Spin-out companies in materials science for sustainability 2016-2025

AND REFLECTIONS ON THE INNOVATION POTENTIAL OF THE WALLENBERG INITIATIVE MATERIALS SCIENCE FOR SUSTAINABILITY (WISE)

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WISE

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1 Summary

Measuring the impact of research on societal development, including the green transition, is challenging. In materials science, one important pathway to impact is the translation of research findings into innovations, for example, when knowledge of advanced materials is applied to products, services, or processes that improve existing technologies or enable entirely new ones. Although it is difficult to capture all forms of knowledge transfer, the creation of companies based wholly or partly on research findings provides a tangible and measurable indicator of research uptake. Their potential for societal impact grows as they scale their operations and develop into commercially viable businesses.

This report updates and expands on the 2023 report Innovation potential based on recent spinouts, which mapped companies established between 2016 and 2022 based on materials science research at the eight WISE partner universities and affiliated research groups of excellence. The present report examines how those companies have developed since the previous study and broadens the analysis to include companies established between 2023 and 2025.

Of the 103 companies established between 2016 and 2022, 93 remain in operation. A further 31 companies were established between 2023 and 2025, bringing the total number identified across both periods to 134. Of these, 88 have a strong connection to sustainability and align with one or more thematic areas of the WISE matrix (see Figure 1). The remaining 46 have a less direct connection to sustainability and are therefore more difficult to position within the matrix.

Total employment increased from 380 across the 103 companies covered in 2022 to 646 across the 134 companies covered in 2025. The spinouts analysed in this study can generally be characterised as deep-tech companies, which typically require lengthy development periods before achieving commercial success. Many therefore rely on external investment for several years before they can scale their operations. The financial data reflect this pattern. According to the latest available annual reports, only one company with ten or more employees reported a profit. Total operating costs rose from SEK 573 million in 2022 to SEK 1,109 million in 2025, while total turnover increased from SEK 254 million to SEK 467 million. Operating costs thus remained more than twice total turnover in 2025, highlighting the companies' continued need for external financing.

2 Background

2.1 WISE - Wallenberg Initiative Materials Science for Sustainability

The Wallenberg Initiative Materials Science for Sustainability (WISE) is a research program financed by the Knut and Alice Wallenberg Foundation. Launched in 2022, WISE aims to advance materials science to enable the transition to a sustainable society. The program supports research into new materials and technologies that address environmental and climate challenges. It brings together researchers across Swedish universities, combining scientific excellence with a shared commitment to sustainability. WISE funds research projects and recruits outstanding scientists through its WISE Fellows program. Its Research School supports the next generation of researchers through education, collaboration and interdisciplinary exchange. Investments in research infrastructure provide access to advanced tools for developing and characterising materials. WISE Research Arenas connect academia and industry to address shared challenges and accelerate innovation. Sustainability training and the WISE ASSIST assessment tool help researchers integrate sustainability into their work. Through these coordinated efforts, WISE seeks to translate discoveries in materials science into lasting societal benefits. Research conducted in WISE can be mapped against the topic-thematic illustrated in Figure 1, below.

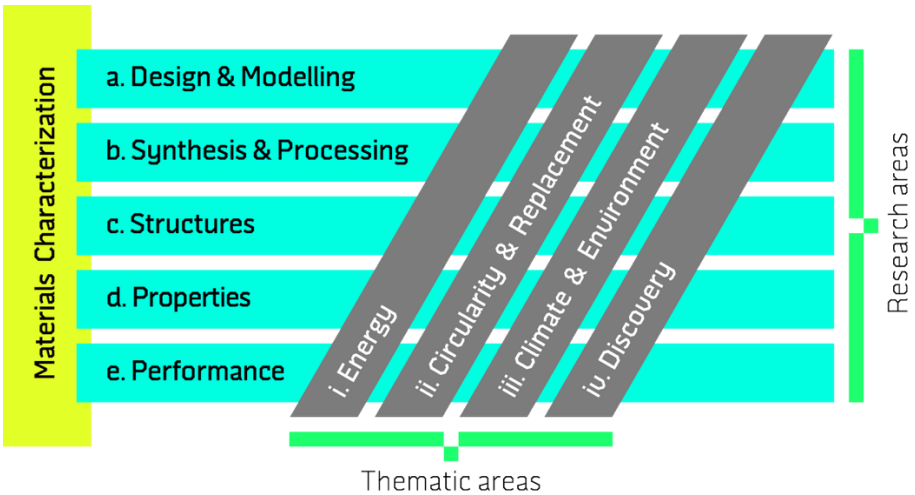


Figure 1. The WISE matrix is composed of four thematic sustainability areas and the research topics of materials science.

Of specific relevance to this report, the WISE program supports industry projects (WISE-ip) and research arenas with industry (WIRA), while the Knut

and Alice Wallenberg Foundation funds proof-of-concept projects (KAW-PoC). These funding components are briefly described in the sections below.

2.1.1 WISE Industry Projects (WISE-ip)

The WISE-ip calls for projects offer funding for industrial doctoral students and industrial postdoctoral researchers, with each proposal supporting one position. It welcomes basic and need-driven research across the WISE program matrix, combining excellent materials science with a clear contribution to sustainability. Applications must integrate sustainability through a structured methodology. Each project involves an eligible academic PI and an industry PI from a Swedish company or a company with substantial operations in Sweden. So far, in total, 42 WISE-ip projects have been granted through decisions from two separate calls, decided in 2025 and 2023, respectively. A third call will open in April 2027. About 40% of the participating industries are referred to as start-up companies.

2.1.2 WISE Research Arenas with Industry (WIRA)

WISE Research Arenas with Industry (WIRAs) are collaborative platforms designed to bridge fundamental academic materials science with real-world industrial and societal sustainability needs. WISE Research Arenas connect academic researchers and industrial partners, providing access to production environments, testbeds and specialized facilities. They support the testing and scaling of new materials, address shared research and sustainability challenges, and foster networks among doctoral students, postdoctoral researchers and industry engineers. Four WIRAs have been decided and receive funding from WISE and they address complementary sustainability challenges: WIRA-SET focuses on PFAS-free electrochemical technologies and reduced use of critical raw materials; WIRA-SuPRA develops sustainable alternatives and circular approaches for plastics; WIRA-Water wise explores water–fibre interactions for construction and packaging; and WIRA-ICME advances digital and computational materials development.

2.1.3 Knut and Alice Wallenberg Foundation Proof of Concept (PoC) Grants in Materials Science for Sustainability

The Knut and Alice Wallenberg Foundation Proof of Concept Grant supports the translation of academic discoveries in materials science for sustainability into validated methods, products or processes. It funds goal-oriented research projects lasting up to two years, enabling researchers to address remaining scientific questions and advance their findings towards innovation and commercialisation. Researchers within the WISE community, along with other recipients of KAW grants, may apply. To date, 18 KAW-PoC grants have been awarded through two calls held in 2025 and 2026. A third call closed on 15 October 2026, with funding decisions expected in 2027.

2.2 Motivation

The overall goal of the WISE program is to advance materials science that enables the transition to a sustainable society. As Sweden approaches its target of net-zero emissions by 2045 and net-negative emissions thereafter, WISE must promote translation of research into timely and substantial sustainability benefits. Knowledge and scientific advances (in materials science) can reach society and industry through several pathways: (1) publishing research results in scientific journals, (2) the recruitment of doctoral graduates and trained postdoctoral researchers, (3) licensing and collaboration with established companies, (4) establishment of open research infrastructures, and (5) the creation of spin-out companies. This analysis focuses on the latter pathway and examines the critical criteria for enabling spinouts to translate research into practical applications rapidly and deliver meaningful, and significant, contributions to sustainability.

All components and activities of the WISE program focus on materials science for sustainability. Translating this research into successful spinouts and scalable technologies require attention to the conditions for commercialization and scale-up from the earliest stages of both fundamental and applied research. A dead end in scaling up can also be a dead end for realizing sustainability benefits. This report includes tables and figures to examine the development of spin-out companies in materials science for sustainability. It presents data on employee numbers and annual turnover, both in aggregate and broken down by thematic area and WISE partner university. The report concludes with open questions and recommendations intended to stimulate discussion and inform future action within WISE and among stakeholders supporting the translation of research into viable commercial enterprises. These insights are relevant to green technology, deep technology, the circular economy and renewable energy, where timely and effective scale-up is essential to delivering sustainability benefits.

As a way of reviewing and describing the innovation potential of materials science, and maybe contribute to long-term evaluation of the WISE program, a previous report (“Innovation potential based on recent spin-outs”, 2023) targeted to provide a snapshot of the innovation potential of materials science for sustainability by summarizing a 7-year history of spin-out companies generated (2016 through 2022) from WISE partner universities and affiliated groups of excellence (KaU, ÖrU and UmU). This report has continued to monitor the number of spinouts from the same universities in the following three-year period, 2023 through 2025, see Figure 1.

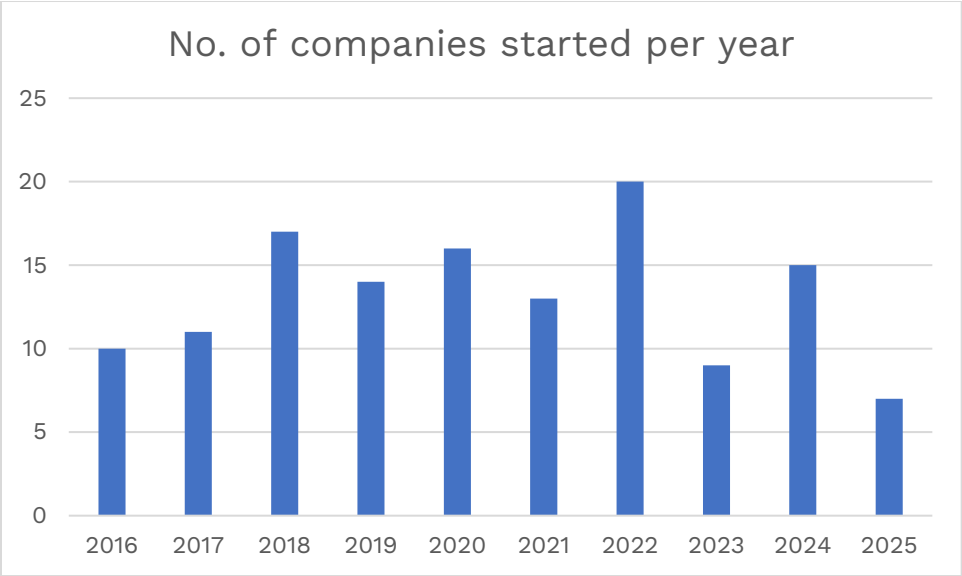


Figure 1. Total number of companies started based on materials science results, from all universities participating in WISE, per year.

The number of started companies is an indication of the innovation potential but to achieve impact on sustainability the companies need to scale their operations and not remain as micro companies (less than 10 employees) over time. Therefore, this report also adds an analysis of how all these identified companies develop and contribute to creating jobs and growth in Sweden.

At first, it seems as if the number of companies started per year in the first period, 2016-2022, are somewhat higher than during the period of 2023-2025. When comparing the number of spin-out companies in shorter periods it is relevant to consider that conditions or willingness to start companies may vary over time. As an international comparison, we have included data from the report[1] "The OECD Start-ups Database: A new lens on the global entrepreneurial ecosystems", see Figure 2. Here the global trend of the establishment of companies versus the funding year is provided. There is a clear decline in the number of new companies after the peak 2015-2018. 2019 and 2020 are clearly lower. 2021 and onwards we observe an incremental decrease. However, in addition to reflecting the underlying business dynamics, the patterns in Figure 2 may also be influenced by how companies enter the database. It may take something between three to four years for an entire cohort of companies to appear fully registered, thus making the data set complete.

[1] Berger, M. et al. (2026), "The OECD Start-ups Database: A new lens on the global entrepreneurial ecosystems", *OECD Science, Technology and Industry Working Papers*, No. 2026/04, OECD Publishing, Paris, https://doi.org/10.1787/be8e5317-en.

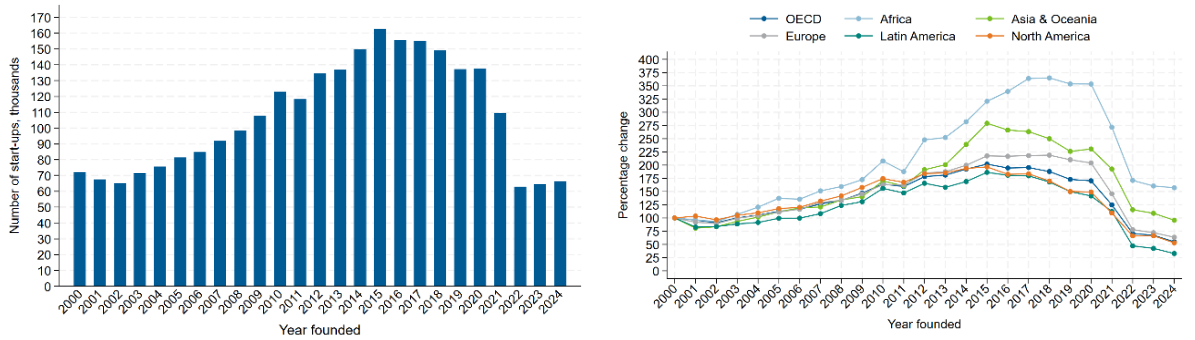


Figure 2. Figures are found in an OECD report[1]. Left shows the trend in the number of new companies registers in OECD start-ups Database by year. Right presents the relative growth in new company formation by location.

3 Methodology

3.1 Selection of companies and classification

Information on spin-out companies was collected from a range of sources at each WISE partner university. Company websites and other relevant sources were then reviewed to assess the extent to which each company's activities are based on materials innovation and to identify the WISE thematic areas to which they relate. Companies whose activities are based on materials innovation but have no direct connection to sustainability are classified as "Outside WISE".

The universities use different procedures to identify and document spin-out companies originating from materials science research. Consequently, the dataset may not capture all relevant companies, and coverage may vary between universities. These limitations should be considered when interpreting the findings and making comparisons across institutions. The report may not capture all companies founded by materials scientists or based on materials research findings, of the WISE universities. However, a broadly consistent approach to data collection was applied across all participating universities.

Sources of information from WISE universities:

- Chalmers: Grants and Innovation Office
- KaU: Grants & Innovation Office
- KTH: KTH Innovation
- LiU: URG provided list of companies already compiled for SFO application, and Norrköping Science Park
- LTU: Innovation office at LTU
- LU: LU innovation
- SU: Department for Research and Collaboration Support

- UmU: Uminova Innovation
- UU: URG and Uppsala Innovation Centre

3.2 Company data

The financial and employment data presented in this report are drawn from the most recently published annual reports. For most companies, these cover 2025; for 13 of the 134 companies, the latest available reports cover 2024.

Ten companies that were active in 2022 were deregistered before the end of 2025. Of these, three had merged with or been acquired by other companies. None of these ten companies is included in the employment, turnover or operating cost totals reported for 2025.

4 Data analysis

A total of 134 companies based on materials science research at the WISE partner universities and affiliated groups of excellence were established between 2016 and 2025, including 31 between 2023 and 2025, see Figure 1.

4.1 Number of companies and thematic areas

Table 1 shows the number of companies established by university and thematic area, with two sets of columns covering different periods. The columns labelled 2016–2022 show companies established during that period that were still in operation at the end of 2022. The rightmost columns, labelled 2016–2025, also include companies established between 2023 and 2025.

The annual number of companies established has declined over the past three years. This may reflect a broader international trend: the OECD report The OECD Start-ups Database: *A new lens on the global entrepreneurial ecosystems* documents a decline in new business formation after 2018, see Chapter 2.2.

Approximately one third of the identified companies (46 out of 134) have activities with no clear, direct connection to sustainability. These companies are classified as “Outside WISE”, indicating that they fall outside the thematic scope of the WISE program, and are listed in the corresponding columns in Table 1.

The companies established between 2016 and 2025 are fairly evenly distributed across the WISE thematic areas of Energy, Circularity & Replacement, and Climate & Environment, with considerably fewer in Discovery. The first three areas show similar proportional increases in company numbers since 2022. No new companies have been identified within Discovery for the period 2023–2025.

Table 1. Number of companies established based on materials science research at WISE partner universities and affiliated groups of excellence, classified by thematic area. Companies whose activities have no clear, direct connection to sustainability are classified as "Outside WISE".

	2016-2022						2016-2025					
University	Energy	Circularity & Replacement	C & E	Discovery	Outside	Total	Energy	Circularity & Replacement	C & E	Discovery	Outside	Total
CTH	4	3	4	2	8	21	4	4	5	2	10	25
KaU		2	1			3		2	1			3
KTH	7	3	7	7	9	33	10	4	9	7	11	41
LiU	5	1			9	15	9	1	1		15	26
LTU		2	2			4	1	2	3		1	7
LU	1	2	4		5	12	1	2	4		6	13
SU	2	2				4	2	2	2			6
UmU		1				1		1				1
UU	5	2			3	10	6	3			3	12
	24	**18**	**18**	**9**	**34**	**103**	**33**	**21**	**25**	**9**	**46**	**134**

KTH accounts for the largest number of companies established between 2016 and 2025, with 41 in total. Together with CTH, it is also one of only two universities with companies represented in all WISE thematic areas. LiU follows with 26 companies, closely followed by CTH with 25. LU and UU account for 13 and 12 companies, respectively, followed by LTU (7), SU (6), KaU (3), and UmU (1). The distribution of companies by university and thematic area is presented in Table 1**Fel! Hittar inte referenskälla.** and illustrated in Figure 3 for 2016-2022 and in Figure 4 for 2016-2025.

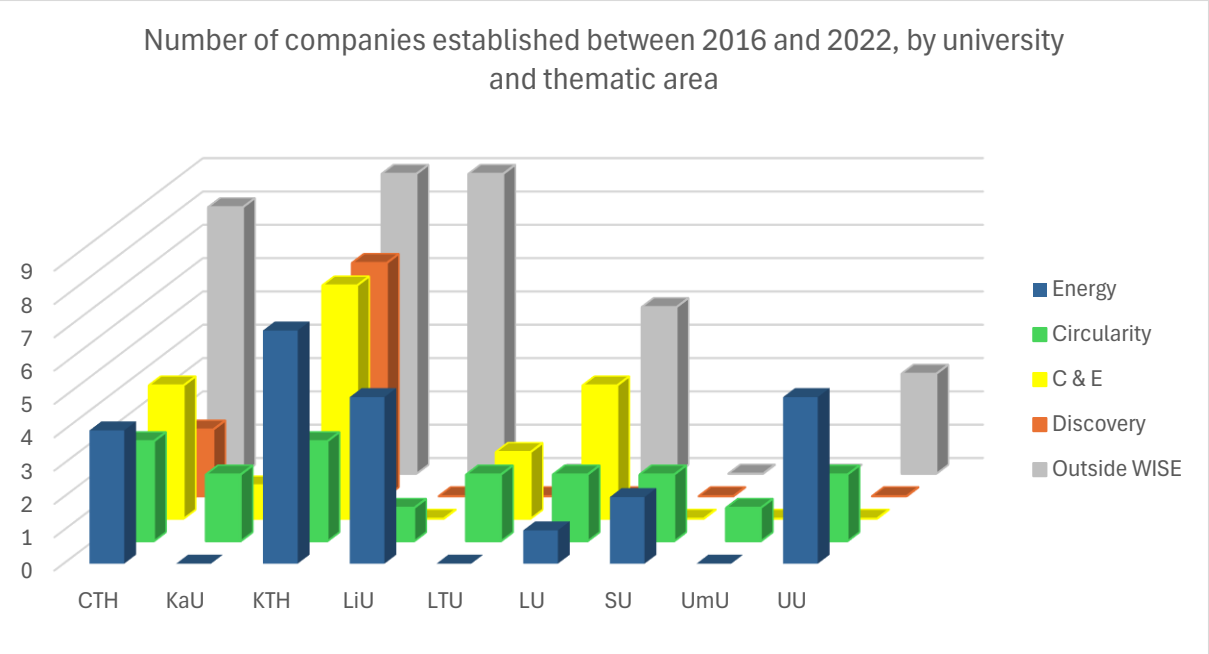


Figure 3. Number of companies established between 2016 and 2022, by university and thematic area. "Outside WISE" refers to companies whose activities have no clear, direct connection to sustainability.

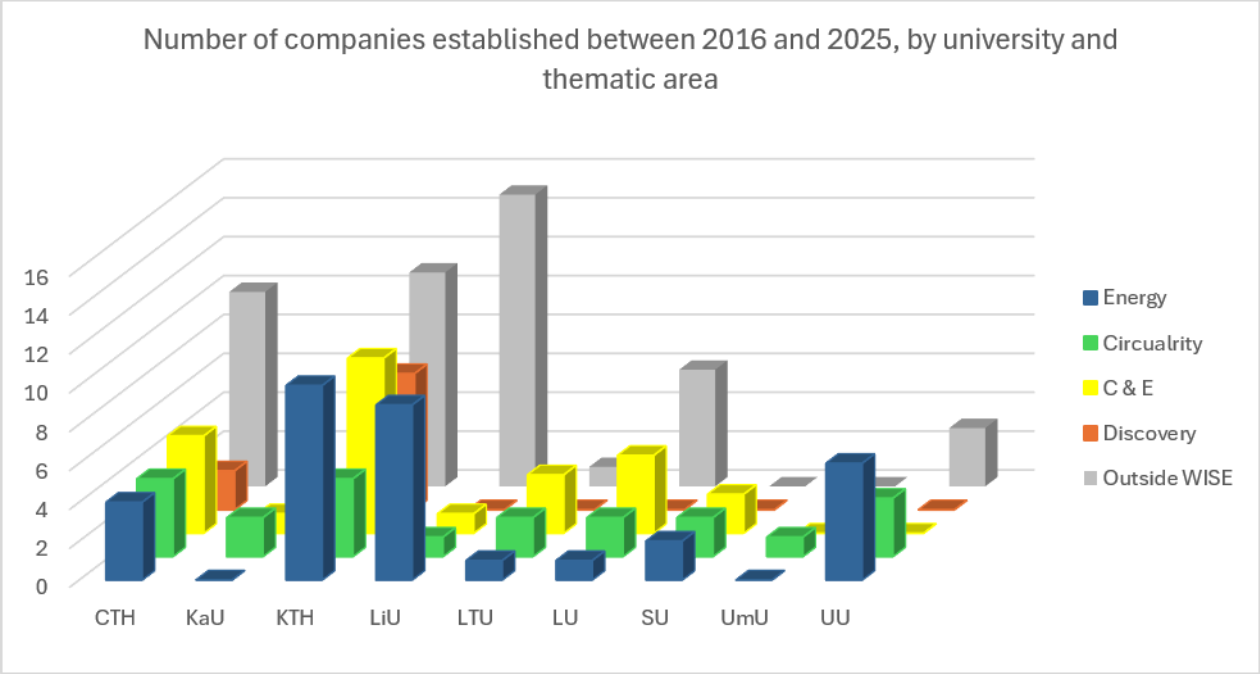


Figure 4. Number of companies established between 2016 and 2025, by university and thematic area. "Outside WISE" refers to companies whose activities have no clear, direct connection to sustainability.

4.2 Number of employees and economic data

Overall, the spin-out companies included in this study show growth in both employment and turnover between 2022 and 2025, see Table 2. Ten companies established by the end of 2022 have since been deregistered: three were acquired by or merged with other companies, and seven were liquidated. Although these ten companies no longer contribute to the 2025 totals, total employment across the companies analysed increased from 380 at the end of 2022 to 646 at the end of 2025, a rise of 70%. Over the same period, total turnover increased by 84%, from SEK 254 million to SEK 467 million.

Data from the collected annual reports also reveal that many of the companies are dependent on investors or soft funding from national or EU agencies since their operational costs are significantly higher than their turnover, the latter in most cases identical to income from sales. The operational costs have increased from 573 MSEK in 2022 to 1 109 MSEK in 2025.

Table 2. Total number of spin-out companies by university, together with their employment, turnover and operating costs in 2022 and 2025.

University	Total 2016-2022	No. of employees 2022	Turnover 2022 [kSEK]	Operational costs 2022 [kSEK]	Total 2016-2025	No. of employees 2025	Turnover 2025 [kSEK]	Operational costs 2025 [kSEK]
CTH	21	76	42 555	115 628	25	112	84 278	203 506
KaU	3	6	4 799	5 867	3	9	7 648	11 597
KTH	33	62	34 448	58 828	41	196	122 967	263 975
LiU	15	80	39 442	116 757	26	132	72 026	222 969
LTU	4	4	4 009	6 916	7	2	1 879	1 166
LU	12	48	52 941	94 095	13	83	84 574	165 474
SU	4	11	9 485	11 889	6	7	4 600	6 055
UmU	1	1	901	911	1	1	2 546	1 431
UU	10	92	65 267	162 059	12	104	86 864	232 696
	103	**380**	**253 847**	**572 950**	**134**	**646**	**467 382**	**1 108 869**

Figure 6 and 7 below are graphical representations of the figures in Table 2 showcasing how the number of employees has increased from 2022 to 2025 together with an increase in turnover (figure 6) and operational costs (figure 7).

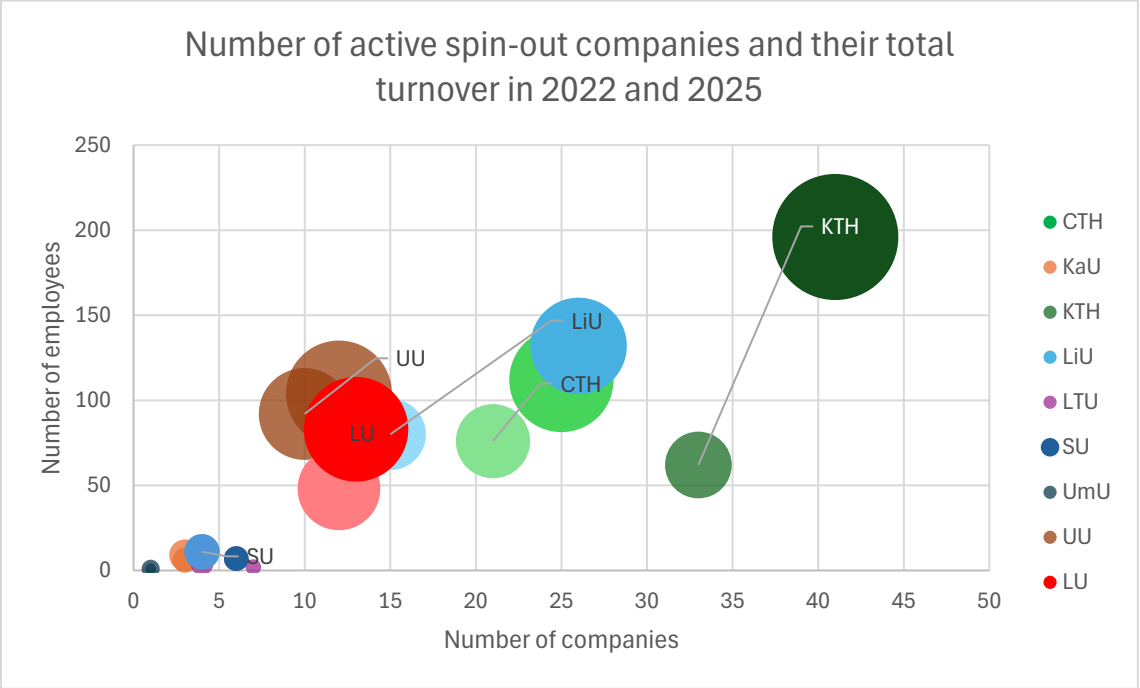


Figure 5. Movement diagram showing the change in number of spin-out companies between 2022 (lighter bubbles) and 2025 (darker bubbles), with bubble size representing the total turnover of spin-out companies originating from each university.

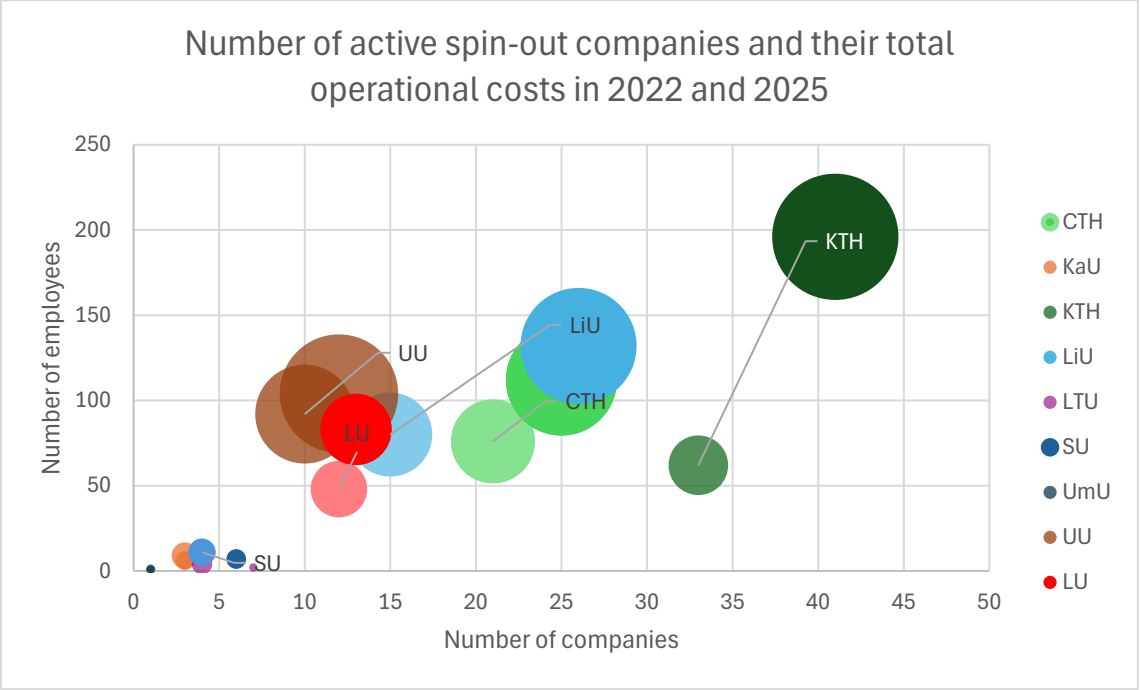


Figure 6. Movement diagram where the size of the bubbles corresponds to the aggregated total operational costs for companies originating from respective university in 2022 (lighter bubble) and 2025 (darker bubble).

Figure 7 illustrates whether employment and turnover are concentrated in a few companies or distributed more evenly across the companies analysed. Each company occupies a separate position along the x-axis, with the number of employees shown on the y-axis and bubble size representing turnover. Figure 10 - Figure 11 present the same data separately for companies originating from selected universities.

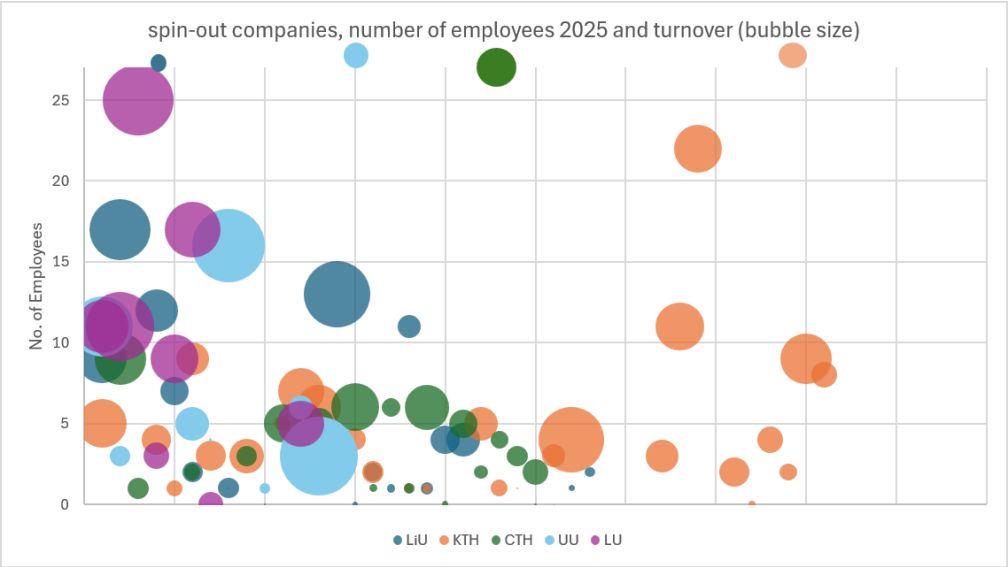


Figure 7. Each company occupies a separate position along the x-axis in each series, the number of employees on the y-axis, and bubble size is proportional to each company's turnover.

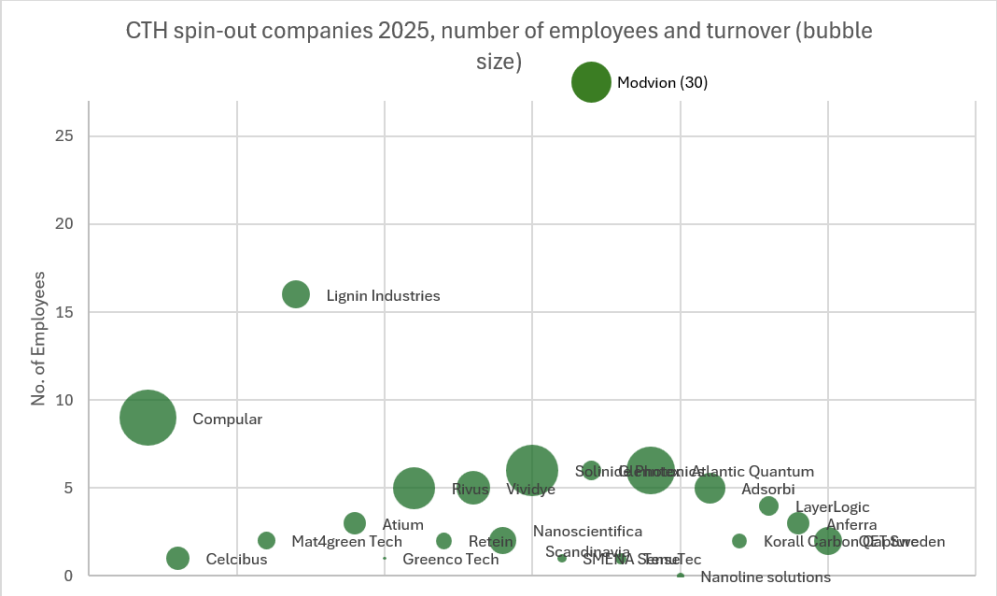


Figure 8. Companies originating from materials science research at CTH. Each company occupies a separate position along the x-axis, with the number of employees shown on the y-axis and bubble size proportional to turnover.

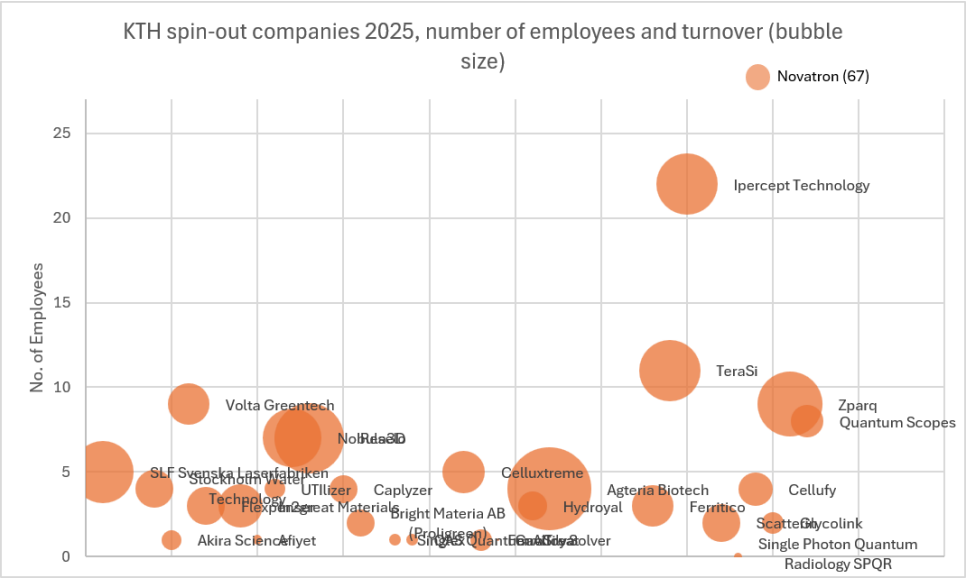


Figure 9. Companies originating from materials science research at KTH. Each company occupies a separate position along the x-axis, with the number of employees shown on the y-axis and bubble size proportional to turnover.

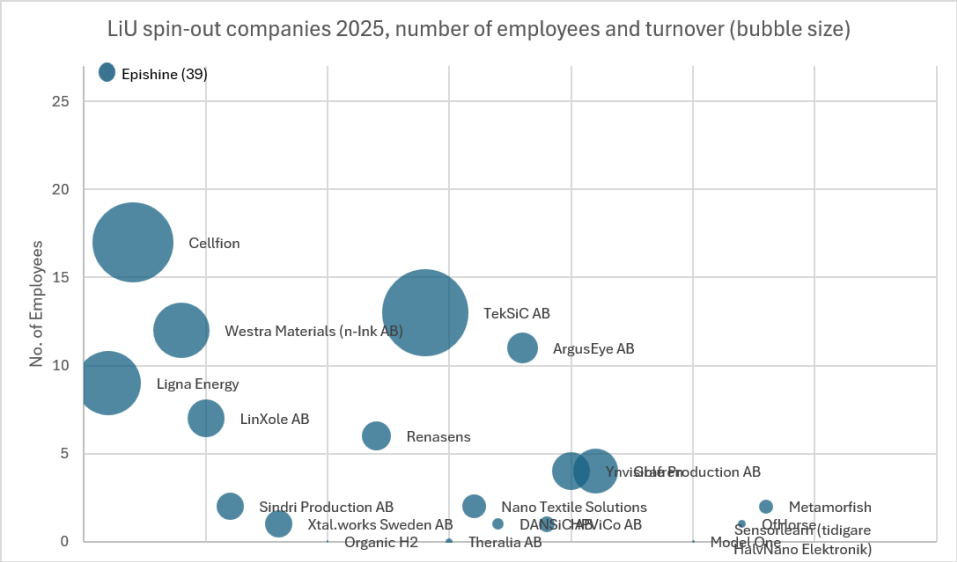


Figure 10. Companies originating from materials science research at LiU. Each company occupies a separate position along the x-axis, with the number of employees shown on the y-axis and bubble size proportional to turnover.

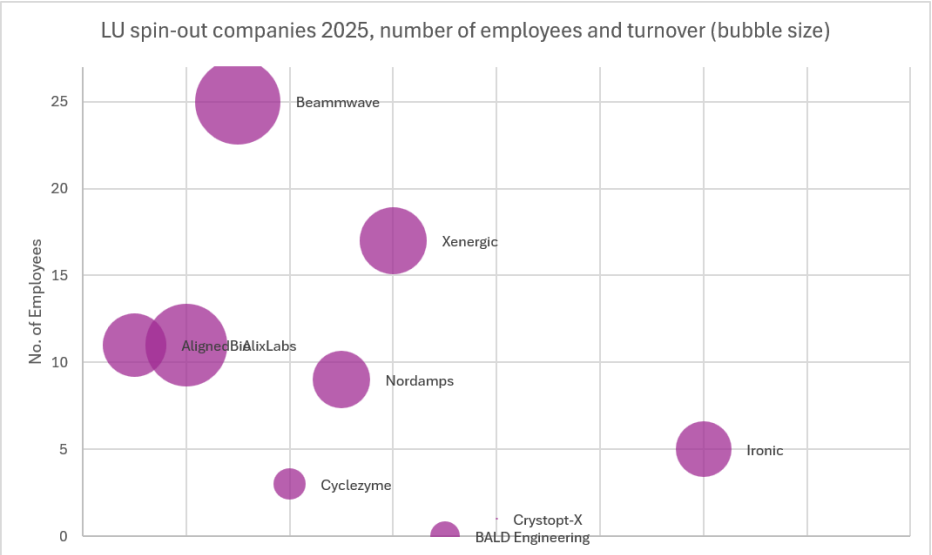


Figure 11. Companies originating from materials science research at LU. Each company occupies a separate position along the x-axis, with the number of employees shown on the y-axis and bubble size proportional to turnover.

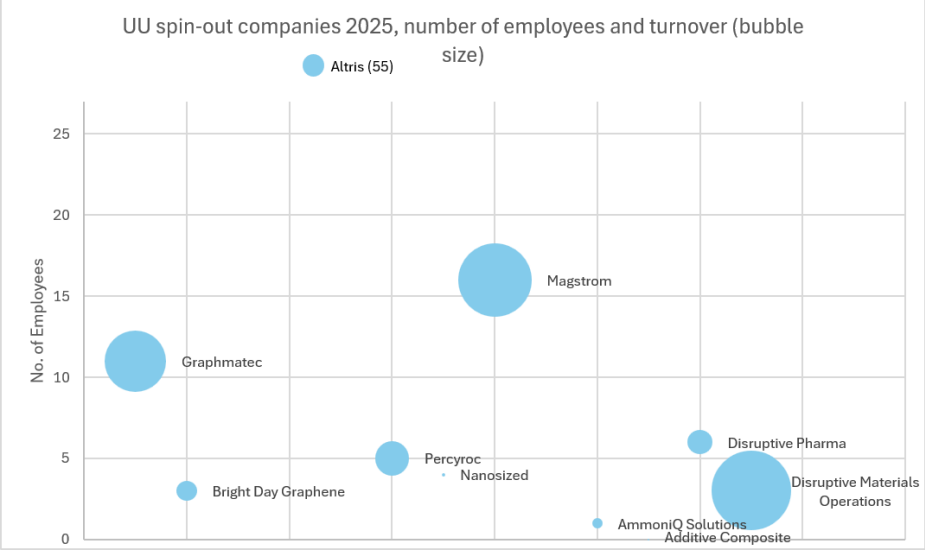


Figure 12. Companies originating from materials science research at UU. Each company occupies a separate position along the x-axis, with the number of employees shown on the y-axis and bubble size proportional to turnover.

4.3 Need for investments and successful business

Young companies often have limited retained earnings and may therefore require external financing when operating costs exceed turnover. This financing may include public funding, venture capital or other sources. Table 3 summarises changes in turnover and operating costs between 2022 and 2025, grouped by university of origin. The aggregate gap between operating costs and turnover, indicating the potential need for external financing,

increased from approximately SEK 320 million in 2022 to SEK 641 million in 2025. Companies originating from KTH recorded the largest proportional increases in both turnover (+257%) and operating costs (+349%).

Despite the substantial aggregate growth, many companies remain small and have yet to scale. At the end of 2025, 41 companies established in 2022 or earlier were still active but had fewer than three employees each, employing just 37 people in total.

Table 3. Comparison of turnover and operational costs 2022 and 2025 and calculated need for external investments as aggregated figures divided per originating university.

University	Year	Turnover	Rel. Change 2025 from 2022	Op. Cost	Rel. Change 2025 from 2022	Need for investments	
						Absolute	% of Op. Cost
CTH	2022	42 555		115 628		73 073	63%
	2025	84 278	98%	203 506	76%	119 228	59%
KaU	2022	4 799		5 867		1 068	18%
	2025	7 648	59%	11 597	98%	3 949	34%
KTH	2022	34 448		58 828		24 380	41%
	2025	122 967	257%	263 975	349%	141 008	53%
LiU	2022	39 442		116 757		77 315	66%
	2025	72 026	83%	222 969	91%	150 943	68%
LTU	2022	4 009		6 916		2 907	42%
	2025	1 879	-53%	1 166	-83%	-713	-61%
LU	2022	52 941		94 095		41 154	44%
	2025	84 574	60%	165 474	76%	80 900	49%
SU	2022	9 485		11 889		2 404	20%
	2025	4 600	-52%	6 055	-49%	1 455	24%
UmU	2022	901		911		10	1%
	2025	2 546	183%	1 431	57%	-1 115	-78%
UU	2022	65 267		162 059		96 792	60%
	2025	86 864	33%	232 696	44%	145 832	63%

5 Success stories

It is well known that start-ups in the advanced material sector often require long lead times to scale up in terms of, for example, turnover, number of employees, and profit. This is also reflected in the figures for the 134 companies mentioned above, all of which launched their operations in 2016 or later. To identify possible factors behind successful scaling, we have singled out three companies that have performed well and have also operated for a longer period. These companies are Excillum (founded in 2007), DP Patterning (founded in 2013) and Low Noise Factory (founded in 2015).

- Excillum was founded in 2007 and develops high-brightness, high-resolution X-ray sources, including the MetalJet and NanoTube. Its pioneering liquid-metal-jet technology supports advances in science, medicine and manufacturing, serving several major industries. Since 2009, the company's products have been supplied to demanding research laboratories and instrument manufacturers in the USA, Europe, and Asia. The company has also acquired the former spin-off Exciscope to strengthen its expertise in 3D X-ray imaging. Today, the company has over 80 employees and supplies advanced X-ray sources to industries including semiconductors, batteries, materials science and pharmaceuticals, worldwide.
- DP Patterning was founded in 2013 and has developed a unique patterning technology for sustainable manufacturing of flexible antennas, printed circuit boards (flex-PCBs) and heating elements for the communication, electronics, and automotive industries. DP Patterning stems from the research environment of the Laboratory of Organic Electronics, LiU, and Acreo institute (now RISE). The DP Patterning technology was initially developed within the PAELLA project funded by VINNOVA and industry, conducted from 1999 to 2002. Recently, the company inaugurated a new production facility in Norrköping and has become the provider of flex-PCBs with the largest manufacturing capacity in Europe (> 10 million square metres per year). In total, DP Patterning has about 50 employees and the turnover for the second quarter of 2026 reached 71 MSEK with an EBITDA of 31 MSEK. Success criteria: Large international customers, price-competitiveness, environmentally friendly manufacturing technology.
- Low Noise Factory (LNF) was founded in 2015 and has made an impressive journey, evolving from a small, research-oriented start-up into a world-leading player in ultra-low-noise microwave amplifiers (Low Noise Amplifiers, or LNAs). These amplifiers are used near absolute zero –cryogenic– temperatures for space exploration, quantum computing, radio astronomy, and for various ground-breaking scientific endeavours where extreme sensitivity is paramount. The foundation was laid through advanced semiconductor research and the development of unique transistors based on indium phosphide. The company initially supplied components primarily for radio astronomy and space research, but a major shift occurred around 2020; today, approximately 85% of its business serves the quantum computing industry. LNF has grown from a handful of employees to a team of around 25 people in Gothenburg. Revenue has nearly doubled every two years, and during the fiscal year ending in August 2025, Low Noise Factory AB generated over SEK 190 million in revenue with a very strong profit margin.

6 Key Findings

Within materials science, the number of spin-out companies and how they distribute within the WISE thematic areas is substantially different between the universities. Despite local variations, overall coverage is good and there are many spin-off companies whose operations contribute to sustainability. This is good news for Sweden, for the green industry sector, and for the transition toward a more sustainable future.

88 spin-out companies formed between 2016 and 2025, position themselves within the WISE matrix and

- they are evenly distributed within the three different thematic sustainability areas of WISE, 33, 21, and 25 for *Energy*, *Circularity/Replacement*, and *Climate/Environment*, respectively, of which
- KTH and CTH are the only universities with spin-out companies covering all thematic areas, while
- LiU has a strong tradition in forming spin-out companies in Energy; UU in Energy and Circularity/Replacement, LTU in Circularity/Replacement and Climate/Environment, and LU in Climate/Environment, and
- nine spin-out companies position themselves within Discovery.

Comparing aggregated figures for spin-out companies active in 2022 (103) with those active in 2025 (124), all formed since 2016, we find that the total

- number of employees increased from 380 to 646 (70% increase)
- turnover increased from 254 to 467 MSEK (84% increase)
- operational costs increased from 573 to 1 109 MSEK (94% increase)
- need for investment or soft funding therefore increased from 320 to 641 MSEK (100 % increase)

This shows that the availability of investment capital and willingness to invest in deep-tech materials-based companies in Sweden and that support for innovation from agencies is significant.

In addition,

- At the end of 2025, 41 spin-out companies established in 2022 or earlier remained active with fewer than three employees each, employing 37 people in total.
- 10 spinout companies active in 2022 have been deregistered before the end of 2025, thereof 3 merged with or bought by other companies.

7 Further discussions

- According to a 2025 report by *Sveriges universitets innovationskontor*, more than 2,500 spin-out companies have been established across all research and application fields since 2010. These companies predominantly originate from Sweden's major research universities, with LU, UU and KTH accounting for the largest numbers. However, the materials science spinouts identified in this study for 2016–2025 show a different pattern, with KTH, LiU and CTH ranking highest (see Table 2). This difference may partly reflect local traditions and entrepreneurial cultures at the WISE partner universities, although the reporting periods also differ. Is this due to a strong clustering of spinouts originating from specific research environments within individual universities? This raises the further question of the extent to which university profiles, local champions or environments stimulate company formation.
- Only a few spinout companies established during the reporting period have entered a pre-scale-up or scale-up phase. Over a longer timeframe of 10–20 years, however, several materials science companies have successfully scaled their operations and become profitable. These long development times pose several challenges. First, as the rapid scaling of advanced materials solutions is crucial to tackling climate change and accelerating the green transition. Secondly, international competitiveness in advanced materials research, particularly for sustainability, depends not only on scientific excellence but also on the speed of the lab-to-fab transition. Without the capacity to translate scientific breakthroughs efficiently and rapidly into commercially viable businesses, Sweden risks falling behind. How can the transition to scaling be accelerated and what is the role of WISE?
- Many spin-out companies are founded by, and are recruiting, members from their originating research groups. But at what stage does one realize the need for other types of expertise. How can spinout companies gain access to networks of experienced entrepreneurs with commercial expertise, or to boards with industrial experience and strong connections to relevant industries and investors?
- For the 134 spin-out companies here reviewed, we find that
    - 8 and 4 spin-outs have founding PIs or employees engaged in WISE-ip or KAW-PoC projects, respectively,
    - 2 spin-out companies are engaged in WISE Research Arenas (WIRA), and as reported above,
    - 41 companies remain with less than 3 employees over the period from 2022 to 2025. Are they small due to lack of funding, a depot for IPR, or conduct any other operation justifying for remaining small?
- Patents are certainly a key asset for spin-out companies, particularly in materials science. Some companies hold more than ten patent

(familie)s, with annual maintenance costs typically exceeding SEK 1 million. Combined with development periods that can exceed ten years, and the ownership arrangements associated with the professor's privilege, these costs can create sustained financial pressure as companies progress towards commercial viability, often relying on a combination of public funding and venture capital. How can a robust, long-term framework be established to secure patent protection and support freedom to operate for spinout companies?