



Spinning out Success: Demystifying UK university spinout trends, equity and investment

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The views and arguments expressed in this report are of the authors and do not represent the positions of organisations or expert groups of which the authors are currently, or were previously, members.

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ABOUT UCI

The Policy Evidence Unit for University Commercialisation and Innovation (UCI) is based at the University of Cambridge and aims to support governments and university leaders in delivering a step change in the contributions universities make to innovation and economic prosperity – nationally and locally – through their commercialisation and other innovation-focused activities and partnerships.

UCI seeks to improve the evidence base and tools available to key decision makers in public policy and university practice as they develop new approaches for strengthening university research-to-innovation pathways, with a particular focus on commercialisation. To do so it draws on the latest advances and insights from both academic research and policy practice, as well as lessons learned from experiences in the UK and internationally.

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Our project also greatly benefited from engaging with TTO directors, experts in the field of technology transfer and spinning out companies from universities, and data management professionals, ensuring the accurate interpretation of the data. Their insights and advice were invaluable to our ability to analyse and interpret the data.

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Disclaimer

The views and arguments expressed in this report are of the authors alone. They **do not** represent the positions of organisations or other groups to which the authors belong, or the positions of any of the organisations engaging with the study.

The authors have made every effort to accurately capture and analyse the data and information generously provided by university TTOs as part of the study. Any errors in data linking, analysis and interpretation, and presentation of the evidence are the authors' responsibility.

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Executive Summary



Executive summary

This report presents detailed empirical evidence to policymakers, university leaders and other stakeholders on:

- ❖ Key patterns and trends around spinout production and how this compares to similar universities in the United States.
- ❖ Equity and other deal terms being negotiated between universities and their spinout teams at the point of foundation, and how levels of university founding equity are changing over time.
- ❖ Spinout success in raising private investment to drive their development and growth, and the ability of the UK to retain spinouts as they scale and mature.
- ❖ The relationship between the level of equity a university takes in their spinouts at the point of their foundation and the success of these companies in raising private investment.

University spinouts have an important role to play in helping drive innovation-led economic growth, not least by providing a vehicle to commercialise breakthrough technologies which are able to open up new wealth-creating opportunities, seed new markets, and provide solutions to help other companies raise their productivity and efficiency. Once a critical mass is reached, they can also help to drive entrepreneurial dynamism within a local cluster or key industry.

Given this, policymakers around the world are turning their attention to strengthening their nation's entrepreneurial and innovation systems to produce more, high potential university spinouts. These ambitions often form part of strategies to better harness the power of a nation's science and technology base to drive national competitiveness and economic growth, and to tackle major global, national and regional challenges.

Building and nurturing a successful university spinout ecosystem is a multifaceted challenge that requires many building blocks to be in place and strengthened. Despite this, much of the debate in the UK over recent years has been dominated by a narrow focus on the role of university founding equity in their spinouts, with some arguing that higher equity taken at the point of foundation results in spinouts finding it harder to raise investment.

Although some progress has been made in the past year, the university equity-investment success debate has historically been held back by a lack of robust and systematic evidence on deal terms, with previous studies either building on anecdotes, poor-quality data, or partial information about the deal. Our study attempts to address these limitations by working closely with the Technology Transfer Offices (TTOs) of 15 universities responsible for approximately half the spinout production in the UK to obtain internal data on their populations of spinouts, including founding equity and other key deal terms at the point of foundation and initial non-grant investments raised; data which can be very hard to obtain through public and commercial sources.

The following key findings emerged from our in-depth and systematic analysis of the data provided by these universities, integrated with data obtained from other sources.



1. UK university spinouts are an important driver of entrepreneurial activity in key sectors of the economy

Universities are key players in driving entrepreneurial activity in strategically important sectors for the UK, such as pharmaceuticals and biotechnology, semiconductors, advanced materials, and healthcare devices. Spinouts from 15 UK universities, representing about half of the nation's total spinout production, make up a significant proportion of investment-led start-ups in these sectors. Notably, university spinouts make up a substantial proportion of top-ranking start-ups in terms of investment, comprising 60% of the top 25 pharmaceutical and biotech start-ups, 44% of healthcare devices start-ups, and 28% of semiconductor start-ups.

Although the number of academics involved in spinning out companies is relatively small, our findings underscore the vital importance that university spinouts play, as a part of their portfolio of knowledge exchange activities, for driving a science and technology-driven economy.



2. UK universities have increased spinout production, with spinouts raising increasing amounts of investment

In recent years, the number of spinouts created by UK universities has increased, reaching an average of 180 per year, with evidence of strong survival rates. The production of spinouts is heavily skewed towards universities with larger research bases, with those generating over £90 million in research income accounting for 67% of spinouts over the past four years.

Spinout production appears to scale linearly with the amount of research undertaken once a threshold scale of research is reached (around £90 million), with the average spinout production rate similar across groups of universities of similar research scales. However, we do observe variations around the median for each group, suggesting potential differences in spinout production performance.

Spinouts emerging from Greater South East universities attract significantly higher external investment than those from other UK regions, regardless of university size. However, the location also intersects with the research base: universities outside the Greater South East generate similar spinout numbers per £100 million of research income as their larger counterparts in the Greater South East. On the contrary, smaller research universities within the Greater South East (with annual research incomes between £30 million and £90 million) produce fewer spinouts per £100 million of research income than their counterparts in the rest of the UK.



3. UK university spinout production compares favourably with their US counterparts

Spinout production rates in the UK and the US are remarkably similar for larger research universities once differences in the scale of universities' research bases are accounted for. As with the UK, spinout production in the US correlates very strongly with the size of a university's research base. With the largest US research universities being much bigger than the largest UK universities, it is perhaps unsurprising that they produce higher absolute numbers of spinouts annually.



4. Our findings suggest challenges in the UK retaining value from their spinouts as they scale and mature

While universities perform well in producing spinouts, our findings tentatively suggest that the UK struggles to fully capitalise on the value potential created by its spinouts to drive long-term national and regional benefits. We observe the growing importance of overseas markets, investors, and companies in enabling UK-based spinouts to grow and scale. Further work is urgently needed to understand the scale, nature, and drivers of this challenge.



5. UK university founding equity has been trending downwards in recent years

Fifteen universities with research incomes exceeding £90 million shared detailed data on their spinout populations and key deal terms at the point of foundation for those founded from 2015 onwards. The median equity held by these universities in their spinouts was 20%, with a range of 5% to 37%. For spinouts attracting the most initial investment (top decile of investment), the median equity was 24%, ranging from 7% to 47%. Equity stakes varied notably across different industrial sectors, from 25% in pharmaceuticals and biotechnology to 10% in IT software.

Consistent with our 2022 landscape report on the reality of UK university approaches to spinout equity, our analysis finds that the level of equity taken by a university in their spinouts has been trending downwards since 2015. The reductions were driven by those that historically took higher levels of equity.



6. Universities outside the largest research institutions are more likely to balance equity terms with fee-bearing licenses in deals

Our analysis reveals varied approaches to balancing equity and fee-bearing licenses for intellectual property (IP). While the largest research universities often secure some form of fee-bearing licenses alongside equity, universities with research incomes ranging from £200 to £400 million exhibit a more nuanced

approach. Approximately half of the spinouts from these universities involve a combination of fee-bearing licenses and equity. Conversely, spinouts from universities with more modest research incomes typically only seek fee-bearing licenses when combined with minimal or no equity.



7. Spinouts from universities in the Golden Triangle typically raise considerably more than others in initial rounds of investment

Spinouts in our study typically secured a median average of £600,000 in their initial funding round from private investors (i.e. excluding grants), which increased to £1.2 million in their second round. Moreover, in line with broader findings, spinouts originating from universities within the Golden Triangle generally raise substantially more in both their initial and subsequent funding rounds compared to those from universities located outside this area of the UK.



8. Long development times from initial investments to raising significant financing to drive scale-up or securing a positive exit

More than half of the 7- to-8-year-old spinouts in our study, established between 2015 and 2016, secured funding exceeding £15 million. Additionally, 20% of these spinouts raised more than £25 million, and an additional 22% achieved favourable outcomes in the form of acquisitions or initial public offerings (IPOs). As expected, these shares reduce for more recent companies, likely reflecting the long development times for many spinouts and challenges in securing the necessary financing to scale.



9. Evidence of only a weak, non-linear relationship between university founding equity and the initial investment success of spinouts, with the shape dependent on context

Our study examined the relationship between university equity in spinouts and their initial investment success. We found a weak non-linear relationship that varies based on university context. For the major spinout-producing universities in our sample (all based in the Golden Triangle), there was a very weak U-shaped relationship, suggesting the level of university founding equity has little impact on initial investment success. Conversely, for universities in our sample with lower levels of spinout production, mostly based outside the Golden Triangle, we observed an inverted-U-shaped relationship. However, this relationship is again weak, with the peak in initial investment raised covering spinouts with a wide range of university founding equity levels, between around 17%-35%. Other factors like value proposition, team strength, support available, investor access and relationships, and market access likely play a more significant role. Further research is needed to understand these dynamics better.

In interpreting our findings, it is important to note that our empirical study is necessarily based on historical data. As such, should conditions in the spinout ecosystem change significantly – for example, changes in market conditions, investor and founder preferences, university leadership and support, government policies and translational funding – the continued relevance of our findings would need to be re-tested. To address this, it is crucial to keep a finger on the pulse of the health and performance of the UK spinout ecosystem, and the drivers, conditions and preferences of universities, funders, founders, and investors that shape success.

Moving forward:

- We need to **expand the debate** beyond the traditional focus on university founding equity to identify the critical factors influencing spinout success and find ways of building and reinforcing them.
- We need a concerted effort to **understand how the UK can scale and grow spinouts** and ensure that more of the long-term value unlocked by spinouts is captured for the benefit of the UK and across regions and nations.
- We emphasise the **importance of leveraging data-driven insights to inform policymaking and guide efforts to strengthen the UK spinout ecosystem**. Given the rapid developments in the ecosystem, we need to actively monitor and track the health and performance of the system, and the conditions, preferences and drivers that shape success. Given the importance of spinouts in driving innovation in strategically important technologies and sectors of the economy, we need to get much better at classifying spinouts to understand the unique potential of spinouts in different technology or market segments, and ensure policy and funding are well targeted. The development of a national spinouts register is a critically important first step towards this.
- We highlight the necessity of **better aligning policy efforts across different domains** to ensure that the UK spinout ecosystem is able to help deliver on the Government’s ambitions for global leadership in key technology sectors. This includes policy areas such as: science and technology (research commercialisation, strategic technology prioritisation etc.); economy and finance; geography (clusters, local conditions, etc.); education and skills, immigration, business (supply chains); and trade (access to key markets, development partners, and overseas investors, etc.).

In summary, our proposals aim to foster a more comprehensive understanding of spinout dynamics and to formulate strategic policies that support their sustainable growth and success. By broadening the scope of the debate, leveraging data-driven insights, and aligning policy efforts across multiple domains, we can enhance the UK’s position in the global technology landscape and capitalise on the potential of spinouts to drive innovation, economic growth, and societal advancement.

Introduction



1 Introduction

This report presents findings from a major study by the Policy Evidence Unit for University Commercialisation and Innovation (UCI) at the University of Cambridge investigating the link between the founding equity taken by universities in their spinouts and the success of these companies in raising private investment. It also provides an in-depth assessment of the UK spinout landscape and key patterns and trends in spinout production, deal terms, and investment into spinouts. This study builds on the findings from a report published by UCI in 2022, looking at the reality of the *typical* approaches of UK universities to taking equity in their spinouts (Coates Ulrichsen et al., 2022).

University spinouts have an important role in helping to drive innovation-led economic growth, not least by providing a vehicle to commercialise breakthrough technologies that can open up new wealth-creating opportunities in existing industries, help to seed new markets, and provide new commercial solutions to help other companies raise productivity and efficiency. Once a critical mass is reached, they can also help to drive the entrepreneurial dynamism of a local cluster or key industry.

Given this potential, policymakers around the world are increasingly keen to find ways to strengthen the ability of their nation's entrepreneurial and innovation systems to produce more, high potential spinouts as a means to harness the power of their science and technology bases to drive national competitiveness and economic growth, and tackle major regional, national and global societal challenges. In the UK, the commercialisation of university research has become an important part of the Government's ambitions to become a global science and innovation superpower (BEIS, 2021; HM Treasury & DSIT, 2023).

What is a university spinout?

For this study we consider university spinouts to be legally distinct ventures incorporated with the goal of further developing and commercialising intellectual property generated through research undertaken at least in part at the university. IP can be either hard IP (such as that protected through patents) or soft IP (e.g. know-how, data, algorithms, designs). The university may or may not hold equity in the company.

Alongside the growing policy interest in university spinouts, a debate has developed within some quarters regarding whether the level of equity universities take in their spinouts is conducive to spinout success, as well as whether the level of external financing these companies is able to raise to drive their development and growth. This debate, however, has been hampered by a lack of robust and systematic evidence on the relationship between university founding equity in their spinouts and the scale of investment they raise.

Although some progress has been made over the past year to move beyond anecdotes, empirical studies of this relationship have relied on publicly or commercially available data on spinout deals and investments. This typically limits attention to the equity component of the deal. As our 2022 report showed, university founding equity can be balanced against other deal terms in spinout negotiations, not least the terms of any license negotiated between the spinout and the university to access the intellectual property generated at the university. Furthermore, these data sources typically struggle to accurately capture the equity split negotiated between universities and academic founders before

it becomes diluted (for example, by investment), the full population of spinouts emerging from universities, and the very early investments they secured to drive their initial development.

This concern over the lack of robust evidence and insight led the UK Government to commission an independent review of university spinouts in March 2023 in an attempt to identify what needs to be done to ensure the UK remains competitive in producing high-potential spinouts (HM Treasury & DSIT, 2023).

1.1 Objectives and structure of the report

Building on this context, this report aims to provide robust and detailed empirical evidence to policymakers, university leaders and other stakeholders on the following key topics:

- ❖ Key patterns and trends around UK spinout production and how this compares to similar universities in the United States.
- ❖ Equity and other deal terms negotiated between universities and their spinout teams at the point of foundation, and how levels of university founding equity are changing over time.
- ❖ Spinout success in raising private investment to drive their development and growth, and the ability of the UK to retain spinouts as they scale and mature.
- ❖ The relationship between the level of equity a university takes in their spinouts at the point of their foundation and the success of these companies in raising private investment, controlling for wider deal terms and other factors.

Note that the study did not examine the effects of university approaches to taking equity in their spinouts on the propensity of academics to engage in the spinout process at all. While an important topic, to do this properly would have required a more extensive data collection effort that was beyond both the scope and resources of the project. This issue should be investigated further.

The analyses presented in this report build on a comprehensive and robust dataset assembled with support from Technology Transfer Offices (TTOs) of UK universities active in producing spinouts. Through working closely with them to secure access to key information on each company, we were able to construct, from the ground up, a database of spinouts emerging from their institutions based on consistent definitions of key variables and foundation points, including: university founding equity (excluding that taken for cash investment); wider deal terms; and early investments that are hard to capture in commercial databases. We were also able to capture information about the departmental origins of the spinout. Through this, we are able to overcome a number of key limitations of existing studies on this topic and provide an in-depth, robust analysis of deal terms, encompassing equity, licensing terms, and anti-dilution provisions on equity, and whether these influence the ability of a spinout to raise investment.

This spinout-level dataset is supplemented by other sources of data on the production of spinouts by universities in both the UK and the US to enable sector-wide trends, patterns, and international comparisons to be investigated.

The structure of this report comprises the following chapters.

[Chapter 2:](#) Contextualises the analysis by delving into key concepts and definitions related to commercialising research via spinouts, including what a spinout is, the spinout journey and the point at which a spinout is founded, university founding equity, and other key deal terms.

[Chapter 3:](#) Explores key trends and patterns in the production of spinouts across the UK university sector, compares university spinout production to the wider UK start-ups landscape and their importance in driving innovation in key sectors, and presents a systematic comparison of spinout production by UK universities and their peers in the US.

[Chapter 4:](#) Introduces and describes the data and sample of universities participating in our study and the spinouts that underpin our core analyses of spinout deal terms. We also examine the relationship between university founding equity and initial investment success.

[Chapter 5:](#) Presents patterns and trends in UK universities' founding equity in their spinouts, along with other deal terms.

[Chapter 6:](#) Examines the initial investment successes of our sample of spinouts in different contexts, namely for spinouts emerging from different types of universities, in different sectors, and different parts of the country. We also begin to tentatively examine the UK's ability to retain value from its spinouts as they scale and grow.

[Chapter 7:](#) Explores the relationship between university founding equity in their spinouts and the initial investment success of these companies in raising external investment (excluding grants).

[Chapter 8:](#) Discusses the findings and sets out a path for moving forward.

Concepts And Foundations



2 Concepts and foundations

Before we turn to the empirical evidence on university spinouts, equity and wider deal terms, and investment success, we first present several important foundational concepts that we believe will aid interpretation of the findings. These concepts include how we define a spinout and the point of foundation for our study; the complexities of the spinout journey and the distribution of risk and reward; and what we know about the relationship between universities and their spinouts.

We must also acknowledge that commercialising research can follow different pathways from idea to application. These can include: universities collaborating with industry partners to jointly develop new technologies and IP, which are then further developed by the partner; licensing IP emerging from research efforts funded by others (e.g. public or charitable research funders) to existing companies for further development on an exclusive or non-exclusive basis; spinning out and nurturing new ventures to develop the IP and its commercial viability; and of course, placing the IP in the public domain. Decisions on the appropriate route can depend on various factors, such as the technology readiness, how innovative or complementary to existing solutions the technology is, the maturity and saturation of the market, the competitors, the ambitions and capabilities of the founders amongst others.

Typically, the two most common routes are licensing and spinouts, where licensing is usually preferred for technologies with specific applications and a mature market (Scott Shane, 2004). In contrast, the spinout route is more suited for disruptive technologies and a wide range of applications requiring ongoing support or complex chains to take a product to market. The commercialisation route may also be influenced by the support available within the university. For example, Aldridge & Audretsch (2010) showed that US-based scientists - funded by the National Cancer Institute at the National Institutes of Health (NIH) - who sought to commercialise their research through their university's TTO were more likely to pursue a licensing route over spinouts compared to those who did not.

2.1 Defining a university spinout and the point of foundation

Definitions of university spinouts vary, with some being more inclusive than others. This reflects a high degree of diversity within the spinout population itself. For example, Mathisen & Rasmussen (2019) highlight that definitions in use can variously incorporate exclusion criteria based on who creates the company (university/TTO, academic etc.) and type of scientific knowledge (patentable IP, know-how etc.). For the universities that operate their own technology transfer office (TTO), there is the misconception that the TTO creates all spinouts. However, studies have shown, consistent with our experience, that a proportion of spinouts bypass the formal commercialisation route through the TTO (Fini et al., 2010).

According to the UK Higher Education Statistics Agency's (HESA) Higher Education Business and Community Interaction (HEBCI) survey – the UK's national survey capturing, among other things, data

on spinouts across all eligible Higher Education Providers¹ – “*spin-offs are companies set-up to exploit IP that has originated from within the Higher Education Providers (HEP)*”². HEBCI spinout guidelines exclude student start-ups, as in the UK, students typically own any IP they create during their studies, subject to some constraints (i.e. unless stated otherwise on agreements with third parties, the student used university facilities and resources on the condition that the university would then own the IP, or that the IP was created together with university staff). Student start-ups are recorded separately. HEBCI also separates companies created by staff that are not based on IP originating from within the university – these are classified distinctly as staff start-ups.

2.1.1 Spinout definition

In this report, we adopt the HESA HEBCI guidelines on defining a spinout and define a spinout as any new venture established with the primary objective of commercialising intellectual property (IP) originating from the university. This IP may take various forms, such as patented innovations, proprietary knowledge or software, and know-how, provided it was developed within the university. It is essential to note that our definition of spinouts is deliberately not dependent on the university having some equity ownership in the company, but rather focuses on its relationship with the IP being commercialised. This contrasts with other work such as Hellmann et al. (2023), which limits their sample to companies where universities have more than 1% founding equity. Our report, therefore, also considers spinouts where, for example, universities take no founding equity but there is a transfer of IP into the company (either assigned or licensed) or where there is no equity or licensing arrangement (for example, due to the type of IP being commercialised).

For the purpose of this study, we further limit our sample of spinouts by excluding spinouts structured as Community Interest Companies (CIC), social enterprises, or other forms of not-for-profit organisations. Many non-profit-oriented entities do not typically seek private venture capital (although this may be changing), their primary objectives differ from profit maximisation, and they face different pathways and dynamics in their development and growth. Doing this helps ensure greater precision in examining the links between university founding equity and investment.

2.1.2 Foundation year

An essential term in our analysis is the “foundation year” concept. The founding processes and timing of university spinouts can vary considerably both between individual spinout cases and between universities. For example, in some instances, researchers will incorporate a company well in advance of seeking to transfer in the IP emerging from their research. Once the IP reaches the necessary stage of maturity, the researcher will approach the university to formally access the IP. In other scenarios, the company is established at the point at which the IP is transferred in (e.g. through a license or assignment) and investment is secured. Our experience and the analysis of the data provided to us by

¹ The Higher Education Business and Community Interaction (HEBCI) survey collects data related to a wide range of knowledge exchange mechanisms, including on spinouts, from all eligible UK Higher Education Providers each academic year, and has been running since 1999.

² Definitions in <https://www.hesa.ac.uk/support/definitions/hebc> accessed on the 5th of February 2020.

TTOs suggest that in some cases, the difference between the legal incorporation of the company and the point at which it acquires the IP can be significant.

To create a uniform reference point for tracking the journey of these spinouts and enabling us to compare fairly across universities and spinout cases, we define the “foundation year” as the moment when the initial equity split happens between the university and the founders. Where no equity was taken in the spinout, we define it as the point at which the IP was transferred into the spinout. In cases where “foundation year” data is unavailable, we impute the year using the incorporation date.

2.2 From idea to innovation: the spinout journey

Understanding the progression of a university spinout from idea to innovation is essential for being able to navigate the evidence around the relationship between the deal terms negotiated and the investment success of the spinout. The spinout journey is a multifaceted and often complex process influenced by various dimensions and a network of key stakeholders. The journey from research to commercial application may have been supported by financial and in-kind contributions from multiple sources, often from public research and innovation funding agencies, as well as from industry partners and charitable foundations (particularly in health-related technologies).

As these spinouts progress toward market entry, they typically have to further develop the technology to align with commercially viable market applications (Figure 1). This involves establishing production processes and supply chains; developing a sound business model; assembling a capable team and network to steer the venture; and securing the necessary financial resources to make progress along the journey. Consequently, spinouts are initially characterised by high levels of risk spanning technology, production, market, financial, team-related, and other aspects. Success requires mitigating these risks to attract investors and secure customers.

The journey of a spinout is also not isolated; it is intertwined with developments in the wider innovation system. For example, market conditions, industrial structure, demand dynamics, and the institutional environment impact the spinout's potential and journey. The institutional environment refers to the ‘rules of the game’ that shape behaviours and choices (e.g. legal frameworks and intellectual property policies, regulations and standards, labour market conditions, R&D and financial systems) and is typically pivotal in shaping the spinout's development trajectory. On the supply side of the innovation system, the availability of resources such as access to skilled labour, complementary knowledge, enabling tools, networks, and financing, is also critical to the spinout's development and scaling-up.

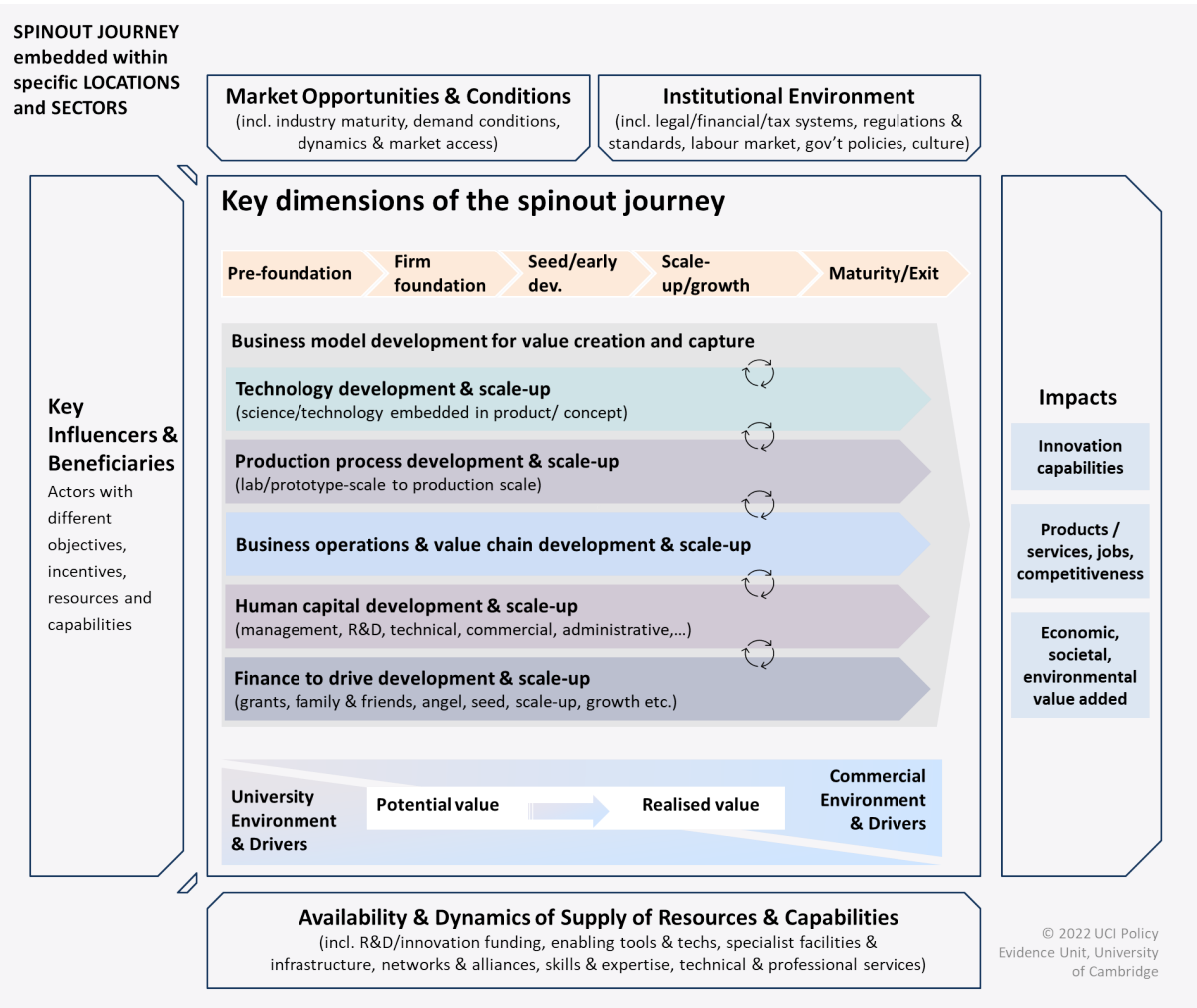


Figure 1 | Key dimensions and factors influencing the spinout development and scale-up journey.

Source: Developed in Coates Ulrichsen, Roupakia & Kelleher (2022) and informed by insights from, among others, Phaal et al. (2011), O’Sullivan & Lopez-Gomez (2017), Maine & Garnsey (2006), Edquist & Charles (1997), Hayter et al. (2018).

The journey of a university spinout involves a wide range of stakeholders who contribute to and benefit from the process (Rasmussen et al., 2015; Hayter, 2016). Key stakeholders include funders, researchers, technology development experts, universities, angel investors, public innovation funders, venture capitalists, and accelerator programs. These entities play varying roles at different stages of the spinout journey.

In this study, we are focusing on the point of the venture’s foundation, when the equity split and other deal terms are being negotiated between the academic founders and the university’s TTO, and may involve initial investors. These negotiations determine the terms and conditions that shape the risk and reward dynamics associated with launching the venture and generating commercial value. These diverse objectives and capabilities of stakeholders, coupled with contractual obligations (for example, to funders and research partners), can complicate the negotiation process. Understanding these differences is vital to ensure smoother and more effective negotiations.

Pre-foundation, our 2022 study presented the views of UK university TTO Directors on the barriers that have to be overcome to set up a spinout to commercialise research. This revealed important categories of factors that influence the process pre-foundation (Figure 2). These are consistent with findings from academic literature reviews on this topic (e.g. Hayter et al., 2018).



Figure 2 | Key categories of factors influencing the spinout process pre-foundation.

Source: Adapted from Coates Ulrichsen, Roupakia & Kelleher (2022).

2.2.1 Risks and rewards

The transition of research into innovation, particularly in the context of transformational technologies, demands substantial resource investment and risk-taking over an extended period. This process typically requires development across many areas, as depicted in Figure 1, with investments in some areas (e.g. the knowledge base and technology) required for many years before tangible rewards begin to emerge. The intricate nature of this journey lies in its collective foundation, where multiple individuals and organisations contribute cumulatively to shape the technology's trajectory. However, this collective effort can lead to a misalignment between the distribution of cumulative risks and the eventual rewards.

Figure 3 illustrates a stylised risk-reward profile for a technology-based spinout, underscoring that negotiations primarily focusing on future risks (area C) versus future rewards (area D) at the point of foundation may not capture the whole picture. A lifecycle perspective reveals that total lifetime rewards encompass areas D *and* B, while lifetime risks include areas C *and* A, where A may be significantly greater than zero. The distribution of these risks and rewards across stakeholders can create an imbalance in negotiations, potentially undervaluing or overemphasising specific contributors and discouraging their ongoing involvement. This can be complicated by some stakeholders not being directly involved in spinout negotiations.

Scholars such as Lazonick & Mazzucato (2013) advocate for a shift from the 'maximising shareholder value' paradigm to a 'risk-reward-nexus' approach. This approach promotes entrepreneurial activities aligned with long-term growth objectives, ensuring a more equitable distribution of gains among all stakeholders involved in the innovation process. By adopting the risk-reward-nexus perspective in shaping incentives, policies, support programs, and norms within the innovation system, we can encourage a broader range of stakeholders to invest their resources and expertise in the innovation process, fostering a fairer and more inclusive ecosystem (Lazonick & Mazzucato, 2013; Tassey, 2014).

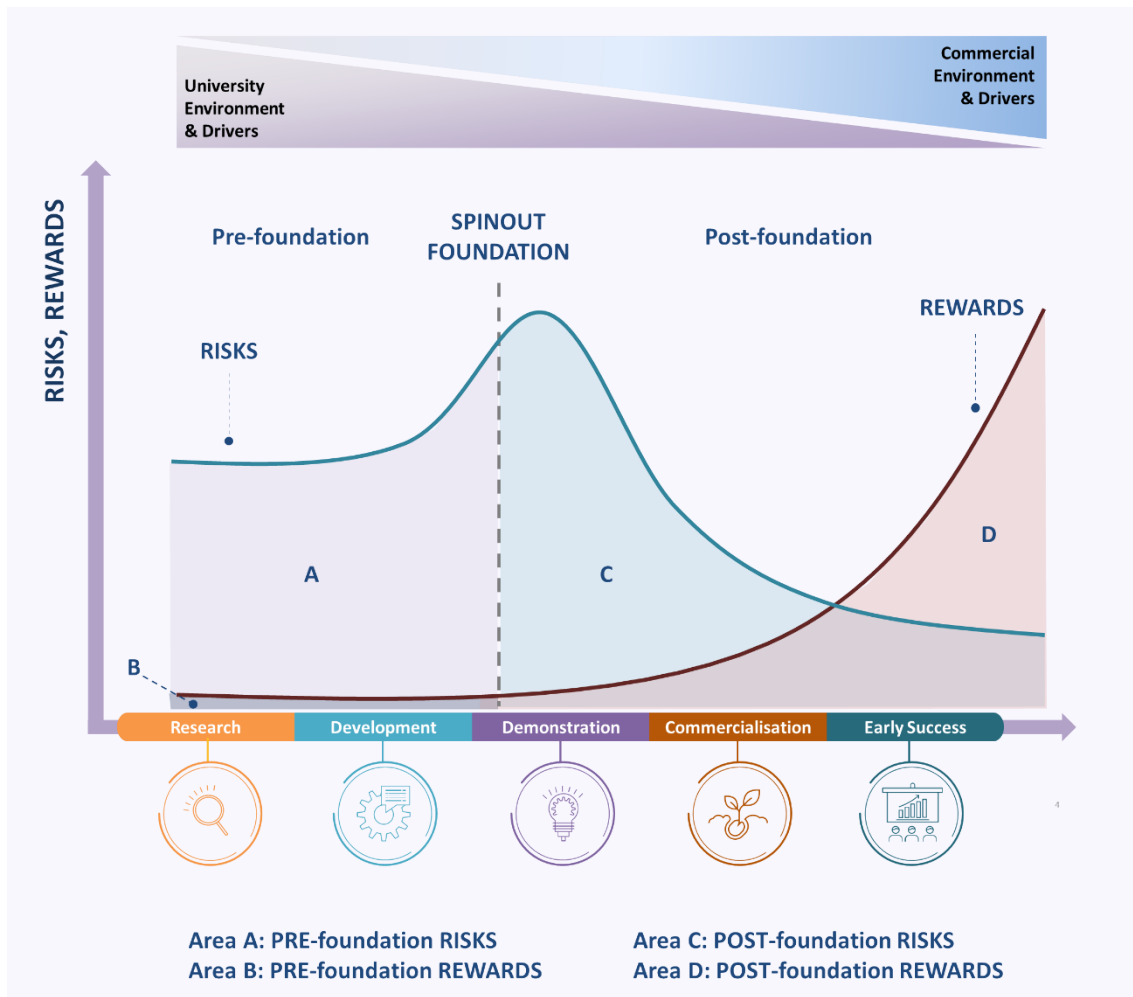


Figure 3 | Lifecycle risk-reward profile for a technology-based spinout.

Source: Developed in Coates Ulrichsen, Roupakia & Kelleher (2022) drawing on insights from Tassey (2014), Lazonick & Mazzucato (2013) and others.

In summary, university spinouts bridge academic research and real-world applications. The journey of a spinout is riddled with challenges, and its success depends on effectively navigating risks, engaging with stakeholders, and capitalising on opportunities within the broader innovation ecosystem. Understanding the intricacies of this journey and the diverse roles of key stakeholders is vital for the growth and success of university spinouts.

2.2.2 Founding university equity and wider deal terms

The founding equity split is just one of a number of terms that typically need to be negotiated when establishing a university spinout company. A critical decision revolves around the transfer of protected intellectual property (IP) to the spinout company for its subsequent development and commercialisation. The primary alternatives include transferring IP ownership to the spinout, licensing the IP to grant rights for its commercial use and exploitation, or adopting a hybrid approach that combines elements of both strategies.

Licensing intellectual property (IP) to spinout companies often necessitates negotiating various financial terms, such as royalties, upfront fees and milestone payments. Rarely, according to Coates Ulrichsen et al. (2022) there are exit fees linked to the company's exit value. They also found that in some cases the terms of the license can be balanced against the amount of equity taken in the spinout, with no or lower fees in exchange for higher equity.

The wider set of deal terms is captured in Figure 4.

FINANCIAL TERMS	OTHER TERMS AND CONDITIONS
<ul style="list-style-type: none">• Equity split across founding shareholders• Equity for different types of contributions e.g. IP, cash, active support/‘sweat’• Equity pools for incoming CEO, employee options, and decisions on how these pools dilute founding shareholders• Financial terms on license (royalty-free vs royalty-bearing; upfront fees; milestone-based payments)• Patent prosecution costs pre- and post-spinout foundation• Conditions on any cash payments (e.g. deferrals based on ability to pay / stage of start-up)	<ul style="list-style-type: none">• How the IP is transferred into company (license or assign IP, license now & assign at trigger point)• Rights of the spinout to IP pipelines and improvements• How enabled products are to be treated (products enabled by research but not covered by original patents)• Fields of use and sublicensing terms• Access to valuable and specialist university facilities and services (e.g. high performance computing services, lab space, ongoing support)• Ongoing role of academics & relationship with research in university• Board seats and voting

Figure 4 | Types of terms that typically have to be negotiated as part of a spinout deal.

Source: Developed in Coates Ulrichsen, Roupakia & Kelleher (2022) drawing from detailed insights provided by 24 UK TTO Directors.

The term 'university founding equity position' in spinouts typically denotes the initial division of the 100% equity pool at the outset of negotiations. This process typically occurs between the university, often represented by their TTO, and the academic founder(s). This division takes place before the introduction of any financial contributions or the involvement of external parties in the negotiation. Often, equity pools are reserved as incentives for other parties, such as CEO or employee options, to compensate initial investors for support ('sweat' equity), or for funders due to contractual obligations. These equity pools can act to dilute the founding shares of the university and academic founders even before any investment enters the company.

These intricacies further complicate the comparison of university founding equity positions, especially in the pre-money stage, due to the confidential nature of the reserved equity pool. We have

attempted to deal with this by seeking information on the university's founding equity stake in the spinout directly from the TTO, requesting that the information provided reflects, to the best of their ability, the position before any dilution takes place. **In the report, when we mention founding equity, we refer to pre-money and pre-dilution university shares.**

In 2023, TenU³ (TenU, 2023) published a university spinout investment terms guide that aims to simplify and streamline the negotiations to reduce transaction costs and accelerate deals. Though focused on life sciences, the guide provides a clear framework for negotiations based on the experiences and best practices of the six UK members of TenU (Cambridge, Oxford, UCL, Imperial, Edinburgh and Manchester) and key investors in UK spinouts. It provides their recommendations on a 'landing zone' for typical deals across many of the deal terms mentioned in this section.

2.3 University-spinout ties, signalling effects, and the effects of university policies

2.3.1 Related work to ours

There are very few studies that have empirically examined the relationship between university founding equity in their spinouts and the investment success of these companies. One key exception is the recent study by Hellmann et al. (2023). To drive their research into the topic, the study authors compiled a comprehensive dataset of 650 spinouts incorporated between 2010 and 2021. The equity held by universities, founders and other shareholders was extracted from Companies House⁴ data based on publicly available information on company shareholdings⁵. From this, they estimated the equity held by universities and the academic founders at the point of spinout foundation. By contrast, we collect information on the population of spinouts directly from university TTOs, along with information on the university founding equity negotiated between the university and academic founders and wider deal terms (which are typically not available publicly). Due to the different sources of information and the issues described in section 2.1.2, we may see some differences between our samples and results.

Hellmann et al. (2023) discovered that the influence of university equity on venture capital fundraising success and the formation of university-owned spinouts is very weak but statistically significant. However, they found no impact on the amount of funding raised or post-money valuation. When

³ TenU, funded by Research England, is "an international collaboration formed to capture effective practices in research commercialisation and share these with governments and higher education communities. Ten U members are the technology transfer offices of the University of Cambridge, Columbia University, University of Edinburgh, Imperial College London, KU Leuven, University of Manchester, MIT, University of Oxford, Stanford University, and UCL." Source: <https://ten-u.org/about>.

⁴ Companies House is an executive agency of the UK Government that incorporates and dissolves limited companies, examines and stores company information (such as company accounts and shareholding information), and makes information available to the public (<https://www.gov.uk/government/organisations/companies-house/about>).

⁵ All limited companies in the UK are required to file a confirmation statement with Companies House that confirms, among other things, the shares held by each shareholder. This statement typically has to be filed within 14 days of the first anniversary of the company's incorporation and annually thereafter.

examining specific sub-samples, they observed a similar lack of a statistically significant relationship between university equity and the likelihood of raising venture capital for science-intensive companies. Interestingly, for less science-intensive companies, which include IT-based spinouts, the study identified a small but statistically significant negative effect of university equity share on the probability of securing venture capital, although they did not test its effect on the amount of funding raised. Interpreting their results, the paper largely builds on the theories of incentives and how academics and universities respond to these in making decisions about whether and how to engage in the spinout process.

2.3.2 The signalling effect of university-spinout ties

One benefit of university involvement in their spinouts often overlooked in this debate is the potential for signalling effects arising from the university's ties to the spinout on its development potential and trajectory. This effect refers to the impact that the involvement of a university as the parent organisation of the spinout (and in particular, as an equity holder in the company) has on the perceptions of the external stakeholders, including investors, partners, and customers. Various studies explore this effect, highlighting its multifaceted role in shaping spinouts, not least by enhancing their legitimacy and credibility, with university involvement in spinout signalling quality, technology, and business potential. This favourably positions spinouts for investor interest, funding, and partnerships. The signalling effect can also guide strategic direction and alliances, fostering collaborations. However, there is a balance to maintain, as a university's influence on a spinout's strategic direction and governance may lead to potential conflicts of interest and tensions.

University spinouts, considered risky investments (McAdam et al., 2009), depend on external funding for success. Establishing links with the investment community is crucial, signalling quality and wealth potential. Spinouts tied to parent universities gain credibility as well as easier access to cutting-edge science, facilities, and human capital, improving chances of attracting early investors (Lubik et al., 2013; Ferretti et al., 2019). An empirically driven and qualitatively validated 2021 study (Bolzani et al., 2021) of 551 Italian spinouts founded between 2000 and 2008 found that spinouts with university equity involvement exhibited superior market performance, especially when located close geographically to their academic institutions. Equity-linked spinouts gained advantages such as enhanced resource access, administrative support, funding assistance, and guidance on intellectual property, providing attractive prospects for investors.

Access to networks through universities can also be valuable for spinouts. Research has found that ongoing collaboration between a university and venture capital firms can signal quality to investors, especially for universities with a history of spinout activities (Mueller et al., 2012). This connection can then serve as a credible indicator of a spinout's potential to help secure investment. Furthermore, according to Hayter (2015), the success of university spinouts hinges on the academic entrepreneur's social network size and type. These networks, including with investors and advisors, contribute to spinout success by providing access to diverse knowledge and resources. In essence, linkages between spinouts and their parent institutions offer investors attractive access to valuable networks and resources.

Liu et al. (2017) also analyse the impact of various equity positions on the acquisition of university spinouts. They argue that founders, universities, banks, business angels, venture capitalists, and other equity holders collectively influence spinout acquisitions, highlighting equity's role as a signal for potential acquirers. Their study concludes that an increase in university's equity position negatively affects the acquisition of university spinouts.

The effects of university policies on spinout production

The effects of university policies on academic entrepreneurship and university spinout production have been the subject of several academic studies. A recent review of the literature by Hayter et al. (2018) highlights a number of key findings on this topic, including:

- The importance of universities having a clear entrepreneurship-focused mission;
- That tensions that can emerge between top-down academic entrepreneurship initiatives, given the historically decentralised nature of academic systems;
- The importance of the co-evolution of university systems and policies to fit *both academic and commercial* goals;
- The importance of incentives to encourage technology disclosures and patenting activity, particularly at the department level, and recognise that incentives may need to vary for different academic communities;
- That while some studies show that university-level incentives can have a positive effect on licensing and spinout activity, other studies contest this (e.g. Ouellette & Tutt, 2020) find no relationship in the US context);
- That, in the Italian context, universities having spinout-specific policies and regulations has a positive effect on spinout creation, as does having a policy that ensures academics receive a minimum threshold of equity in their spinouts (Muscio et al., 2016);
- That how university IP policies are constructed can favour licensing versus spinout routes to commercialising university research.

UK Trends In Spinouts



3 Trends and patterns in UK university spinout production

Building on the conceptual foundations, we now turn to presenting what we know about recent trends and patterns in spinout production from UK universities. We then provide two points of comparison to explore how UK universities perform in the production of spinouts. We first examine the prevalence of UK university spinout production in a *relevant* population of start-ups founded in the UK during the same period. We then compare UK university spinout production to similarly sized US universities.

How to read a boxplot

In our analysis, we employ 'box-and-whisker plots' as a powerful tool for data visualisation. These plots serve as a valuable tool to illustrate not just the median average of a variable but also the extent of variability surrounding the median. In this way, it provides a visual summary of the distribution and central tendencies of a dataset while also identifying potential outliers or extreme values. This allows for much more meaningful comparisons between different groups.

Interpreting a box plot involves understanding the key components and features it represents.:

- 1. Box:** The box in the plot represents the interquartile range (IQR), which includes the middle 50% of the data. **The left (or bottom) edge of the box represents** the first quartile (Q1) or the 25th percentile, and the right (or top) edge represents the third quartile (Q3) or the 75th percentile. The height of the box, therefore, shows the spread of the middle 50% of the data.
- 2. Line inside the box:** This line represents the data's median or the 50th percentile. It shows the midpoint of the dataset.
- 3. Cross inside the box:** Where represented, this indicates the mean average of the distribution.
- 4. Whiskers:** The whiskers extend from the edges of the box and reach the minimum and maximum data values within a defined range.

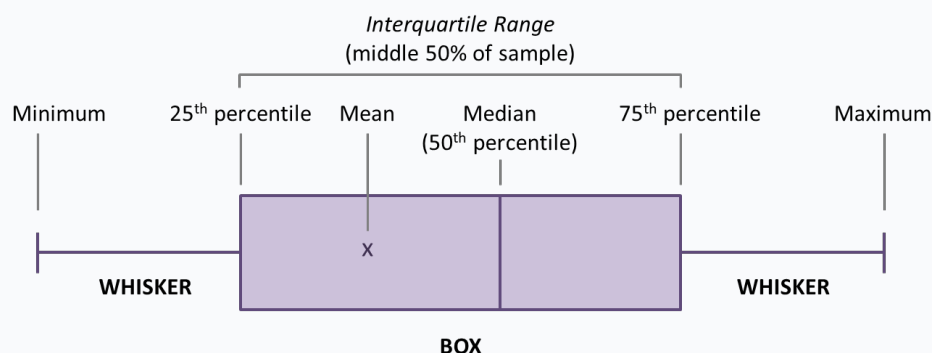


Figure 5 | Interpreting box plots.

3.1 UK trends and patterns in spinout production and investment performance

This section examines recent trends and patterns in creating spinouts within UK universities. It draws on data available across all UK universities on their production of spinout and the investment raised by these companies available through the Higher Education Business and Community Interactions (HEBCI) survey⁶.

3.1.1 Key UK trends and patterns in spinout production

Between 2019 and 2022, UK universities have produced around 180 spinouts per year, increasing from an average of almost 150 between 2013-2018 (Figure 6.A). Furthermore, there is observable consistency in the growth of the active spinout population, suggesting robust survival rates (Figure 6.B). This suggests that new companies are being added to the total stock of spinouts at a steady rate, with few being removed. Spinout production is also heavily concentrated in universities with larger research bases, with those with research incomes greater than £90 million (26 universities out of a total of 168) generating 67% of spinouts during the period 2019-22 (Figure 6.C).

Generally, there appears to be a strong and positive correlation between the number of spinouts generated by a university and the amount of research being undertaken at the institution (Figure 7.A). Nevertheless, while universities with smaller research bases exhibit a lower absolute number of spinouts when normalised by the amount of research, the average production of spinouts for larger research universities (annual research incomes of over £200 million) is remarkably similar at around 2 per £100 million. This decreases a little to 1.5 per £100 million research income for universities with smaller research bases (£10 million - £90 million) (Figure 7.B). Furthermore, the distributions around the median for universities with smaller research bases are quite large; indeed, some smaller research universities can produce more spinouts per £ of research resource than their larger counterparts.

⁶ The Higher Education Business and Community Interaction (HEBCI) survey is a mandatory annual data collection for UK higher education institutions, and is managed by the Higher Education Statistics Agency (part of Jisc). It was initiated in 1999 and reports information on a wide range of knowledge exchange activities, including business and third-sector participation in research, consultancy, and the commercialisation of intellectual property. Regarding spinout production, it publishes aggregated numbers on newly registered spinouts, active spinouts, and estimates for the employment, turnover, and external investment of active spinouts. Full details available at <https://www.hesa.ac.uk/data-and-analysis/business-community/introduction>. Accessed on 12th December 2023.

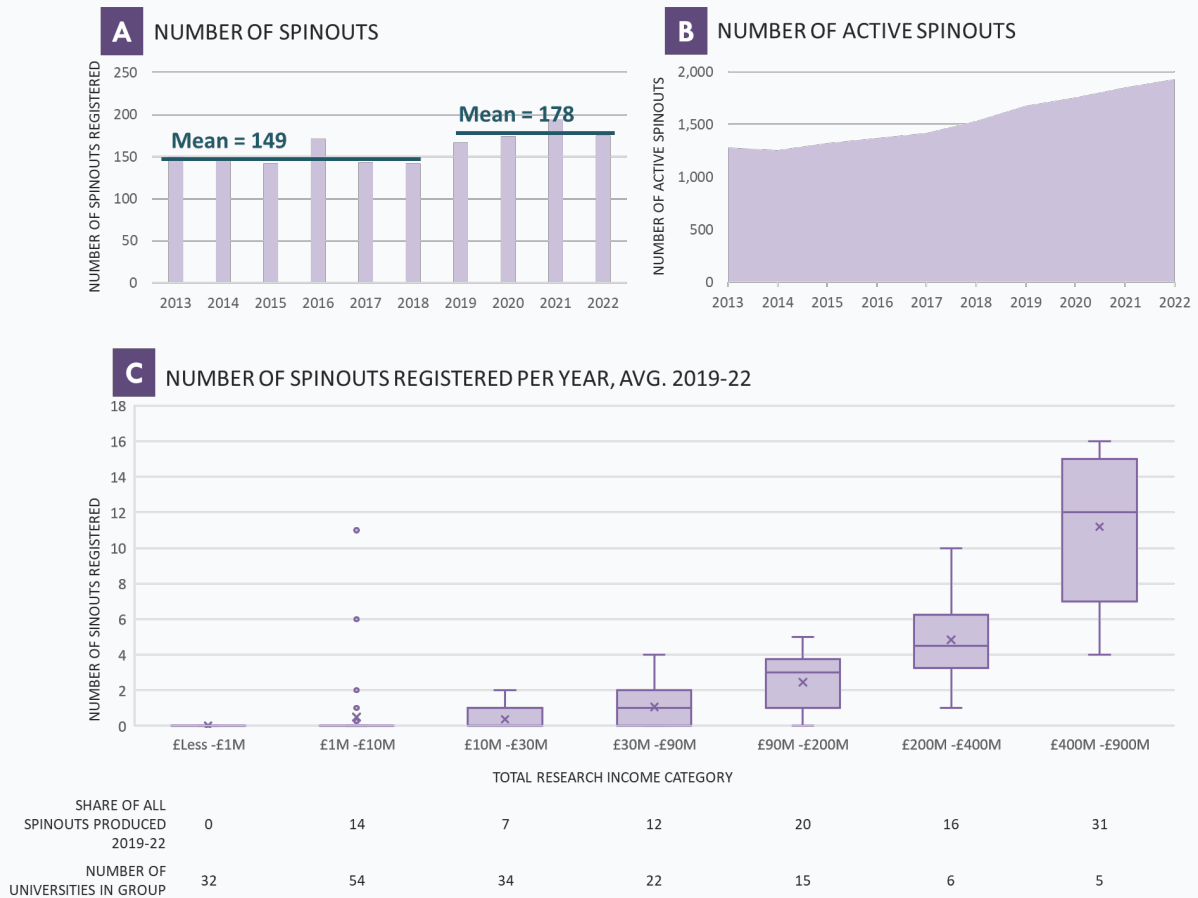


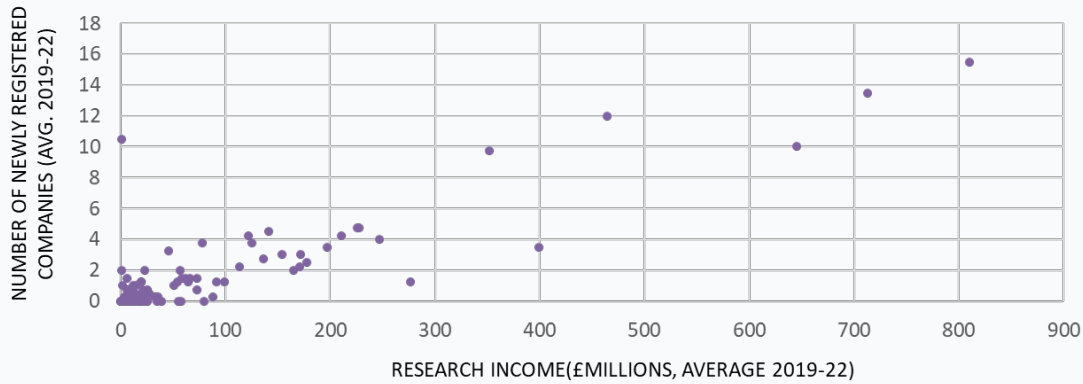
Figure 6 | Key UK trends: spinout production.

Source: HESA HEBCI survey & finance records. All UK Higher Education Providers including specialist institutions.

3.1.2 Key UK trends and patterns in external investment raised by spinouts

The amount of external investment raised by spinouts can provide a useful measure of the market’s belief in the successful development of the companies. There are, of course, spinouts that pursue a development path driven by revenue growth. The amount of external investment raised by active spinouts increased quite significantly between 2019 and 2022 (Figure 8.A). The amount raised per company has also been increasing in recent years (although it dropped slightly between 2021 and 2022 (Figure 8.B); this aligns with findings reported in Royal Academy of Engineering & Beahurst (2023).

A RELATIONSHIP BETWEEN NUMBER OF SPINOUTS AND THE SCALE OF RESEARCH BASE OF UNIVERSITIES



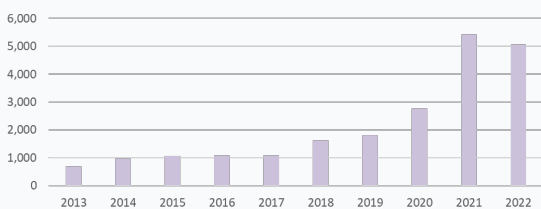
B AVERAGE NUMBER OF SPINOUTS REGISTERED PER £100 MILLION RESEARCH 2019-22 FOR UNIVERSITIES WITH DIFFERENT SCALES OF RESEARCH BASE



Figure 7 | Key trends: research base and spinout production.

Source: HESA HEBCI survey & finance records. Excludes specialist higher education providers.

A EXTERNAL INVESTMENT RAISED IN ACTIVE SPINOUTS (£ MILLIONS)



B EXTERNAL INVESTMENT RAISED PER ACTIVE SPINOUT (£000s)

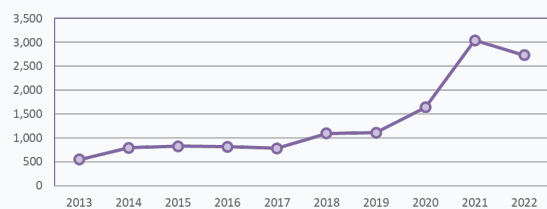


Figure 8 | Key UK trends: external investment raised by active spinouts.

Source: HESA HEBCI survey & finance records. Excludes specialist higher education providers.

In looking at trends in the investment raised by UK university spinouts, it is important to acknowledge key developments within the system with the emergence of substantial investment companies and funds affiliated with specific universities. For example, Oxford Science Enterprises (OSE), an investment company, has raised £850 million dedicated to investing in spinouts from the University of Oxford; and, Cambridge Innovation Capital (CIC), a venture capital firm in Cambridge, UK, has raised more than £500 million to invest in companies emerging from the University of Cambridge and the wider Cambridge cluster. More recently, Northern Gritstone was established by the universities of Manchester, Sheffield, and Leeds, raising £312 million to invest in their spinouts, and eight research universities in the Midlands have co-founded Midlands Mindforge as a patient capital investment company with an ambition to raise £250 million.

These developments underscore the evolving landscape of external investment in university spinouts, with universities increasingly seeking to fill a critical gap in both early-stage investment capital and the ability to follow-on investments by strategically establishing investment funds and companies dedicated to supporting and investing in their ventures to drive innovation.

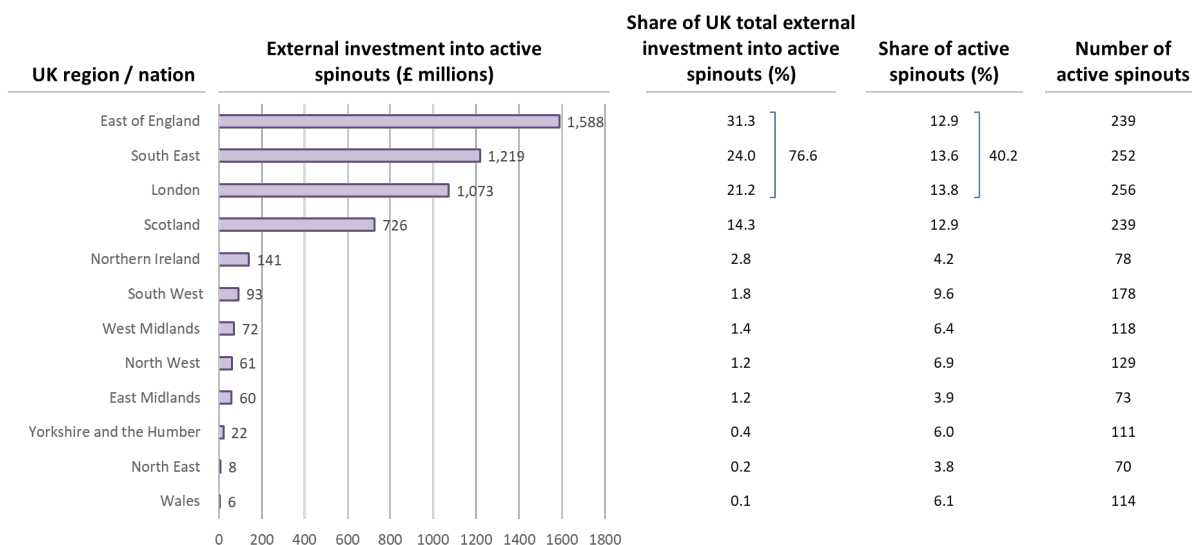
3.1.3 Sub-UK trends and patterns in spinout production

The strength of local entrepreneurial and innovation ecosystems varies considerably within the UK. For example, a 2023 report by the British Business Bank showed that over 80% of equity investment raised in 2022 goes to companies located in the Greater South East, including London (65% by investment value), the South East (10% by investment value, which includes Oxford), and the East of England (7% by investment value, which includes Cambridge) (Business Bank, 2023).

Recognising these spatial differences across the UK, Figure 10 examines how the production of spinouts (chart A) and external investment raised by active spinouts (chart B) vary for universities based in the Greater South East compared with the rest of the UK. It shows that, on average, universities with different scales of research base based outside the Greater South East generate similar numbers of spinouts per £100 million of research income as their larger counterparts within the Greater South East. Interestingly, smaller research universities within the Greater South East (with annual research incomes of between £30 million - £90 million) produce fewer spinouts per £100 million of research income than their counterparts in the rest of the UK. However, the distributions around the median increase significantly for smaller research universities, highlighting the increasingly varied experiences of universities at this level in producing spinouts.

3.1.4 Sub-UK trends and patterns in external investment raised by spinouts

Figure 9 shows that active spinouts linked to universities in the Greater South East attracted over 76% of all external investments into active spinouts in 2022, similar to the amount of external investment attracted by all businesses located in this area. By contrast, universities in this area of the UK generated 40% of the active spinout population, suggesting that companies outside this area are raising less than those within it.



* Excludes specialist higher education providers as defined by the Knowledge Exchange Framework in England

Figure 9 | External investment raised by active spinouts across different parts of the UK.

Source: HESA HEBCI survey. Excludes specialist higher education providers.

Turning now to look at spinout production for universities in different parts of the UK, in the Greater South East and the Rest of the UK, we find that, controlling for the scale of the research base, spinout production for larger universities is broadly similar (chart A in Figure 10). For smaller research-active universities, those based outside the Greater South East generate, on average, more spinouts than those within it, although the distributions around the median are very large (suggesting very different experiences across specific universities).

On the amount of external investment raised per active spinout linked to universities of different research scales in the Greater South East and the Rest of the UK (chart B in Figure 10), we find that, for universities with research bases of £90 million and above, regardless of the university size, spinouts affiliated with universities in the Greater South East attract notably higher levels of external investment compared to their counterparts in other regions of the UK. Moreover, spinouts originating from the largest universities situated in the Greater South East appear to be able to secure significantly more investment per company than universities in other areas. The distributions around the median also highlight that spinouts affiliated with certain research universities in the Rest of the UK have been able to attract substantial investments.



Figure 10| External investment raised by active spinouts linked to universities of different sizes across different parts of the UK.

Source: HESA HEBCI survey & finance records. Excludes specialist higher education providers.

Note 1: * We have removed the data point from this category as it is based on just one university.

Note 2: Chart A is based on HEBCI data for all non-specialist, research-active UK universities. Chart B is based on HEBCI data for all non-specialist, research-active UK universities with active spinouts.

3.2 UK university spinouts in the context of the wider start-up population

The UK Government's recent Science and Technology Framework notes that "science and technology will be the major driver of prosperity, power and history-making events this century" (DSIT, 2023e). A vibrant, dynamic economy producing innovative start-ups that harness the power of science and technology is seen as critical to delivering on these ambitions. The HMT-DSIT independent review of university spinouts argues that university spinouts play an important role within this context.

In exploring the importance of university spinouts in helping to drive the future competitiveness of the UK economy, we must first recognise that university spinouts are not like an average new business set up to sell goods and services into the economy. University spinouts are typically set up to commercialise novel ideas and technologies emerging at the frontiers of knowledge. In addition to developing a viable business model, their successful development typically requires significant and sustained investment over a number of years to further develop and de-risk the technology into an application.

It would seem to us, therefore, not make much sense to compare them with the general population of UK companies (as is sometimes done), the majority of which are companies in wholesale and retail, construction, hospitality, accommodation services, arts and entertainment, professional services, etc. (Office for National Statistics, 2023). A more relevant comparator would be a population of knowledge-intensive start-up companies that typically require external investment to develop and grow. While identifying such a population is very difficult, we leverage the fact that commercial investment databases such as PitchBook typically track companies that are likely to raise venture capital, private equity and other private investment to drive their growth. In doing so, they focus on a similar population of companies, of which some will be university spinouts.

In this section, we, therefore, focus our attention on the 555 university spinouts founded between 2015 and 2022 that were provided to us by the 15 UK universities engaging with our study. We limit our sample to the 390 companies (70%) that are identified in PitchBook. Note that, as we show later, our university sample generates about half of all the UK's spinouts. We then identify in PitchBook all UK-headquartered start-ups founded during the same period.

Figure 11 compares the prevalence of university spinouts founded between 2015 and 2022 by the 15 universities and identified within PitchBook within the population of start-ups founded during the same period. Across all sectors, we find that these spinouts represent 3.6% of start-ups. However, this average hides significant variation across sectors. For example, over a third of semiconductor-based start-ups founded in this period were university spinouts, 26.4% of pharmaceutical and biotechnology companies were spinouts, 17.6% of start-ups in materials, textiles and chemicals were spinouts, and 15.2% of those in healthcare devices and supplies were spinouts.

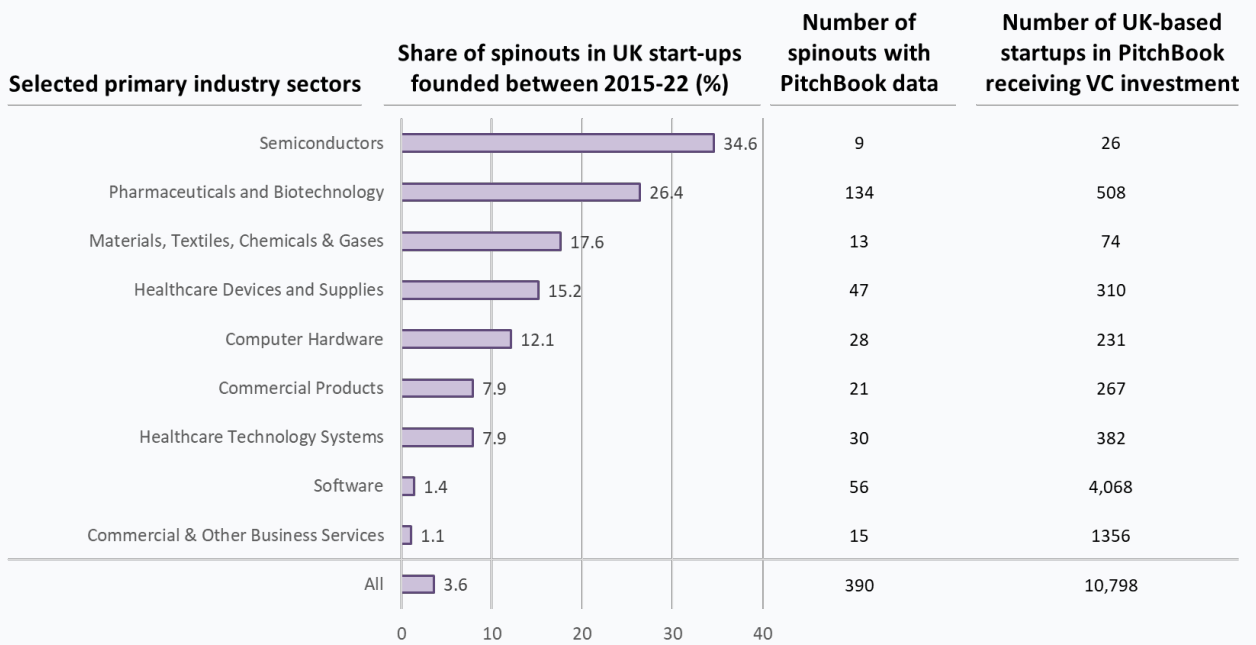


Figure 11 | Prevalence of spinouts from 15 UK universities founded between 2015-22 in the UK PitchBook population of start-ups founded in the same period.

Source: PitchBook, UCI analysis.

Software-based university spinouts represented 14% of the total number of spinouts identified in PitchBook; however, they represent just 1.4% of all software start-ups founded during this period. This may be partly explained by the large numbers of software companies being founded in the UK coupled with the breadth of the type of company this category captures, covering everything from deep-tech companies developing artificial intelligence technologies to fintech companies, software-based games and multi-media companies, and companies developing apps and other digital services and platforms.

Many start-ups also fail. Figure 12 looks at the prevalence of university spinouts in the top 25 and top 50 start-ups founded between 2015 and 2022 in different sectors (as defined by PitchBook), ranked based on the total amount of investment they have raised to drive their development and growth. This can be seen as a proxy for the strength of belief by the market in the commercial viability of the company. Here the results are striking; in the pharmaceutical sector, university spinouts represented 60% of the top 25 start-ups ranked by investment raised and 42% of the top 50; for healthcare devices, spinouts represented 44% of the top 25 and 34% of the top 50; for semiconductors, spinouts represented 28% of the top 25; in many other key sectors, they represent around 20% of the top 25 start-ups by total investment raised.

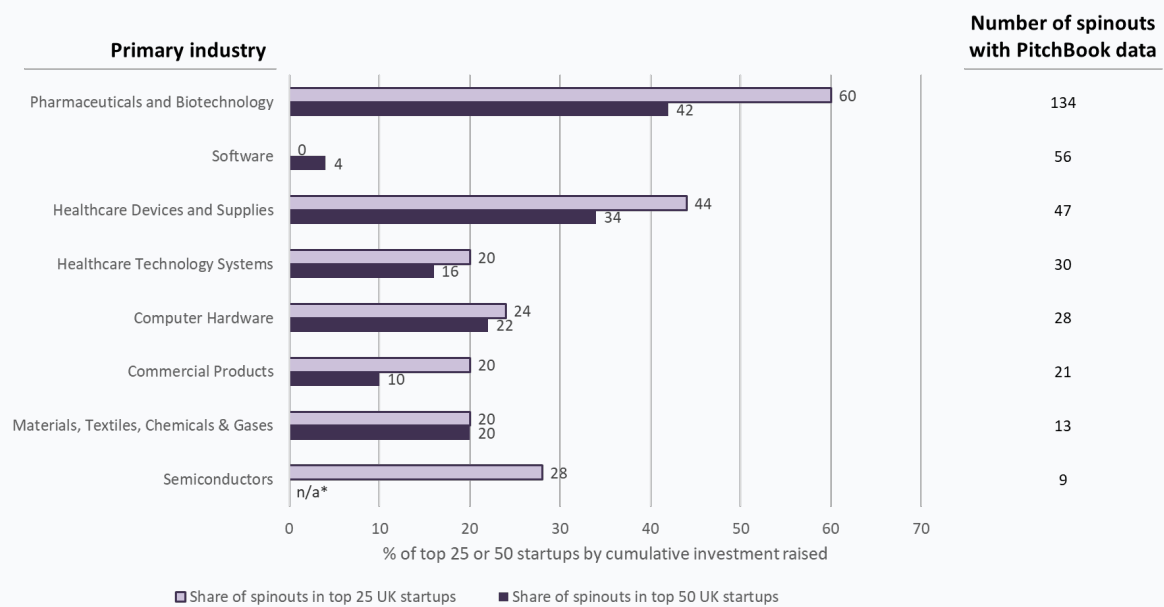


Figure 12 | Prevalence of UK university spinouts founded between 2015-22 in the top 25 and top 50 UK-based start-ups identified in PitchBook founded during the same period raising the most amount of investment.

Source: PitchBook, UCI analysis.

Software once again stands out; university spinouts are largely absent from the top start-ups by investment raised. When diving into the data, many of the software start-ups raising the most money are fintech companies like Revolut, multimedia and games companies, and business-focused digital application platform companies. These companies, should investors see potential, will attract significant amounts of investment to enable them to rapidly scale their customer base to either create new markets or secure their position in existing ones. Currently, universities do not appear to produce many of these types of companies. This may be due to the types of IP generated within universities being less critical for these types of companies to found, grow and succeed; the capabilities and know-how of the founding team to develop disruptive applications based on either existing technologies or incremental improvements to these technologies may be much more important.

Overall, it is clear that, with the exception of software, university spinouts are playing a significant role in driving innovation in sectors and technology spaces that have been identified as strategically important for the UK's future competitiveness, including life sciences (including medical biotechnology, medical devices), advanced materials, and semiconductors. Further research should be undertaken to better understand where and how university spinouts can play a bigger role in driving innovation in the software sector.

3.3 US and UK comparison on spinout production

The success of the UK university system in producing spinouts is also frequently compared to the US, with suggestions that US universities perform better. This section examines this claim. At the outset, we must recognise that cross-country comparisons of spinout production are challenging due to how data is collected across different countries, varying data definitions and the importance of contextual factors in shaping spinout production. Nevertheless, they can be informative, providing insights into translatable factors that could be implemented to improve UK spinout production.

In undertaking these comparisons, we rely on the main datasets available for each country: for the US, we use the Association of University Technology Managers (AUTM) licensing activity survey⁷, which is accessible through the Statistics Access for Technology Transfer (STATT) database; and for the UK, we refer to the Higher Education Business and Community Interaction (HEBCI) survey⁸, made available by HESA/Jisc. Financial data from the US is converted into British Pounds using purchasing power parity (PPP) exchange rates⁹. These try to equalise the purchasing power of different currencies by eliminating the differences in price levels between countries.

Several challenges complicate the process of making comparisons between the UK and US datasets. Firstly, the UK HEBCI dataset encompasses all UK universities, whereas the AUTM licensing survey in the US is voluntary, resulting in a less comprehensive AUTM STATT database. Moreover, the minimum research base of a university submitting to the AUTM is £9.7 million (average for 2019-21), while HEBCI includes universities with minimal or no research income. Additionally, the AUTM dataset specifically focuses on technology transfer activities such as licensing and start-ups, meaning that participating universities typically engage in some level of technology transfer. In contrast, HEBCI may even include universities with some research activity but no technology transfer activity.

Furthermore, some universities contributing to the AUTM database do so as part of much larger US State university systems, such as the University of California system, which had a research base of £7.3 billion (average for 2019-21, converted using PPP exchange rates). The aggregated nature of these submissions makes it impossible to isolate the performance of individual universities within these systems, hindering a nuanced analysis of institutions like UC Berkeley, UC San Diego, and UC San Francisco. Lastly, we must recognise that the largest US universities are significantly bigger than the largest UK universities in terms of scale of research base. The AUTM dataset identifies five individual universities (i.e. not reporting as part of a system) with average annual research expenditure in excess of £1 billion for 2019-21.

Different definitions of spinouts between the AUTM and the HEBCI datasets further complicate comparative analyses. In the AUTM context, spinouts are characterised as companies *"formed that were dependent upon the licensing of your institution's technology for their initiation."* Conversely,

⁷<https://autm.net/surveys-and-tools/surveys/licensing-survey>: "The AUTM Licensing Activity Survey offers quantitative data and real-world examples about licensing activities at U.S. and Canadian universities, hospitals and research institutions."

⁸ <https://www.hesa.ac.uk/data-and-analysis/business-community>

⁹ Available from the Organisation for Economic Cooperation and Development (OECD)

HEBCI defines spinouts as registered companies set up to exploit intellectual property originating from within the Higher Education Provider (HEP). The discrepancy in these definitions introduces nuances in the identification and categorisation of spinouts, adding a layer of complexity to cross-system comparisons.

In order to facilitate meaningful comparisons, our study restricts the sample as follows: for the US, we include 122 universities that submitted data to AUTM. For the UK, we exclude universities with a research income below £20 million unless they have some spinout activity. This selection process helps to create a more comparable and relevant dataset for a UK-US comparative analysis.

Figure 13 shows the relationship between spinout production and the scale of the research base for UK and US universities. In the US, as in the UK, the scale of spinout production appears to be closely related to the scale of the research base above a certain threshold. Below this threshold, the relationship appears to be much weaker. It is also evident from the chart that the largest US universities have a significantly greater scale compared with the largest UK institutions. Following their scale, we observe these universities producing a greater absolute number of spinouts each year. At the other end of the scale, the UK appears to have more smaller research-active universities generating at least a few spinouts than the US.

Figure 14 categorises universities in the US and the UK into distinct groups based on the scale of their research and examines the number of spinouts each university generates, normalised to the size of its research base. It reveals that larger research universities in the UK (research incomes above £200 million) produce spinouts at a similar level to those in the US, once adjusted for the scale of the research base. Once normalised by the amount of research, the median spinout production is broadly similar between UK and US universities for the larger research universities.

Within each group in both the US and the UK, there are universities producing more than the average spinouts and those producing fewer. The variation within each size group can be relatively high. This suggests that factors beyond the research scale are likely to influence spinout production, such as university culture, entrepreneurial support, and industry linkages.

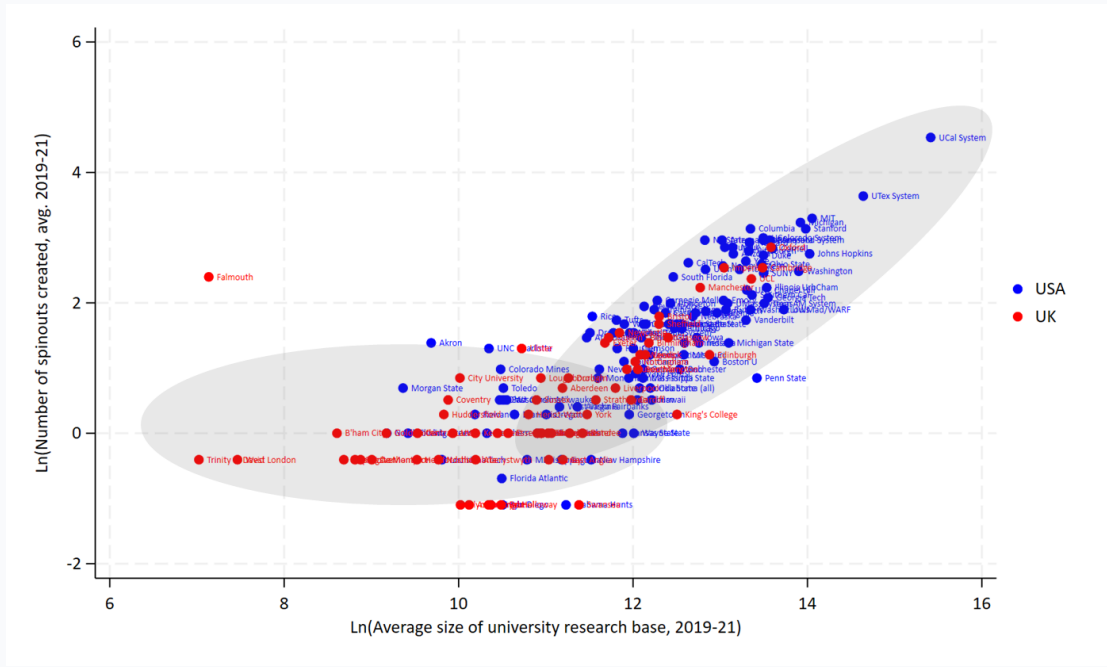


Figure 13| The relationship between spinout production and the scale of the research base: US-UK comparisons.

Source: HESA HEBCI survey & AUTM licensing survey.

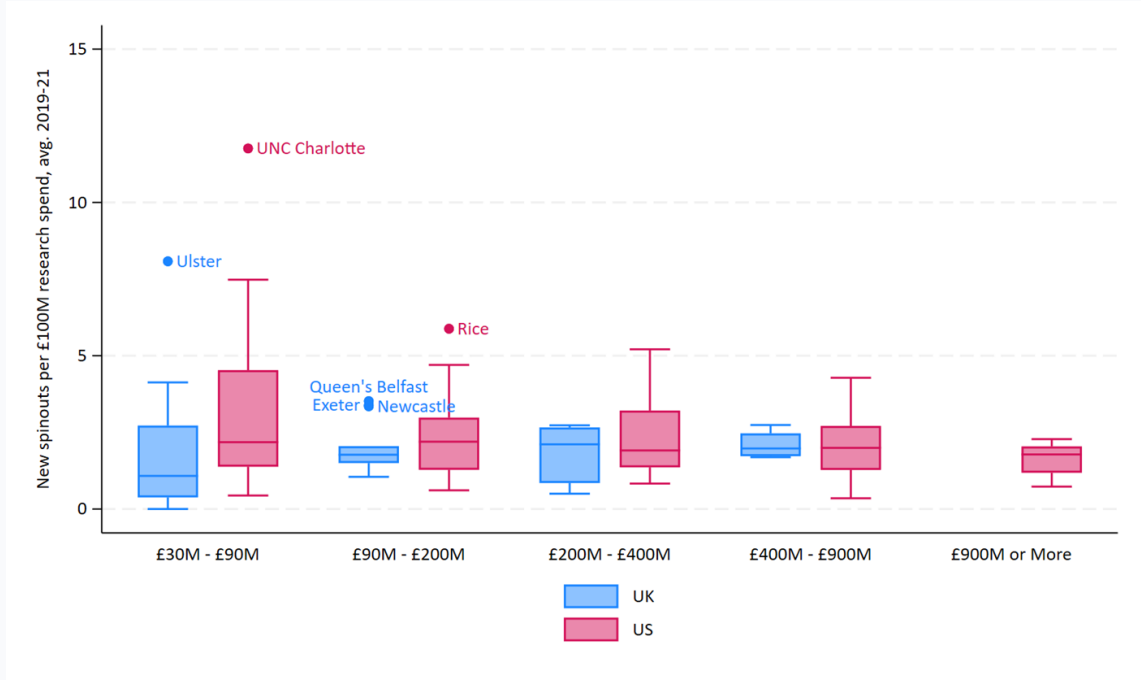


Figure 14| Spinout production normalised by the scale of the research base for universities of different sizes, US-UK comparisons.

Source: HESA HEBCI survey & AUTM licensing survey.

Understanding Our Data And Sample



4 Understanding our data and sample

Before we present the results of our analysis on deal terms (chapter 5), investment performance of spinouts (chapter 6), and the relationship between these variables (chapter 7), it is important for readers to understand the sample of spinouts upon which our analyses are based, not least in terms of its structure and coverage. This is crucial for understanding the extent to which our findings can be generalised.

Our analysis is underpinned by a robust and diverse dataset bringing together data sourced directly from UK university TTOs and linked to information gathered from public and proprietary commercial channels. Full details on the data collection methods and information about each data source are provided in the APPENDIX to this report.

Recognising the limitations of publicly available lists of spinouts and on data on spinout deal terms, as agreed at the point of spinout foundation, we decided to work collaboratively and closely with UK TTOs to obtain information directly from them on their full populations of spinouts and on key deal terms. Our primary objective was to ensure consistent and robust acquisition of data. Commencing in March 2022, an extensive data collection initiative was implemented using a structured data request form distributed to senior stakeholders of all TTOs active in generating spinouts (see APPENDIX).

The information collected includes datapoints:

- Crucial for accurately identifying the spinouts in other databases, including Company Registration Number (CRN), foundation year, and country of incorporation;
- To characterise ventures by capturing information on technology, departmental affiliation;
- On the first two investment funding rounds (excluding public grants), recognising that these very early rounds can be difficult to identify in commercial data providers;
- On the deal terms, covering the university's founding equity, licensing terms, and anti-dilution provisions on equity.

4.1 Composition of the university and spinout sample

4.1.1 Universities represented in the sample

We targeted our study on universities with a track record of actively generating spinout companies. We deliberately did not explore universities that may produce spinouts on a sporadic or infrequent basis. Our approach resulted in fifteen non-specialist universities and their TTOs from across the regions and nations of the UK participating in our study and supplying detailed information on their populations of spinouts. This represents approximately 12% of UK universities (excluding specialist institutions).

Collectively, these universities play a substantial role in the UK's academic and spinout landscape. They secured 56% of the total research income in the academic year 2021/22, while their active

spinouts represented 54% of the total number of active spinouts in the same year (Table 1). Over the period from 2014/15 to 2021/22, they generated nearly half (49%) of all spinout companies within the UK university ecosystem. Notably, during the same timeframe, their active spinouts linked to these universities successfully attracted 83% of the total external investment directed towards spinouts.

We therefore believe that our sample provides robust insights into the trends, patterns and relationships between equity and investment for UK universities active in generating spinouts. It will not be able to provide much insight into those that produce spinouts more sporadically.

Table 1 | Report’s university sample vs the population of universities in the UK.

	UK population	Sample	% sample in population
Number of universities (excluding specialists)	122	15	12
Total research income 2021-22 (£ million)	8,700	4,900	56
Number of spinouts created 2014-15 – 2021-22	1,235	612	49
Number of active spinouts in 2021-22	1,860	1,010	54
External investment into active spinouts 2014-15 – 2021-22	19,900	16,500	83

Table 2 | Composition of the report’s sample by research scale and location.

		Number of universities in the sample (% total population in group)	Number of spinouts created by universities in the sample 2014/15 – 21/22 (HEBCI) (% total population in group)
Total research income 2021-22	£400 million - £900 million	5 (100%)	389 (100%)
	£200 million - £400 million	3 (43%)	82 (41%)
	£90 million - £200 million	7 (54%)	141 (54%)
	Less than £90 million	0 (0%)	0 (0%)
Locations (Golden Triangle and Rest of the UK)	Golden Triangle (London, Cambridge, Oxford)	5 (18%)	387 (86%)
	Rest of UK	10 (11%)	225 (29%)
Locations (Regions and nations of the UK)	North, Midlands & South West	5 (9%)	134 (28%)
	London, East of England & South East	6 (14%)	406 (81%)
	Scotland, Northern Ireland & Wales	4 (17%)	72 (29%)
Total		15 (12%)	612 (50%)

Our previous work (Coates Ulrichsen et al., 2022) showed that the investment environment accessible to the university and founding team is perceived as a barrier more often by TTO directors outside the Golden Triangle area than within, and more often by TTOs in universities generating less spinout activity. For this reason, we have carefully designed our sample to examine the trends and patterns of different sizes and types of universities located in entrepreneurial ecosystems of different strengths.

Our selection of universities for this analysis encompasses a diverse range of institutions, as detailed in Table 2:

- We have included universities with research incomes exceeding £90 million, ensuring a well-balanced representation across various size groups above this threshold.
- Geographically, our sample extends across universities in regions with varying strengths in local entrepreneurial ecosystems. This diversity is reflected in the inclusion of five universities based in the highly dynamic Golden Triangle regions of London, Cambridge, and Oxford, alongside ten universities dispersed across the rest of the UK.

4.1.2 Overall characteristics of the spinout sample

The TTOs from the fifteen universities participating in our study provided details of their spinout populations going back as far as they could, based on the resources they had available. Details of the sample are provided in Table 3. This resulted in 1,141 spinouts being identified. We then requested more detailed information on those companies founded from 2015 onwards, with accompanying information on key deal terms and the first and second investment rounds (excluding public grants) along with the total raised to date. In cases where the TTOs did not provide investment information, we derived estimates by leveraging investment data obtained from the commercial investment database PitchBook. To the best of our knowledge, we excluded grants (such as Innovate UK grants) and focused only on private-sector investments for the first and second rounds.

Given the time lag between a company's founding and its fundraising activities, we limited our analyses to the period 2015-2021. The base dataset for our analysis was, therefore, comprised of a total of 500 spinouts set up during this period (Table 3). Of these companies, 452 had information on the university's founding equity (90%), 411 had information on the licensing terms (82%) and 408 spinouts had complete information on both equity and licensing. **This formed our core sample for analysing patterns and trends in deal terms (hereafter referred to as core sample 1).**

We were able to gather information on the first investment raise (excluding grants) for 379 spinouts (76%). Filtering for those companies with complete deal terms *and* first investment information resulted a sample of 351 spinouts. **This formed our second core sample for analysing the relationship between university founding equity and the investment success of spinouts (hereafter referred to as core sample 2).**

Anti-dilution provisions on equity are uncommon in the UK. Focusing on our core sample 2, merely 10% of the spinouts within the sample incorporate such provisions. It is noteworthy that this subset comprises spinouts originating from six different universities with varying characteristics, including research scale, geographical location, and intellectual property policies (see Table 4).

Table 3 | Number of spinouts in the sample.

Spinouts	Number of spinouts	Percentage of all spinouts (2015-2021)
Full list of spinouts provided with very basic information (identifiers, foundation year, disciplinary origins) -> OUR FULL BASIC SAMPLE	1,141	n/a
Spinouts founded between 2015 and 2021	500	100%
With information on university founding equity	452	90%
With information on licensing terms	411	82%
With full deal terms data -> OUR CORE SAMPLE 1 (for capturing patterns in deal terms)	408	82%
With information on first investment raise	379	76%
With full deal terms and first investment raise -> OUR CORE SAMPLE 2 (for analysing equity-investment relationship)	351	70%

Table 4 | Basic characteristics of sample 2.

	Number of spinouts in the sample	Percentage of all spinouts in the sample
Our sample 2015 - 2021	351	100%
With anti-dilution provisions on the equity	36 (from five universities)	10%
With royalty/fee-bearing license	235	67%
With positive first investment raise	308	88%
With positive second investment raise	225	64%

Most spinouts (63%) in our sample originated from large research universities, specifically those with research incomes exceeding £400 million (Table 5). Note that four out of five of these universities are located within the Golden Triangle region. Moreover, 15% of all spinouts in the sample were produced by universities with research income between £200 and \$400 million, and 22% by universities with research income between £90 and £200 million.

Table 5 | Characterising core sample 2: breakdown of the spinout sample by the research scale of the universities.

SPINOUTS LINKED TO UNIVERSITIES OF DIFFERENT SCALES		
University group (by research income group)	Number of spinouts in the sample	Percentage of all spinouts in the sample
Research income: £400-900 million	221	63%
Research income: £200-400 million	53	15%
Research income: £90-200 million	77	22%
Total	351	100%

4.1.3 Sectoral composition of the spinout sample

It is well known that the commercialisation pathways from research to innovation through new venture creation differ for different types of technologies and sectors of application (Maine & Seegopaul, 2016; Coates Ulrichsen, 2019). Sector differences were recognised in the HMT-DSIT university spinout review, which notably distinguished between life sciences, engineering, and software.

In undertaking any sectoral analyses, we must recognise the real limitations with using existing sector classifications. Standard Industrial Classification (SIC) codes are frequently used to categorise and classify industries based on their primary economic activities. While they are useful for various purposes, several problems and limitations exist, particularly when interested in emerging technologies and sectors (Losurdo et al., 2019). These include, not least, that SIC codes are updated only very infrequently, and typically fail to capture emerging industries; and, in being formed around the economic activity of a business, do not focus on the technological underpinnings of this activity, thereby making it very difficult to identify economic activity of emerging technologies.

For these reasons, we opted to develop our classification taxonomy, which integrates Pitchbook industry sectors and augments this with information pertaining to the commercialised technology. This supplementary information was obtained through TTOs or manual inspection (Table 6). This allowed us to focus on sectors of particular value to the current spinout debate.

Leveraging our taxonomy, an analysis of our spinout sample reveals four key industry sectors with more than 40 spinouts. These sectors include pharmaceuticals and biotechnology (33% of the total sample), IT-software (12%), healthcare devices (12%), and IT-hardware (which includes semiconductors) (11%). Notably, spinouts in pharmaceutical and biotechnology were prevalent across both the Golden Triangle and in the Rest of the UK. By contrast, the software-focused spinouts in our sample were concentrated in the Golden Triangle. Overall, approximately two-thirds of the spinouts in our sample originated from universities based within the Golden Triangle.

Table 6 | Characterising core sample 2: breakdown of the spinout sample by industry sector and association with universities in the Golden Triangle.

Source: UCI Data, Pitchbook based on authors analysis.

SPINOUTS IN DIFFERENT SECTORS LINKED TO UNIVERSITIES IN DIFFERENT TYPES OF AREAS						
Industry sector	Linked to universities based in the Golden Triangle		Linked to universities based in the Rest of the UK		Total	
	Number of spinouts	Percent of total spinouts in Golden Triangle	Number of spinouts	Percent of total spinouts in the Rest of the UK	Number of spinouts	Percent of total spinouts
Pharmaceuticals and Biotechnology	68	31%	48	37%	116	33%
Information Technology - Software	34	15%	8	6%	42	12%
Healthcare Devices	26	12%	17	13%	43	12%
Information Technology – Hardware (including semiconductors)	26	12%	14	11%	40	11%
Industrial equipment and products	18	8%	13	10%	31	9%
Other healthcare	27	12%	11	8%	38	11%
Materials, Chemicals & Gas production	5	2%	7	5%	12	3%
Other	16	7%	13	10%	29	8%
Total	220	100%	131	100%	351	100%

4.1.4 A focus on artificial intelligence technologies

There is a significant interest in spinouts seeking to commercialise Artificial Intelligence (AI) technologies. This reflects in part the rapid growth of the digital and Artificial Intelligence (AI) sector, and the strategic importance of these sectors globally and for the UK, not least for opening up significant new wealth-creating opportunities, and for tackling complex industrial and innovation challenges.

A major challenge exists in accurately identifying these companies within business populations. This is particularly acute in the context of AI, with its multifaceted nature and rapid evolution (OECD, 2019). For example, current classifications often identify companies operating in these spaces as ‘software’ or ‘computer programme’, with little ability to distinguish companies developing, for example, foundational AI technologies and those applying existing AI technologies to develop new applications. Furthermore, the rapid growth in the application of digital technologies across wide range of sectors (e.g. biotechnology, aerospace, wider manufacturing, agriculture, creative industries, etc.) means that

we can often find digital companies listed with these other sectoral classifications. These distinctions are crucial for understanding the unique potential of these types of companies, their funding and support requirements, and development trajectories. More generally, accurately characterising the spinout landscape, therefore, requires understanding the distinction between platform technologies, which form the foundation for other developments, and technologies that address specific applications or problems.

To gather insights on this important category of spinouts, we attempted to isolate those focused on AI within our sample. We did this by utilising the Pitchbook classification system (verticals), with a particular focus on technology related to "Artificial Intelligence". Table 7 shows our sample's breakdown for AI technologies and different sectors. It identifies 53 spinouts developing AI technologies or leveraging them to develop applications. These are spread across multiple sectors, highlighting the difficulties of industrial classifications in isolating AI-focused companies. Almost half of these are listed within PitchBook as operating within the IT software sector; a further 17% are listed as healthcare devices companies; 15% as healthcare technology systems companies; and 9% as pharmaceutical and biotechnology companies. While not perfect, we believe our approach identifies a relatively coherent group of companies based on the sectors within which they are operating.

Table 7 | Characterising core sample 2: breakdown of spinouts in artificial intelligence operating in different industry sectors.

Source: UCI Data, Pitchbook based on authors analysis.

SPINOUTS IN ARTIFICIAL INTELLIGENCE OPERATING IN DIFFERENT INDUSTRIAL SECTORS		
Industry sector	Number of spinouts in the sample	Percentage of AI spinouts
Information Technology - Software	24	45
Healthcare Devices	9	17
Healthcare Technology Systems	8	15
Pharmaceuticals and Biotechnology	5	9
Business, IT, Professional & Technical Services	3	6
Information Technology - Hardware	3	6
Industrial equipment and products	1	2
Total	53	100

Deconstructing The Deal: UK Terms



5 Deconstructing the deal: UK terms

In this chapter, we present empirical evidence on key deal terms as agreed at the point of foundation of a spinout emerging from the UK universities in our sample. We deconstruct the deal to look at the university’s founding equity, the presence of anti-dilution provisions, and the existence of fee-bearing licenses. When looking at the university’s founding equity, we exclude equity taken by the university for cash investments and focus on equity taken for the support provided and IP being transferred.

This section focuses on our core sample 1 (unless otherwise stated), consisting of 408 spinout companies for which we have completed university founding equity and licensing information.

5.1 University founding equity in UK spinouts

The median university founding equity in our sample of spinouts founded between 2015 and 2021 is 20% (with an interquartile range of 5%-37%) (Table 8). The mean average is slightly higher at 22%. If we now limit the sample to those spinouts that have raised at least some investment, and in particular those that are in the top 10% in terms of the amount of first investment raised, the mean university founding equity in these companies rises to 27% (with an interquartile range of 7%-47%).

Table 8 | Average university founding equity of spinouts in the sample.

Source: UCI data, Pitchbook based on authors analysis. Includes spinouts where no equity was taken by the university at foundation.

UNIVERSITY FOUNDING EQUITY (2015 – 2021)					
Spinout sample	Number of spinouts in the sample	University founding equity			
		Mean	Median	25th percentile	75 th percentile
Spinouts	408	22%	20%	5%	37%
Spinouts raising positive first investment	308	23%	20%	8%	40%
Spinouts corresponding to the top 10% of investments	31	27%	24%	7%	47%

Table 9 presents both the average (mean, median) and ranges of university founding equity in spinouts associated with universities with different scales of research base. It shows that the mean founding equity taken by universities in their spinouts is similar across institutions with different scales of research base. The median university founding equity is slightly lower for universities with research bases of £200 million - £400 million than for the other university groups.

The variation around the median is both high for larger universities (typically producing more spinouts) and much higher than their smaller peers. This suggests that university equity allocation is not solely determined by fixed intellectual property and spinout policies but instead emerges from negotiations involving various stakeholders influenced by diverse circumstances and considerations.

Table 9| Average university founding equity of spinouts in the sample associated with universities with different scales of research base.

Source: UCI core sample 1. Includes spinouts where no equity was taken by the university at foundation.

UNIVERSITY FOUNDING EQUITY (2015 – 2021)					
Scale of university research base	Number of spinouts in the sample	University founding equity			
		Mean	Median	25th percentile	75th percentile
£400 million - £900 million	246	23%	20%	5%	40%
£200 million - £400 million	71	20%	15%	0%	35%
£90 million - £200 million	91	22%	20%	12%	32%

Table 10| Average university founding equity of spinouts in different industrial sectors.

Source: UCI core sample 1, Pitchbook based on authors analysis. Includes spinouts where no equity was taken by the university at foundation.

UNIVERSITY FOUNDING EQUITY (2015 – 2021)							
Industrial sector	Number of spinouts in the sample	Number of different universities in sample*	University founding equity				
			Mean	Median	25th percentile	75th percentile	
Pharmaceuticals and Biotechnology	126	14	25%	25%	8%	40%	
Healthcare Devices	48	13	20%	15%	6%	33%	
Information Technology - Software	51	9	16%	10%	5%	24%	
Information Technology - Hardware	47	10	19%	17%	3%	40%	
Industrial equipment and products	40	12	20%	20%	6%	30%	
Healthcare Technology Systems	32	9	26%	26%	10%	40%	
Business, IT, Professional & Technical Services	27	13	17%	10%	5%	28%	
Materials, Chemicals & Gas production	13	9	31%	38%	24%	40%	
Healthcare Services, Supplies & other healthcare	13	7	18%	20%	11%	20%	

* The number of universities represented in the sample is shown here to demonstrate the extent to which the average founding equity and ranges for each sector are based on a broad range of universities.

When analysing the distribution of university founding equity in spinouts across various industries, we observe comparable median equity levels in sectors such as IT-software, IT-hardware, and healthcare devices at around 10-15% (see Table 10). By contrast, spinouts in the pharmaceutical and biotechnology sector exhibit higher average university founding equity levels (median of 25%), while the median university founding equity for spinouts in the materials, chemicals and gas production sectors (which includes advanced materials companies) was 38% (note here, however, the relatively few spinouts in this sector).

The distributions of university founding equity are perhaps more important to observe than the averages. Here, most sectors exhibit high interquartile ranges (the middle 50% of each sample), typically ranging from 10-40% for the more IP-heavy, science and hardware-intensive sectors. For IT-software, this range is considerably lower, from 5-25%.

5.2 University approaches to taking founding equity in spinouts

UCI's 2022 Busting Myths report surveyed UK university TTO directors in May 2022 to gather insights on their university's *typical* approaches to taking equity in their spinouts. The aim was to focus on the application of their IP and spinout policies in practice rather than on what is written down in policy documents. It revealed that many universities active in generating spinouts had multiple 'typical' approaches, reflecting the different types of spinout cases they have to deal with. They often had an approach focused on spinout where a significant amount of support was provided and IP was being transferred into the company, and one where little support or IP was provided. Other approaches focused on the trade-off between equity and licensing terms to accommodate the needs of the spinout.

In this section, we build on these findings to examine what the data supplied by TTOs on specific deals demonstrates regarding typical university approaches to taking founding equity in their spinouts. Figure 15 provides illustrative representations of the realised approaches taken by the UK universities in our sample. These examples draw upon actual data while being aggregated and stylised to safeguard data privacy.

Consistent with UCI's 2022 report, the equity approaches adopted by universities exhibit distinct patterns in our analysis. Some universities have a fixed policy, displaying minimal variation in the university's founding equity stake they take in spinout ventures. These patterns are exemplified by cases labelled "Pattern 1" and "Pattern 3". By contrast, other universities demonstrate greater flexibility, with university founding equity stakes showing significant variation across the spectrum of spinouts, as observed in "Pattern 2" and "Pattern 4". Additionally, some universities adopt a more segmented approach, featuring multiple spikes in the equity policies, as evident in "Pattern 5" and "Pattern 6".

The diversity of approaches underscores the variety of equity strategies universities employ in commercialising research through spinouts; in simple words, there is no one-size-fits-all solution. UCI's 2022 report, based on the insights shared by TTO directors, showed that several key factors justify the diverse approaches universities have adopted regarding spinout equity (Coates Ulrichsen et al., 2022).

These factors include the level of university support provided to the spinouts (funding including for proof of concept and to develop the business proposition, access to facilities, staff), the type of the IP involved (strong patented IP vs “soft” IP, software, know-how, etc.), the licensing fees, the contributions made by academic founders, and the commercial potential of the spinout.

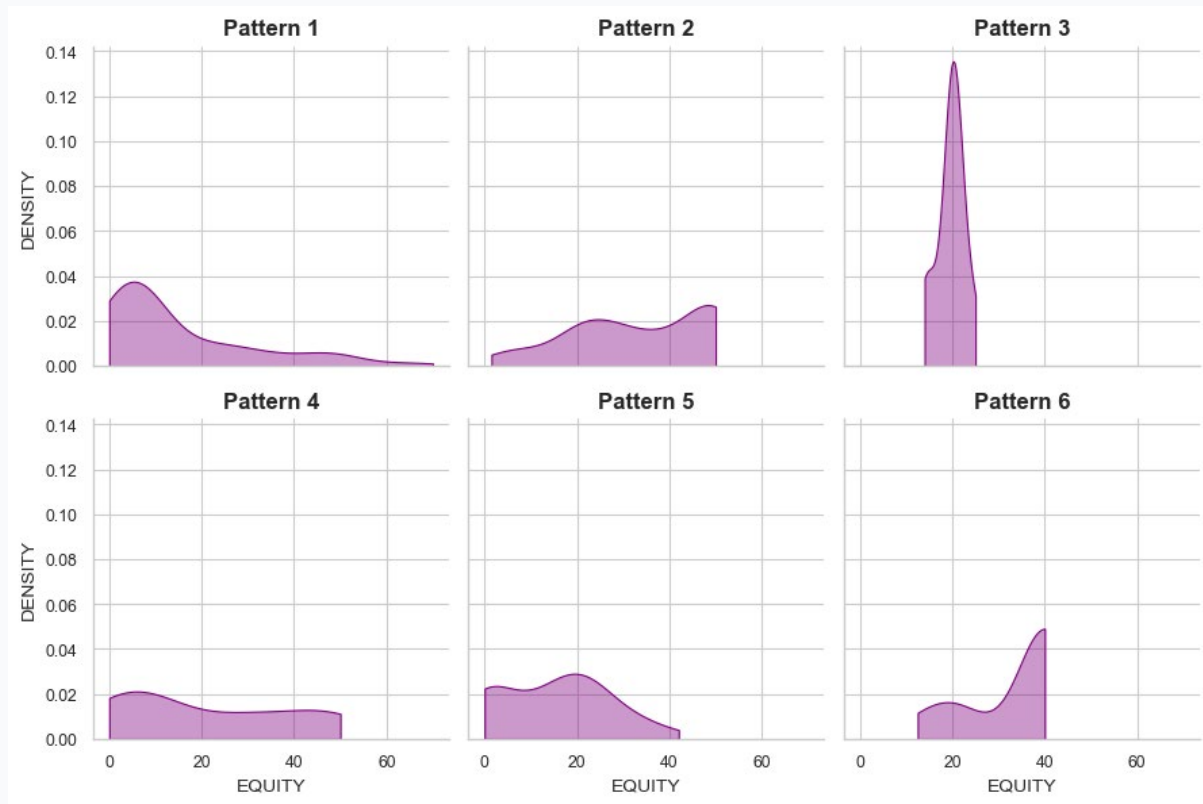


Figure 15| Stylised example of UK universities’ IP policies.

5.3 University founding equity and licensing terms

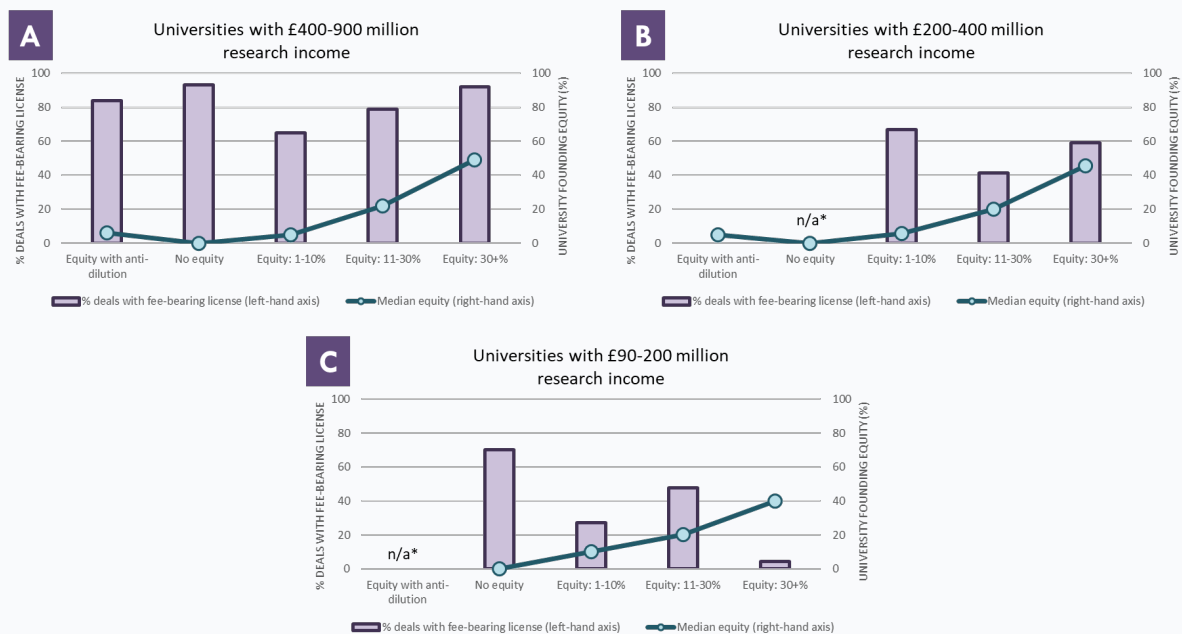
The spinout deal consists of a number of key terms that shape the overall financial ties between different parties involved, including not least the equity received by the university at the point of foundation, and the terms of any license transferring the IP into the company. UCI’s 2022 Busting Myths report highlighted that some universities will trade off the amount of equity in a spinout with the terms of the license to meet the specific needs and circumstances of the spinout case in front of them.

In this section, we examine the extent to which this relationship between university founding equity and the presence of a fee-bearing license is reflected in deals negotiated. We look at this relationship for different groups of universities, recognising that universities may adopt different approaches.

The charts in Figure 16 present the prevalence of fee-bearing licenses in spinout deals (the purple bars, left-hand axis) for different levels of university founding equity. Note that fees could include

upfront payments, milestone payments, royalties, etc. The line on the chart captures the median university founding equity for each equity group (right-hand axis).

Chart A shows that the largest research universities tend to incorporate some form of fee-bearing license in conjunction with equity in many of their spinout deals (in over 75% of deals), regardless of how much equity is taken at foundation. Note that most of these universities are also located in the Golden Triangle, where external investment is more readily available locally.



*Data removed due to category being based entirely on a single university's spinouts

Figure 16 | Patterns of equity and licensing terms for different research scales of UK universities.

Source: UCI data, Pitchbook based on authors analysis.

Note: Categories are removed where data is based entirely on one university's spinouts.

Chart B in Figure 16 shows that universities with research incomes ranging from £200 to £400 million take a combination of fee-bearing licenses and at least some equity in their spinouts in 40-60% of deals analysed. The flipside to this is that in a similar proportion of deals, they provide the IP to the spinout fee-free. It suggests that, for this group of universities, the decision to seek fees through the IP license is driven by other factors and is largely independent of the amount of equity taken.

By contrast, universities with lower research incomes typically only involve fee-bearing licenses in scenarios where they do not take founding equity within the agreements. Our analysis suggests that the equity-licensing trade is most pronounced for this group of universities.

5.4 Trends in university founding equity over time

A key finding in our 2022 Busting Myths report on UK university approaches to taking equity in their spinouts found that, far from being static and fixed over the long term, many universities have been reviewing their spinout-related policies and approaches, and have been reducing their equity positions over time.

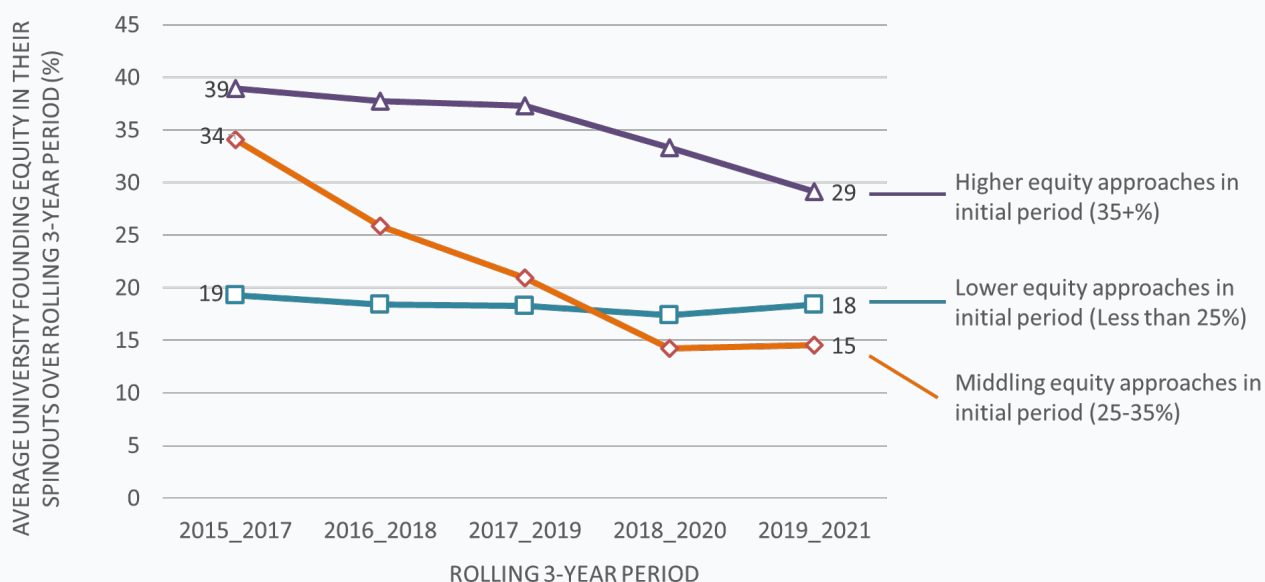


Figure 17| Trends in university founding equity in their spinouts over time.

Source: UCI data, core sample 1.

The empirical evidence gathered as part of our current study validates this finding (Figure 17). It shows that, of the 15 universities in our sample, among those that had higher equity approaches in the initial period (2015-2017), the mean average equity position taken in their spinouts has reduced from 39% to 29% for 2019-2021. For those that had a mid-level equity position in the initial period, the mean average founding equity taken in their spinouts reduced from 34% to 15% for 2019-2021. In the third category – those that had a lower equity approach in the initial period- the mean average equity taken in their spinouts remained very similar (19% for 2015 and 18% for 2019-2021). This finding of a lowering of equity positions for those universities that historically took higher levels of equity in their spinouts is consistent with findings in other studies using different measures of university founding equity (Hellmann et al., 2023; Royal Academy of Engineering & Beauhurst, 2023).

Investment Performance Of University Spinouts



6 Investment performance of university spinouts

In this chapter, we turn our attention to investment outcomes of university spinouts, focusing on the levels of investment secured across early funding rounds, the cumulative investment raised to date, and key spinout exits, including initial public offerings (IPOs) and acquisitions. This provides the basis from which we investigate the relationship between the founding equity a university negotiates with its spinouts and the ability of these companies to raise investment.

Our investment metrics, unless otherwise stated, exclude grant-based investments raised by spinouts, for example, from government innovation funding programmes.

The analysis in this chapter is based on our core sample 2, consisting of 351 spinouts for which we have both complete deal terms information and information on their investments secured (see [Chapter 4](#)). Much of the investment data was provided directly by the universities participating in the study, recognising the very early rounds can be harder to pick up in commercial investment data providers. Where information was missing, we sourced information from PitchBook.

6.1 Scale of investments into UK university spinouts

Almost nine in ten of the university spinouts founded between 2015 and 2021 that emerged from the fifteen universities participating in this study raised at least some investment. They collectively raised a total of £7.6 billion in investment between the point of foundation and March 2023. For those spinouts that had raised at least some investment, the mean total cumulative investment raised was £23.8 million (median of £3.6 million).

Table 11| Scale of investments raised by university spinouts founded between 2015 and 2021.

Source: UCI core sample 2, spinouts that have raised at least some investment in a relevant round, Pitchbook based on authors analysis.

INVESTMENT INTO UNIVERSITY SPINOUTS FOUNDED BETWEEN 2015 AND 2021

Investment round	Number of spinouts	Total investment raised (£ millions)	Mean investment (£ millions)	Median investment (£ millions)
First investment round	308	567	1.8	0.6
Second investment round	224	1,053	4.7	1.2
Total cumulative investment raised up to March 2023	308	7,570	23.8	3.6

At the first round of (non-grant) investment, the spinouts in our sample raised a mean average of £1.8 million (median of £0.6 million). Where spinouts have raised a second round of investment, the mean average second raise was £4.7 million (median of £1.2 million). This increase is consistent with the growth trajectories of spinout companies requiring increasing investment as they continue to develop the technology and invest to scale.

Table 12 | Number of spinouts founded between 2015 and 2021, and the scale of investment corresponding to the top 10% of the investment rounds.

Source: UCI core sample 2, Pitchbook based on authors analysis.

INVESTMENT INTO TOP-PERFORMING UNIVERSITY SPINOUTS FOUNDED BETWEEN 2015 AND 2021			
Investment round	Number of spinouts in top 10% investments	Mean investment (£ millions)	Median investment (£ millions)
First investment round	31	11.4	6.0
Second investment round	23	27.7	29.1

When we further limit our sample to those university spinouts that raise the most in their first round, the median first investment raise increases dramatically to £6.0 million (up from £0.6 million per spinout across the whole sample) (Table 12). For the second round, the top performing spinouts that raised the top 10% investments raised a median of £29.1 million. While these dramatic increases can be attributed in part to the types of technologies being commercialised, and in particular by the prevalence of pharmaceutical and biotechnological innovations within our sample, it also reflects the inherently skewed distribution of spinout potential, where a few enterprises will attract substantial investments while the majority secure comparatively smaller amounts.

Early investments into spinouts emerging from universities in different parts of the UK

Table 13 breaks down our sample of spinouts to compare the investment raised by those emerging from universities based within the Golden Triangle and those based in the Rest of the UK. On average, it is clear that spinouts emerging from universities within the Golden Triangle raise more than those from the Rest of the UK at each of the first and second (non-grant) investment rounds. They have also raised more cumulatively since the point of foundation up until the end of 2021. This reinforces the growing evidence of the importance of geography within the UK in influencing the investment potential of university spinouts.

Table 13 | Comparing the investment raised in different funding rounds by university spinouts emerging from universities in the Golden Triangle and Rest of the UK.

Source: UCI core sample 2, UCI data, Pitchbook based on authors analysis.

Investment round	Golden Triangle			Rest of the UK		
	Number of spinouts	Mean investment (£ millions)	Median investment (£ millions)	Number of spinouts	Mean investment (£ millions)	Median investment (£ millions)
First investment round	189	2.5	1.0	119	0.7	0.3
Second investment round	137	5.6	2.0	87	3.3	0.8
Total cumulative investment raised up to March 2023	196	32.3	5.5	122	10.1	1.9

Cumulative total investment raised by university spinouts

Figure 18.A presents information on the cumulative investment raised by spinout ventures (from all sources, including grants) categorised into three distinct periods to reflect the time-dependent development pathways of spinouts (i.e. that older spinouts will likely have had the need and opportunity to raise more than younger spinouts).

Particularly noteworthy is the substantial increase in the average total cumulative investment raised by older spinouts compared to younger companies; the median cumulative raise for spinouts aged 7 to 8 years was close to £10 million (mean of £59.9 million), compared with a median of £4.1 million for 5 to 6-year-old spinouts and £2.8 million for 3 to 4-year-old companies. These differences will be driven in part by the impact of the developmental timeline on the financial needs of these spinout companies.

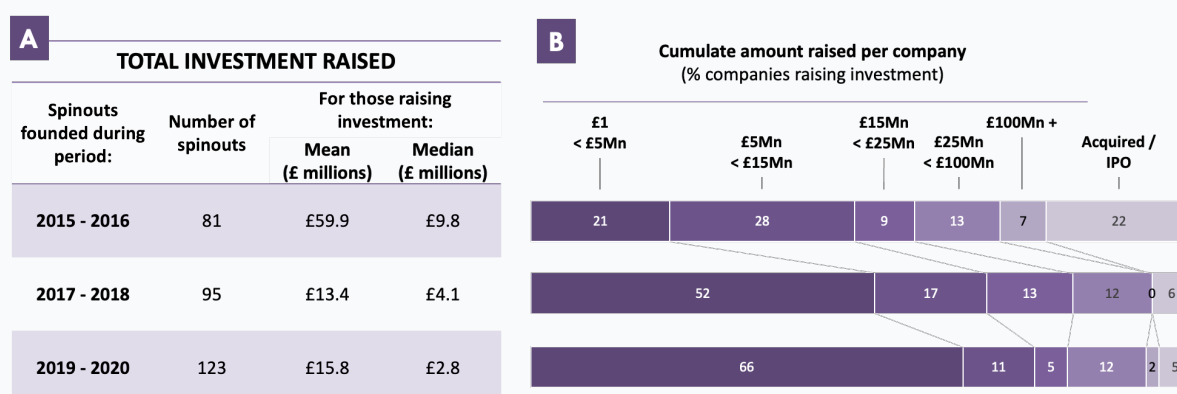


Figure 18 | Total investment and exits of university spinouts founded in different time periods.

Source: UCI data, Pitchbook based on authors analysis.

Figure 18.B offers additional insights into the funding and success trajectories of these spinout ventures. Notably, 51% of the 7 to 8-year-old spinouts in our sample secured investment exceeding £15 million or achieved a favourable exit in the form of an IPO or acquisition; 20% raised more than £25 million, and 22% went to an IPO or were acquired. Perhaps expectedly, the proportion raising significant amounts of investment or achieving a positive exit reduce for younger companies. This reinforces the correlation evident between the maturity of a spinout venture and its ability to attract substantial funding and achieve successful exits in the form of acquisitions or IPOs.

Diving further into the 27 spinouts in our sample that have been acquired, Table 14 also shows that spinouts that ended up being acquired secured higher median investments at both the first and second rounds than those that have not been acquired.

Table 14 | Investment raised and acquisitions for university spinouts founded between 2015 and 2020.

Source: UCI data, Pitchbook based on authors analysis.

Note: The rate of acquisitions of spinouts, while highest during the period 2015-2016, is similar for time periods 2017-2020. We therefore believe it is justified to look at the wider period 2015-2020 for this analysis.

INVESTMENT RAISED AND ACQUISITIONS (2015 – 2020)			
Spinout acquired	Median first investment raise (£ millions)	Median first and second investment (£millions)	Number of spinouts
Yes	1.2	3.0	27
No	0.6	1.5	247

6.2 Investment patterns for spinouts linked to different universities and locations

We now delve more deeply into exploring how the investment success of spinouts varies by ventures emerging from different types of universities based in different parts of the UK.

Investment success of spinouts linked to universities with different scales of research base

Unlike patterns in the average level of university founding equity in their spinouts, which were relatively similar across universities with different scales of research base, we see much bigger differences in the ability of university spinout companies to raise initial investment (Figure 19.A). This figure shows that spinouts from the largest research universities (mostly based in the Golden Triangle) raised significantly larger investments than spinouts from other academic institutions during their first non-grant funding round. Note that spinouts from this group of universities also exhibit a much higher variation around the median, although even companies from these universities raising below-average

investment are still typically raising more than spinouts emerging from universities with smaller research bases.

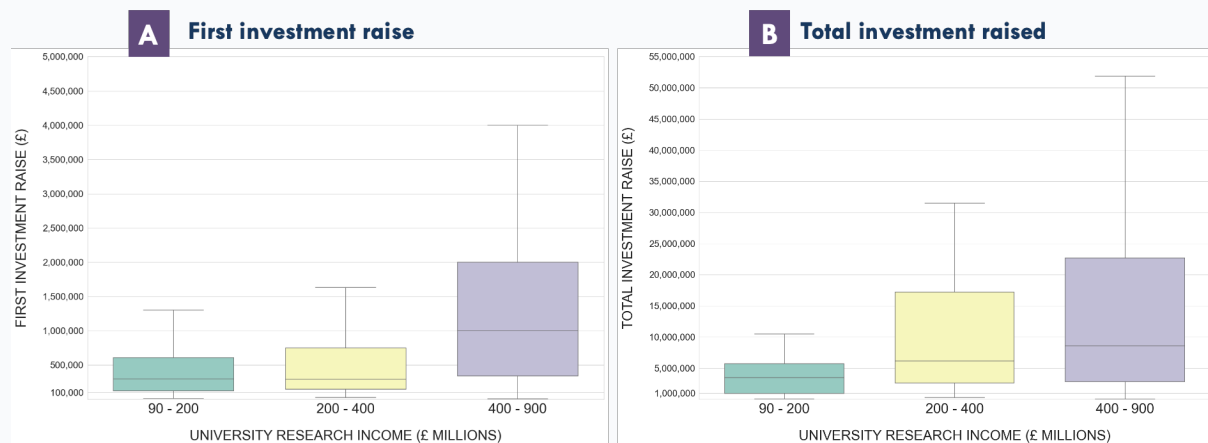


Figure 19| Scale of investment raised by spinouts linked to universities of different scales of research income.

Source: UCI data, Pitchbook based on authors analysis.

Note 1: The sample for first investment raise is limited to spinouts founded until the end of 2021. The sample for total raise is limited to spinouts founded until the end of 2018, recognising that newly founded spinouts cannot compare to established ones.

Note 2: We performed two-sided Welch's t-tests. The mean first investment for spinouts linked to universities with £400-£900 million of research income is statically different from the means observed in the other groups.

Beyond these largest research universities, the median first investments raised by spinouts in other university groups was relatively similar, as was the distribution around the median.

When shifting our focus to total investment raised by spinout companies that have operated for five years or more, we observe that spinouts associated with the largest research universities exhibited the highest median figure, standing at £7.7 million (Figure 19.B). Interestingly, however, spinouts linked to universities with research incomes ranging between £200-400 million now appear to be raising *comparable* amounts to those originating from the largest universities in terms of total investment secured. This marks a noteworthy shift compared to their performance during the initial investment round, where they exhibited similarities to universities with smaller research scales.

This finding raises important questions about the development pathways of spinouts from different types of universities and warrants further research to understand key drivers at different stages of development. In particular, it would be useful to understand the influence of the initial resources and capabilities of the spinout endowed in part by the university at the point of foundation on the development pathway and the ability of the spinout to scale.

Given the influence of the pharmaceuticals and biotechnology sector on investment trends – due not least to the substantial capital requirements for innovation in this sector, and the prolific generation of such spinouts by large universities – Figure 20 presents the investment patterns for our sample

excluding pharmaceutical and biotechnology spinouts. We find similar patterns of investment potential across university types, reaffirming that these trends are not only shaped by the pharmaceuticals and biotechnology sector.

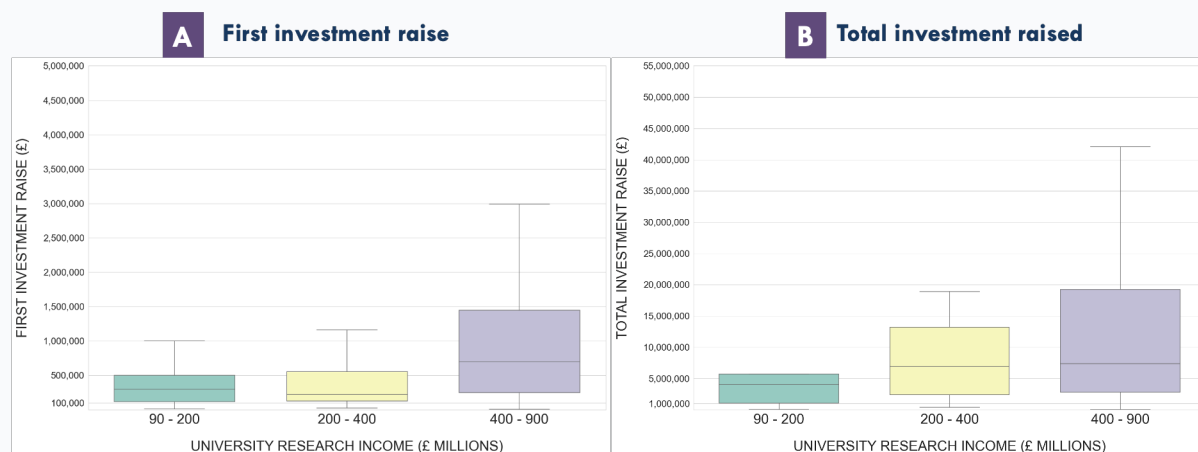


Figure 20| Scale of investment raised by spinouts linked to universities of different scales of research income excluding pharmaceuticals and biotechnology sector.

Source: UCI data, Pitchbook based on authors analysis.

Note 1: The sample for first investment raise is limited to spinouts founded until the end of 2021. The sample for total raise is limited to spinouts founded until the end of 2018, recognising that newly founded spinouts cannot compare to established ones.

Note 2: We performed two-sided Welch's t-tests. The mean first investment for spinouts linked to universities with £400-£900 million of research income is statically different from the mean observed in the group with £90-£200 million.

Investment success of spinouts linked to universities in different parts of the UK

We now break down the sample into spinouts emerging from universities based in the investment hotspot of the Golden Triangle and those based elsewhere in the UK where access to investment is harder. Here, we find that spinout companies associated with universities located within the Golden Triangle (which, in our sample, is dominated by those linked to universities with research incomes exceeding £400 million) raised larger amounts of investment than those located elsewhere. This held true both for their initial funding rounds (for the spinouts founded between 2015 and 2021) and when considering cumulative investments over time for spinouts aged five years or older (Figure 21).

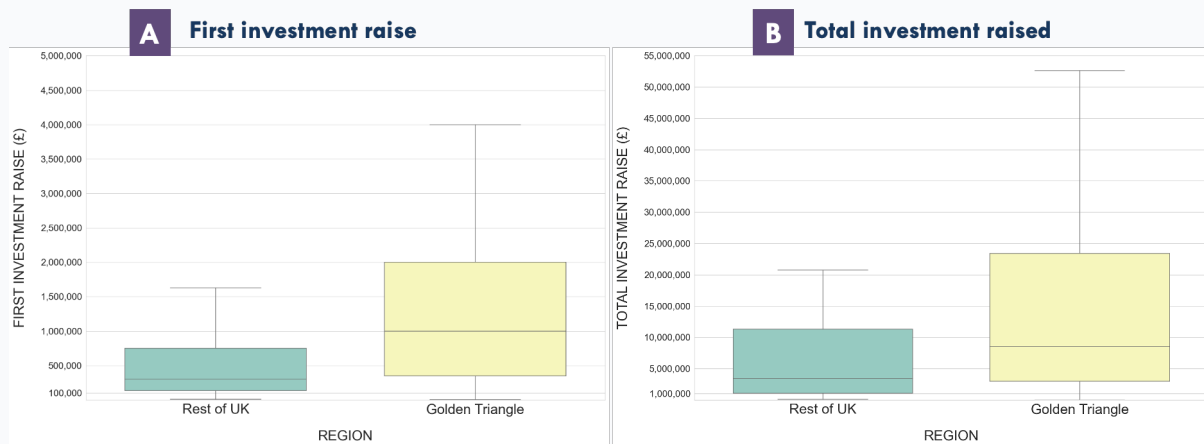


Figure 21 | Scale of investment raised by spinouts linked to universities in the Golden Triangle vs the Rest of the UK.

Source: UCI data, Pitchbook based on authors analysis.

Note 1: The sample for first investment raise is limited to spinouts founded until the end of 2021.

Note 2: We performed two-sided Welch's t-tests. The mean first investment for spinouts in Golden Triangle is statically different from the mean first investment in the rest of the UK.

6.3 Ability of the UK to retain value from their spinouts

In recent years, considerable policy attention has been given to efforts to strengthen the ability of universities to produce high-potential spinouts, with the ambition that this will help to drive a science- and technology-led economy that opens up and secures new wealth-creating opportunities for the benefit of the UK. Within this debate, there have been suggestions, however, that while the UK is performing well in producing spinouts – and in section 3.3, we show that many larger research universities in the UK compare well with their peers in the US – we struggle to retain them in the UK over the longer term.

One major challenge in retaining value created by spinouts as they grow is that they can become increasingly geographically mobile as they scale and require access to new or significantly expanded sets of capabilities (skills, facilities, infrastructure, etc.), development partners, key early markets, and finance among other things. Where these are more competitively accessed or acquired abroad, or where the innovation and business environment is more competitive elsewhere, there can be pressures to expand or relocate outside the UK.

Figure 22 provides some synthetic examples (based on aggregated experiences of real-world spinout cases) of the development of the geographic footprint of spinouts as they grow and scale. For example, in Spinout 1, they emerge from a particular university in a region of the UK. As they develop and employ more staff, they retain their headquarters and R&D activity co-located with their parent university but open manufacturing facilities in another part of the country. By contrast, Spinout 2 is acquired by a multinational organisation, and their operations are moved abroad. For Spinout 3, as they develop, they realise they need to relocate to another part of the UK to remain competitive.

Spinout 4 begins its life co-located with its parent university. As they scale they secure major investment from overseas and decide to relocate their headquarters in that country. They retain their original site as an R&D facility and open a manufacturing plant in a third country. In each of these examples, the geographic mobility of the spinout shapes where value is realised – for example, through jobs being created, wages paid, goods and services procured, and taxes paid.

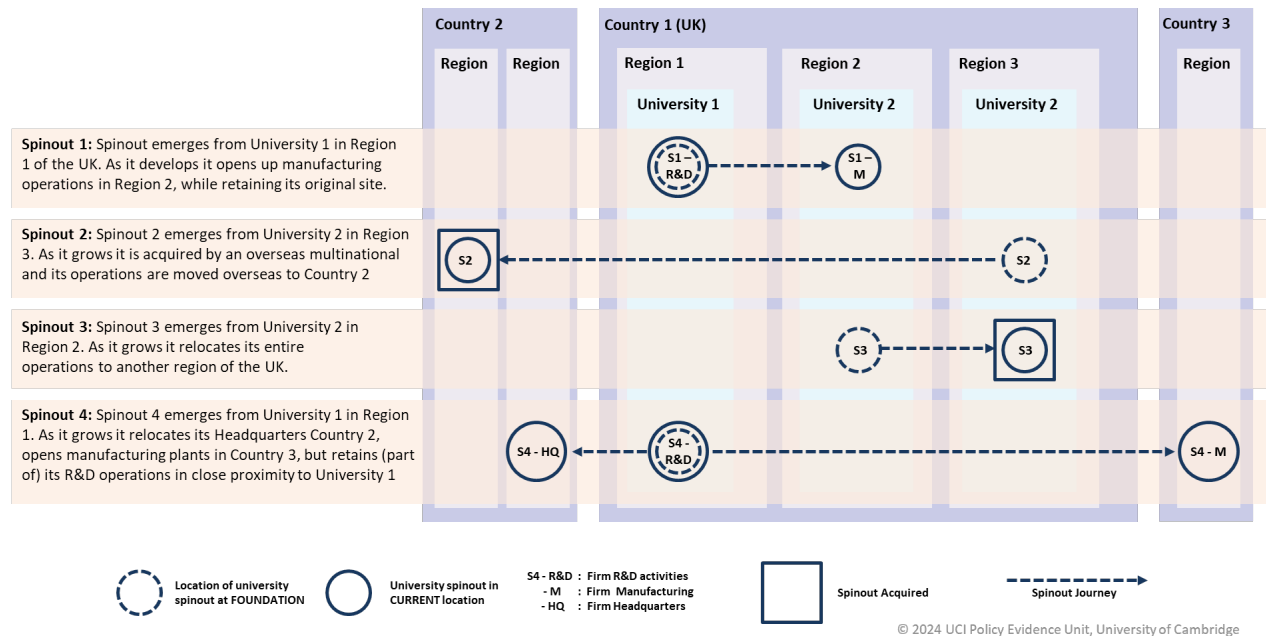


Figure 22| Synthetic examples of the geographic mobility of spinouts (based on aggregations of real-world examples).

There are a number of ways of examining the extent to which the UK is able to capture long-term value from its spinouts. One approach is to examine how the employment footprint evolves geographically as it develops. This was beyond the scope of this study and the data available, but is the subject of a new study by the Policy Evidence Unit for University Commercialisation and Innovation.

Other approaches include:

- Looking at the extent to which spinouts choose to pursue an Initial Public Offering (IPO) in the UK or list on a stock exchange in another country. This can provide an indication of the attractiveness of, and confidence in, the business and investment climate to enable companies to scale into significant global corporations.
- The location of companies acquiring UK-based spinouts. Acquisition by companies headquartered and based overseas can weaken ties between the spinout and the UK, and increase the likelihood of further development overseas rather than at home.
- The location of investors involved in spinout deals as they grow and scale. If spinouts are forced to look overseas for investors for larger funding rounds as they scale, it is likely that this increases pressures on the spinout to expand (and/or move) operations overseas rather than at home.

To examine long-term trends on IPO locations, we draw on the full sample of spinouts provided to us by the 15 universities participating in our study and founded between 2002 and 2021¹⁰. Using this sample, we leverage information provided by PitchBook and other sources to identify whether the spinout had listed on a stock exchange and identified where globally it (first) listed.

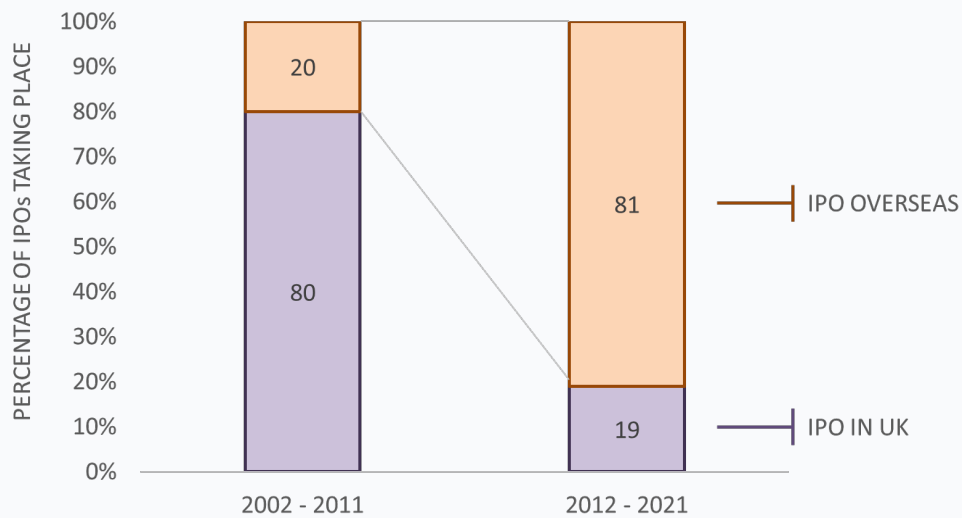


Figure 23 | Location of Initial Public Offerings (IPOs) of spinouts for different time periods.

Source: UCI data, Companies House data, Pitchbook based on authors analysis.

Figure 23 presents the results. It shows that during the early period 2002-2011, 80% of spinout IPOs took place on UK-based stock exchanges. This reverses, for the more recent period 2012-2021, 80% of IPOs taking place overseas (the vast majority on the US NASDAQ). Diving further into the data reveals another trend: during the earlier period 2002-2011, there was a greater balance of IPOs for life science spinouts and spinouts in other industrial sectors (approximately 60:40). For the period 2012-2021, just 13% of IPOs in our sample were for spinouts outside the life sciences industry.

We draw on the same sample and leverage information available in PitchBook and from other sources (e.g. Companies House) to identify whether the spinout had been acquired and the company that acquired it (the acquirer). From this, we then identified the headquarters of the acquirer. Figure 24 presents the results for the two time periods 2002-2011 and 2012-2021. For the ten years 2012-2021, about a third of acquisitions of spinouts from the 15 universities that participated in our study were by UK-headquartered companies. A further 36% were acquired by US-headquartered companies, and 24% by European-headquartered companies.

¹⁰ About a quarter of this sample are pharmaceutical and biotechnology companies.

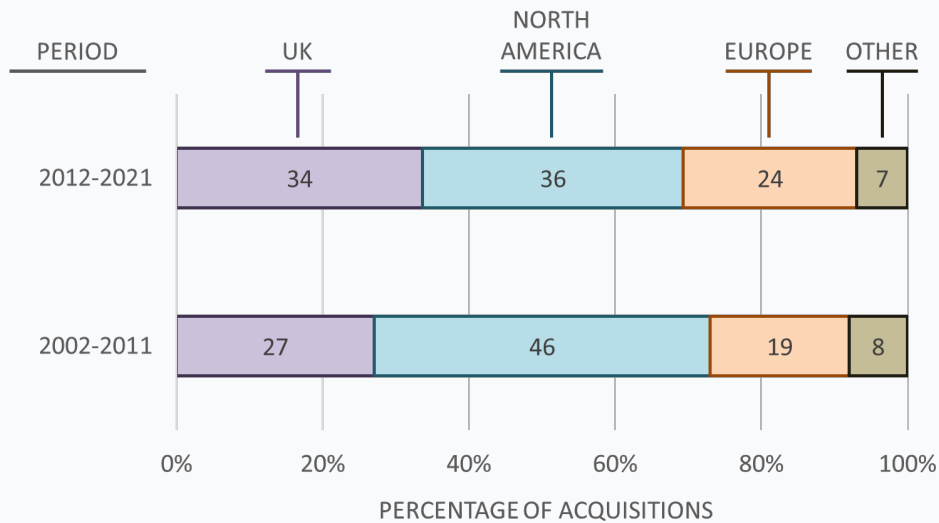


Figure 24| Location of the acquirer’s headquarters for UK-based spinouts founded in different time periods that have been acquired.

Source: UCI data, Companies House data, Pitchbook based on authors analysis.

Our third analysis focuses on the location of investors investing in the spinout as it grows and scales. To drive this analysis, we focus only on those spinouts founded between 2012 and 2021 represented in PitchBook and for which both deal and investor information were available. This allowed us to examine the progression of deals as spinouts grow and scale and how the location of investors shifts for deals of different sizes. The investor location is determined by the investor headquarters¹¹.

We first look at the locational composition of investors involved in spinout deals of different sizes. Spinout deals can involve multiple investors. We isolated the headquarters location of each investor and we examined whether the deals involved UK-based investors only, a mix of UK and overseas-headquartered investors, and overseas-headquartered investors only. Figure 25 shows that for smaller deals (up to £1 million and excluding grants), the vast majority of deals (75%) were driven by UK-based investors. As deal sizes increase, many more deals begin to involve overseas investors. For deals up to £100 million, this happens alongside UK-based investors. For the largest deals (above £100 million), just over half of the deals identified were driven by overseas investors alone, while the rest were a mix of UK and overseas investors.

¹¹ Of course, some investors will have offices in the UK. Adjusting for this should be the subject of further work.

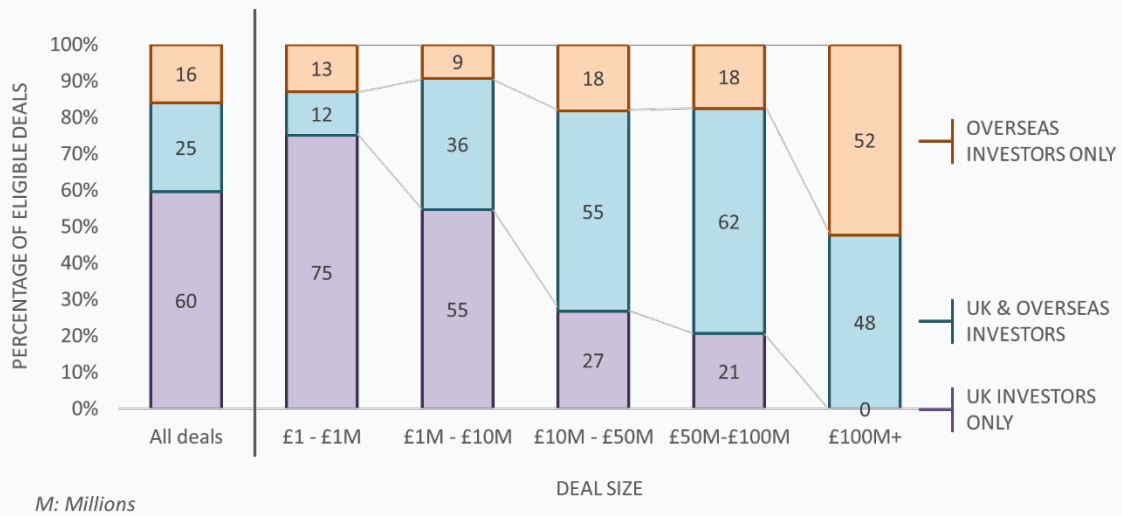


Figure 25| Locational composition of investors (based on investor headquarters) involved in spinout deals of different sizes for spinouts founded between 2012 and 2021.

Source: UCI and Pitchbook data based on authors analysis.

Note: Analysis is based on spinouts with deal and investor location information available in PitchBook. Excludes grants.



Figure 26| Location of lead investors in spinout deals of different sizes for spinouts founded between 2012 and 2021.

Source: UCI and Pitchbook data based on authors analysis.

Note: Analysis is based on spinouts with deal and investor location information available in PitchBook.

We were also able to isolate the lead investor and their headquarters locations for most of the eligible deals (excluding grants). Figure 26 presents the proportion of deals led by investors based in the UK, in North America, and in other geographies. The trend is clear; while most deals up to £10 million are led by UK-headquartered investors, as deals go beyond this threshold, we see the growing importance of overseas investors in leading deals, particularly from North America. Indeed, for deals between £50 million - £100 million, 47% of deals in our sample of UK-based spinouts were led by investors headquartered in North America, while just 32% of deals were led by UK-headquartered investors. For deals above £100 million, this rises to 56% of deals being led by US-headquartered investors, with just 22% led by investors headquartered in the UK.

Overall, the evidence points to the growing importance of overseas markets, investors, and companies for enabling UK-based spinouts to grow and scale into large, global corporations. This may weaken the ties of these companies to the UK, increase pressures on them to expand their operations overseas, and reduce the ability of the UK to capture long-term value from its spinouts. Further work should be undertaken to further investigate and validate this finding, with implications for policy development in the UK.

University Equity And Investment



7 University equity and investment

Having presented information on key patterns and trends in university founding equity negotiated at the point of foundation of their spinouts, and on the investment success of these companies, we now turn to investigating the relationship between these key variables. The shape of this relationship is at the heart of the current policy debate on university spinouts, with some claiming that higher levels of university founding equity in a spinout make it harder for spinouts to raise investment.

This section examines this relationship in some detail, first using descriptive methods, before moving to develop and run a statistical model able to investigate how investment success is influenced by university founding equity controlling for a range of other characteristics and conditions. We focus our analyses on examining three specific hypotheses:

- **Hypothesis 1:** When accounting for variations in spinout types and other control variables, a higher level of university founding equity is associated with a lower amount of external investment raised from private investors.

A key finding from our descriptive analysis is that the largest research universities produce more spinouts in absolute terms every year (Chapter 3). It has been suggested by technology transfer practitioners that this absolute scale of activity results in greater and more regular exposure of the TTOs involved in spinout negotiations to the key trends, preferences, and conditions of the investment markets in the key technology spaces and sectors their spinouts are operating in. This, it is argued, allows them to understand changing investor preferences regarding deal terms (including equity). It also allows them to build close working relationships with a wider range of investors, which increases mutual understanding of each other's preferences, approaches, and constraints, while also making it easier for investors to identify and understand the value proposition. Previous research has shown that investors with experience investing in university spinouts behave differently to those with limited or no experience and prioritise different factors – including seeing fewer issues around joint ownership of IP – when deciding whether to invest (Wright et al., 2006).

Furthermore, as evidenced in the HMT-DSIT-commissioned independent review of spinouts (HM Treasury & DSIT, 2023), the absolute scale of spinout production by a university can yield benefits, suggesting critical mass effects may be at play. For example, universities may find it easier to justify the investment necessary to build up the scale and breadth of professional technology transfer support required to support the process. Economies of scale and scope mean they can build up a greater range of support, experience, networks and so on across a wider range of technology/ sector spaces to provide more focused support. The increased scale of activity, coupled with the scale of the university, may also raise the bargaining power of the university with investors, making it easier to negotiate terms more closely aligned with their preferences.

Lastly, universities that produce high volumes of spinouts, which are able to attract investment and grow, will develop a track record and reputation for spinout success. This, we argue, will signal to investors that they are able to produce an ongoing pipeline of investable IP. We then suggest that this will reduce the effect of equity terms on the ability to complete spinout deals, with other factors likely to be more important.

As a result, we suggest that, for the largest spinout-producing universities, equity terms will not be a key driver of spinout deals, with factors much more important in driving investment decisions. By contrast, we suggest that universities with lower levels of spinout production will have to reduce their equity (and other deal terms), even if this means deviating from their policies, in order to successfully complete the spinout deal. This leads to our second key hypothesis:

- **Hypothesis 2 (largest spinout producers):** When accounting for variations in spinout types and other control variables, for spinouts emerging from universities with the largest production of spinouts, university founding equity will have no effect on the scale of initial investment raised by the spinout. By contrast, for spinouts emerging from universities with lower levels of spinout production, higher levels of university founding equity are associated with lower amounts of external investment raised in the first round.

We also know from the evidence presented in this report that spinouts emerging from universities based in entrepreneurial hotspots of the UK raise more investment initially and overall. We suggest that universities based in entrepreneurial hotspots (which includes most of the largest research universities) have easier access to a wider range of investors, resulting in greater competition for investment into their spinouts. This proximity also makes it easier for universities to build closer relationships with investors, leading to a greater mutual understanding of spinout opportunities (including the value proposition, team potential, etc.), university approaches and constraints. As a result, universities in entrepreneurial hotspots are more likely to be able to successfully implement their own spinout equity policies regardless of the level of equity sought. For these universities, we would therefore expect to see no statistically significant relationship between university founding equity and initial investment raised by their spinouts. By contrast, universities in weaker entrepreneurial ecosystems find themselves in weaker bargaining positions and have to trade off equity and other deal terms in order to secure the spinout deal. We would, therefore, expect to see a statistically significant relationship between university equity and investment in spinouts. This leads to our third key hypothesis:

- **Hypothesis 3 (entrepreneurial hotspots):** When accounting for variations in spinout types and other control variables, for spinouts emerging from universities in entrepreneurial hotspots, we do not observe any relationship between university founding equity and initial investment. By contrast, for spinouts emerging from universities based in weaker entrepreneurial ecosystems, higher levels of university founding equity are associated with lower amounts of external investment raised in the first round.

We have made every effort in the development of our datasets to focus on investments acquired from market-based sources and exclude public grants. This approach allows us to target our study at testing the hypothesis at the centre of the spinout debate in recent years, that higher levels of university founding equity in spinouts make them less attractive to *private* investors.

The analyses in this section are based on our core sample 2, focusing on the 308 spinouts in our sample that emerged from 15 different universities across the UK with complete information on deal terms and initial non-zero (non-grant) investments raised. Recall also that we have deliberately excluded any

equity taken by the university for cash investments it makes into the spinout and focus specifically on the equity sought for other reasons, in particular, the support provided and IP transferred into the company to drive its development.

7.1 University equity and spinout investment: a descriptive investigation

Our descriptive analysis of the relationship between university founding equity in a spinout and the investment it raises begins by comparing the medians (and distributions around the median) of these two key variables. We do this first for universities with different scales of research base, for universities based in different parts of the UK, and finally for spinouts operating in different industrial sectors. We then examine how the initial investment raised by spinouts varies for spinouts with different levels of university founding equity.

7.1.1 Comparing the average equity and investment raised in spinouts

Comparing spinouts associated with universities with different scales of research base

In section 6, we observed that universities with research income exceeding £400 million tend to secure higher initial investment amounts. However, as Figure 27 illustrates, this pattern is not reflected in the distribution of university founding equity in our core sample 2. Regardless of research income levels, universities exhibit comparable median equity allocations in spinouts.

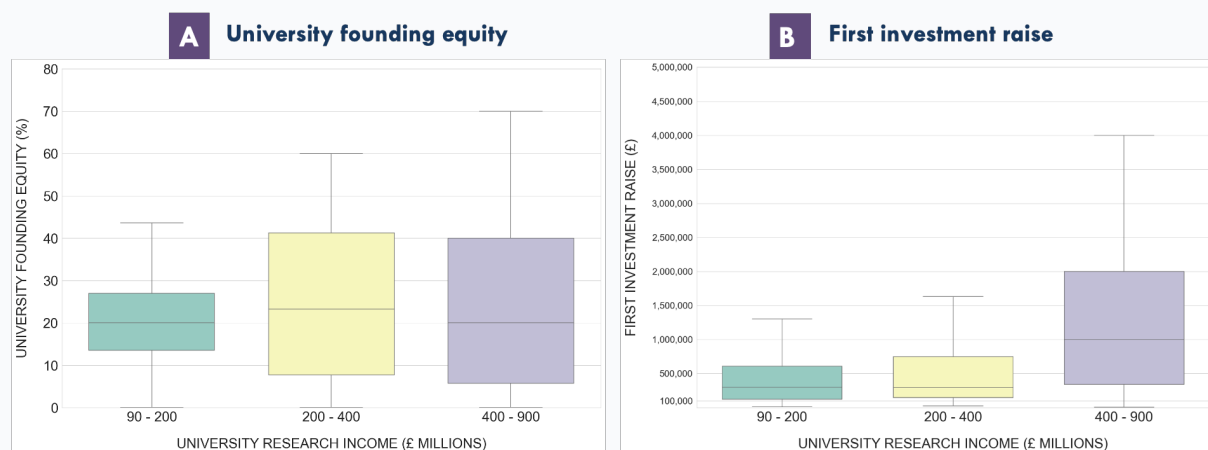


Figure 27| University founding equity and investment for different types of universities based on the scale of research income.

Source: UCI data, Pitchbook based on authors analysis.

Note: We performed two-sided Welch's t-tests. The mean first investment for spinouts spun out of universities with research income between £400-900 million is statistically different from the means observed in the other groups.

We conducted two-sided Welch’s t-tests to assess the means of the initial investment and university founding equity. The results confirm that the mean first investment raise for universities with research incomes exceeding £400 million is statistically distinct from the means observed in the other categories. However, the means of equity do not exhibit significant differences across these categories.

It is also worth noting that as research income increases, the variability in equity distributions also tends to increase. This may suggest that universities with different approaches to negotiations may result in similarly good early outcomes in terms of investment potential.

Comparing spinouts associated with universities based within and outside the Golden Triangle

The following chart compares the median and distribution of university founding equity in their spinouts with the first investment raised by these companies for spinouts emerging from universities based within the Golden Triangle and those located elsewhere in the UK¹². Based on our core sample 2, we observe that universities in the rest of the UK tend to take higher equity when there is no fee or royalty-bearing license, while the reverse pattern occurs in universities within the Golden Triangle (Figure 28).

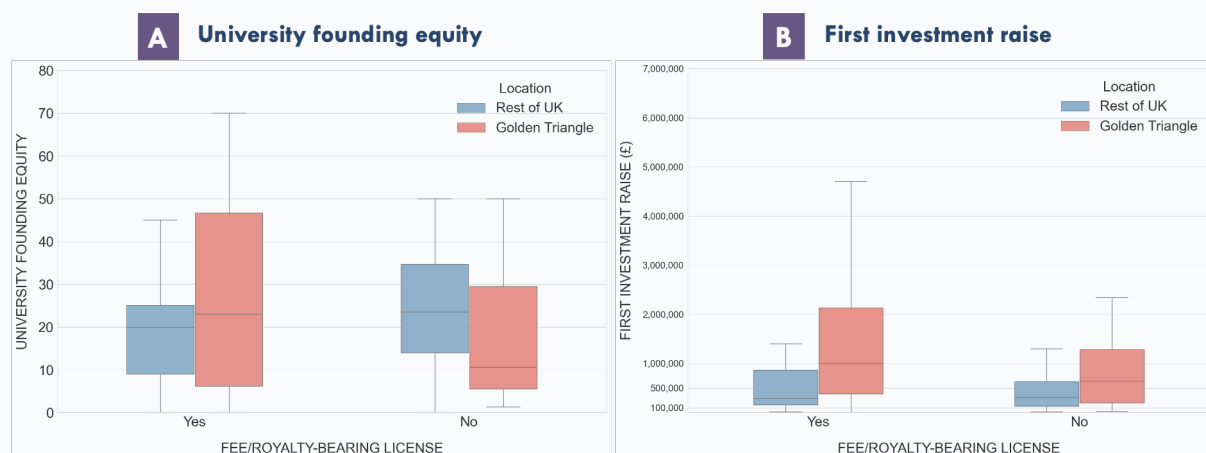


Figure 28| University founding equity and scale of investment raised by spinouts for different licensing terms: deep dive in location, Golden Triangle versus Rest of the UK.

Source: UCI data, Pitchbook based on authors analysis.

Note: We performed two-sided Welch's t-tests. The mean first investment and the mean university founding equity for spinouts spun out of universities within the Golden Triangle and with a fee/royalty-bearing license are statistically different from those without a fee/royalty-bearing license. In the presence of a fee/royalty-bearing license, the mean first investments for spinouts within the Golden Triangle and the rest of the UK are statistically different.

¹² We were not able to examine differences across more finely grained geographies due to the sample sizes being relatively small and becoming dominated by the spinouts of a single university.

In comparison to the rest of the UK, spinouts spun out of universities within the Golden Triangle raise larger initial investments, regardless of whether a fee/royalty-bearing license is present. However, when universities have such licenses, there is increased variability. This variation may be influenced by specific sectors, like pharmaceuticals and biotechnology.

Comparing spinouts operating in different industrial sectors

Figure 29 presents a comparison of the median university founding equity in their spinouts and the investment raised by these companies for spinouts operating in different industrial sectors. We limit our attention here to the sectors with at least 40 spinouts in our sample. We observe comparable median equity levels in sectors such as IT-software, IT-hardware, and healthcare devices (Figure 29), while the median university founding equity in pharmaceutical and biotechnology sector spinouts is statistically higher at 25%. Once again, it is worth noting that there is substantial variability in university founding equity across all sectors, and particularly in the pharmaceuticals and biotechnology sector.

Looking at the scale of the first investment raised by the same sample of spinouts, the same pattern is observed as in equity; spinouts in the pharmaceuticals and biotechnology sector raise on average more than spinouts in operating in other sectors (and this mean is statistically different based on a two-sided Welch's t-test), with wide distributions for each sector around the median.

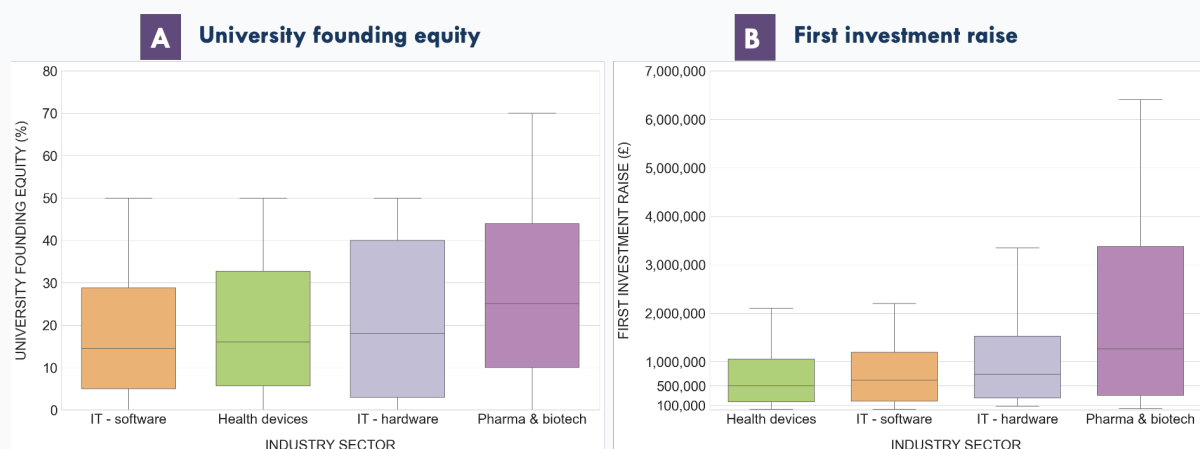


Figure 29 | University founding equity and scale of investment raised by spinouts for different industries.

Source: UCI data, Pitchbook based on authors analysis.

Note: We performed two-sided Welch's t-tests. The mean first investment for spinouts in the pharmaceutical and biotechnology sector is statistically different from the means observed in the other groups. The mean university founding equity of IT-software and pharmaceuticals and biotechnology sectors spinouts are statistically different.

Figure 30 dives deeper into the distributions of university founding equity and initial investment raises for university spinouts specialising in Artificial Intelligence and Machine Learning (AI/ML) technologies across various industrial sectors. Notably, the median founding equity for AI/ML spinouts in health

tech, at approximately 30%, is higher than for AI/ML spinouts in other sectors, where the median is 10% or less. Looking at the investment raised for this sample of spinouts, we find that the median first investment raised by AI/ML spinouts in the health-tech and pharma/biotech sectors is much higher than those entering the health devices and IT-software sectors, although the distributions around the median are also very large.

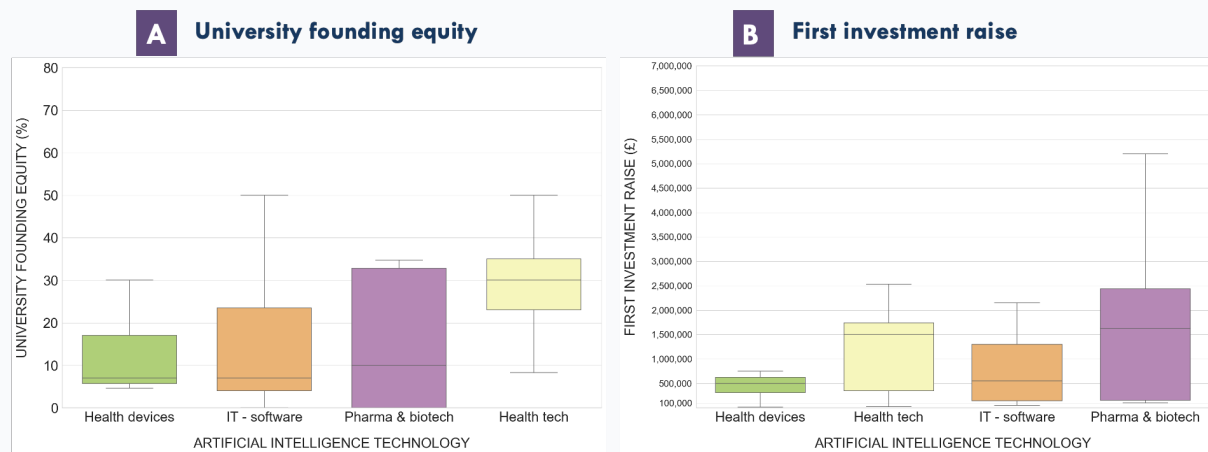


Figure 30| University founding equity and scale of investment raised by spinouts for artificial intelligence technology for different industries.

Source: UCI data, Pitchbook based on authors analysis.

Note: We performed two-sided Welch's t-tests. The mean university founding equity of health tech spinouts is statistically different from that of healthcare devices and IT-software spinouts.

7.1.2 Descriptive analysis of the university founding equity and investment relationship

We now turn to more explicitly linking the investment raised by spinouts to the levels of university founding equity. The charts in Figure 31 present the median investment amounts raised during the first and second investment rounds, for spinouts categorised by varying levels of university founding equity. Additionally, the percentage of deals involving fee/royalty-bearing licenses within each equity category is displayed below the charts.

Regarding the first investment round, there is no evident correlation between the median investment raised across the various equity categories, as substantial variations in investment distributions are observed within each category. This suggests that spinouts with diverse university founding equity levels are capable of securing investments of comparable magnitudes. Notably, spinouts falling under the high equity category (40% or more) stand out, raising more investment than those with lower university founding equity.

Various factors could influence this phenomenon. These factors may include specific sectors, such as pharmaceuticals and biotechnology; a case of self-selection, where universities may opt for higher equity in spinouts with greater growth potential; or it could be attributed to a signalling effect. The act of universities retaining higher equity stakes may signal a greater level of confidence in the spinout's value proposition, which, in turn, could attract more investors to participate in the venture.



Figure 31 | Investment raised by spinouts for different university equity categories.

Source: UCI data, Pitchbook based on authors analysis.

Note 1: AD corresponds to Anti-dilution.

Note 2: We performed two-sided Welch's t-tests. The mean first investment raise for the equity category 40% plus differs from the mean first investment raise for the equity categories 10%-20%, 20%-30%, 30%-40%, and equity with anti-dilution provisions. The means of second investment raise are not statistically different as pairs of two.

Also worth noting is that despite the low median raise of the 'zero-equity' category, many spinouts in this category are able to secure higher investments than those with higher levels of university equity. Most of these deals often involve a fee-/royalty-bearing license.

When analysing the second investment round (Figure 31.B), a positive relationship between the median university founding equity levels and the amount of investment raised becomes apparent. However, the distributions around the median are large in each category suggesting, only a weak correlation.

Deep dive into the pharmaceuticals and biotechnology sector and AI technology

Figure 32.A presents a deep dive into the relationship between university founding equity and investment raised by spinouts operating in the pharmaceuticals and biotechnology sector. For this sample of spinouts, there seems to be no obvious correlation between equity taken by a university at spinout foundation and the amount of investment raised. However, it is notable that spinouts with either higher university equity levels or minimal equity (but often with fee-/royalty-bearing licenses) are capable of securing higher investment levels in the initial funding round.

Limiting our sample to spinouts commercialising AI technologies (into different industrial sectors), Figure 32.B shows that, in contrast to the pharmaceutical and biotechnology sector, AI spinouts with university founding equity ranging from 10-20% have a higher median first investment raise compared to spinouts with lower university equity levels.

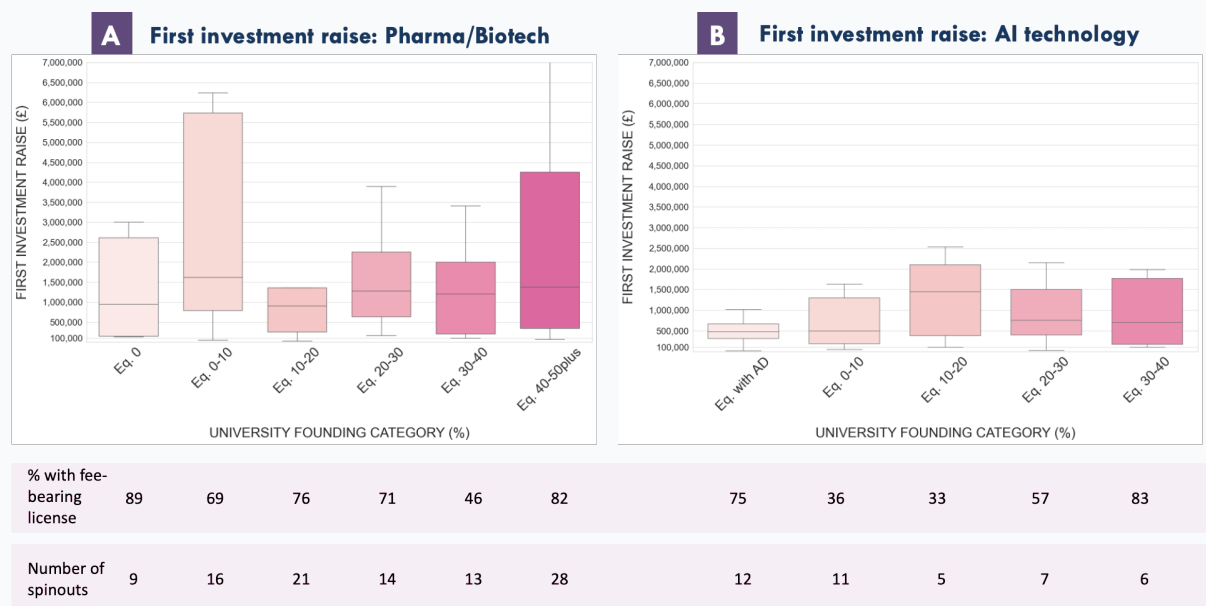


Figure 32 | Investment raised by spinouts for different university equity categories: deep dive into pharmaceuticals and biotechnology sector and AI technology.

Source: UCI data, Pitchbook based on authors analysis.

Note 1: The sample for cumulative first and second investment is limited to spinouts founded up until the end of 2020.

Note 2: We have excluded the equity categories with less than five data points from the charts.

Note 3: We performed two-sided Welch's t-tests. **Chart A:** The mean first investment raise for the equity category 40% plus differs from the mean first investment raise for the equity category 10%-20%. **Chart B:** The means of investment are not statistically different as pairs of two.

Deep dive into the location of Golden Triangle versus the Rest of the UK

Figure 33 presents data on the median initial investment raise and the associated variation for spinouts with different levels of university founding equity and originating from universities located within the Golden Triangle (dominated in our sample by institutions with research incomes exceeding £400 million), and from universities based in the rest of the UK (dominated by universities with research incomes less than £400 million).

Within the Golden Triangle, we observe a potential 'U-shaped' relationship between university equity and the amount of initial investment raised by spinouts. Specifically, spinouts with higher university equity positions and those with 10% equity or less tend to raise more capital than those with equity levels falling within the 10-20% range. It is worth noting that the percentage of deals involving a license is most prevalent among spinouts with no equity or higher equity positions in this context.

Conversely, outside the Golden Triangle, the pattern appears to reverse. Spinouts in which the university equity share falls within the 10-30% range tend to raise more capital than those with lower or higher equity. Notably, except for cases where equity is 10% or less (excluding those with anti-dilution), many fewer spinout deals involve a fee-bearing license compared with those emerging from universities in the Golden Triangle (dominated here by very large research universities).

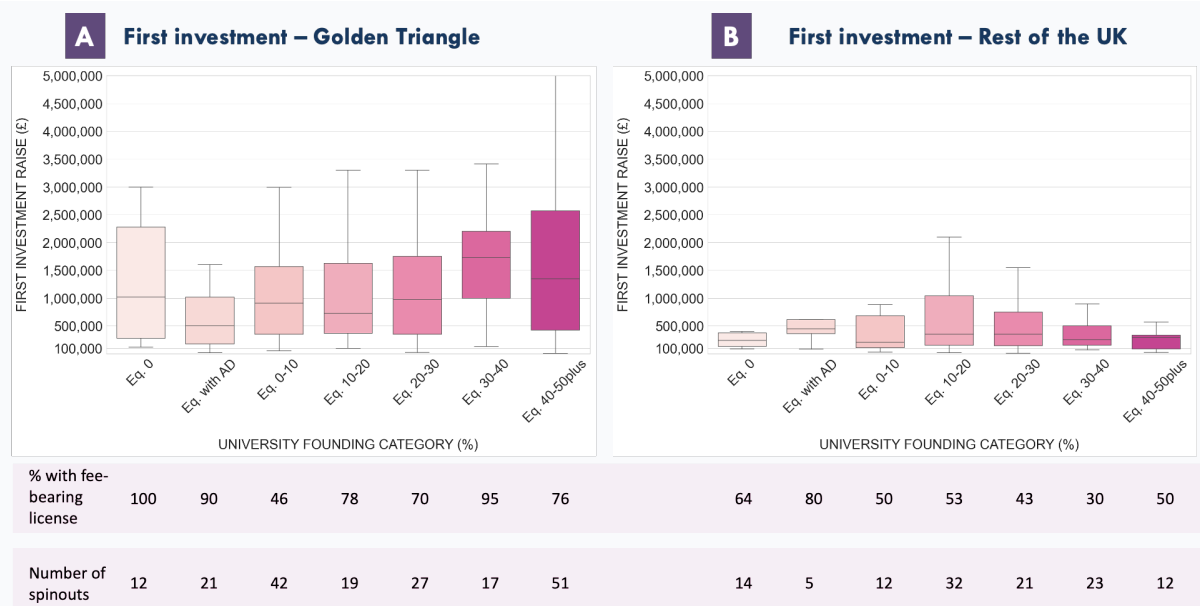


Figure 33 | Investment raised by spinouts for different university equity categories: deep dive in location, Golden Triangle versus Rest of UK.

Source: UCI data, Pitchbook based on authors analysis.

Note 1: AD corresponds to Anti-dilution.

Note 2: We performed two-sided Welch's t-tests. The means of first investment for the categories 40-50% and Eq. with AD in Golden Triangle (Chart A) are different with statistical significance. The means of first investment for the categories 40-50% plus and 10-20% in the rest of the UK (chart B) are different with statistical significance.

7.1.3 University founding equity for different levels of the cumulative investment raised by spinouts to date

Additionally, we examined how university founding equity in their spinouts varied for companies raising different cumulative amounts of investment over their lifetime to date. We focused our attention here on companies at least five years old (ventures founded between 2015-2018).

Figure 34 shows that the median university founding equity of spinouts that raised between £25 million and £100 million and those that raised more than £100 million is considerably higher compared to spinouts falling within other investment bands or those that have been acquired. However, this figure also shows that the distributions around the median for each of the categories are very high; it is, therefore, unsurprising that we do not find the differences to be statistically significant (based on two-sided Welch's t-tests).



Figure 34 | University founding equity for different scales of total investment raised by spinouts founded between 2015 and 2018.

Source: UCI data, Pitchbook based on authors analysis.

Note 1: The sample for total raise is limited to spinouts founded until the end of 2018, recognising that newly founded spinouts cannot compare to established ones.

Note 2: We performed two-sided Welch's t-tests. The means of university founding equity distributions of the various groups are not statistically different.

7.2 University founding equity and initial investment success

We now move on from the descriptive analyses of the relationship between university founding equity in spinouts and their investment success to develop and run statistical models to test the three central hypotheses at the heart of our study. Our model focuses on the hypothesis that higher levels of university equity are associated with lower levels of investment raised by spinouts and explores whether this relationship varies based on whether or not the university is based in an entrepreneurial hotspot or has significant and regular exposure to the spinout investment market.

Note that statistical modelling of this type of model provides a useful tool to help us explore how our main variable of interest – university equity – interacts with other key factors and variables while controlling for underlying structural differences that might influence the outcome. **It is important to note, however, that a positive and statistically significant result does not necessarily imply causation (i.e. that higher equity directly causes a particular outcome).** Rather, it suggests a statistical relationship between the two variables, implying that they are associated in some manner.

7.2.1 The model, data and methods

We have constructed a statistical model to test our hypotheses that controls for structural differences between spinouts and conditions of the universities from which they are emerging and the places and sectors into which they are entering. The model is structured as follows:

$$\begin{aligned} & \textit{Investment raised} \\ & = f \left(\begin{array}{l} \textit{university equity, wider deal terms, university controls,} \\ \textit{location controls, market controls} \end{array} \right) \end{aligned}$$

Dependent Variable:

- **First round investment:** Value of investment raised at the first funding round from non-grant sources. This variable has a skewed distribution (a few spinouts raise a lot of investment, while many raise much less). As is standard practice, we, therefore, transform the variable using its natural logarithm.

Explanatory variables:

- **University founding equity:** This variable is defined as the amount of equity taken by the university in the spinout at the point of foundation. It includes equity received by the university as a result of its ownership of the IP, its support for its generation and development, conditions of research grants, and for supporting the spinout's development both pre- and post-foundation. We deliberately exclude equity taken by the university for any cash investment it makes into the company.

In light of our descriptive analysis, we include both linear and non-linear terms for the equity variable to test for the presence of a non-linear (potentially U-shaped) investment relationship between equity levels and initial investment success.

Control variables (wider deal terms):

- **Fee/royalty-bearing license:** A binary variable indicating whether the deal includes a fee- or royalty-bearing license. This helps us to control for other deal terms that affect the financial terms of the deal.
- **Anti-dilution provisions:** A binary variable denoting whether the university equity stake incorporates anti-dilution provisions. This helps us to control for other deal terms that affect the financial terms of the deal.
- **No equity spinouts:** A binary variable (1/0) for spinouts where there is no university equity at the point of foundation. This recognises that the spinout cases in which universities take no equity are likely to be specific types of commercialisation opportunities and merit distinguishing from those where at least some equity is taken.

Control variables (universities):

- **University dummy:** A binary variable (1/0) for each university. This university-level dummy variable seeks to capture university-specific conditions, such as university policies, cultures, and research scale. As most universities in our sample are located in different parts of the country, this dummy will also partly capture local economic conditions. We explored the potential of using alternative controls for university and local economic conditions, such as research income and local productivity measures; however, these typically resulted in substantial collinearity issues with other control variables, which could act to reduce the statistical power and interpretability of our model.

Control variables (locations):

- **Local gross value-added growth at the ITL3 geographical level (ITL3 GVA growth) at spinout foundation:** The international territorial level (ITL) is a geographic standard for referencing the subdivisions of the United Kingdom for statistical purposes. ITL3 is one of the levels of regional disaggregation in the UK. It is made up of 179 areas¹³. This level of detail allows for a more nuanced understanding of the economic performance of different parts of the country. This variable shows the growth rate of the local gross value added, providing insights into the dynamics of economic performance in the area at the point at which the spinout is founded.

Control variables (markets):

- **Pharmaceutical and biotechnology sector dummy:** A binary variable (1/0) indicating whether the spinout belongs to the pharmaceutical and biotechnology sector. Pharmaceutical and biotechnology companies typically have to raise significantly more investment than other companies in order to commercialise their technologies.
- **Growth of industry-specific external investment (industry-specific investment growth) at spinout foundation:** This variable refers to the percentage change in the three-year rolling

¹³ More details available at <https://www.ons.gov.uk/methodology/geography/ukgeographies/eurostat>, accessed on 2nd January 2024

average of external investment in a specific industry over time. The growth rate is measured in the year of foundation of the spinout. It helps us to control for the dynamics of investment in the sector that the spinout is entering at the point of its foundation.

Sample and methods:

Our regression models are based on our **core sample 2** dataset. This comprises the 351 spinouts emerging from the 15 different universities across the UK participating in our study that have complete information on deal terms (equity, licenses, and anti-dilution) and initial (non-grant) investment raised. These data were supplied directly to us by the TTOs of the participating universities. Full details on the dataset and how the data were collected are provided in section 4.

We employ an Ordinary Least Squares (OLS) regression with robust standard errors to analyse the data. We first apply our model to the whole sample and then to a number of sub-samples in order to examine hypotheses 2 (largest spinout producers) and 3 (entrepreneurial hotspots). We identify the subsamples in the following ways:

- **Largest spinout producers:** Our analysis of the UK spinout landscape reveals that a small group of universities produce significantly more spinouts than others, driven not least by the scale of their research base. Four of them participated in our study. We, therefore, distinguish between spinouts emerging from these four largest spinout-producing universities (all of which are in Oxford, Cambridge and London) and universities producing lower absolute numbers of spinouts.
- **Entrepreneurial hotspots:** We distinguish between spinouts affiliated with universities based in Oxford, Cambridge and London (the Golden Triangle) area and those emerging from universities in other parts of the UK. Note that the vast majority of spinouts linked to Golden Triangle in our sample are from the largest research universities.

For each regression, we undertake a series of diagnostic tests to examine the reliability of the regression results (and, crucially, whether the coefficients are likely to be unbiased and consistent and whether the statistical significance of each variable is reliable). These include an examination of the normality of the residuals, the influence of outliers, the presence and effects of collinearity, homogeneity of the variance of the error terms, and whether the model may be mis-specified.

Previous studies have raised the potential issue of endogeneity in regressions investigating this type of relationship. We also acknowledge that this could affect our study. This phenomenon arises when the independent variable of interest (in our case, university founding equity) is not randomly assigned but instead influenced by the same factors that affect investment, leading to potentially biased estimates. For example, where universities do not have fixed equity policies, universities may take higher equity in spinouts with great potential of success, which makes them also likely to raise higher scale of investment. In that case, university founding equity and the level of initial investment raised is probably endogenous; here, the coefficient would not reflect a causal effect of equity on investment, but rather shared underlying drivers. In cases of fixed equity policies, university founding

equity and investment are not influenced by the same factors; universities will take a predetermined amount of equity independent of the potential, the sector or any other factor related to the spinout.

Based on our descriptive analysis, we also suspect a quadratic (non-linear) form of relationship between equity and investment raised. While instrumental variables (IV) are a common approach to address endogeneity, their application becomes complex when dealing with non-linear relationships. Finding valid instruments for both the linear and squared terms of university equity would be challenging, and potential instrument weaknesses could then exacerbate bias. Additionally, implementing quadratic IV procedures adds complexity and reduces overall estimation efficiency.

We, therefore, opted for a regression model approach that incorporates a quadratic term for university equity. While this approach does not directly address endogeneity, it acknowledges the possibility of a more nuanced relationship and avoids the limitation of a simple linear model. This allows us to capture potential non-linear effects, where the impact of equity on investment might weaken or even reverse at higher levels. However, it is important to note the limitations of this approach. Endogeneity, if present, could still bias our estimated coefficients, potentially overestimating the true impact of university equity on investment. Thus, we encourage future research to explore this further.

7.2.2 Regression Results

The results emerging from our regression models are presented in Table 15. Before diving into the results, it is important to note that the regressions presented in this table all passed key diagnostic tests, suggesting that the coefficients and statistical significance of variables are likely to be reliable and consistent.

Table 15| OLS regression results investigating the relationship between university founding equity and initial investment raised by spinouts.

Sample: Spinouts founded between 2015 and 2021 (core sample 2) raising at least some investment.

Dependent variable: Natural logarithm of the amount of investment raised during the spinout's first non-grant funding round.

VARIABLES	Whole sample	Largest spinout producers (hypothesis 2)		Entrepreneurial hotspots (hypothesis 3)	
	(1) All	(2) Top 4 Unis	(3) Other Unis	(4) Golden Triangle	(5) Rest of the UK
University equity	-0.013 (0.576)	-0.048* (0.082)	0.080** (0.027)	-0.054* (0.054)	0.090** (0.011)
(University equity) ²	0.000 (0.633)	0.001* (0.072)	-0.002** (0.019)	0.001* (0.055)	-0.002*** (0.010)
Fee/Royalty IP license (Y/N)	0.237 (0.298)	0.370 (0.243)	0.087 (0.781)	0.472 (0.131)	0.020 (0.947)
Anti-dilution (Y/N)	-0.403 (0.250)	-0.560 (0.125)	1.908*** (0.000)	-0.606* (0.098)	1.955*** (0.000)
No-equity spinouts (Y/N)	-0.035 (0.931)	-0.372 (0.523)	0.822 (0.160)	-0.545 (0.323)	1.122* (0.059)
University dummies (Y/N)†	Included	Included	Included	Included	Included
Local GVA growth	-0.023 (0.206)	0.001 (0.979)	-0.035 (0.119)	0.003 (0.928)	-0.041* (0.073)
Pharmaceutical sector (Y/N)	0.931*** (0.000)	1.119*** (0.000)	0.564** (0.036)	1.049*** (0.000)	0.646** (0.020)
Sectoral VC investment	0.009*** (0.002)	0.010*** (0.003)	0.006 (0.266)	0.009*** (0.004)	0.007 (0.189)
Constant	13.107*** (0.000)	13.079*** (0.000)	11.386*** (0.000)	13.119*** (0.000)	11.214*** (0.000)
Observations	306	181	125	189	117
R-squared	0.306	0.244	0.278	0.243	0.313
Adjusted R-squared	0.252	0.194	0.156	0.192	0.195

Robust p-values in parentheses: *** p<0.01, ** p<0.05, * p<0.1

† Results for individual university dummies are not reported to ensure non-disclosure of results at the university level. This was part of our agreement with the participating universities; that we would limit our reporting to system-level effects and not report on specific universities.

University founding equity

The heart of our hypotheses is the relationship between university founding equity in their spinouts and the initial investment success of these ventures. Across our whole sample, we find little evidence of any statistically significant relationship (negative or positive) between university founding equity and the level of initial investment raised by spinouts. We, therefore, reject our first hypothesis.

Rather, our results suggest a more nuanced and, crucially, *non-linear* relationship between university founding equity and investment success *that varies depending on the context*. In both of our subsamples (largest spinout producers and entrepreneurial hotspots), we find statistically significant relationships, with the shape of the relationship differing based on the specific sample. This suggests different dynamics are at play in different contexts. However, while statistically significant, the scale of effects is weak, with a wide range of levels of university founding equity leading to similar initial investment outcomes.

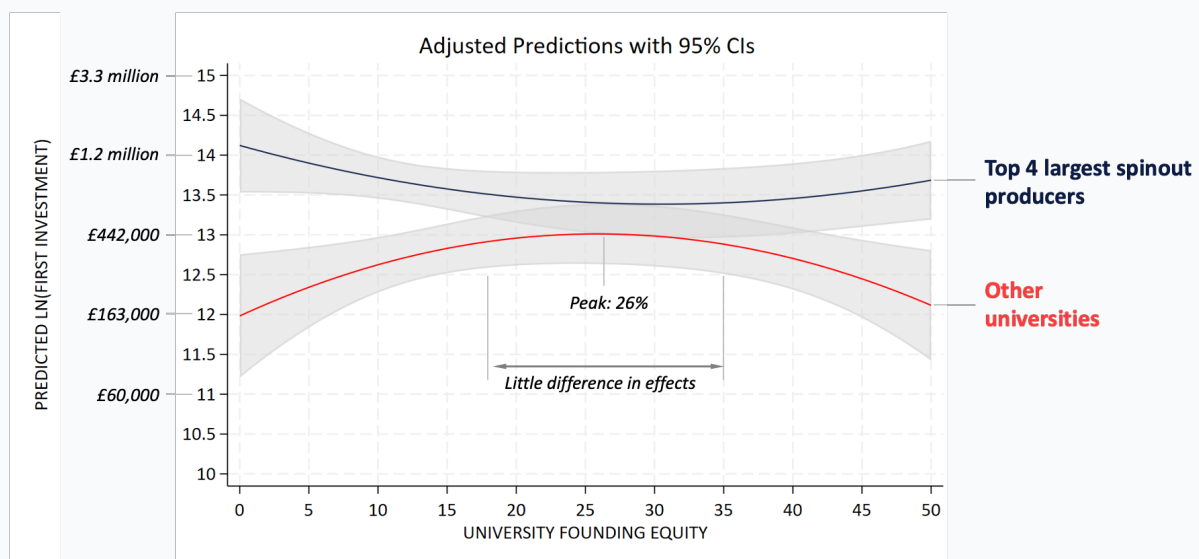


Figure 35 | Predicted (marginal effects) of the natural logarithm of the amount of investment raised during the first (non-grant) funding round for different levels of university founding equity for spinouts emerging from the top 4 universities producing the most spinouts and other universities.

Source: UCI data, Pitchbook based on authors analysis.

Our findings relating to the second hypothesis (largest spinout producers) are visualised in Figure 35, which presents the initial investment for different levels of university equity as predicted by the model, controlling for other factors and conditions. It shows that for the largest spinout-producing universities in our sample (all of which are based in entrepreneurial hotspots in the Golden Triangle), we observe a statistically significant U-shaped relationship between university founding equity and the level of initial investment raised by their spinouts; i.e. spinouts with lower, and higher, levels of university equity were able to raise similar levels of initial investment (Figure 35). However, the scale

of effects is very weak (highlighted by the grey shaded box). This suggests that these types of universities have been able to employ a wide range of equity approaches without harming the investment success of their spinouts.

For universities with lower levels of spinout production (mostly, but not all, based outside the Golden Triangle), we observe a statistically significant *inverted-U* relationship with a peak level of university equity at around 26% associated with raising the highest levels of initial investment (controlling for other factors). However, once again, while statistically significant, the scale of the effect is weak, with the levels of university equity between around 17%-35% (accounting for confidence intervals), all leading to similar levels of initial non-grant investment being raised (Figure 35).

We observe similar patterns for our entrepreneurial hotspot samples, with a statistically significant U-shaped relationship for spinouts linked to universities based within the entrepreneurial hotspots in the Golden Triangle, and an inverted-U-shaped relationship for those outside this area. However, we suggest caution in interpreting this finding as the Golden Triangle sample is dominated by the largest research universities.

Wider deal terms

Other than equity, the presence of a fee-bearing license has no statistically significant effect on the initial investment raised (although the coefficient is positive in all regression models, we cannot say with any certainty that it has a positive effect).

Spinout deals that include some form of anti-dilution approach appear to be positive and statistically significant for universities outside the largest spinout producers universities (and typically located outside the Golden Triangle) once other factors are taken into account. This was surprising, but when digging into the data, this appears to be driven by a particular approach to anti-dilution whereby institutions target a certain level of equity post-initial fundraising.

Other factors (controls)

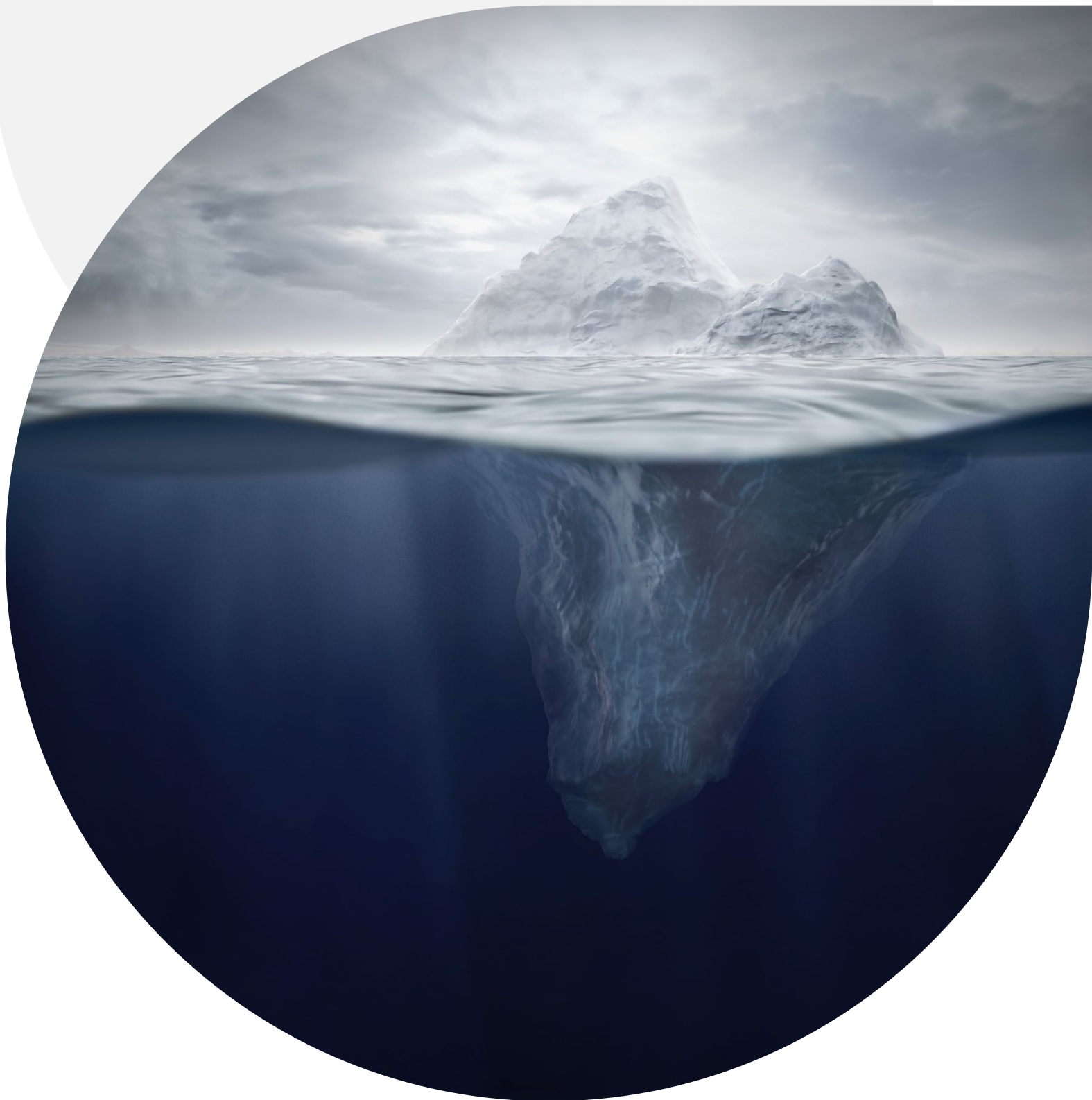
Our regression models attempted to control for a number of different factors, including university-wide policies and conditions, location dynamics and market sector conditions and dynamics. A number of interesting findings emerge here.

First, some university-specific dummy variables are statistically significant, suggesting that, once controlling for other factors (e.g. deal terms and industry), university-specific conditions (internal or local external) can partly explain differences in the level of initial investment raised by their spinouts.

Second, the dummy variable for pharmaceutical and biotechnology spinouts is both positive and statistically significant, likely reflecting that developing biomedical products (e.g. therapeutics) requires significant investment over prolonged periods of time.

Third, spinouts entering industrial sectors in which VC investment is growing typically raise more initial investment than those entering sectors where investment is in decline (i.e. the coefficient on the sectoral VC investment variable is both positive and statistically significant). This suggests that the dynamics of the investment market, alongside deal terms and factors, are also an important factor in shaping the development of spinouts.

Reflections And Moving Forward



8 Reflections and moving forward

This report provides a detailed assessment of the UK spinout landscape, key patterns and trends in spinout production, deal terms and investment into spinouts, and crucially, evidence on the relationship between the amount of university founding equity in their spinouts and the amount of initial investment these companies are able to raise from private sources. This final section of the report brings together the key findings and discusses how we might move forward from here to strengthen the ability of the UK to produce high-value spinouts that deliver benefits for the UK.

8.1 Key Findings

University spinouts are an important driver of entrepreneurial activity in key sectors of the economy

UK universities have become an important driver of entrepreneurial activity in strategically important sectors of the economy, including pharmaceuticals and biotechnology, semiconductors, advanced materials, and healthcare devices. Spinouts from our sample of 15 UK universities (which account for about half of the UK's total spinout production) form an important proportion of a comparable population of UK start-ups founded during the same period. When limiting our attention to those start-ups in these sectors that attract the most investment, the importance of university spinouts becomes even clearer; spinouts make up 60% of the top 25 pharmaceutical and biotech start-ups ranked by total investment raised; 44% of healthcare devices start-ups; and 28% of semiconductors start-ups.

Overall, while the number of academics engaging in this activity is small, our findings validate the importance of universities in a science- and technology-driven economy, and in particular, university spinouts as an important route for commercialising emerging technologies and breakthroughs to open up new opportunities for wealth creation.

The UK faces challenges in retaining value from spinouts as they scale and mature

Our findings point to the growing importance of overseas markets, investors, and companies for enabling UK-based spinouts to grow and scale into large, global corporations. This may weaken the ties of these companies to the UK and increase pressures on them to expand their operations overseas. It (tentatively) suggests that the UK struggles to fully capitalise on the value potential created by its spinouts. Further work should be undertaken to further investigate and validate this finding, with implications for policy development in the UK.

UK universities have increased spinout production, with spinouts raising increasing amounts of investment

In recent years, UK universities have increased their production of spinouts, producing an average of 180 spinouts per year over the past five years. Based on official national data, there was an active spinout population of over 1,900 companies in 2022. New spinouts are being established at a consistent pace, with few exiting the market, suggesting robust survival rates.

The production of spinouts correlates strongly with the amount of research undertaken by a university, resulting in universities with larger research bases being the primary drivers of spinout creation, accounting for 67% of spinouts between 2019 and 2022. Once normalised by the scale of the research base, smaller research universities, on average, produce a similar number of spinouts per £100 million of research income as their larger counterparts. However, there can be large differences in spinout production rates between individual universities, even within each size group, with the breadth of experience much larger for smaller research universities.

Alongside an increase in spinout production, we also find a significant increase in the amount of external investment being secured by university spinouts. Consistent with wider patterns of equity investment, much of this investment is concentrated in spinouts emerging from universities based in the Greater South East of the UK. This is driven not just by the number of spinouts produced by these universities. We also find that for universities with research bases exceeding £90 million, regardless of their size, spinouts affiliated with universities in the Greater South East attract significantly higher external investment per company compared to those in other parts of the UK. Additionally, spinouts from the largest Greater South East universities secure notably more investment per company than their counterparts elsewhere.

UK university spinout production compares favourably with their US counterparts

The UK frequently seeks to compare the spinout performance of its universities to that of the US. Our comparative UK-US analysis shows that spinout production in both countries correlates strongly with the size of the research base of a university, particularly once a certain threshold of research activity is reached (around £90 million). It is then unsurprising that some of the largest US universities produce many more spinouts in absolute terms, given their research budgets are significantly larger than even the largest institutions in the UK. When normalised by the scale of the research base and looking at groups of similarly sized universities in the US and UK, we find that larger research universities in the UK (with research incomes exceeding £200 million) generate spinouts at a level similar to their counterparts in the US.

UK university founding equity has been trending downwards in recent years

Fifteen universities with research incomes above £90 million provided us with detailed information on their spinout populations and key deal terms negotiated at the point of foundation. The median equity taken by these universities across their spinouts during the period 2015 – 2021 was 20%, with the middle half of the distribution (interquartile range) ranging from 5% to 37%. For spinouts that raised the most initial investment (top decile of investment), universities took a median average of 24% equity in these companies (mean of 27%), with an interquartile range of 7% to 47%. The median university founding equity also varied considerably for spinouts operating in different industrial sectors, from 25% in pharmaceuticals and biotechnology to 10% in IT software.

A second key finding is that consistent with our 2022 Busting Myths report, the average university founding equity in their spinouts has been trending downwards during the 2015-2021 period. In particular, for universities that historically took higher levels of founding equity in their spinouts, the average equity stakes across their spinouts have reduced from 39% to 29%.

Universities outside the largest research institutions are more likely to balance equity terms with fee-bearing licenses in deals

We also find different approaches to balancing equity with fee-bearing licenses to the IP. While the largest research universities appear able to seek fee-bearing licenses in most cases alongside different levels of equity, for universities with research incomes ranging from £200 to £400 million, we observe a nuanced approach to their spinout deals. In approximately half of the spinouts analysed from these universities, the deals involved a combination of fee/royalty-bearing licenses and equity. In contrast, spinouts originating from universities with more modest research incomes primarily take fee/royalty-bearing licenses in scenarios where they take little or no equity. We also find similar trade-offs when we focus our sample of spinouts on those emerging from universities based outside the Golden Triangle (which, in our sample, are mostly from universities with research incomes less than £400 million).

Spinouts from universities in the Golden Triangle typically raise considerably more than others in initial rounds of investment

Based on the median average, spinouts in our sample typically raised £600,000 in their first funding round, rising to £1.2 million in their second round. Consistent with wider evidence, we also find that spinouts emerging from universities based in the Golden Triangle typically raise significantly more at both the first and second rounds compared to those emerging from universities based outside the area of the UK.

There are long development times from initial investments to raising significant financing to drive scale-up or securing a positive exit

Over half of our sample of older spinouts in our sample (founded between 2015 and 2016) have raised more than £15 million or had a successful exit through acquisition or IPO. As expected, this share reduces for more recent companies, likely reflecting the long development times for many spinouts and challenges in securing the necessary financing to scale. Furthermore, we also found that spinouts that were eventually acquired secured higher median first investment and higher cumulative investment in their first and second rounds compared to spinouts that have not been acquired. This suggests, tentatively, that the scale of early raises may provide an indication of acquisition potential, although this would need to be tested and validated further.

There is evidence of only a weak, non-linear relationship between university founding equity and initial investment success of spinouts, with the shape dependent on context.

The core of our study focused on investigating the relationship between the equity a university takes in its spinouts and the initial investment success of these companies. Drawing on both a detailed descriptive analysis and insights from a statistical regression model, we find evidence of a *non-linear relationship* between university founding equity and the level of initial investment secured by spinouts, with the *shape of the relationship dependent on the context*. For the largest spinout producers in our sample (all of which are very large research universities in the Golden Triangle), we find a very weak, albeit statistically significant, U-shaped relationship between university founding equity and initial investment in the spinout, controlling for other factors. The weakness of the

relationship suggests that, for these universities, equity is not likely to be a driver of investment success, with other factors likely to be much more important.

By contrast, for universities in our sample with lower levels of spinout production, mostly based outside the Golden Triangle, we find an inverted-U-shaped relationship between university founding equity and initial investment success (i.e. we observe a peak in initial investment). However, once again, while statistically significant, the relationship is relatively weak, with spinouts with university founding equity levels between around 17%-35%, all associated with similar levels of initial, non-grant investment being raised. This suggests that, for these universities, a broad range of equity approaches, albeit within some limits, appears to lead to similar investment success. The weakness of the relationship again suggests that other factors – such as the strength of the value proposition, team, strength of support available (within the university and in the local ecosystem), access to markets and development partners, and access to investors – may play a bigger role in shaping how much investment a spinout is able to raise initially. Further research should attempt to disentangle the relative roles and importance of these different factors under different contexts.

Keeping our finger on the pulse of the health and performance of the spinout ecosystem, and the conditions and drivers for success, is crucial

Overall, it's important to recognise that our analysis has necessarily relied on historical data of spinouts (spanning from 2015 to 2021). Of course, the success of the spinout ecosystem will be influenced by the social, economic, and political context, as well as the specific conditions, policies, and preferences (of investors, funders, universities, founders, etc.) during that period. Conditions may evolve, and as such, it is essential to approach analyses based on historical data for predictive purposes or policy recommendations with some caution. Acknowledging the dynamic nature of the spinout landscape (market conditions, technology policies, funding availability, investment preferences, university policies, etc.), we believe that it is important to keep our finger on the pulse of the health and performance of the spinout ecosystem, and on the conditions, drivers and preferences shaping success. Regular monitoring of spinout data to investigate trends, opportunities and challenges at a granular level is crucial. This will ensure policies and practices are effectively tailored to the current environment and can be adjusted dynamically as needed.

8.2 Moving forward

Our evidence emphasises the importance of university spinouts for commercialising emerging technologies and ideas to drive innovations and wealth creation in strategically important sectors of the UK economy. Indeed, for some sectors, many of the investment-backed start-ups founded between 2015 and 2022 raising significant investment are spinouts from our sample of fifteen universities.

It is, therefore, crucial that policymakers, funders, universities, investors and others continue to come together to find ways of strengthening the ability of the system to produce more high-potential spinouts able to open up new opportunities for wealth creation both for the UK as a whole and for their local economies. Within this context, we very much welcome the publication of the HMT-DSIT commissioned independent review of university spinouts and the efforts by review chairs Professor

Irene Tracey (Vice Chancellor of the University of Oxford) and Dr Andrew Williamson (Chair of the Venture Capital Committee at the British Private Equity & Venture Capital Association (BVCA), and Managing Partners at Cambridge Innovation Capital), to engage these different stakeholders to identify effective practices and ways the system could be further strengthened.

Moving forward, our evidence study suggests a number of critical areas where we need to make progress: (i) moving the debate beyond its traditional focus on university founding equity to identify other key factors shaping spinout success; (ii) focusing our efforts on understanding how the UK can scale and grow spinouts and capture more value over the longer-term from these ventures; (iii) the need for more data-driven insights to inform policymaking in this area; and (iv) the need to align policy efforts to support spinouts across multiple domains (including not least commercialisation, strategically prioritised technologies, education and skills, business (supply chains, clusters) and trade) as part of the government's ambitions to secure global leadership positions in key technology spaces.

Moving beyond equity

While the level of university founding equity is held up by some as the defining barrier to spinout success, our research does not support this. We found, at best, weak links between university founding equity and the initial investment raised by spinouts, with the relationship non-linear and dependent on context. This prompts a fundamental question as we move forward: If not equity, what other factors drive spinout success?

Our 2022 report started to explore this topic and captured a wide range of barriers, as experienced by TTO Directors, that universities and academic founders have to navigate to facilitate successful commercialisation through spinouts. In addition to deal terms, they highlighted the commercial and technology readiness of the technology/IP; the entrepreneurial capabilities and time availability of academic founders; access to entrepreneurial, commercial, and technical talent to drive the company forward; availability of university resources and support, and processes and cultures conducive to spinouts; and access to an enabling investment environment experienced in engaging with universities to commercialise research. Further research is needed to identify the relative importance of these different factors.

Furthermore, if the equity held by universities in spinouts does not have much influence on the level of initial investment raised, are there other reasons that might shape the approach taken by universities? Equity may play other roles beyond affecting investment capital (examples captured in Figure 36). For example, in addition to incentivising investors to invest, it may play a role in motivating academics to engage with the spinout process; it may influence the efficiency of the negotiation and reduce transaction costs associated with venture formation and operation if, within a given university, it causes frictions; it may create incentives for university leaders to invest more university resources to support the process; and, it may be important for ensuring the fair distribution of downstream rewards across those that contributed to its success. Ultimately, there is likely to be a fine balancing act that has to take place in setting equity to ensure engagement of a number of key stakeholders in the process.

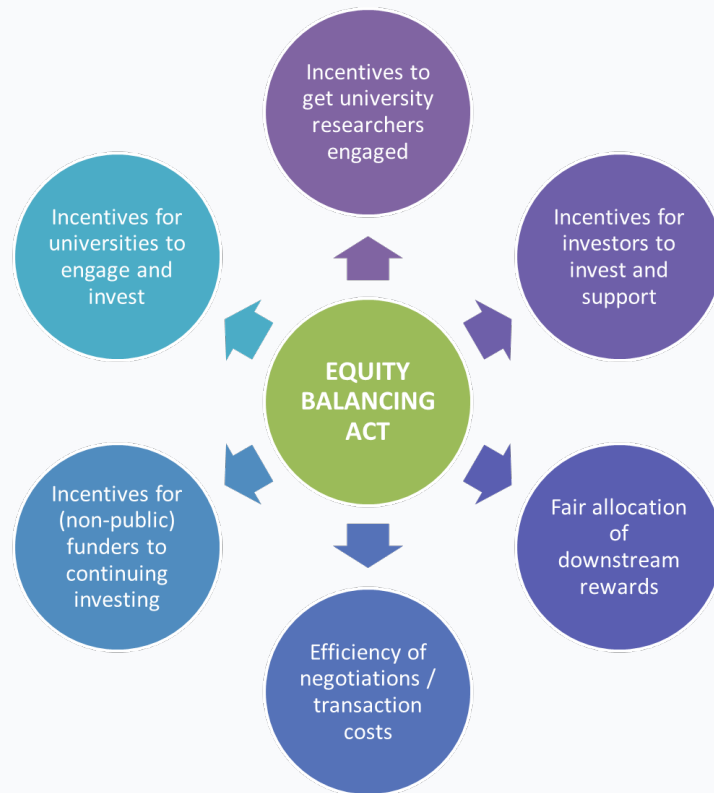
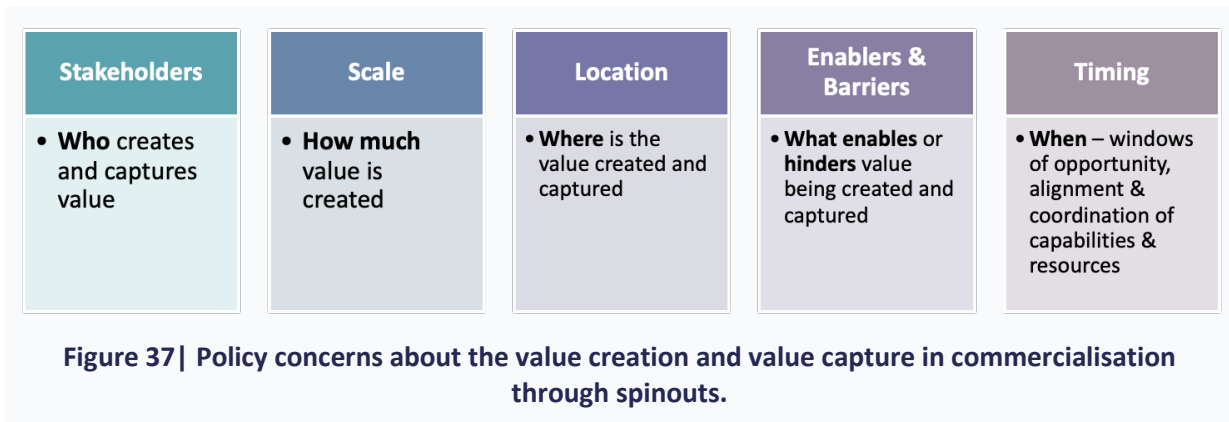


Figure 36| What is the role of equity if it does not affect the amount of investment raised?

A focus on capturing value from spinouts in the UK

As we move forward and invest in stimulating spinout production across the UK, we must also turn our attention to what can be done to anchor these companies in the UK as they scale and grow, and capture much more of the long-term value they unlock for the benefit of the UK. This includes strategies for retaining a greater share of the value generated by spinouts in the region where they are founded. Ultimately, this challenge is a systems problem and would benefit from systems thinking to develop a coherent and integrated solution. Tackling it will inevitably require an integrated cross-government approach that brings together a range of policy areas, including, among others, science and technology, education and skills, business and trade (including supply chains and access to markets), clusters and place, and finance and tax. It will also require a coordinated national-local approach.

Figure 37 illustrates several key questions that could help policymakers start examining where and how the UK can retain more value from their spinouts.



Data-driven insights for effective policymaking

The debate about how to strengthen the UK's ability to produce more, high potential spinouts has long been hampered by the lack of robust data and evidence. This included deal terms as agreed at the point of foundation, which our study has attempted to address. But it also extends to other areas, including fundamentally, the lack of accessible insights on the population of spinout companies emerging from UK universities every year and what they are seeking to commercialise. From a policy perspective, among other things, it:

- Prevents robust and timely evidence from being gathered on key trends, dynamics, opportunities and challenges of the spinout ecosystem and, crucially, for different spinouts commercialising different types of technologies in strategically important areas for the UK;
- Hampers our understanding of the potential of spinouts to help the government deliver on its ambitions in strategically important technology spaces and sectors;
- Hinders our ability to create robust benchmarking tools to support effective practice development within universities;
- Makes evaluating the effects of government policies harder as we have little information on the full spinout population and baselines from which to evaluate change; and,
- Weakens our ability to systematically gather representative and generalisable insights on the health and performance of the UK spinout ecosystem.

We, therefore, need access to better data on spinouts to ensure that policy concerns in this space are well-targeted and addressed effectively. Following the recommendations of the HMT/DSIT Independent Review of University Spinouts, we are committed to contributing to the development of a national registry of spinouts, which will provide a comprehensive overview of the UK spinout landscape and provide a much more robust evidence base from which to inform policy decisions.

The outdated nature of industry classifications poses another significant challenge in understanding the true potential of spinouts to contribute to different emerging and mature technologies and industrial sectors and through this, the future competitiveness of the UK. This is particularly acute for spinouts commercialising emerging platform technologies such as foundational AI technologies, advanced materials, and engineering biology. Existing taxonomies typically force these companies into inappropriate categories, for example, making it almost impossible to distinguish between a company

developing foundational AI technologies from the very large population of ‘software’ and ‘computer programming’ companies that may be leveraging existing AI tools to develop new applications. These distinctions are crucial for understanding the unique potential of these types of companies, their funding and support requirements, and development trajectories.

In response to this challenge, various taxonomies are being developed to address specific problems. For instance, the taxonomy by Sako & Qian (2021) provides a framework for assessing the scale-up potential of AI start-ups. Further investigation in the area is needed to better characterise spinouts and their development trajectories using classification frameworks tailored to the specific needs of policymakers.

Aligning commercialisation policy objectives with the needs of strategically important technologies

The recently published DSIT Science and Technology Framework that set out the UK’s new Science and Technology Superpower agenda argued that *“science and technology will be the major driver of prosperity, power and history-making events this century. The United Kingdom’s future success as a rich, strong, influential country, whose citizens enjoy prosperity and security, and fulfilled, healthy and sustainable lives, will correspondingly depend on our ability to build on our existing strengths in science, technology, finance and innovation.”*

The UK Government has set out clear ambitions to develop a global leadership position in a number of key technologies seen as important for the future of the UK’s economy. Beyond AI, this includes semiconductors, advanced materials, quantum, biotechnology and robotics, among others (Innovate UK, 2023; DSIT, 2023). However, various analyses of the strengths and weaknesses of the UK in these key technology areas, such as advanced materials, point to challenges in our ability to commercialise ideas (BEIS, 2022).

Snippet 2: DSIT – Independent Review of the Future of Compute (DSIT, 2023a)

*... UK AI researchers face significant challenges in obtaining the compute they need...Some researchers rely on international or industrial partnerships to pursue their work, leading to a loss of research independence. This also has implications for oversight and safety, and areas of research that have less direct routes to commercialisation. **Without better access to more compute, breakthroughs may be prevented from diffusing throughout the economy via spinouts and start-ups....***

Snippet 1: BEIS – Advanced Materials – Call for evidence (BEIS, 2022)

*... **Perhaps the most pervasive challenge raised by contributors is that of commercialisation...** Other contributors highlighted that disproportionate focus and resources being expended upon the research stage with little thought on the subsequent development, scale up and commercialisation that are required to bring the breakthrough to market, either from a practicality and feasibility perspective or from a time, finance, resources, knowledge and equipment perspective...*

Government strategies in different sectors and technologies identify key actions needed to bolster the UK spinout ecosystem. For example, the recently introduced battery strategy echoes the findings of the Independent Spinout Review for HMT/DSIT, advocating for cross-disciplinary proof-of-concept funding (DBT, 2023). Additionally, the Independent Review of the Future of Compute underscores the risks associated with inadequate compute infrastructure in the UK and the detrimental effect this is having on the ability to commercialise university research (DSIT, 2023a). This reinforces the

need for targeted investments in infrastructure and access to cutting-edge computing power, a critical resource for many spinouts. The recent national quantum strategy recognises the need to support the UK's "researchers and businesses to translate, demonstrate, and commercialise quantum research", setting out the ambition to establish a 10-year £2.5billion quantum research and innovation programme (DSIT, 2023b). Furthermore, the semiconductor strategy, targeting the UK's strategic leadership in a critical technology with geopolitical ramifications, emphasises the need to de-risk funding, invest in infrastructure, and develop the necessary skills to facilitate the growth of UK spinouts and start-ups (DSIT, 2023c). This aligns with the broader need to create a supportive ecosystem for spinouts across all technology sectors.

While various sector or technology-specific policies already acknowledge the importance of strengthening the UK's spinout ecosystem, a more unified and strategic approach is needed across sectors (DSIT, 2023c). The pressing question becomes: How can we align UK policy objectives across government with the ambition of becoming a global leader in key technologies, leveraging the research output of the UK universities? This strategic alignment is pivotal for realising the UK's aspirations in technological leadership and requires a comprehensive approach that brings together developments across multiple policy domains such as science and technology (research commercialisation, strategic technology prioritisation etc.), economy and finance, geography (clusters, local conditions etc.), education and skills, immigration, business (supply chains), and trade (access to key markets, development partners, and overseas investors etc.). It also needs to be underpinned by a deep understanding of the technological landscape, the potential applications of emerging technologies, and the role that spinouts can play in translating research into commercial success in these key areas.

Snippet 3: DSIT – National Semiconductors Strategy (DSIT, 2023c)

... *The government is looking to holistically address these issues - across sectors (referring to broader factors which the wider technology sector faces which also impact semiconductors). **To attract more investment into the UK, we need to create a strong pipeline of start-ups and spinouts through support for R&D and commercialisation, and providing the conditions to enable more established firms to scale-up.** As part of this the Department for Science, Innovation and Technology will review the pre-*seed/seed funding opportunities available through UK Research and Innovation (UKRI) and public or private business incubators to support start-ups to launch and grow....**

By addressing these challenges and finding ways for the UK to anchor more of the longer-term value unleashed by spinouts in the UK, we can foster a thriving spinout ecosystem that drives innovation, economic growth, and societal benefits for the UK.

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APPENDIX

Data request for Technology Transfer Offices (TTOs)

Between March 2022 and June 2023, we requested access to the internal data of the Technology Transfer Offices within the UK universities. Our data request was structured into two distinct parts:

- **Part 1:** We were interested in creating a historical register of UK university spinouts. Our objective was to compile fundamental information on spinout ventures established over the previous 15-20 years, or as far back as was feasible, given the practical constraints of data collection. Table 16 provides information about the variables we sought and their respective definitions.
- **Part 2:** We requested data from universities to capture the ‘early success’ of spinouts, the university equity stake at the foundation, and some information to identify different types of spinouts, including the technology being commercialised. Our criterion for assessing the ‘early success’ of spinouts was their ability to secure external equity investments, excluding grants. In order to strike a balance between the data collection burden and the need for enough observations to deliver robust analyses, we restricted our request for this information solely to spinouts established since 2015. Table 17 outlines the specifics of our data requisition regarding equity stakes and the measure of ‘early spinout success’.

Table 16| Part 1 of data collection: basic information for understanding spinout ecosystem.

Part 1 data: basic information for understanding spinout ecosystem

Spinouts formed as far back as feasible given burden (15-20 years would be ideal but we recognise this may not be possible / feasible)

Variable	Definition
Spinout name	The name of the spinout
Spinout number (CRN) (if known)	The registration number of the spinout
Spinout website (if known)	The website of the spinout
Incorporation year (if known)	The year the spinout was incorporated
Country of incorporation (if easy to obtain)	The country where the company was incorporated
University faculty / department	Department / faculty / institute of the university where the research was undertaken
Technology Area (if available)	Any internal description of the type of technology being commercialised by the spinout

Table 17 | Part 2 of data collection: equity stakes and early spinout success.

Part 2 data: equity stakes and early spinout success

Spinouts formed since 2015

Variable	Definition
For all spinouts formed since 2015:	
Any university equity in spinout	= Yes / No / Don't know . Indicates whether the university has ever held any equity in the spinout
IP licensed into spinout	= Yes / No / Not relevant . Indicates whether the deal involves a license to the IP (Yes / No). Indicate 'Not relevant' in cases where spinout was not based on any formal IP (e.g. know-how)
License is royalty-/fee-bearing	= Yes / No . Indicates whether the deal involves a royalty- or fee-bearing license to the IP
Only for those spinouts in which the university holds / held equity:	
Foundation year	The year in which the university first took equity in the spinout
University equity (for founding the company, support provided etc.)	University equity stake pre-money (<u>excluding</u> any equity taken for cash investment, equity taken in consideration of an IP license) (% of total equity)
University equity in part/full consideration for an IP license	University equity stake taken in part or full consideration for a license to the IP (% of total equity)
University equity for cash investment	University equity taken in exchange for cash investment into the spinout (% of total equity)
Anti-dilution provisions on university equity stake	= Yes (anti-dilutions included in deal) / No (shares are dilutable). This variable shows whether the deal involves anti-dilution provisions on the university equity stake. Anti-dilution can take different forms from options to 'top-up', pre-agreed payments linked to exit/acquisition, and un-dilutable shares up until a certain financing round (e.g. Series A) or amount raised.
Success metrics data:	
Value of first investment round (£)	Value of investment in £s of the first funding round for the spinout. Exclude grant funding e.g. from Innovate UK
Year of first investment round	Year of first investment round
Type of first investment round (if known/available)	Type of investment round e.g. angel, pre-seed, seed, series A etc.
Value of second investment round (£)	Value of investment in £s for the second funding round for the spinout excluding grant funding
Year of second investment round	Year of second investment round
Type of second investment round (if known/available)	Type of investment round e.g. angel, pre-seed, seed, series A etc.
Total investment raised to-date (£)	Total amount of investment raised by the spinout to-date (from all sources)
Type of last investment round (if known)	Type of last investment round for the spinout

Data sources

This study relies on a variety of data sources, including public, commercial, and proprietary datasets.

Table 18| Data sources that underpin the report's analysis.

DATA SOURCE	PUBLICLY AVAILABLE	SHORT DESCRIPTION
HEBCI Survey	Yes	The HEBCI survey, initiated in 1999, annually compiles financial and output data pertaining to knowledge exchange in higher education. It reports diverse activities, including business and third-sector participation in research, consultancy, and the commercialisation of intellectual property. As far as spinout production is concerned, it publishes aggregated numbers on newly registered spinouts, active spinouts, estimated employment, turnover, and external investment.
AUTM Licensing survey	No; commercial	The AUTM Licensing Survey offers quantitative data on the spinout and licensing activities of US and Canadian universities, hospitals and research institutions.
Companies House data	Yes	Companies House data is the official government register of companies in the United Kingdom, comprising a publicly accessible database with comprehensive information about registered companies. This includes company names, registration numbers, registered office addresses, directors' information, shareholders, financial statements, filing history, mortgages and charges, incorporation documents, and current company status.
Spinouts' website data	Yes	The data extracted from the spinouts' websites was instrumental in triangulating the sector of each spinout.
FAME	No; commercial	The FAME (Financial Analysis Made Easy) database provided by Bureau van Dijk is a comprehensive commercial business and financial database that provides information on private and public companies in

		the United Kingdom. It includes various data, such as financial statements, company profiles, current status, shareholders, and other financial metrics. FAME aggregates information from various sources, including Companies House filings, and presents it in a structured format for easy access and analysis.
PitchBook	No; Commercial	PitchBook is a commercial financial data company that provides information on, among other things, private equity and venture capital investment deals, and mergers and acquisitions. Its platform also offers comprehensive company data, including office locations, shareholders, management teams, industry sectors and verticals, investors, and deals.
UCI Survey	No; provided by TTOs	This is a survey of UK TTO directors conducted by UCI in April-May 2022 about their equity approaches on spinouts since 2015. It includes responses from 24 universities, which cover universities that generated 48% of all UK spinouts between 2015 and 2021 and whose active spinouts secured 71% of all external investment over this period (Ulrichsen, Roupakia, Kelleher, 2022).
TTOs data – UCI sample	No; provided by TTOs	The dataset comprises details about spinouts from fifteen TTOs collected and curated by UCI. This information encompasses registration numbers, founding years, locations, technologies, and departments. For companies established post-2015, the dataset provides comprehensive data on founding deal terms, encompassing university founding equity, licensing terms, and anti-dilution provisions. Furthermore, it includes details about the initial funding rounds (amount, type, year) that can be harder to identify in commercially available databases, and the total amount raised by spinouts.

