Biosolutions innovations in Denmark and the US

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1. Danish companies deliver world-class biosolution innovations

A new global mapping of 761,044 patent applications and publications within biosolutions from January 2000 to September 2022 shows that Danish companies offer world-class innovations. Danish companies such as Novozymes, Chr. Hansen and IFF (formerly Danisco) are in the global top 20 in terms of the number of biosolutions patents.

Danish companies are especially active in innovating within animal feed, including specially adapted animal feed, animal feed additives, milk and milk powder preparations and technologies modifying the nutritive qualities of foods. In general, and within these key areas, the average quality of patents involving Danish actors is considerably above the world average.

Biosolutions are defined as biotechnological solutions to challenges in the food and agriculture sector. Biosolutions control, apply or utilize biological processes or bio-based components for the benefit of agriculture or in food or feed production. Examples include: the use of enzymes, proteins, biological plant protection products, biofertilizers, microbes, bacteria, functional food ingredients, fermentation technology or equipment for any of the processes.

Since 2000, the yearly number of published patents globally has increased from around 2,000 to above 50,000. 256,818 of all patents since 2000 are published in China, which by far is the most active country. However, patents published in Western Europe and North America, including Denmark, are on average of a significantly higher quality in terms of patent citations, patent family size and GDP of national markets covered.

Compared to the relatively small Danish population, Danish companies are highly innovative. Like the global trend, the yearly biosolutions patents involving Danish companies have increased from 51 in 2000 to around 1,000 in recent years. In total, Danish companies are involved in 16,054 patents divided between 1,890 patent families. Patent families are formed when the same innovation, and continuations hereof, is patented in multiple countries.

Outside of Denmark, Danish companies most often apply for and publish patents in the US (2,679 out of 16,054), Australia (1,120), China (1,097), Canada (886) and Brazil (679). Within the US, hotspots for Danish business activities are the Bay Area, Raleigh (North Carolina), Blacksburg (Virginia), Madison and Milwaukee (Wisconsin) and New Jersey. Danish biosolutions innovations complement the R&D focus of North American companies because actors from the two countries tend to innovate within different biosolutions areas. Together with the high quality of Danish patents, this shows the relevance of a strong US presence for Danish companies offering biosolutions.

2. A rapid global increase in biosolutions innovations

A global search of biosolutions patents from 2000 to 2022 results in 761,044 unique patent publications divided between 327,658 patent families.

The analysis shows that biosolution patents have increased rapidly and, to a large extent, are concentrated in China. However, patents published in Western Europe and North America are on average of a significantly higher quality in terms of patent citations, patent family size and GDP of national markets covered. Relative to its small size, Denmark has a set of highly active companies offering high-quality biosolutions innovations.

Globally, most patents are within animal feed, including specially adapted animal feed and animal feed supplemented with additives that affect nutritional value, digestibility, appeal etc. (also termed accessory food factors for animal feeding stuffs). Milk and milk powder preparations and technologies modifying the nutritive qualities of human foods are also top areas of innovation globally.

However, most North American biosolutions innovations are within other areas than the globally most areas. Top areas of North American innovations are genetic modification of organisms, angiosperms (flowering and seed-producing plants), different elements and kinds of medicinal preparations and different kinds of biocides, pest repellants/attractants and plant growth regulators.

The following presents an analysis of the identified patents, looks at the global development and distribution of patents, as well as the most common technological areas of innovation, and focuses on the patents that involve Danish actors.

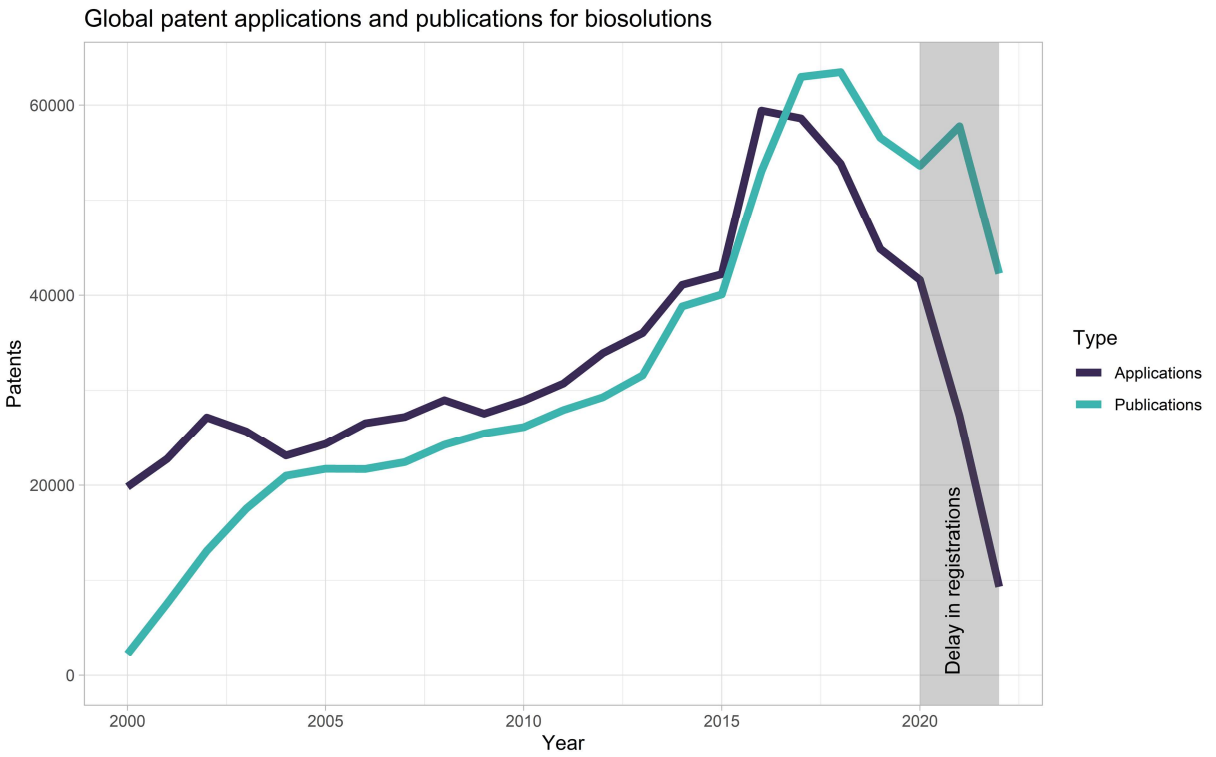

Figure 1. Global patent applications and publications for biosolutions

Since 2000, the yearly published patents globally have increased from around 2,000 to above 50,000. Figure 1 shows how biosolutions technologies are being developed and patented at an increasing pace. Delays in registrations make data from 2020 onwards incomplete.

Published patents are highly concentrated in East Asia. 34 per cent of all patents since 2000 are published in China (equals 256,818 patents), which by far is the most active country. The US comes second with 11 per cent of all patents (84,198). The third and fourth most active countries are Japan (53,863) and South Korea (53,676) both with 7 per cent of all patents. Figure 2 shows the global distribution of individual patents in terms of the country they are published in.

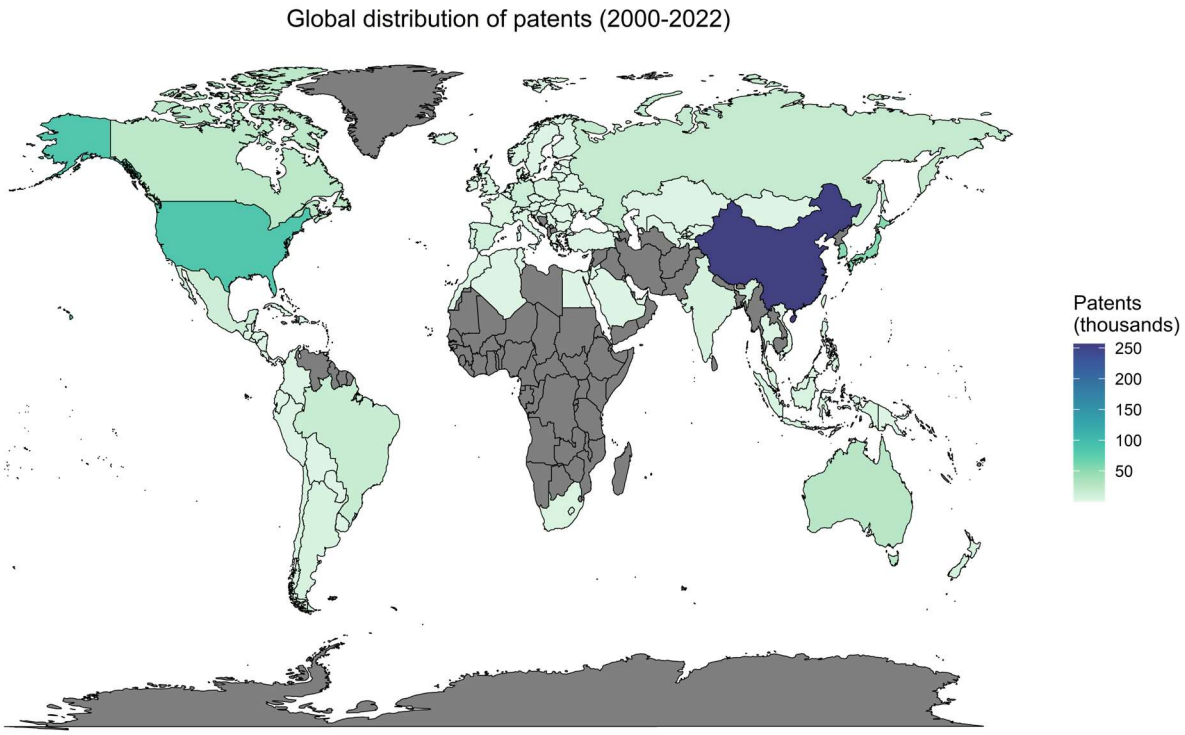

Figure 2. Global distribution of patents in terms of country of publication

This global distribution does, to a certain extent, reflect differences in the population sizes of countries. Figure 3 shows the global distribution of patent publications relative to each country's population size. This shifts the perspective. Now the top five countries are Australia, South Korea, New Zealand, Denmark and Canada.

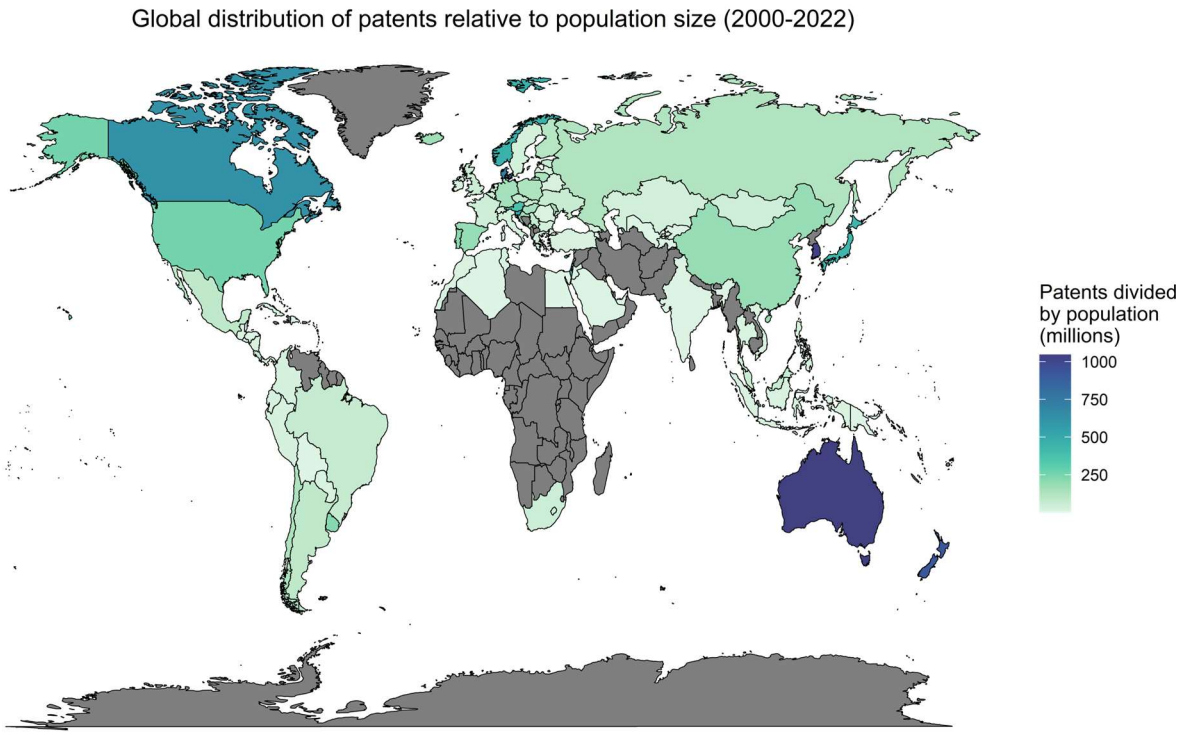

Figure 3. Global distribution of patents (country of publication) relative to population size

In addition to mapping the global distribution of patents, it is important to examine the quality of patents across countries. Different patenting cultures and different country incentives to apply for patents create marked differences in the number of patent publications. However, this may obscure large differences in the quality of the published patents.

Figure 4 shows the country averages of patent quality. Here we shift from looking at individual patents to patent families. Patent quality is only meaningfully measured at the family level. Patent families are formed when the same innovation, and continuations hereof, is patented in multiple countries.

The map shows the average quality of patent families that (actors from) a country is involved in. The results clearly show that the patent family quality in many Asian countries is lower than in North America, Europe and Australia. Even though most biosolutions patent publications take place in East Asia, especially China, the average quality of patent families involving East Asian actors is relatively low.

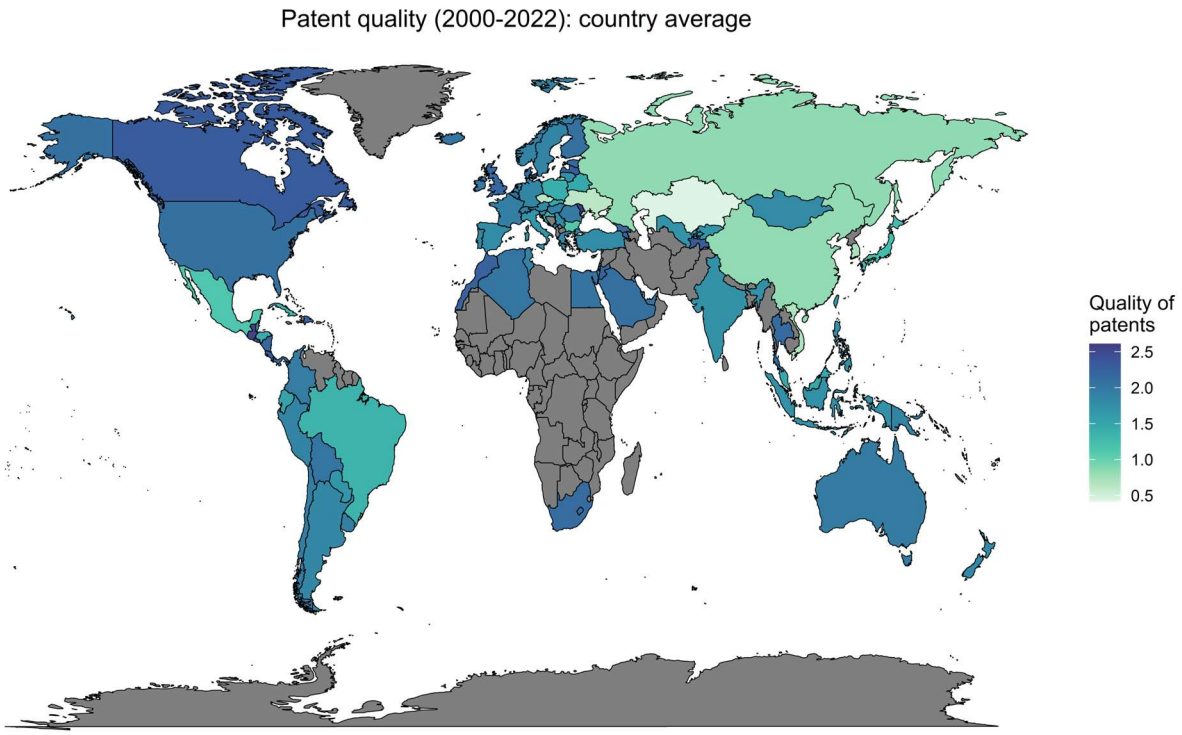

Figure 4. Average quality of patent families a country is involved in

Finally, Figures 5 and 6 show the most common areas of biosolutions innovations on a global scale and in North America, respectively. Patents are classified according to the International Patent Classification (IPC) system. Typically, a patent is classified under multiple systems of many subdivisions. Around 300 subdivisions are included in this study.

Globally, the most common areas for biosolutions patents are animal feed, including specially adapted animal feed and animal feed supplemented with additives to affect nutritional value, digestibility, appeal etc. (also termed accessory food factors for animal feeding stuffs). Milk and milk powder preparations as well as technologies modifying the nutritive qualities of foods are also top areas of innovation. These are also top technological areas for patents that Danish companies are involved in (see Section 3).

Most US biosolutions innovations happen within other technological areas than the globally most prevalent. Most patents in the US are related to genetic modification, angiosperms (flowering and seed-producing plants), different elements and kinds of medicinal preparations and different kinds of biocides, pest repellants/attractants and plant growth regulators.

Figure 5. Top ten areas of global biosolutions innovations

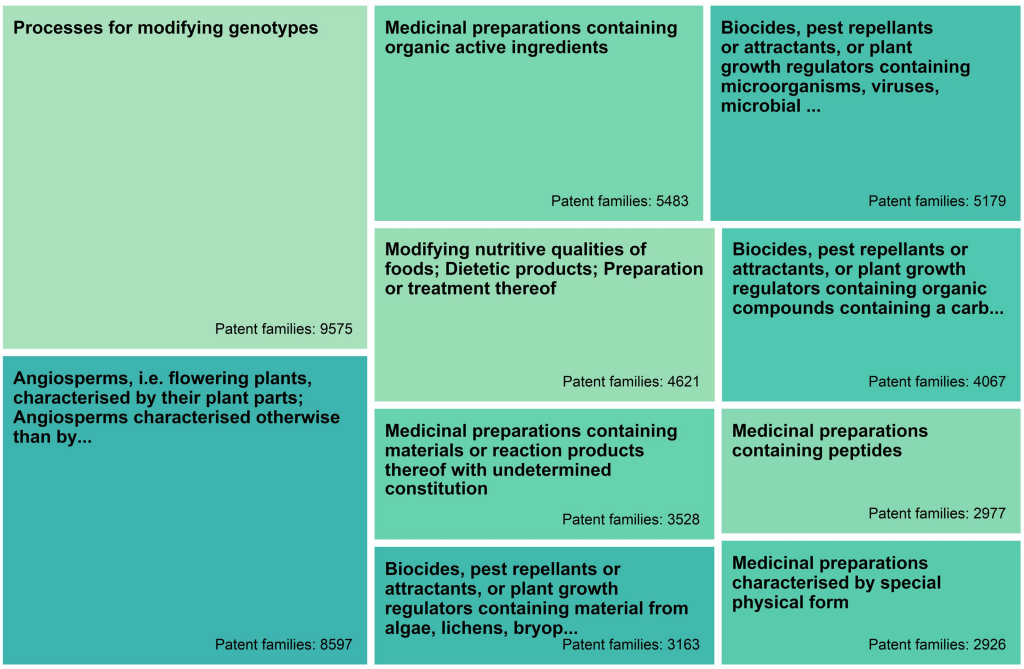

Figure 6. Top ten areas of North American biosolutions innovations

3. The strengths and US presence of Danish biosolutions companies

This section presents the analysis of Danish biosolutions patents. The focus is on patents that involve Danish actors. These patents are not necessarily exclusively owned by Danish actors since several actors from different countries may share a patent. The patent mapping provides knowledge on the key technological areas that Danish companies are innovating within, the quality of patents involving Danish actors compared to the rest of the world and the global and US presence of Danish biosolutions patents. Overall, the analysis shows that Danish companies offer high-quality biosolutions innovations within technological areas different from those that US companies tend to focus on.

The most active Danish companies are Novozymes, the Danish branch of IFF (formerly Danisco), Chr. Hansen, Arla Foods and Gumlink. They are part of around half of all patents that involve Danish actors. The US market is key to Danish biosolution innovations. Most patents involving Danish actors are published in the US (approx. 17 per cent of all patents). Key areas for offices and US partners are the Bay Area, Raleigh (North Carolina), Blacksburg (Virginia), Madison (Wisconsin) and New Jersey.

Like the global trend, the yearly published biosolutions patents that Danish companies are involved in have increased from 51 in 2000 to around 1,000 in recent years. In total, Danish companies are involved in 16,054 patents divided between 1,890 patent families. Figure 7 shows the development in the number of biosolutions innovations being patented that Danish, Swedish and Norwegian actors are involved in, respectively. Compared to their Nordic counterparts, Danish actors are great biosolutions innovators.

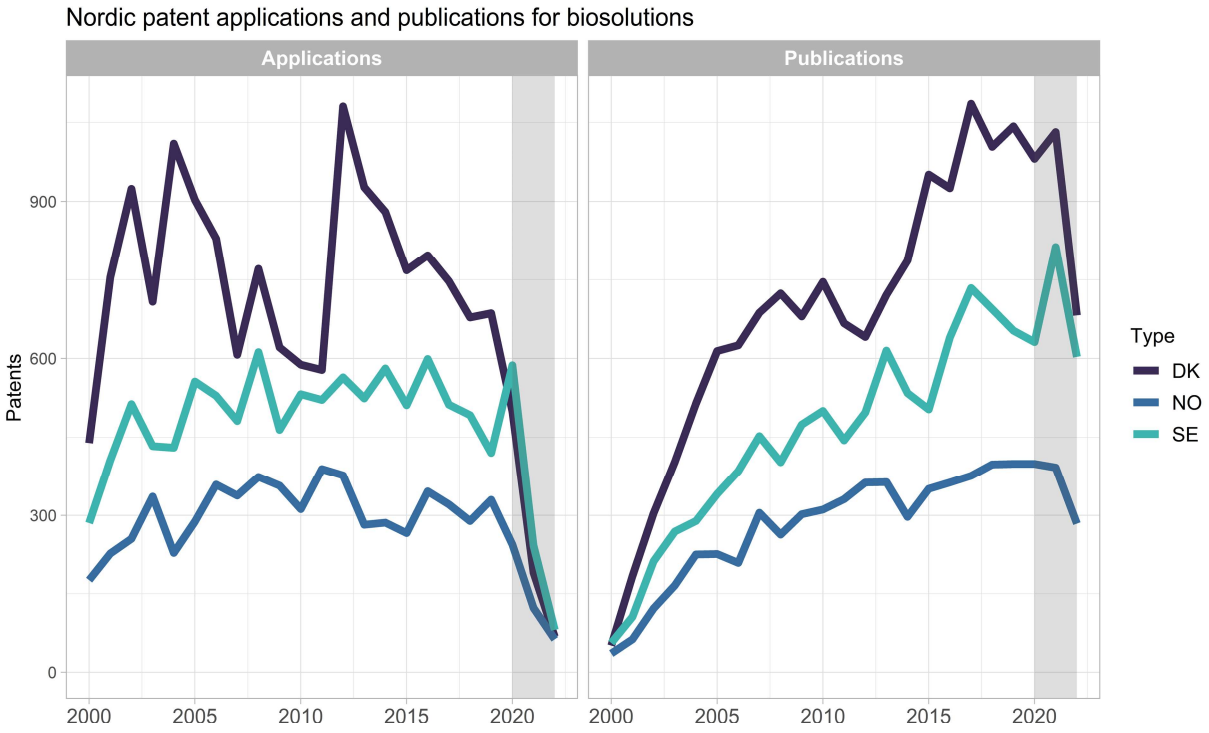

Figure 7. Number of biosolution patents that involve Danish, Swedish and Norwegian actors

The average quality of patent families involving Danish actors is relatively high. They are of the same quality as patent families involving US actors, slightly better than their Scandinavian counterparts and markedly higher quality than patents involving Chinese actors. This is an interesting observation since Danish and Chinese actors often innovate within the same areas.

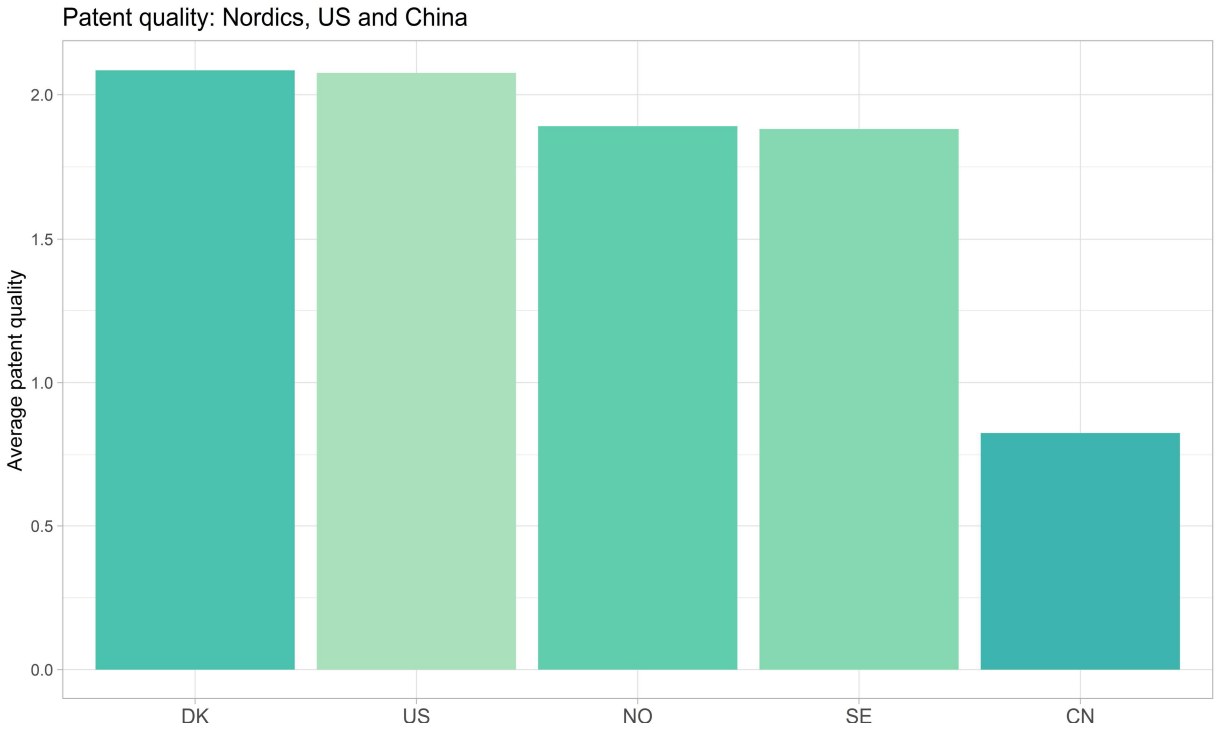

Figure 8. Average quality of biosolution patent families by country involvement

Figure 9 shows the ten most common areas for biosolutions patents that Danish actors are involved in. Milk and milk powder preparations is the most common area. Chr. Hansen is the Danish company with the most patents in this area followed by Arla Foods and the Danish branch of IFF (former Danisco). This is followed by technologies modifying the nutritive qualities of foods where Novozymes and the Danish branch of IFF (former Danisco) are the most active companies. Finally, many patents are within animal feed and animal feed additives. Here Novozymes is the leading Danish company.

These are also top technological areas for patents globally, but Chinese actors are especially involved in patents within these areas (albeit less so within milk and milk powder preparations). These are not areas where US actors are the most active.

Figure 9. Top ten areas of Danish biosolutions innovations

Within the top ten areas for Danish biosolutions, Figure 10 reports the average quality of patent families involving Danish actors compared to the world average. Danish patents are generally of a quality well above the world average. Within these areas, patent families, especially involving Chinese actors, are often well below the world average.

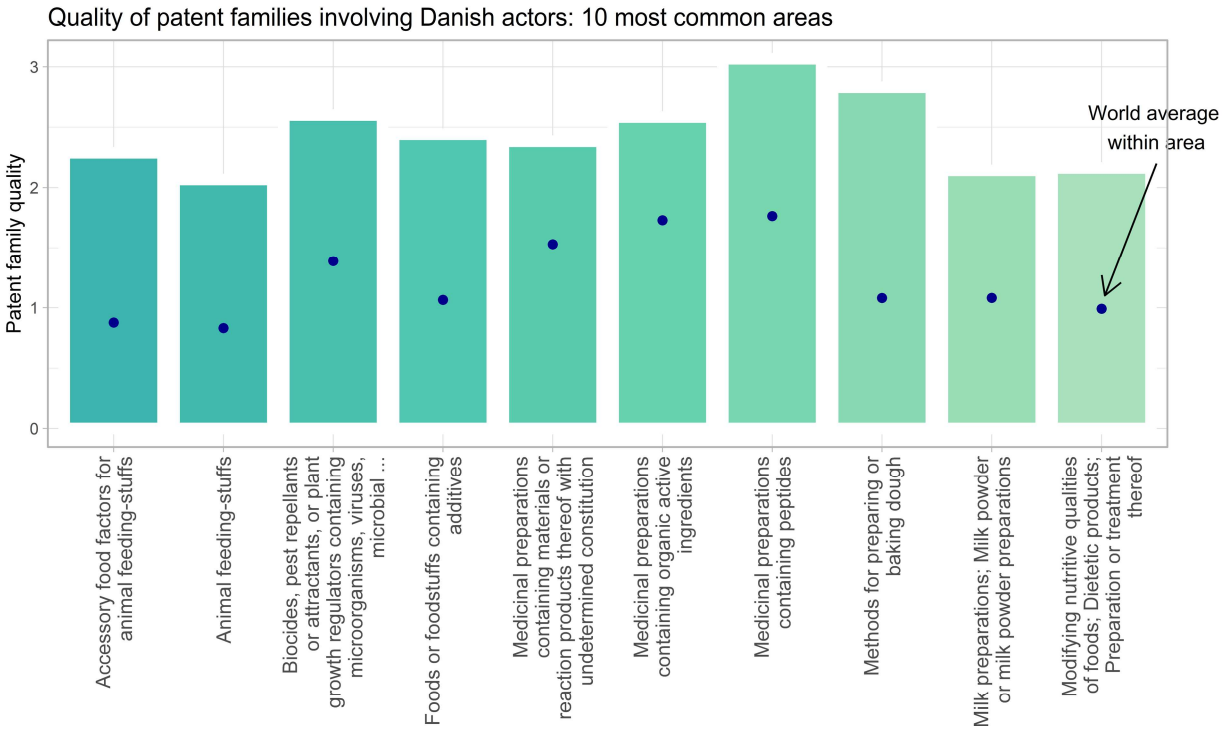

Figure 10. Quality of patent families involving Danish actors within top areas

Finally, Figures 11 and 12 show the geographical hotspots where Danish actors are most actively involved in patenting biosolution innovations. Figure 13 shows the global picture. The top five countries are the US (2,679 individual patents), Australia (1,120), China (1,097), Canada (886) and Brazil (679), closely followed by Germany (648) and Japan (571).

Figure 14 shows US hotspots. This map tells a story about where Danish actors themselves and their US partners are located. Key areas of activity are the Bay Area, Raleigh (North Carolina), Blacksburg (Virginia), Madison and Milwaukee (Wisconsin) and New Jersey.

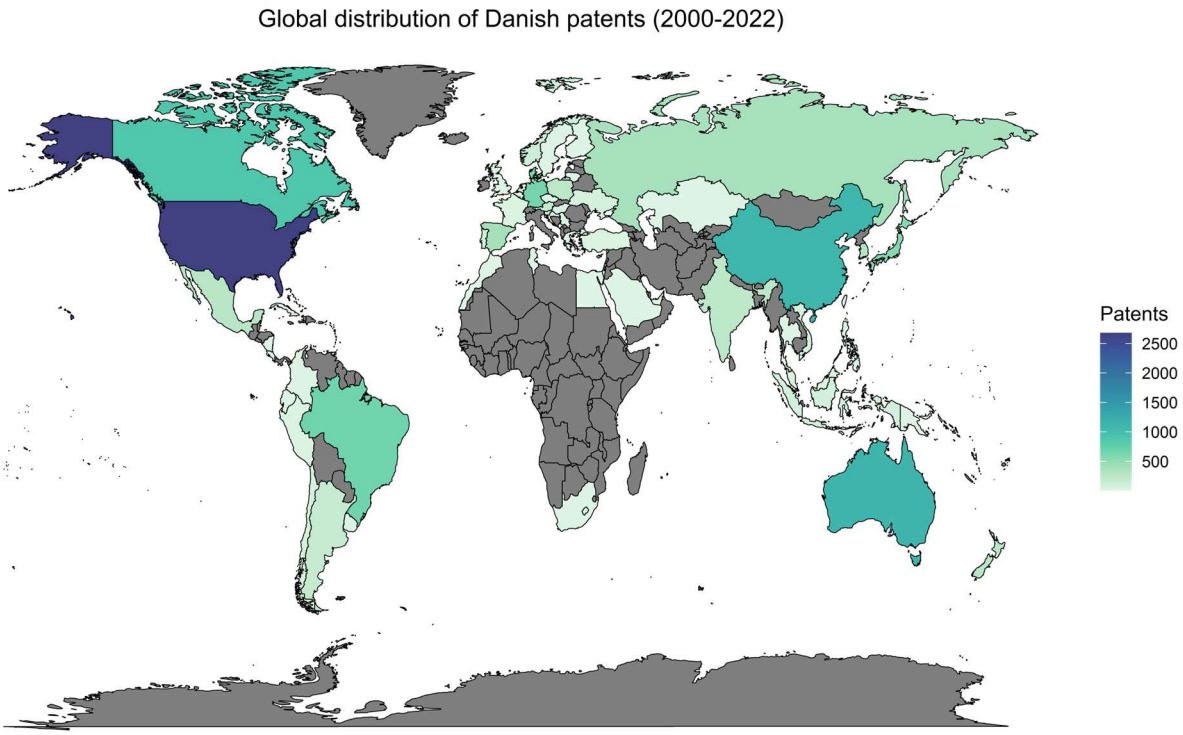

Figure 11. Global hotspots for patents involving Danish actors

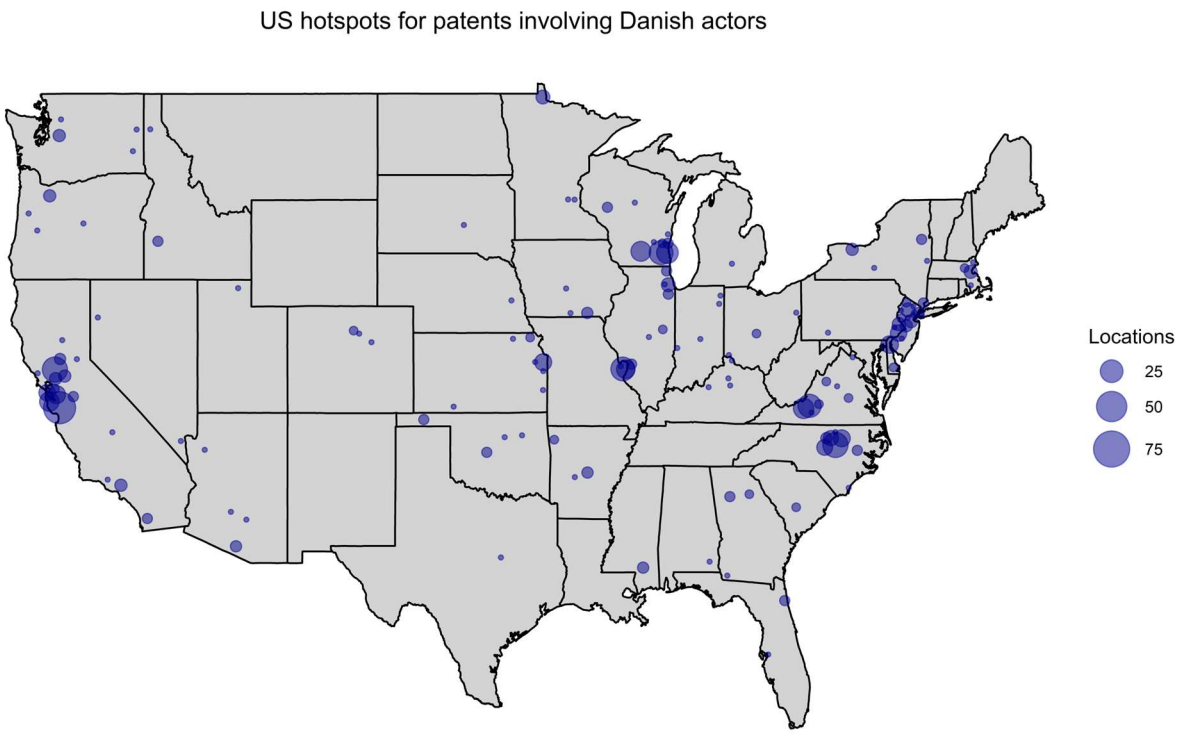

Figure 12. US hotspots for patents involving Danish actors

4. Profiles of top ten innovative Danish companies

Novozymes

Novozymes is one of the world's leading innovators in terms of biosolutions. In 2019, Novozymes was the third most active patent applicant in the world within the field of biotechnology.[1] Novozymes supplies agriculture and food-related industries with biological solutions. They deliver enzymatic and probiotic feed solutions to support businesses with healthier animals and more efficient production. Their BioAg solutions improve crop performance, both in terms of added nutrients and protection against insects and disease pests. Novozymes offers a large range of enzyme innovations aiming to improve the quality and sustainability of the food and beverage industry. They produce animal-free, nutritious, environment-friendly, fermentation-derived protein ingredients. These are just some of the solutions that Novozymes has to offer businesses around the world.

Chr. Hansen

For more than 140 years Chr. Hansen has developed natural ingredient solutions for the food, nutritional, pharmaceutical and agricultural industries. Chr. Hansen has five key areas of business: Food Cultures & Enzymes, Plant Health, Animal Health and Human Health, Probiotics and Human Milk Oligosaccharides. Constituting 63% of the company's total revenue in the fiscal year of 2021/22, Food Cultures & Enzymes is Chr. Hansen's largest business area. The Danish bioscience company develops and produces cultures, enzymes and probiotics for the food and beverage industries. The dairy industry especially enjoys the expertise of Chr. Hansen. As a global market leader Chr. Hansen has supplied a dairy ingredient for every second cheese in the world. In short, Chr. Hansen sets the tone globally when it comes to natural ingredients.

[1] https://www.novozymes.com/en/news/news-archive/2019/03/novozymes-named-most-innovative-company-in-denmark-by-european-patents-office

International Flavors and Fragrances (formerly Danisco)

In 2011, DuPont acquired the Danish company Danisco, formed in 1923, and continued its operations under DuPont Nutrition Biosciences. In 2021 it fused with IFF to create a global heavyweight within biosolutions in the dairy industry. IFF sells and innovates bio-based ingredients for use in food and beverages and industrial enzymes. 1,000 Danish employees develop and manufacture products within emulsifiers, standardized textural ingredients, cultures, functional systems and enzymes (mainly for the milling and bakery industries). The company is one of the world's largest producers of enzymes in foods.

Arla Foods

Arla Foods is a global producer of dairy products. Arla Foods specializes in supplying innovative whey ingredients of the highest quality. Whey, a by-product of cheese production, was once considered a waste product. However, Arla Foods Ingredients has lain the foundation for a more effective and sustainable way of production within the food industry. The company's vision is "to become the true global leader in value-added whey while sustaining attractive returns". They are well on their way to achieving this goal, serving global manufacturers of early life nutrition, medical nutrition, sports nutrition, health foods and other food and beverage products.

Gumlink

Gumlink is one of Europe's leading chewing gum manufacturing companies. In 2009 they joined forces with Yildiz Holding, a Turkish non-food manufacturer. Today Gumlink produces a variety of gum, pellets and candy. Gumlink built up its business by manufacturing and selling chewing gum brands such as Stimorol and V6 before branching into nicotine gum. They have developed different methods of applying sweeteners, flavors and other forms of beneficiaries, including vitamins and enzymes, to their products.[2] Furthermore, they

[2] https://www.naturalproductsinsider.com/healthy-living/gumlink-positioned-global-growth

have developed biodegradable chewing gum by including biodegradable polymers in the manufacturing process.[3] Overall, their research and productions encompass many varieties of using and combining natural resources to enhance their products.

Hamlet Protein

Hamlet Protein cultivates and processes soy protein to be used in the feed of animals. Their soy-based specialty ingredients improve the health, welfare and performance of young animals such as swine and poultry. Hamlet Protein commits to sourcing responsible soy that does not contribute to deforestation or habitat conversion. They cooperate with selected suppliers industrywide and national organizations to ensure a responsible value chain. Over 30 years ago the founder developed their patented bioconversion process, which focused on minimum water and energy consumption, minimum carbon emissions and maximum utilization of raw materials, and the excess heat from their production is redistributed for heating, amounting to 3,200 households today. Hamlet Protein utilizes the fact that no other source of vegetable protein holds so many benefits for health and the environment than soy.

Upfront Chromatography

Upfront Chromatography is a company specializing in the development of customized protein separation processes. They provide the food & feed, industrial enzymes and life science sectors with the technology to isolate and separate biomolecules such as proteins and oligosaccharides. Upfront is currently focusing on assisting the dairy industry. However, the company's core protein technology Rhobust® can be applied to feedstock from many different industries, making Upfront Chromatography a desirable business partner for a large range of companies within the food and feed industry.[4]

[3] https://patents.google.com/patent/US20040142066A1/en

[4] http://www.upfront-dk.com/index.php

Glycom

Glycom is a biosolutions company specializing in Human Milk Oligosaccharides (HMO) for human consumption. The company was acquired by the Dutch conglomerate DSM in 2020, but it is still based in Denmark. Naturally occurring in mother's milk, HMOs are complex carbohydrates with great nutritional value to people of all ages. Glycom is "the world's leading HMO supplier and the only fully integrated HMO player with its own product development, preclinical and clinical development, regulatory and large-scale production."[5] By entering into a partnership with Glycom, early life nutrition and dietary supplements businesses are guaranteed the latest HMO innovations.

Carlsberg

Founded in 1847 by brewer J. C. Jacobsen, the Carlsberg Group is now one of the leading brewery groups in the world, with a large portfolio of beer and other beverage brands. Since its founding days, research and development have been part of the Carlsberg Group's legacy. In particular, the Carlsberg Research Laboratory possesses strong competences in barley, yeast, ingredients and brewing technology research. Over the years, the Carlsberg Research Laboratory has delivered ground-breaking research results and revolutionized modern brewing. It is driven by the purpose to develop beer of the highest possible quality and provide a model for brewing in Denmark and the rest of the world.

[5] https://www.glycom.com/about/who-we-are/

5. Patent mapping: data and method

Patent mapping is an effective way of examining technological developments in a rapidly evolving technological field. The patent mapping method is based on a global search across 128 million patents. It is crucial to be sure of the relevance of patents so that irrelevant patents do not create too much noise in the search results.

This report refers to **patents** and **patent families** as two different units of analysis. Patents are individual patents. A patent family consists of the total number of patents relating to a single innovation. Because a patent may be granted by several authorities, typically in multiple countries or by international agencies, a patent family includes several individual patents.

When analyzing developments and differences in the number of patents published, the individual patent is used as a unit of analysis, while the patent family is used as a unit of analysis to identify key technological areas of innovation and evaluate the quality of innovations. The subject of interest is innovation, and studying whole families rather than individual patents provides a more accurate picture in this respect.

Similarly, a distinction is made between the **country of** a patent application/publication and the **country involvement** in a patent application/publication. A patent is applied for and published in a particular country but may involve several actors (universities, research institutions, companies, inventors) from different countries. Beyond the simple global picture in the number and geographical distribution of patents, patents are ascribed to countries based on whether they include an actor from the country.

It is also important to note that up to about 18 months may pass between when a patent application is submitted and it is made public. Hence the data provided by the PatSnap database (and any other patent system) will be incomplete concerning patents younger than 18 months.

5.1. Patent databases

Patent information is information about intellectual property rights. With a patent, a sovereign state or intergovernmental organization grants exclusive rights to the owner of an invention in the form of a specific solution, product or process for a limited time. In exchange for the patent, there is a detailed public disclosure of the invention. The following is a brief presentation of the information stored in global patent databases and the advantages and limitations of tech mining.

The information is stored in national and international patent databases. Each national authority stores the information on the invention, the inventors, reference to other patents and technical classifications

such as Cooperative Patent Classification (CPC) codes. The technical code systems are very detailed and were developed in cooperation between the European Patent Office (EPO) and the patent office of the United States (USPTO)[6].

The same patent can be registered with patent authorities in several countries. In 2016, the number of new patent applications registered in a year passed 3 million patents according to WIPO[7]. Almost two out of three patents in 2016 were filed in Asia. The information is kept in publicly accessible databases and can be used to make sure that a "new" invention is in fact new.

The attraction of the patent databases, from an analytical point of view, is that the databases are updated constantly with detailed information about new technologies and their assignees. Using big data techniques, the wealth of patent data can be analyzed for strategic information on technological development over time and place. This type of analysis is referred to as tech mining. The data source for tech mining can be patent databases, or it may be global publication databases or business-related databases.

5.2. Tech mining: insights and limitations

Tech mining is a relatively new analytical tool that has been developed over the past 10-15 years. Patent information has always been publicly available, but tech mining of big data in the databases is only possible thanks to the internet, powerful computers and analytical software. The analyses that we do now in a matter of seconds were virtually impossible and almost unthinkable a decade ago.

Tech mining provides insights that can be found nowhere else. However, tech mining patent data is not an exact methodology. The advantage of tech mining is to identify trends and patterns in the data, but it is not sufficient for a full analysis or a complete understanding of technological developments and markets. The purpose of tech mining is to extract strategic insights on technologies, actors and markets from the data.

In tech mining, the objective is to identify a relevant sample of patents within a technological field to study patterns in innovation. It is big, messy data, so it is not possible to specify a search query that completely identifies all relevant patents and leaves out all irrelevant patents. This is mainly due to

[6] EPO & USPTO. (2022). "*Cooperative Patent Classification*". Available at: http://www.cooperativepatentclassification.org/ [accessed 20-10-22]

[7] WIPO. (2017). "*World Intellectual Property Indicators 2017*". Available at: http://www.wipo.int/edocs/pubdocs/en/wipo_pub_941_2017-chapter2.pdf [accessed 20-10-2022]

inconsistencies in how patents are registered by national authorities. Typically, it will be the case that a narrow search focusing on a few, but high-certainty, IPC and CPC codes will find most relevant patents but not all. Broadening the search possibly includes more relevant patents. However, this might come at the cost of including irrelevant patents at a higher rate.

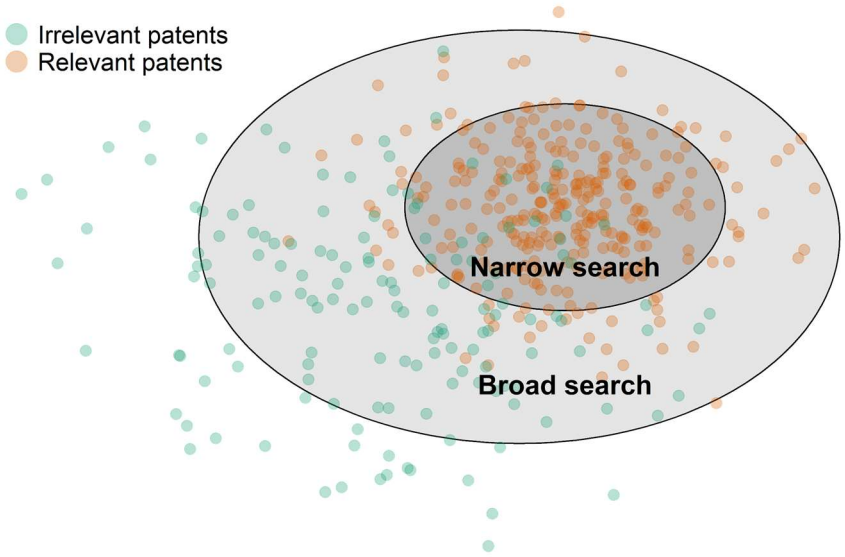

Figure 13. Illustration of patent search

Tech mining of patent data is useful for gaining insights into trends and how one technology develops and relates to other technologies. Tech mining patent data is useful for identifying technological leaders and knowledge clusters. Growth in the number of patents might indicate a strategic interest or a market interest in a specific technological area. Tech mining also offers insights into the geographical clustering of actors and innovation activities.

Still, it is important to keep weaknesses in mind when interpreting results. Tech mining patents do not answer every relevant question. There are several blind spots to be aware of:

- First, for several reasons, not all technologies are patented, e.g., some companies want secrecy around their innovations, in some areas the technological innovation is moving so fast that technologies are obsolete before the patent process is done or some companies think that patenting is too expensive.
- Secondly, national authorities and local offices are located all over the world, and this leads to inconsistencies in the databases. For example, Danish Technological Institute is one of the

leading patenting companies in Denmark, but the recorded name of the company may also be "DTI", "technological institute" and other variations. The lack of consistency leads to data being overlooked and misinterpreted. Smart software helps to alleviate this problem to some degree.

- Third, patenting cultures may differ from country to country. For example, in China, there are personal rewards for taking out patents, and in the US fights over technology rights in the judicial system might also inflate the number of patents as compared with patents taken in Europe.[8,9]
- Fourth, there is no market information connected to the patent data. There is no data on licensing or the value of patents and often no links to business databases, and the data cannot be readily summed into measures or indicators of economic strength. Tech mining should not stand as the only source for analysis, but it provides a useful supplement to any technology analysis with data and insights that are impossible to gain through other types of sources.

5.3. Measuring patent quality

Without data on the economic activity a patent creates, we cannot directly measure patent quality in terms of revenue generation. However, the PatSnap database includes data that allows us to construct a different kind of quality measure that serves as a proxy of the economic potential of a patent family. We do so by combining data on patent family citations, the size of patent family and the combined GDP of countries covered by the patent family.

Research indicates a strong relationship between patent citations and market valuations of firms.[10] It is expensive to apply for patents, so choosing to apply in many countries is indicative of a strong confidence in the qualities and market potential of the innovation. Finally, having patents in high-GDP countries increases the market reach of the innovation.

The measure is weighted, so patent citations account for 50 percent of the score, while the size of the patent family (number of countries covered), as well as the combined GDP of countries covered, each

[8] Chinapower. "Are patents indicative of Chinese innovation?" See https://chinapower.csis.org/patents/ ; Markovich. (2012). "U.S. Patents and Innovation". Council on foreign relations. See https://www.cfr.org/backgrounder/us-patents-and-innovation

[9] Europe has a "loser pays cost" juridical system, where often in the US it is each party that is responsible for paying its own attorney's fees. That has led to some inflation in the patent system in the US, where "patent trolls" are companies with patents attempts to enforce patent rights against accused infringers far beyond the patent's actual value using hardball legal tactics. See Strowel & Utko. 2016. "The trends and current practices in the area of patentability of computer implemented inventions within the EU and the U.S.". EU Commission. Available at: https://ec.europa.eu/digital-single-market/en/news/report-trends-and-current-practices-area-patentability-computer-implemented-inventions-within

[10] Hall, Bronwyn H., Adam Jaffe, and Manuel Trajtenberg. (2005). "Market Value and Patent Citations." *The RAND Journal of Economics 36*(1): 16–38. Available at: http://www.jstor.org/stable/1593752 [accessed 20-10-2022]

account for 25 percent. The measure of quality is calculated based on the patents included in the analysis (i.e., search query results) and not all 140 million patents in the PatSnap database. The patent family with average citations, patent family size and combined GDP of countries covered has a score of 1. Patent families receiving a score exceeding 1 are above world average quality.

The distribution of the measure is highly skewed, as the figure below shows. This imbalance is the result of a few patent families of extremely high quality with thousands of citations covering most of the world. These rather few patents significantly increase the world average.

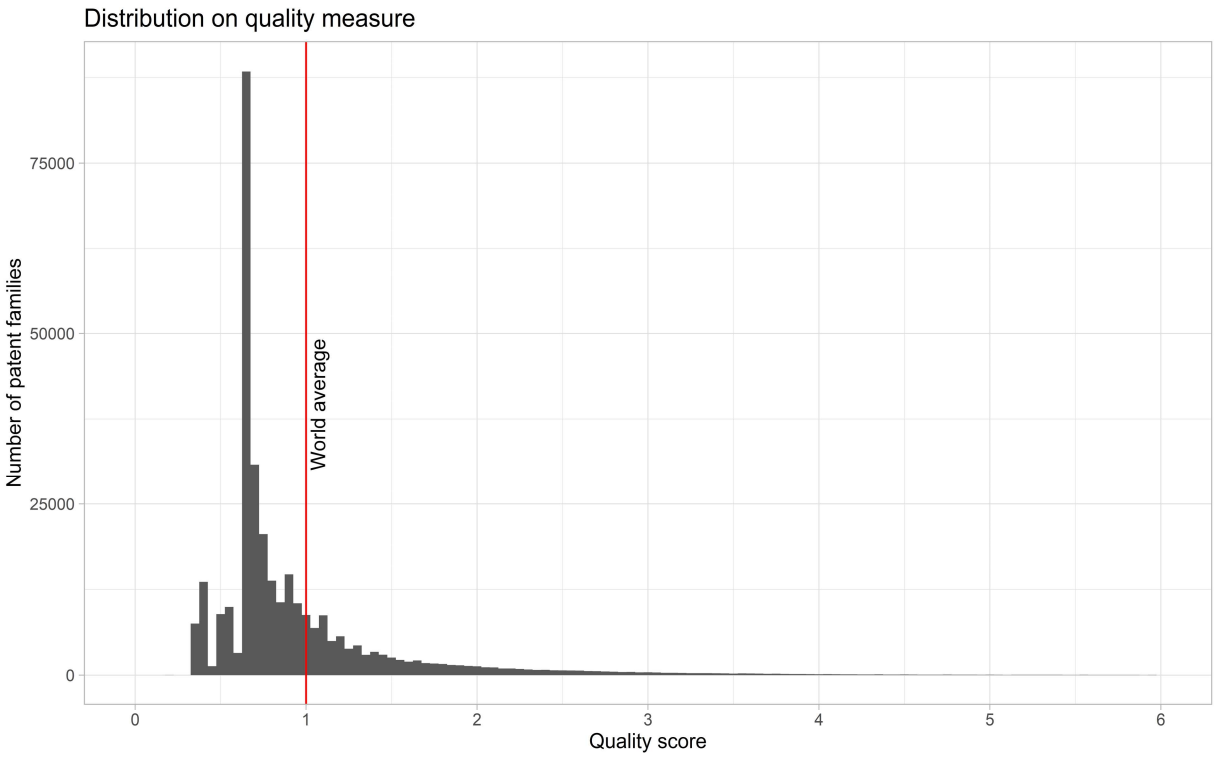

Figure 14. Global distribution of patent family quality scores

5.4. Identification of patents

The patent mapping follows a logical process:

1. Broad identification of IPC and CPC codes that possibly relate to patents of biosolution innovations
2. Construction of a search query combining all of the identified codes
3. Evaluation and filtering of initial findings to narrow the search query by including fewer IPC and CPC codes

We define biosolutions as biotechnological solutions to challenges in the food and agriculture sector. Biosolutions control, apply or utilize biological processes or bio-based components for the benefit of agriculture or in food or feed production. Examples include the use of enzymes, proteins, biological plant protection products, biofertilizers, microbes, bacteria, functional food ingredients, fermentation technology or equipment for any of the aforementioned processes.

Within the IPC and CPC patent classification systems, the classes Agriculture (A01*) and Food (A21*, A22*, A23*, A24*) include codes (or subclasses) related to proteins, enzymes, microbes, bacteria, ingredients, organic and so forth. Almost 300 relevant codes are identified. The appendix includes the full search query.

This search query results in 761,044 patent publications from 2000 to 2022 divided between 327,658 unique patent families.

Appendix: PatSnap search string

(A01G2013/008 OR A01G24/00 OR A01G29/00 OR A01G31/00 OR A01G33/00 OR A21D8/042 OR A21D8/04 OR A01N63/50 OR A23B4/20 OR A23B4/22 OR A23B5/14 OR A23B5/16 OR A23B7/154 OR A23B7/155 OR A23B9/28 OR A23B9/26 OR A23C13/16 OR A23C15/065 OR A23C15/123 OR A23C17/02 OR A23C19/0245 OR A23C19/032 OR A23C19/0328 OR A23C19/04 OR A23C19/041 OR A23C19/043 OR A23C19/054 OR A23C19/063 OR A23C19/0765 OR A23C21/02 OR A23C21/023 OR A23C2220/102 OR A23C2220/104 OR A23C2220/106 OR A23C3/08 OR A23C9/12 OR A23C9/1203 OR A23C9/1206 OR A23C9/1209 OR A23C9/1213 OR A23C9/1216 OR A23C9/127 OR A23F3/10 OR A23F3/166 OR A23F5/163 OR A23F5/204 OR A23F5/246 OR A23G1/42 OR A23G1/423 OR A23G2200/02 OR A23G3/364 OR A23G3/366 OR A23G4/12 OR A23G4/123 OR A23G9/36 OR A23G9/363 OR A23J1/125 OR A23J1/148 OR A23J3/34 OR A23K10/14 OR A23K10/30 OR A23K20/189 OR A23K30/18 OR A23L11/33 OR A23L13/42 OR A23L13/48 OR A23L13/74 OR A23L15/25 OR A23L17/65 OR A23L2/84 OR A23L25/40 OR A23L29/06 OR A23L3/3463 OR A23L3/3571 OR A23L5/25 OR A23L7/104 OR A23L7/107 OR A24B15/307 OR A61F2013/00531 OR A61B5/1486 OR A24D3/145 OR A61F2013/00927 OR A61F2013/8438 OR A23J OR A23J1/00 OR A23J3/00 OR A23K10/00 OR A23K30/00 OR A23K20/00 OR A01N63/00 OR A01N63/20 OR A21D8/045 OR A23C19/0321 OR A23C19/0323 OR A23C19/0325 OR A23C19/062 OR A23C21/026 OR A23C2220/204 OR A23C2220/206 OR A23C9/1238 OR A23L2/382 OR A23L29/065 OR A23L33/135 OR A23V2200/00 OR A23V2200/3204 OR A47L2401/10 OR A01H3/00 OR A01G24/20 OR A01G24/30 OR A01K1/0155 OR A01K2267/025 OR A01H13/00 OR A01N65/03 OR A01N65/00 OR A23J1/009 OR A23J3/20 OR A23J3/347 OR A23V2250/202 OR A23V2250/2042 OR A23V2250/00 OR A01H1/108 OR A01H1/00 OR A01K2207/10 OR A01K2267/01 OR A21D13/064 OR A21D2/26 OR A21D2/261 OR A21D2/264 OR A21D2/267 OR A21D2/268 OR A22C13/0016 OR A23C11/02 OR A23C11/04 OR A23C11/06 OR A23C11/065 OR A23C11/08 OR A23C11/10 OR A23C11/103 OR A23C19/053 OR A23C19/055 OR A23C19/0917 OR A23C19/0921 OR A23C19/093 OR A23C20/005 OR A23C20/02 OR A23C20/025 OR A23C21/04 OR A23C7/04 OR A23C9/1315 OR A23C9/1322 OR A23C9/1422 OR A23C9/1465 OR A23C9/15 OR A23C9/1512 OR A23C9/1526 OR A23G1/00 OR A23G1/44 OR A23G2200/10 OR A23G3/44 OR A23G4/14 OR A23G9/38 OR A23J3/04 OR A23J3/08 OR A23J3/14 OR A23J3/341 OR A23J3/343 OR A23J3/345 OR A23J3/346 OR A23K10/16 OR A23K20/147 OR A23K50/15 OR A23L13/424 OR A23L13/426 OR A23L15/20 OR A23L2/66 OR A23L29/281 OR A23L33/17 OR A23L33/18 OR A23L33/185 OR A23L33/19 OR A23L33/195 OR A23L9/22 OR A23L9/24 OR A23V2200/13 OR A23V2250/54 OR A23V2250/542 OR A23V2250/5424 OR A23V2250/54252 OR A23V2250/5428 OR A23V2250/543 OR A23V2250/546 OR A23V2250/548 OR A23V2250/5482 OR A23V2250/5484 OR A23V2250/5486 OR A23V2250/5488 OR A23V2250/55 OR A23V2300/06 OR A23V2300/08 OR A24B15/306 OR A23B4/12 OR A23B7/10 OR A23C19/0326 OR A23C19/0455 OR A23C19/051 OR A23C2220/208 OR A23C2260/102 OR A23C2260/154 OR

A23C2260/152 OR A23C9/1275 OR A23C9/152 OR A23C9/1542 OR A23C9/1565 OR A23F3/08 OR A23G1/02 OR A23K10/12 OR A23L11/50 OR A23L13/422 OR A23L13/46 OR A23L27/24 OR A23P20/105 OR A23V2200/3202 OR A24B15/183 OR A01K80/005 OR A01N31/00 OR A01N33/00 OR A01N35/00 OR A01N37/00 OR A01N41/00 OR A01N47/00 OR A01N51/00 OR A01N55/00 OR A01N57/00 OR A21D2/08 OR A21D2/14 OR A21D2/24 OR A21D2/28 OR A21D2/30 OR A23B4/0235 OR A23B4/027 OR A23C21/08 OR A23C2250/054 OR A23C9/1522 OR A23F5/40 OR A23G3/36 OR A23G1/32 OR A23G4/06 OR A23G9/32 OR A23K20/10 OR A23J1/142 OR A23L29/03 OR A23L3/3553 OR A23L3/3544 OR A23L3/3535 OR A23L3/3526 OR A23L3/3481 OR A23L5/43 OR A23L5/47 OR A24B15/42 OR A24B15/30 OR A24B15/26 OR A23V2250/30 OR A24D3/14 OR A24D3/08 OR A01N63/30 OR A23C9/1544 OR A23L29/269 OR A23L29/27 OR A23L5/46 OR A23V2250/122)

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