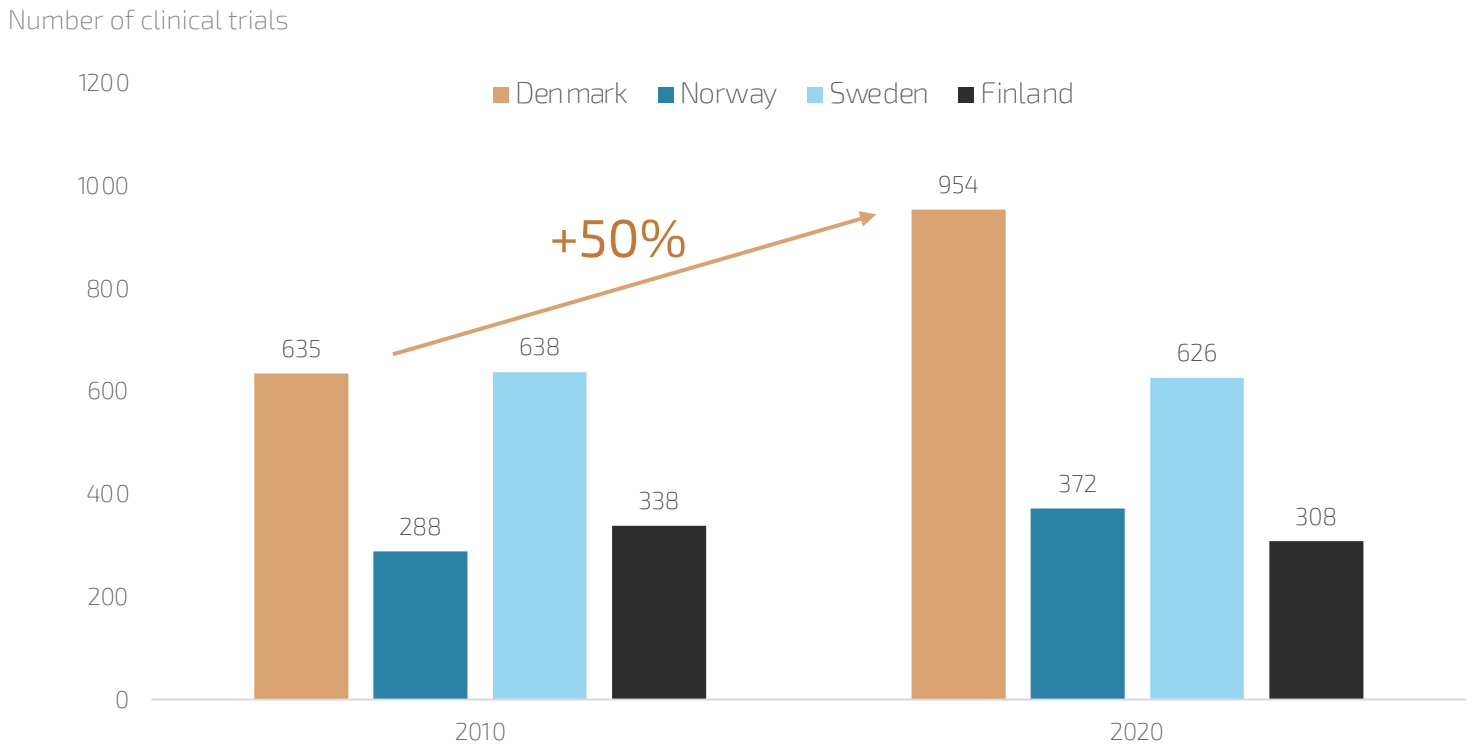
2

**In the early phases, startups invest heavily in R&D**

**Between 2013 and 2019, the Danish life-science industry increased expenditures related to R&D from 15 Bn to 18 Bn DKK, corresponding to an increase of 20 pct.**

**Especially R&D expenditures for medical devices have increased by 72 pct. Investments in R&D generally lead to new know-how, which manifests as increased productivity.**

# R&D is growing and number of clinical trials in Denmark is increasing




Source: WHO Global observatory on health research and development, 2021.

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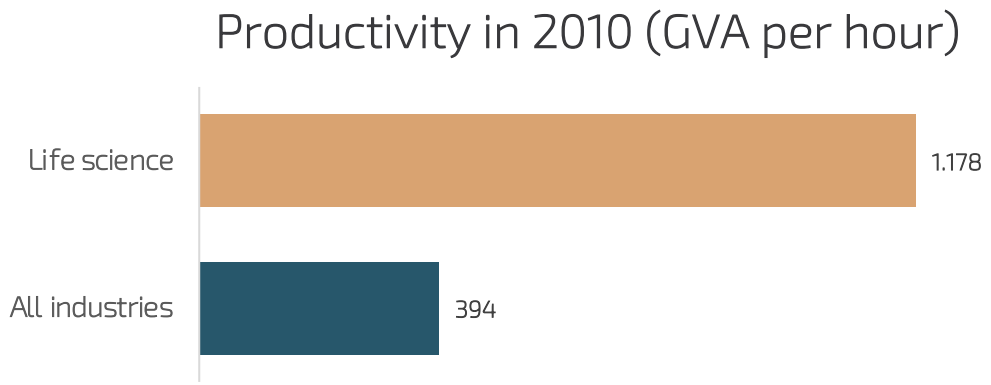
2

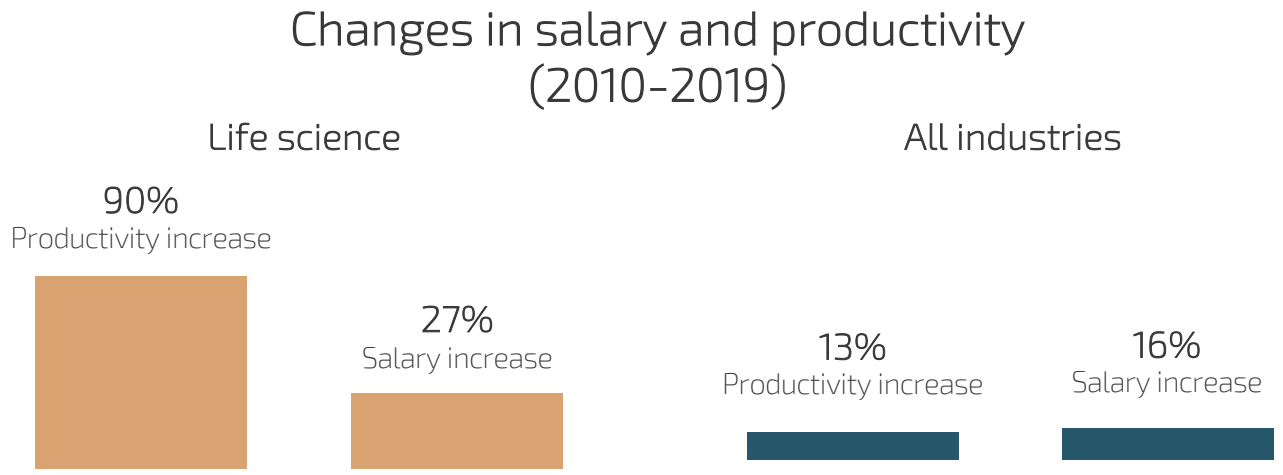
## In the early phases, startups invest heavily in R&D

Clinical research is a cornerstone in making advances in prevention, treatments, and cures of diseases. The number of clinical trials in Denmark has increased by 50 pct since 2010.

Denmark is the Nordic country doing the most clinical research and seeing the largest growth rate. The clinical research is made possible by R&D spending and is strengthening the life science startup ecosystem, making it more attractive for investors and businesses.

# Productivity spillover leads to raise in salaries




Source: DST. Note: Life science figures are based on the industry "210000 Pharmaceuticals".

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3

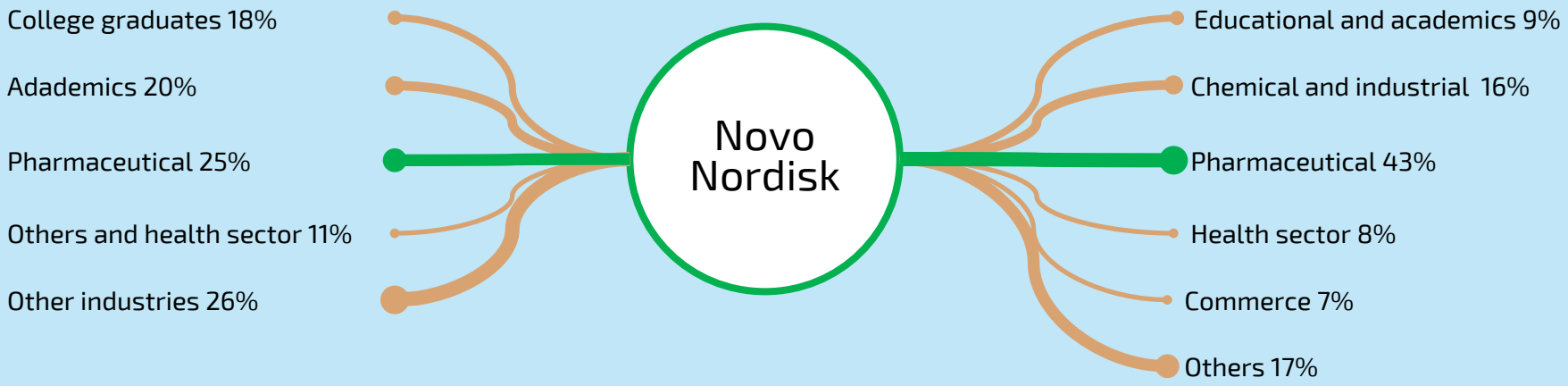
## The ecosystem creates economic benefits

**The knowhow generated by R&D investments increases the productivity of the ecosystem, which in turn increases salaries.**

**Although the Danish life science industry was already 3 times as productive as the average in 2010, continuous investments in R&D have led the industry to increase its productivity by 90 pct between 2010-2019.**

# Case: Novo Nordisk

## Talent development and recycling in the ecosystem




Note: The figure shows the background distribution of employees entering Novo Nordisk R&D as well as the destination distribution of employees leaving Novo Nordisk R&D.
Source: Invitation til vækst i Danmark – Talentvejen til tusindevis af nye jobs (2013)

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4

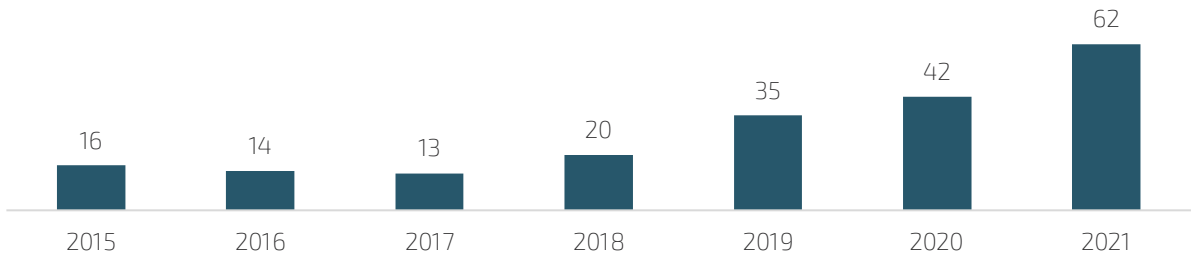
**Resources are "recycled" back into the ecosystem**

Startups hire and develop researchers as well as commercial talent, who eventually move on to new startups within the ecosystem with an increased set of skills and know-how.

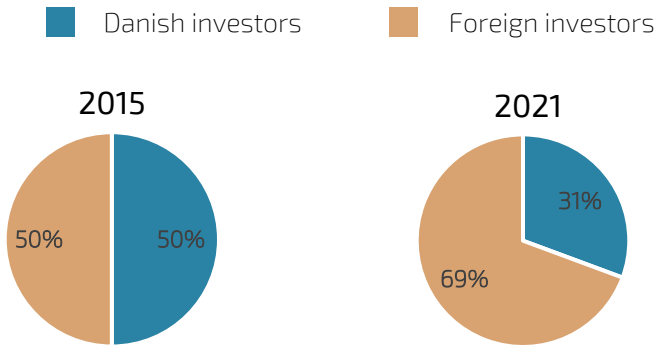
The case illustrates how a company like Novo Nordisk engages heavily in talent development and retention for its industry. Although only 25 pct of new hires were working in the pharmaceutical industry prior to entering, 43 pct of employees leaving stayed in the industry.

# The growing ecosystem attracts new investors

Number of unique investors in Denmark deals




Share of foreign investors in Denmark deals




Source: Crunchbase.

4

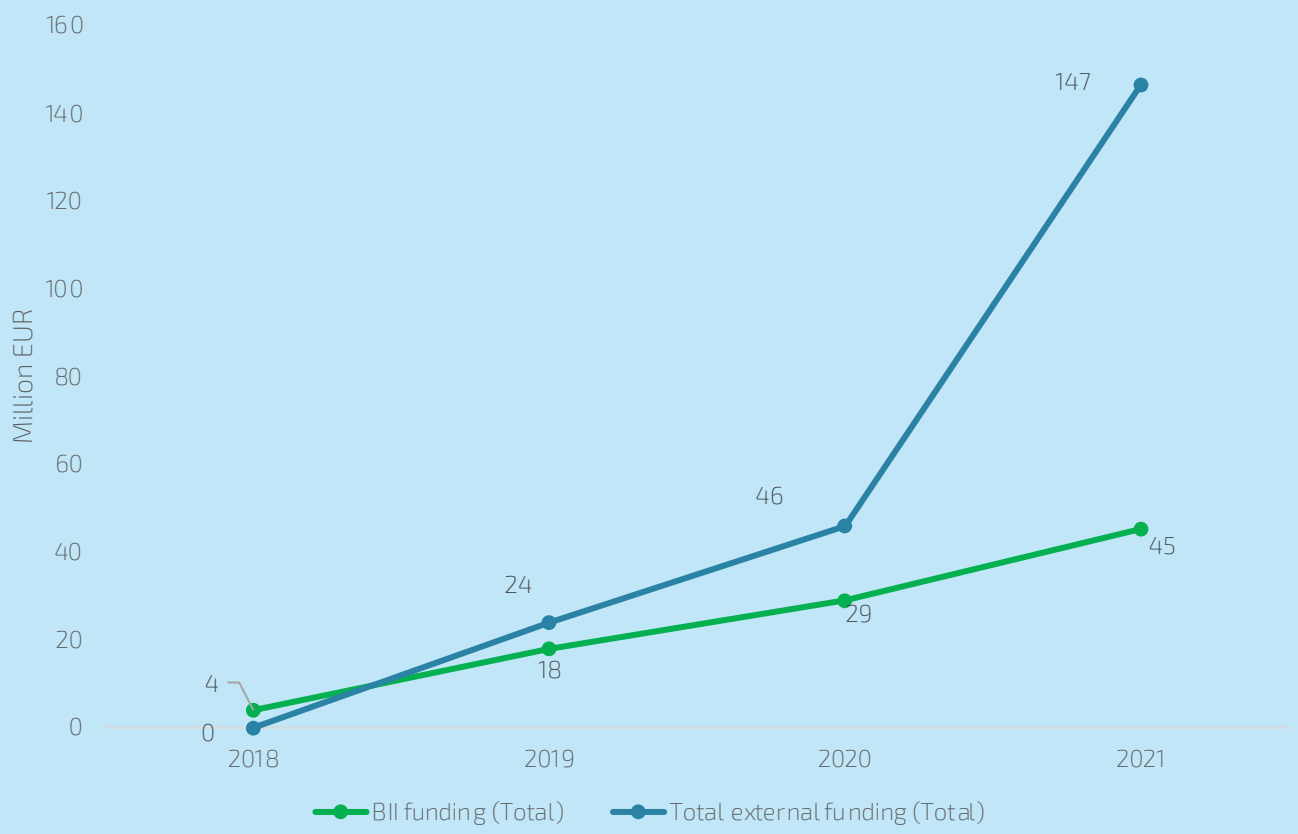
**Resources are "recycled" back into the ecosystem**

**As a result of the startup ecosystem growing and becoming more noticed, it attracts new investments**

**During the years 2015 to 2021, the number of unique investors detected in Denmark deals grew from 16 to 62, while the share of foreign investors grew from 50 pct to 69 pct.**

# Case: BioInnovation Institute

## Venture investments and incubation into life science startups increase funding




66 startups funded by BII

45 million EUR in BII Funding

58% of the companies have received external funding

147 million EUR in subsequent external funding

BioInnovation Institute has helped secure 147 million EUR in additional funding for Biotech startup companies with 45 million in funding and incubation.

Increases show the potential impact of providing initial funding and guidance.

Source: BioInnovation institute impact numbers

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# Multiple channels for reaching the Danish startup potential

*"It is not only a question of retaining all jobs in Denmark – in a global market, companies eventually move functions to locations that make sense. It is about making strategic decisions about which functions we want to master in Denmark. Plenty of foreign companies have relocated their R&D facilities to Denmark."*

**Strengthening the startup ecosystem** → **More startups founded**

**Strengthening the startup ecosystem** → **Increased growth in startups**

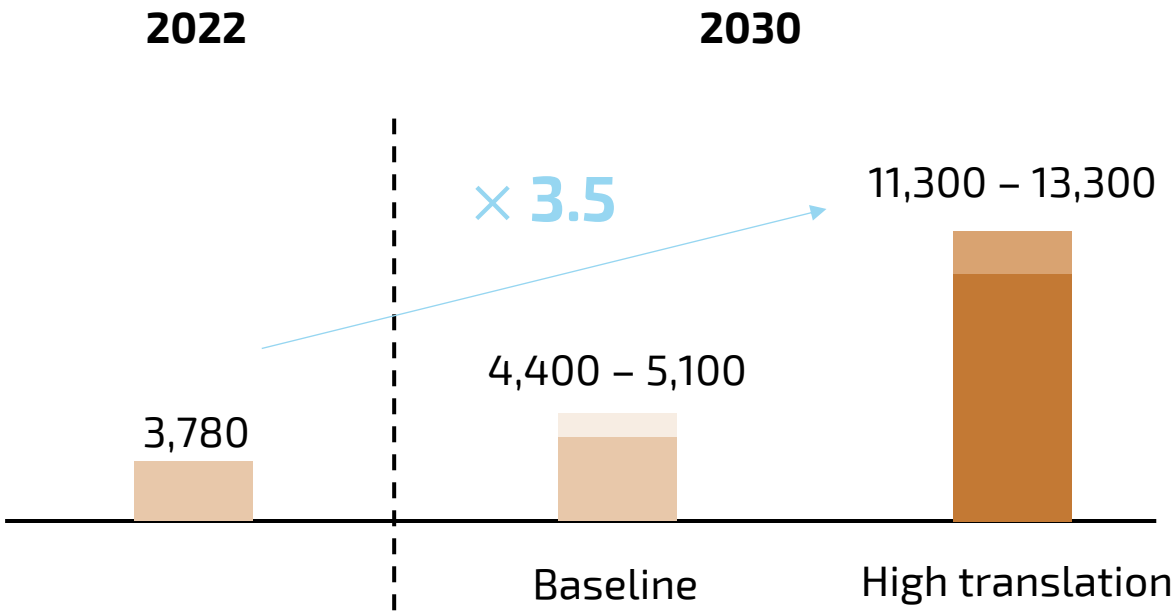
**Strengthening functions of the value chain** → **Retention and attraction of jobs within specifc functions**

**Strengthening the startup ecosystem leads to more startups and higher growth rates for startups, but it is also relevant to consider how the jobs created by startups are retained over time.**

**It is not always possible to retain jobs in a global market, but strengthening certain value chain functions may contribute to both retaining and attracting jobs within those functions.**

# The Danish life science startup ecosystem could be 3.5 times larger by 2030


**Projection of the Danish life science startup ecosystem (FTEs)**




Note: In the baseline scenario, the Danish life science sector is projected based on scenarios in DAMVAD Analytics (2020), and the share of FTEs in startups is assumed constant. The high-translation scenario illustrates the potential of the life science startup ecosystem if Denmark is able to convert publications to startups at a rate similar to that of Massachusetts (corrected for differences in citation impact).

Source: CVR, Crunchbase, DAMVAD Analytics (2020): "Dansk life science frem mod 2030".

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There is a lot to gain from improving the translation of research in Denmark. If Denmark were just as effective as Massachusetts at translating publications into startups, the Danish life science startup ecosystem could be up to 3.5 times larger by 2030.

In the high-translation scenario, up to an additional 9,500 FTEs could be employed in the life science startup ecosystem.

# Identified improvement potentials

## A stronger startup environment

- Denmark has measures in place for labs and incubators, but much more space is needed for labs as well as scale-up and testing facilities. Inspiration for Danish initiatives can be found in Massachusetts and Oxbridge-London, the two regions with the clearest focus on providing sufficient lab and innovation space.
- Denmark is missing a more commercial mindset for research. Inspiration for Danish initiatives can be found for instance in Switzerland offering coaching, training, and tech transfer support to promising startups and SMEs and Oxbridge-London supporting researchers with management training and regulatory advisory.

## A more connected knowledge system

- The comparative review shows that the Danish university system needs to become much more connected in at least three ways. Researchers need to become more connected to business, the health-tech interdisciplinarity linkage is too weak in Denmark, and it is difficult to connect to and attract the right talents (e.g. CEOs, CTOs, CMOs) to Danish life science later-stage startups.
- Inspiration to measures that can fix the Danish connectivity challenges can be found in all of the other life science regions. Switzerland and Singapore are clearly the best talent attraction regions. Massachusetts and Oxbridge-London are most committed to continuously strengthening universities-business connectedness and health-tech interdisciplinarity.

## Better framework conditions

- The Danish tax system is too complicated and does not incentivize entrepreneurship and talent attraction sufficiently. Inspiration for Danish tax reforms can be found in both the Massachusetts, Oxbridge-London, and Swiss regions all having several attractive tax incentives in place to incentivize researchers' entrepreneurship and startup capabilities.
- Danish legislation is not up-to-date when it comes to supporting the adoption of new digital solutions. Danish legislation can be inspired by Oxbridge-London where updated legislation is in place to ensure that the region today is just as strong within digital health, MedTech as well as data & AI.

## Strengthen startup funding structures

- The study shows that funding structures should be strengthened in several ways if the Danish life science startup system should be able to measure up with competing regions. The improvement potential is most clearly present in the limited size of funding for later-stage companies. Access to public funding is also low in the Danish system. At a more general level, the Danish ecosystem around IPOs needs to be further developed with access to lawyers, investment bankers, and developers.
- Inspiration for measures to strengthen the Danish life science startup funding structures in the above areas can most clearly be found in the Massachusetts and Switzerland regions that both have long traditions for optimizing their measures for both startup and later-stage funding.

# Three key recommendations for untapping the potential

### Strengthen the tech transfer system

The comparative review shows that research from Danish universities is less likely to be translated into patents and startups. The results point to a lower productivity at the tech transfer offices (TTOs) of Danish universities vis-à-vis their counterparts in the other leading early life science systems.

We therefore recommend a reform process focusing on strengthening the Danish TTO system. A reform of the system should consider the governance and partnership structures as well as the ownership and incentive structures of the TTO's.

As part of the reform process, we also recommend assessment of the so called open science based Innovation models as well as fast track schemes for innovative solutions inspired by MIT.

### Broaden the public funding base

While the study shows that private funding for startups as well as for R&D has been increasing, it is also noted how public funding does not increase correspondingly. The comparative review highlights how strategic public initiatives and funding pools have been key in developing the other hubs.

We recommend that the national life science strategy of Denmark be accompanied by appropriate funding pools for strategic initiatives. For example, public funding for R&D or talent development could be increased to incentivize startups.

### Increase tax incentives for startups

The comparative review illustrates how all the other major life science hubs engage heavily in incentivization through various tax benefits. Although Denmark generally offers a fairly competitive startup environment, the role of tax benefits cannot be ignored – when the difference in total direct and indirect funding between countries becomes too large, it significantly affects the competitiveness of the startup environment.

We recommend that Denmark designs tax benefits that increase incentives for engaging in R&D, for taking on risky investments, and for attracting and developing talent. A more attractive tax scheme could also be applied to warrant and stock option programs that heavily incentivize committed efforts by employees.

# Appendix: Methodology and defintions

# Methodology

We have adopted a mixed-methods approach to the study. The methods included quantitative data analytics, literature and document reviews and expert interviews. Over the course of the study, we also engaged with a range of stakeholders across academia, government, industry, the BioInnovation Institute (BII) and Novo Nordisk Fonden. The study was structured in a three-phased analytical model. Each of the three phases is elaborated upon below.

## Phase 1: The results of five life science startup systems

In the first phase of the study, we carried out four sub-analyses to compare the results of the early life science ecosystem in Denmark with four of the best life science startup systems in the world, namely Massachusetts, Oxbridge-London, Switzerland and Singapore.

The first two sub-analyses focused on the earliest part of the research and innovation process, publications and patenting. Sub-analyses 3 and 4 focus ed on the subsequent part of the innovative process, where the discovery is financed and translated into new companies. The four sub-analyses were based on data from the databases; Scopus Elsevier, World Bank, QS University Rankings, European Patent Office, The Danish Ministry of Higher Education and Science and Crunchbase. The definitions of regions, industries and investment stages applied are described on the following pages.

## Phase 2: Comparative review of five life science ecosystems

In the second phase, we carried out a comparative review of the systems and structures affecting a life science regions' startup success. Through a detailed literature and document review of academic and grey literature (over the past ten years) and through a series of in-depth interviews with selected experts with experience from and detailed knowledge of framework conditions in early life science ecosystems, we examined how different conditions and support measures affect the establishment of life science start-ups and how the early ecosystem subsequently supports growth opportunities .The knowledge gathered from the Danish system is compared with the early life science ecosystems in the four selected hotspots of Massachusetts, Oxbridge-London, Switzerland and Singapore.

## Phase 3: Derived effects and future potentials

In the third and final phase of the study, we analyse the derived effects of developing and supporting a life science startup ecosystem. We estimate the future potential by using the results from phases 1 and 2 as well as by incorporating knowledge from previous analyses. This results in two projections of potentials towards 2030 focusing on the development in fulltime employees (FTE's). A baseline scenario and a high-translation scenario to illustrate the full potential of the life science startup ecosystem if Denmark is able to convert publications to startups at a rate similar to that of Massachusetts, corrected for differences in citation impact.

# Industry definitions

## Scopus subject areas

Biochemistry, Genetics and Molecular Biology
Immunology and Microbiology
Pharmacology, Toxicology and Pharmaceutics

## Crunchbase

Biopharma
Biotechnology
Life science
Emergency medicine
Health care
Health diagnostics
Medical
Medical device
Pharmaceutical

## Global Patents (IPC Codes used)

| | |
|---|---|
| Medical Technology | (A61B,C,D,F,G,H,J,L,M,N) |
| Organic fine chemistry | (C07C,D,F,H,J,K) |
| Pharmaceuticals, Cosmetics | (A61K, A61P) |
| Biotechnology | (C07G; C12M,N,P,Q,R,S) |

## CVR

| | |
|---|---|
| 211000: | Production of pharmaceutical raw materials |
| 212000: | Production of pharmaceutical preparations |
| 266010: | Production of hearing aid |
| 266090: | Production of irradiation, electromedical and electrotherapeutic equipment |
| 325000: | Production of medical and dental instruments and equipments |
| 721100: | Research and experimental development within biotechnology |

# Region definitions

Due to data availability at the regional level, regions are defined somewhat differently in the different analyses.

## Scopus

Greater Boston:

- Boston, Cambridge (US), Arlington, Belmont, Brookline, Chestnut Hill, Lexington, Medford, Newton, Walthame, Watertown, Woburn

Oxbridge-London:

- Oxford, Cambridge (UK), London

Denmark
Switzerland
Singapore

## Global Patents

Massachusetts
United Kingdom
Denmark
Switzerland
Singapore

## Crunchbase

Massachusetts
Oxbridge-London:

- Oxford, Cambridge (UK), London

Denmark
Switzerland
Singapore

# Definition of investment stages

## Crunchbase

Pre-Seed: A Pre-Seed round is a pre-institutional seed round that either has no institutional investors or is a very low amount, often below $150k.

Seed: Seed rounds are among the first rounds of funding a company will receive, generally while the company is young and working to gain traction. Round sizes range between $10k–$2M, though larger seed rounds have become more common in recent years. A seed round typically comes after an angel round (if applicable) and before a company's Series A round.

Series A and Series B rounds are funding rounds for earlier stage companies and range on average between $1M–$30M.

Series C rounds and onwards are for later stage and more established companies. These rounds are usually $10M+ and are often much larger.

# Thank you for the attention

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