July 2024

Artificial Intelligence Sector Study

Research report for the Department for Science, Innovation & Technology (DSIT)

Perspective Economics

Contents

I Executive Summary

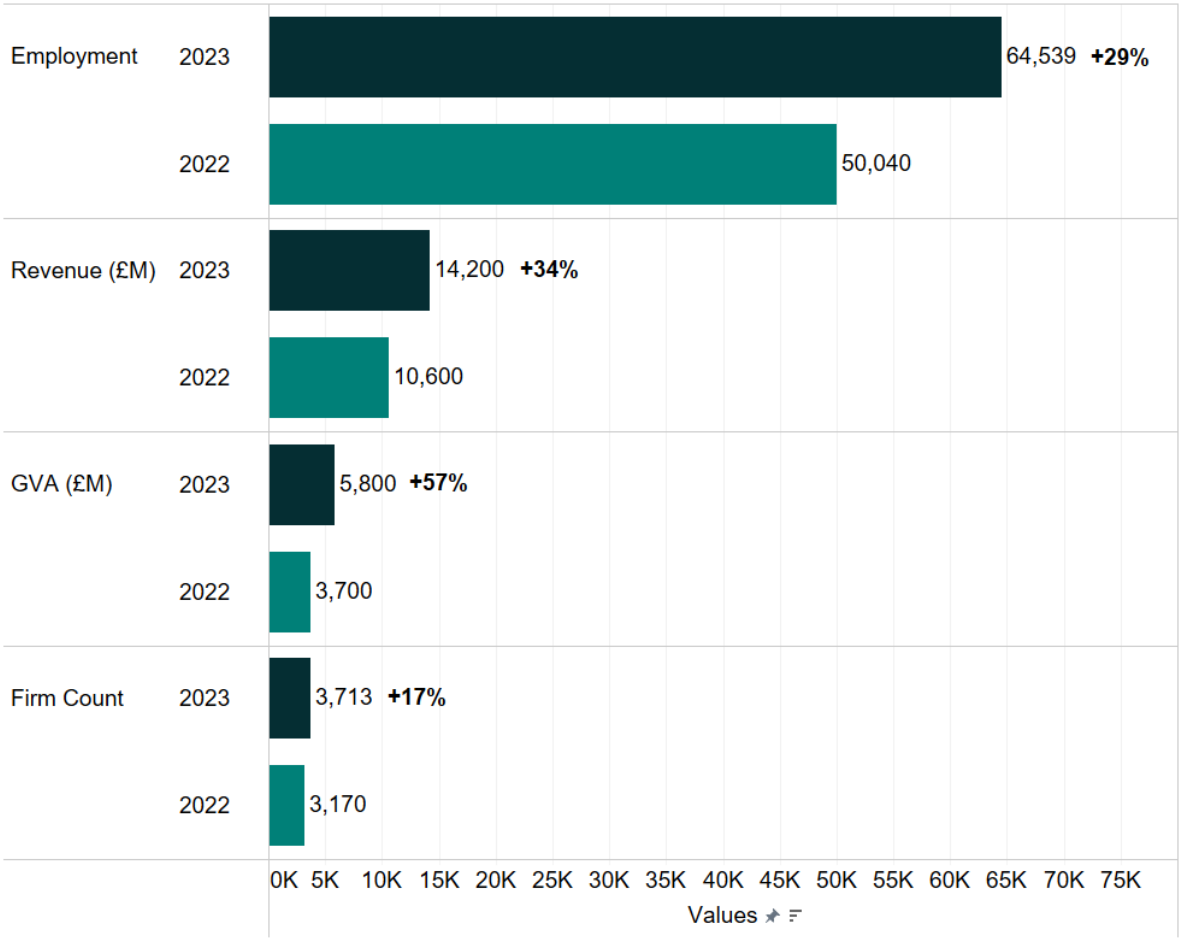
A consortium led by Perspective Economics was commissioned in early 2024 to undertake research into the profile of AI activity in the UK, and its contribution to the UK economy[1].

Based on analysis of secondary data and qualitative research including responses from 297 AI companies and 45 in-depth interviews with AI businesses and strategic stakeholders, this report provides key findings regarding the size and scale of the UK's AI sector.

I.1 Headline Sector Metrics

Since the previous study was conducted in 2022, AI activity in the UK has grown across all core economic measures.

Figure I.1 – AI Sector Study Headline Metrics (2022 – 2023)



Source: Perspective Economics

[1] Consortium members included glass.ai, Beauhurst, glass.ai, Ipsos and academic experts (Professors Rob Proctor and Roger Woods).

I.2 Key Findings

- Compared to the 2022 study, aggregate numbers of AI companies, revenues, employment and GVA are all higher in 2023.
  - Total AI company numbers increased by 17% (+543).
  - Total AI-related employment increased by 29% (+14,500).
  - Total AI-related revenues increased by 34% (+£3.6bn).
  - Total AI-related GVA increased by almost 57% (+£2.1bn).
- Revenue and employment growth have been driven by diversified AI companies.
  - Diversified AI-related revenues have increased by 80% (+£4.3bn).
  - Diversified AI-related employment has increased by 44% (+10,600)
  - Diversified AI-related GVA has increased by 70% (+£1.9bn).
- Dedicated AI companies have also seen increases in both employment and GVA.
  - Dedicated AI-related employment has increased by 15% (3,900).
  - Dedicated AI-related GVA has increased by 20% (+£0.2bn).
- The regional profile of AI companies remains largely unchanged, centred on London, the South East and the East of England.
  - Three quarters of all office addresses are located in London, the South East or the East of England, including 75% of registered addresses and 74% of all trading addresses.
- AI activity within certain sectors is better represented in regions outside of London and the South East, including Automotive & Transportation, Energy & Utilities, Manufacturing and Agriculture & Food (43%, 41%, 38% and 35% of registered company addresses outside London, the South East and the East of England respectively).
- An online survey was conducted which obtained responses from 297 AI focused businesses.
  - When asked about the future drivers of growth and demand for AI within their business, 74% of survey respondents pointed to developing AI products as a key future growth driver, while 53% of respondents identified access to equity as a major barrier to growth.

1. Introduction

Perspective Economics, in collaboration with Beauhurst, Ipsos, glass.ai, and Professors Rob Procter (University of Warwick) and Roger Woods (Queen's University Belfast) was commissioned in February 2024 to deliver an analysis of the UK's artificial intelligence (AI) sector in 2023.

The aim of the study is to continue building a better understanding of the scale, profile and economic contribution of UK's AI Sector by updating baseline data compiled in 2022 to support government's ongoing development and monitoring of key AI policies.

The emergence of consumer-facing generative AI tools in late 2022 and early 2023 radically shifted public conversation regarding the power and potential of AI. Since then, businesses across economic sectors are increasingly recognising the opportunities that AI could provide[2]. However, since the 2022 AI sector study a range of important considerations regarding the future development and application of AI technologies have also come to the fore, including risk and safety, regulation and international cooperation. In addition to providing updated economic data, this report offers insights from UK AI businesses and stakeholders regarding the opportunities, challenges, enablers and barriers to the continued growth of AI activity in the UK.

1.1. Methodology & Sources

This study will form part of the broader DSIT evidence base on AI, building on a similar study conducted in 2021/22. The study has several overarching requirements as follows:

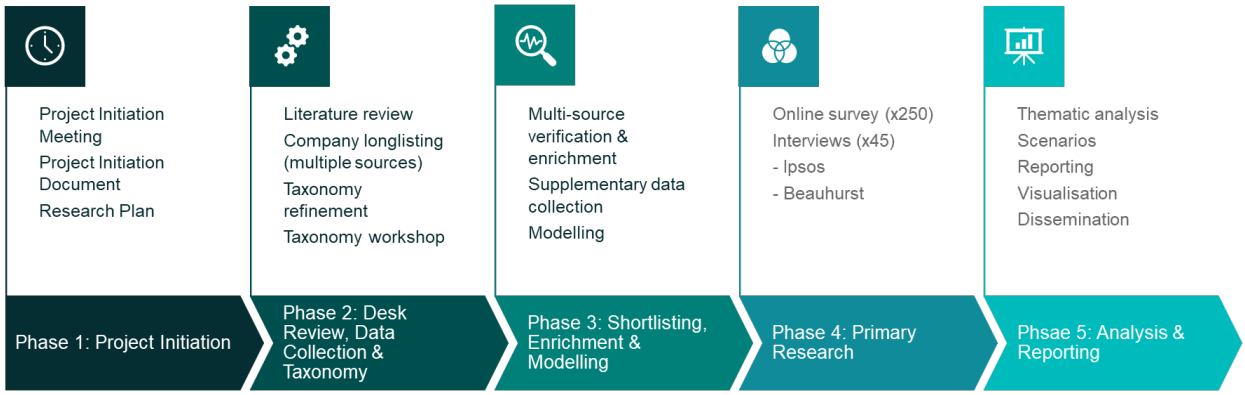
1. Identify and document UK AI companies using a broad range of comprehensive data sources.
2. Conduct qualitative research to understand a range of issues including UK AI company collaboration, sector challenges, growth opportunities and enablers.
3. Produce market demographics and economic estimates and present them in straight-forward and user-friendly outputs including a report and dashboard.
4. Conduct a new thematic analysis focussed specifically on UK market dynamics and competition.
5. Produce future macroeconomic scenarios[3] based on findings regarding UK market dynamics and competition and their implications for UK AI economic activity.

1.2. Approach

The study uses a mixed methods approach, combining desk-based review, qualitative and quantitative research and analysis (Figure 1.1).

[2] MIT Technology Review (2023), The great acceleration: CIO perspectives on generative AI", MIT, 2023
[3] Provided as a stand-alone output accompanying this main report for internal purposes.

Figure 1.1 – AI Sector Study 2023 Method Overview



A total of 45 stakeholder interviews were completed and 297 responses to the online survey were received. The 2022 company dataset was reviewed and updated using multiple sources to provide sector estimates for revenue, employment and GVA in 2023. Key data sources used in the 2023 study are summarised in Table 1.1.

Table 1.1 – Summary of Key Data Sources

Purpose	Sources
Company Identification	• Glass.ai (web) • Bureau van Dijk • Beauhurst • Lightcast • UKRI Gateway to Research • Financial Times FDI Markets
Revenue, Employment, GVA	• Bureau van Dijk • Glass.ai (web)
Investment	• Beauhurst

1.3. Interpretation of Data

Artificial Intelligence activity in the UK is not defined by a formal Standard Industrial Classification (SIC) code[4]. This study therefore uses experimental methods to identify and quantify AI activity across traditional economic sectors. The approach and methodology are consistent with those employed to deliver analyses of the UK cyber security sector annually

[4] SIC codes are the current system of classifying business establishments and other statistical units by type of economic activity in which they are engaged.

since 2018, and with the method used to create baseline evidence regarding the AI sector in 2022[5]. The data used to inform the study includes:

- Identification of AI firms according to an agreed taxonomy using multiple sources, including AI driven language models applied across websites, news, social media, academic and official sources.
- Enrichment of web data using open and proprietary data sources including Companies House (company name, registration number, locations, incorporation date), Bureau van Dijk FAME (revenue, employment, profitability, remuneration, R&D spend) and Beauhurst (external grants, fundraisings, accelerator attendance, M&A activity).

1.3.1. Comparison to Previous Study

This 2023 study builds on the previous AI sectoral analysis. It uses the same approach and methodology to identify AI companies and produce headlines sector estimates of revenue, employment and GVA. However, as the sector continues to evolve, so to do the analytical parameters used to produce lower-level analyses of the sector. The study team worked with DSIT representatives and external experts to update the taxonomy used to categorise the sector. The main changes in the 2023 taxonomy are inclusion of model development as a new capability, segmentation of strategy, consultancy and training (2022) into two separate capabilities – AI strategy and consulting and AI skills and training, segmentation of the broader machine learning capability into different application areas, and updating of the ethics, trust and fairness capability to AI assurance. Similarly, the analytical tools used to classify companies have also evolved considerably within the past 18 months. The 2023 study therefore uses new, LLM-enabled classification techniques to create capability tags based on more comprehensive descriptive information. Given these adjustments, while headline estimates can be considered entirely comparable to the 2022 study, lower level analyses regarding products, services and capabilities may not be entirely comparable because new methods have been used in 2023.

1.4. Acknowledgements

The authors would like to thank members of the DSIT team for their input throughout the study. DSIT and the report authors would also like to thank all those who contributed to the research, including those who took part in in-depth strategic stakeholder interviews, responded to the business survey, or otherwise offered evidence and insights to the study.

[5] DSIT (2022) Cyber Security Sectoral Analysis 2022, accessible at [https://www.gov.uk/government/publications/cyber-security-sectoral-analysis-2022]

2. UK Artificial Intelligence Sector Profile

According to the OECD, artificial intelligence (AI) is *"a transformative technology capable of tasks that typically require human-like intelligence, such as understanding language, recognising patterns and making decisions"*. In the UK, artificial intelligence is used by innovative companies across sectors to solve problems and improve processes that affect millions of lives every day, for example:

- Google Deepmind is an AI research and development company that uses advanced machine learning capabilities to solve problems in healthcare, scientific research, digital transformation and more.
- Darktrace is a cybersecurity company that uses AI for real-time threat detection and response by recognising abnormal network patterns. It provides a proactive approach to cyber resilience that helps keep data, networks and systems safe.
- Tractable uses computer vision and machine learning techniques to quickly and accurately assess damage in everything from road accidents to natural disasters, helping to make insurance claim processes faster and more accurate.
- Limejump uses AI and machine learning across several key areas of energy management, including distributed network management, grid balancing and demand response, helping to support the transition to a more sustainable and efficient energy system.

This section explains how AI is defined for the purposes of the sectoral analysis, before providing key statistics regarding the profile of the AI sector in the UK.

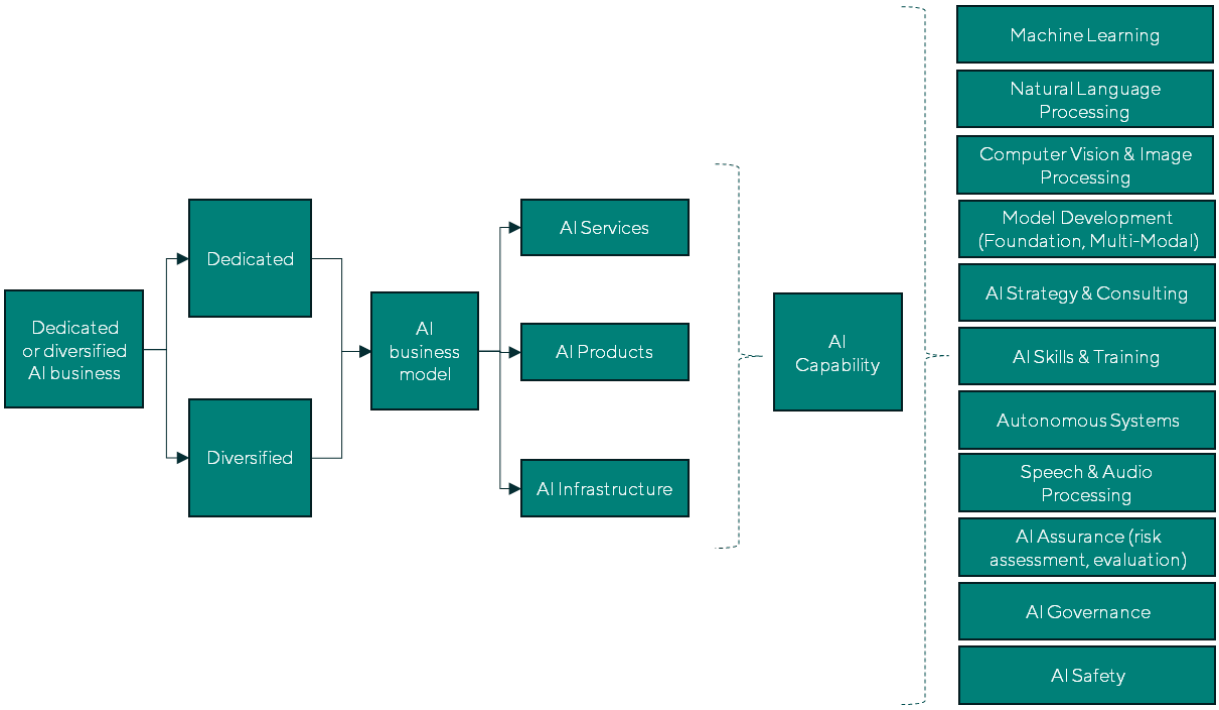
Key Takeaways

- Globally strategic AI companies including Amazon and Microsoft have increased their UK footprint relative to other large, diversified AI companies.
- Since 2022, large professional services strategy and consulting firms have been increasing the size of their AI teams, contributing to notable uplifts in AI headcounts among larger diversified companies.
- Within the last year many new micro enterprises have entered the UK AI sector. The share of large AI companies has remained constant, but the number of small and medium sized companies has declined, pointing to potential scaling challenges.

2.1. Defining the UK Artificial Intelligence Sector

Given that Standard Industrial Classification (SIC) codes do not yet include a specific 'artificial intelligence' classification, the analyses contained in this report are based on a business-focussed taxonomy that can better reflect AI activity in the UK. The taxonomy used to describe AI activity in this study is illustrated in Figure 2.1.

Figure 2.1 – UK AI Taxonomy



Source: Perspective Economics

Salient points regarding the sector taxonomy include:

- Dedicated vs Diversified AI companies: at the highest level, the taxonomy segments the business population according to whether they are a dedicated AI company, or whether AI activity makes up a smaller proportion of a much broader commercial business offering. Dedicated AI companies are considered to be businesses that provide a proprietary AI technical service, product, platform or hardware as their primary revenue source.
- AI Business Model: at a lower level the taxonomy segments between creators of strategic AI infrastructure[6], developers of AI products[7] and AI service providers[8]. Adopters of AI products or services developed by others are considered to be outside the scope of this study.
- AI Capabilities: capabilities apply across business models (denoted in Figure 2.1 by dashed braces), and an AI business may have more than one capability. Core capabilities have been updated following a taxonomy workshop comprising industry and academic

[6] Including hardware, frameworks, software, libraries and platforms.
[7] Companies producing bespoke, value adding AI solutions marketed and sold as products.
[8] Companies offering skills and expertise to support the adoption of AI products.

experts and policy representatives. Changes include: removal of data mining as a stand-alone capability (deemed to be captured within other capabilities); separate categorisation of AI assurance, AI governance and AI safety; inclusion of model development as a new capability; and segmentation of AI strategy, consultancy and training (2022) into two capabilities – AI strategy and consulting and AI skills and training.

Table 2.1 provides an illustration of some of the most prominent dedicated and diversified AI companies identified. Globally strategic diversified companies including Amazon and Microsoft have increased the size of their UK AI teams relative to other major diversified companies. Major strategy and consulting firms such as EY and Capgemini now feature as some of the most prominent AI employers, a trend spurred by OpenAI's launch of ChatGPT Enterprise in August 2023[9].

Table 2.1 – Key AI Sector Contributors – Dedicated & Diversified (AI Employment)

	Dedicated	Position	Business Model		Diversified	Position	Business Model
1	DeepMind	←	Strategic Infrastructure	1	Amazon	↑	Strategic Infrastructure
2	Builder	↑	Products	2	Microsoft	↑	Strategic Infrastructure
3	Databricks	↑	Products	3	Deloitte	↑	Services
4	Faculty	↑	Strategic Infrastructure	4	Google	←	Strategic Infrastructure
5	Exscientia	↑	Products	5	BT	↑	Products
6	Lendable	←	Products	6	IBM	↓	Strategic Infrastructure
7	Oxbotica	↑	Products	7	Accenture	↓	Products
8	Graphcore	↑	Strategic Infrastructure	8	Capgemini	↑	Services
9	Featurespace	↑	Products	9	Cognizant	←	Services
10	Improbable	↓	Products	10	EY	↑	Services

Source: Glass.ai, Perspective Economics

[9] https://openai.com/index/introducing-chatgpt-enterprise/

In addition, each in-scope company has been classified into industry sectors using a bespoke text classification model. These businesses may identify with these sectors as they provide AI solutions specific to these areas. A total of 22 sectors are included in the 2023 study including:

1. Aerospace and Defense
2. Agriculture and Food
3. Automotive and Transportation
4. Construction and Real Estate
5. Consumer Goods
6. Education and Training
7. Energy and Utilities
8. Entertainment and Media
9. Environmental and Sustainability
10. Financial Services
11. Healthcare and Wellness
12. Information Technology
13. Life Sciences and Biotech
14. Logistics and Supply Chain
15. Manufacturing
16. Marketing and Advertising
17. Professional Services
18. Research and Development
19. Retail and E-commerce
20. Security and Investigations
21. Telecommunications
22. Travel and Hospitality

2.2. Number of UK AI Companies

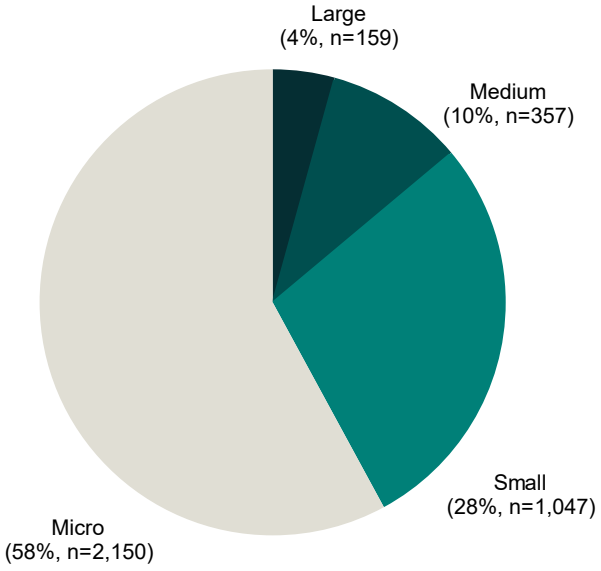
Based on a combination of AI driven web intelligence, and collation of company data from numerous open and proprietary sources set out in Section 1.1, we estimate that there are currently 3,713 active UK companies providing AI products and services.

2.2.1. Registered Companies by Size

Ninety-six percent of the companies identified are SMEs (small and medium-sized enterprises); 58% are micro businesses (Figure 2.2).

Consultation with strategic stakeholders from across industry, academia and policy spheres pointed to the presence of a significant number of large technology firms as a key strength of the UK's AI ecosystem, deemed to be at least in part due to the UK's reputation for high quality scientific research and innovation. This assertion is supported by a comparison of the size of companies in the AI sector vis-à-vis the broader UK business

Figure 2.2 – Size Profile of UK AI Companies



Source: Glass.ai, Perspective Economics (n=3,713)

population[10] (Table 2.2). Comparison with the 2022 study shows that the size profile of the sector has remained relatively constant. However, as discussed in subsequent Sections, in-depth interviews and employment data suggest that the sector may be experiencing scale-up challenges.

Table 2.2 – AI Size Profile Comparison

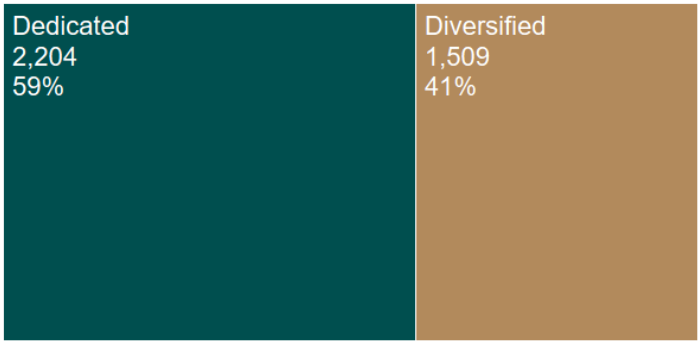
Size	UK Business Population Estimates (2023)	Percentage	No. of AI firms (change on 2022)	Percentage of AI firms (ppt change on 2022)
Large (250+ employees)	7,960	<1%	159 (+27)	4% (-)
Medium (50-249)	36,905	3%	357 (+95)	10% (+1ppt)
Small (10-49)	222,785	15%	1,047 (-)	28% (-)
Micro (1-9)	1,177,335	82%	2,150 (+261)	58% (-2ppt)
All Businesses with at least 1 employee	**1,444,985**	**100%**	**3,713 (+543)**	**100%**

Source: ONS, Glass.ai

2.3. Dedicated & Diversified AI Companies

Of the 3,713 active companies identified through the study 59% are dedicated AI businesses and 41% are diversified (i.e., have AI activity as part of a broader diversified product or service offer, Figure 2.3).

Figure 2.3 – Dedicated and Diversified AI Companies



Source: Glass.ai, Perspective Economics (n=3,713)

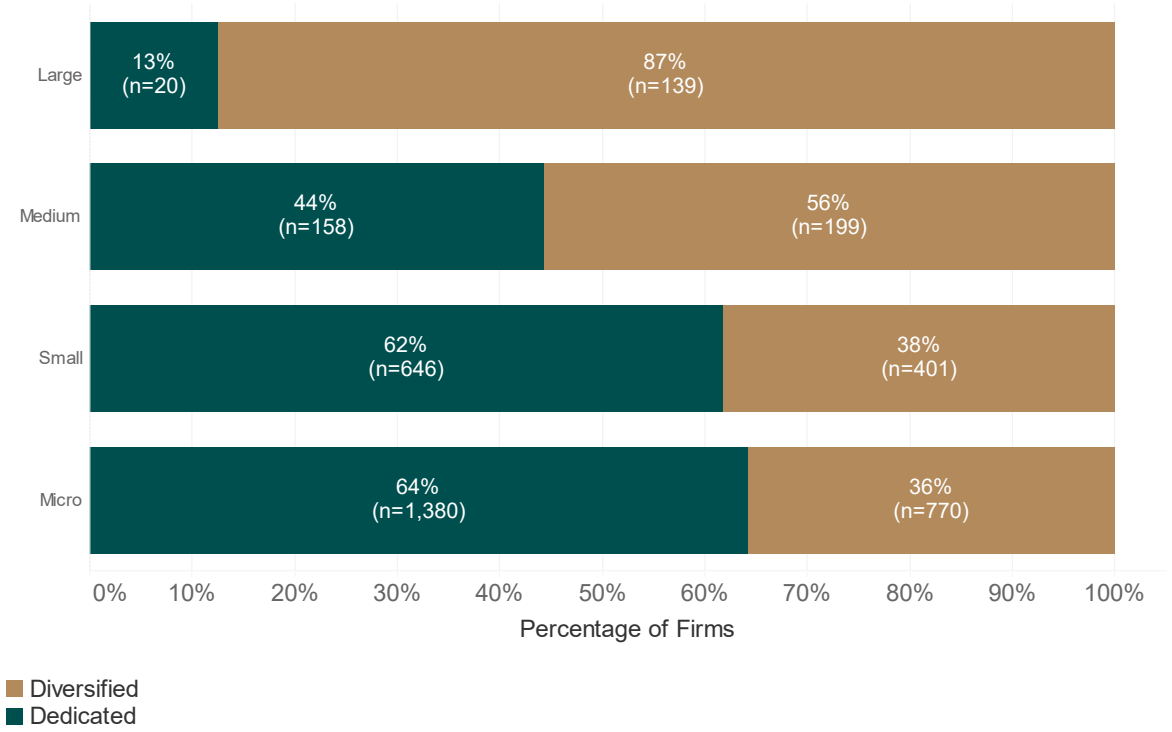
In comparison to other similar studies the proportion of diversified companies within the AI sector is higher than the proportion within the cyber security sector (29%) and slightly lower than the proportion of diversified companies within the Managed Service Provider (MSP) market (47%). This is indicative of the comparatively broad scope for AI technology applications across sectors. When combined with increases in AI related employment, it also points to a strong focus on development of AI products and services among both dedicated companies (e.g., DeepMind,

[10] UK Business Population Estimates (2022): Available at: https://www.gov.uk/government/statistics/business-population-estimates-2022

Improbable, Benevolent AI) and established, diversified technology companies with much broader service offers (e.g., Amazon, Google, Microsoft, IBM)[11].

Figure 2.4 shows that most large AI companies are diversified (87%, n=139), whereas the majority of micro-AI companies are dedicated, meaning that AI is core to their business model (64%, n=1,380).

Figure 2.4 – AI Company Size



Source: Glass.ai, Perspective Economics (n=3,713)

2.4. AI Company Registrations

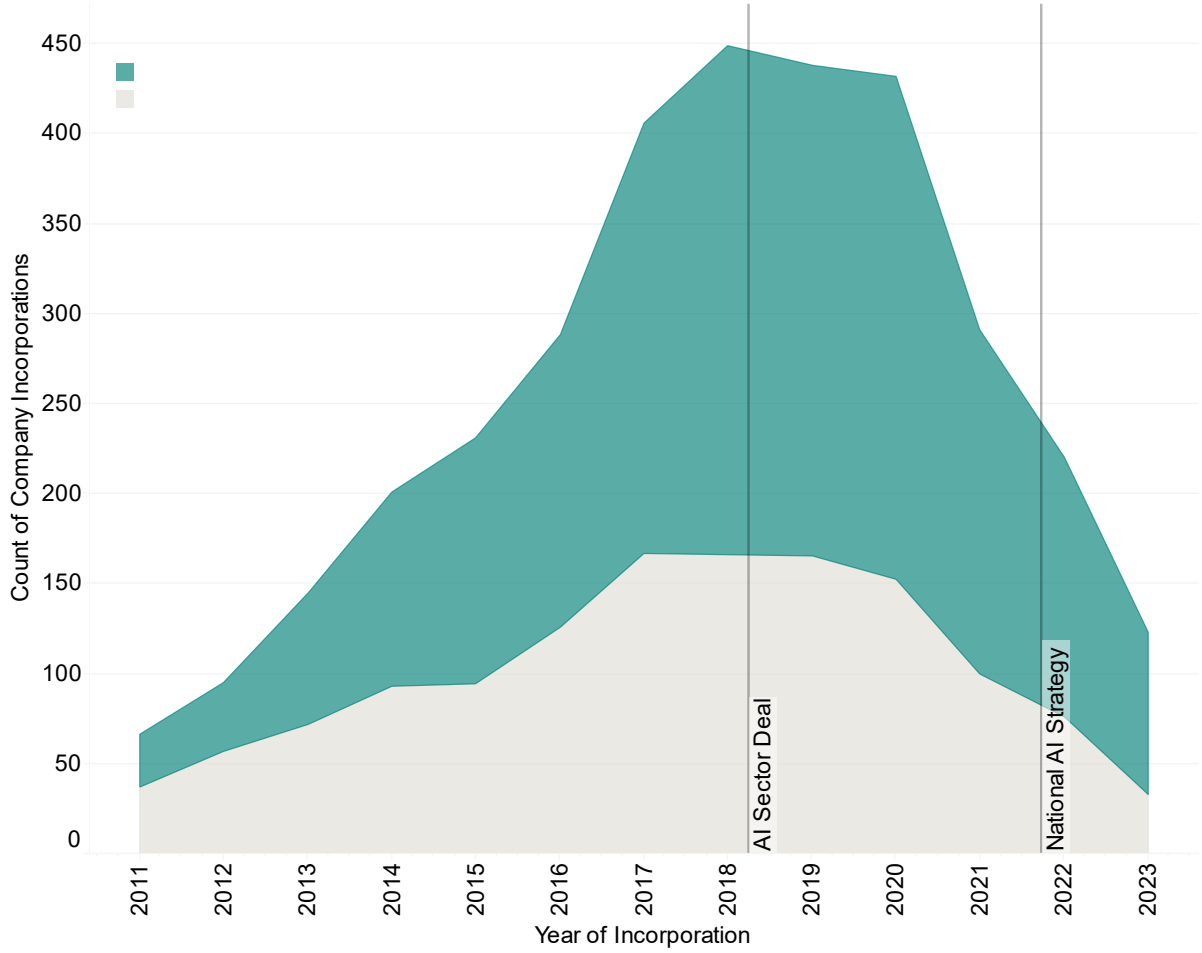
In 2022, analysis of incorporation dates across the population of AI companies showed significant growth in AI company registrations since 2011. On average, 245 new AI companies had been registered each year since 2011, with a peak in new company registrations in the same year as the AI Sector Deal (2018). The 2022 report showed smaller numbers of new company registrations since 2018. A total of 329 companies within the 2023 company dataset have been incorporated since January 2022 (Figure 2.5 overleaf). Just under two thirds of these companies were incorporated in 2022 (65%, n=213). At the time of writing, more than 100 new AI companies were registered in the UK in 2023[12]. However,

[11] It is worth noting here that, given the breadth and varying scale of AI activity, it is not possible to delineate dedicated and diversified AI firms solely on the basis of the proportion of AI related revenue or employment within companies. Companies with relatively small AI teams can be dedicated AI companies and by the same token, companies with large AI teams can be diversified. Therefore instead, the study used a combination of data on AI related employment and a detailed manual review of company descriptions as the basis of final decisions on whether or not a company falls into the dedicated or diversified category.

[12] It is worth noting that the 2023 figure may be an underestimate due to a lag between start-up and registration dates.

analysis of survey data suggests that other factors may also be creating a more challenging start-up environment. For example, when asked about AI input requirements, 70% of respondents pointed to the need for increased computing power, 68% highlighted increased need for software and development tools and just under three fifths (58%) pointed to an increased need for training data. When asked about barriers to growth within the next 12 months, survey respondents saw access to equity investment and other forms of external finance as notable short-term barriers to growth: 53% (n=157) and 32% (n=94) respectively. Depth qualitative interviews highlighted similar challenges, including access to compute by SMEs, and the expense of developing AI products and services.

Figure 2.5 – AI Company Registrations

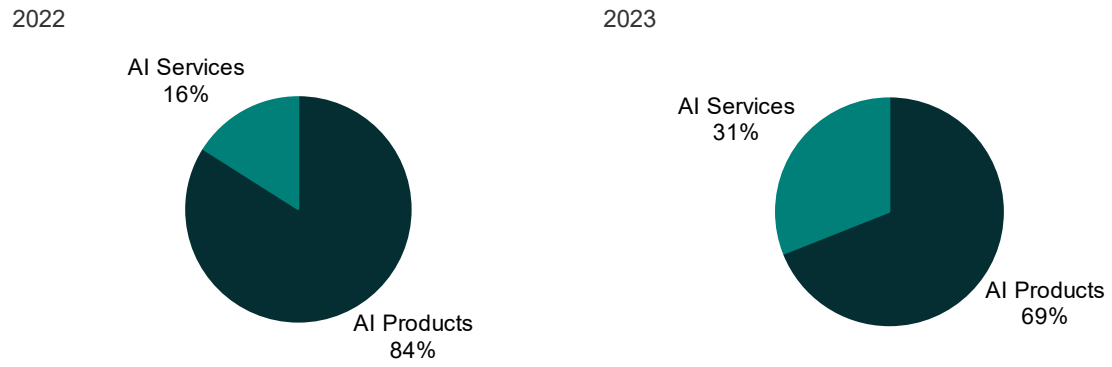


Source: Companies House (2011 – 2023 | n=3,181 incorporations)

2.5. AI Business Model

Figure 2.6 below shows the number of companies involved primarily in providing either AI products, or AI related services across business model categories in 2022 and 2023.

Figure 2.6 – AI Business Models (Dedicated Companies Only)



Source: Perspective Economics

In the 2022 study, a greater proportion of dedicated AI companies primarily produced AI related products. In 2023 most dedicated AI companies remain focussed on developing AI products (69%, n=1,516), however the share of dedicated companies now offering AI related services has increased by more than 10 percentage points, from 16% in 2022 to 31% in 2023.

For the 2023 analysis, a new group of 25 strategic infrastructure providers has been created. This group includes companies such as Microsoft, Google, Meta, OpenAI and Anthropic, and accounts for 20% of employment, 38% of revenues, and 42% of GVA. Creating this new group of companies will allow future iterations of the sectoral analysis to more closely track the contribution of these companies to the UK AI sector.

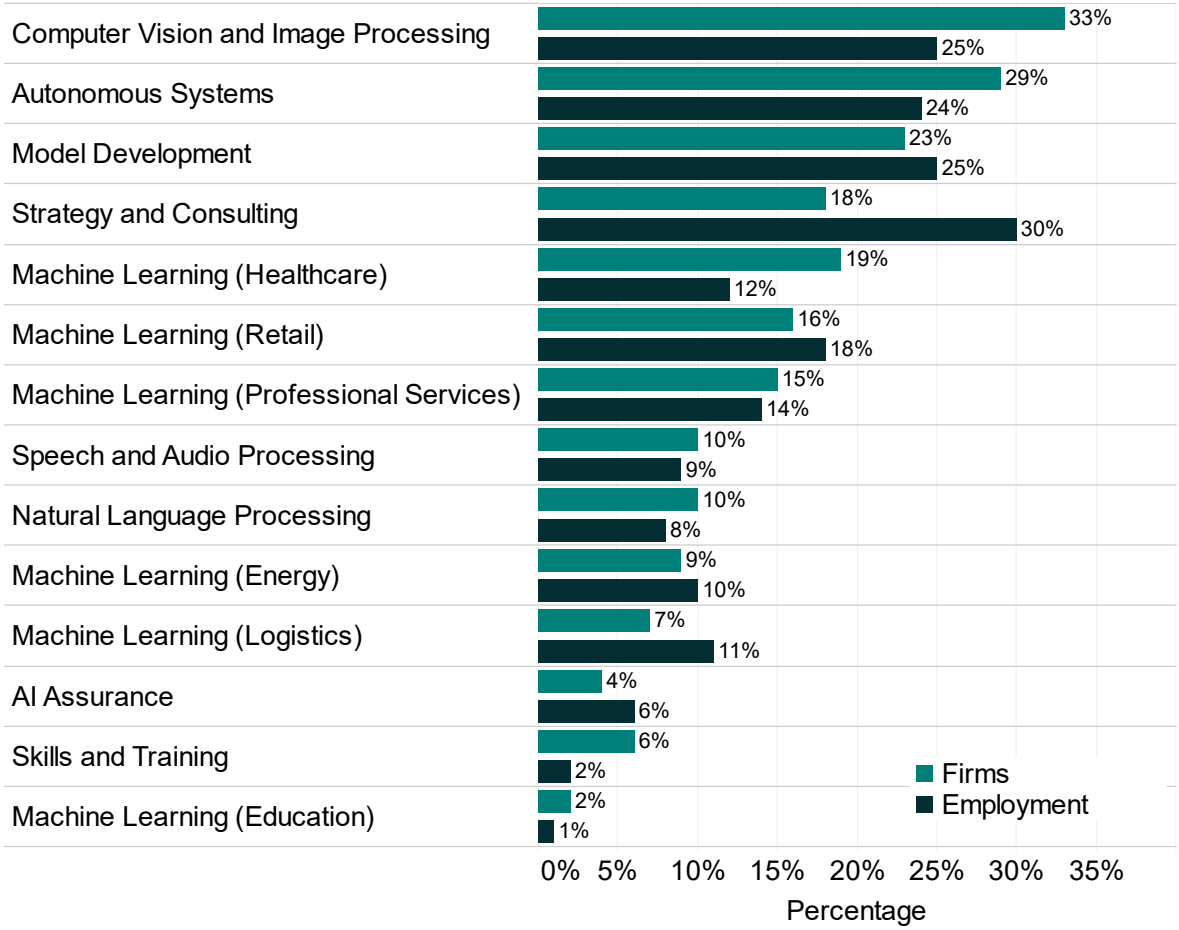
2.6. AI Capabilities

Tailored LLM scripts were used to predict the core capabilities of each company identified in the 2023 dataset. Across 3,713 companies a total of almost 7,500 capability tags were applied[13]. Outputs of the analysis are presented in Figure 2.7 below and suggest that the highest share of employment (30%) is within companies that offer AI strategy and consulting. Computer vision and image processing accounts for the highest share of companies, suggesting high levels of UK AI activity in this space.

[13] The LLM script assigned a score of between 1 and 10 to each company according to whether descriptive information gathered by the research team indicates that the company has the corresponding capability. Based on manual review of a sample of 50 results, a score of 7 or more was deemed to provide a credible reflection of company capabilities. Scores of less than 7 were disregarded and scores of 7 or more were converted to counts to produce the analysis. Results suggest that each company scored highly against two capability areas on average.

Since 2022, both the number of AI Assurance[14] firms and their share of employment has increased, by 3 and 5 percentage points respectively.

Figure 2.7 – AI Capabilities



Source: Perspective Economics (N.B. companies are tagged as having multiple capabilities and therefore percentages sum to more than 100%)

While the method used to assign capabilities to each company has evolved since the 2022 study (see Section 1.3.1) it is possible to draw some illustrative comparisons between changes in market structure between 2022 and 2023 where capability tags have remained similar across both years. Acknowledging this caveat, 2023 data indicates that the number of companies involved in AI assurance activity has almost doubled since the 2022 study (from 25 to 47). Companies primarily involved in autonomous systems account for 8% of all firms in 2023, compared to 6% in 2022. The proportion of companies offering machine learning driven products and services across sectors has increased from 21% in 2022 to 35% in 2023, and the proportion of strategy and consultancy firms with AI activity has increased from 10% in 2022 to 13% in 2023.

[14] Termed 'Ethics, Trust & Fairness' in the 2022 study

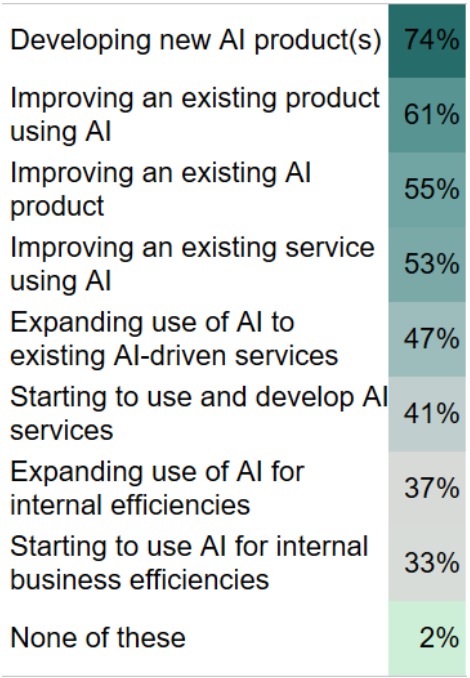
2.7. AI Growth Drivers

When asked about the future drivers of growth and demand for AI within their business, survey respondents pointed to developing and / or improving AI products as key future growth drivers (74% and 61% of respondents respectively).

The top five drivers of growth remain consistent across companies of different sizes and business models, with some limited variation in order.

Almost two fifths (39%) of survey respondents indicated that AI is the main driver of business products and services. A further third of respondents indicated that they had AI products or services already in market or as part of 'business as usual' and 18% suggested that they had AI products or services in production but not yet in market.

Figure 2.8 – Growth Drivers



Source: Ipsos (n=251, multi-response)

2.7.1. Barriers to AI Growth

The survey also asked respondents to identify issues that had significantly affected their ability to meet business goals over the last 12 months. Fifty-three percent of respondents identified access to equity investment as a major barrier.

Subsequent analysis of investment data (Section 5) suggests that investment is skewed towards London. However, survey responses indicate that, even within London, access to investment is a challenge. Almost half of businesses reporting that access to equity investment was a barrier to growth were London-based[15].

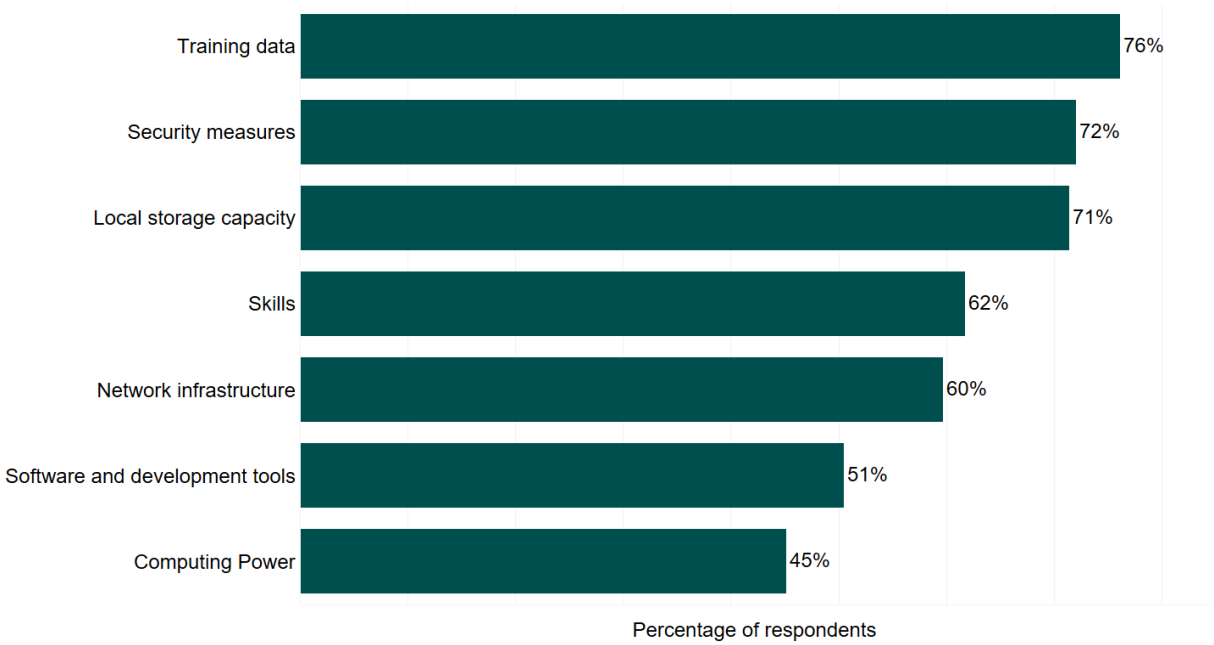
More than one quarter of respondents also indicated that a lack of technical skills has affected their ability to meet their business goals (26%, n=77). Within qualitative responses, several survey participants pointed to the highly competitive market for AI talent as a key contributor to technical skills gaps.

2.8. AI Inputs

Respondents were also asked how their requirement for certain inputs to their AI product and service offer has changed over the past 12 months. Seventy-five percent of respondents highlighted modest or significant increases in their requirements for training data, 71% cited a need for increased security measures and 71% highlighted a need for more local storage capacity (Figure 2.8).

[15] 49% (n=135), weighted average = 40%

Figure 2.9 – AI Input Requirements (Modest or Significant Increase)

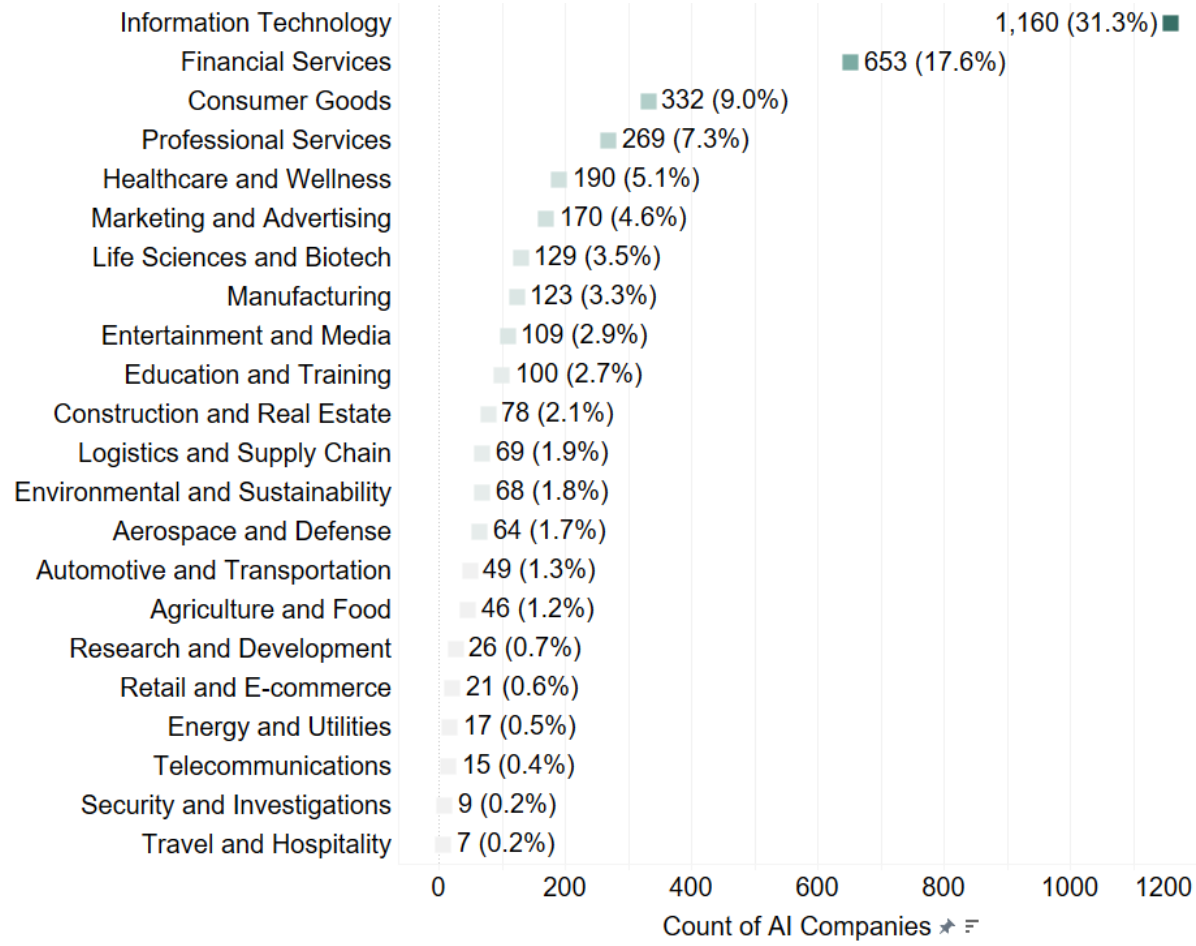


Source: Ipsos (n=297) Note: Respondents could select more than one response and therefore percentages will not sum to 100.

2.9. Development & Adoption

Strategic stakeholder interviews pointed to rapid development and adoption of AI across certain sectors, including financial services, professional services, life sciences, and research and development. Qualitative perspectives on development and adoption are largely mirrored by secondary data, which suggests higher instance of AI companies in financial services, professional services, health and life sciences (Figure 2.9).

Figure 2.10 – Instance of AI companies across sectors



Source: Glass.ai, Perspective Economics

3. Location of UK AI Companies

Understanding the location of AI activity helps to identify and better understand notable clusters and regional strengths to inform policy making. This section presents findings regarding the location of AI companies identified in the 2023 study and draws comparisons with regional data from 2022.

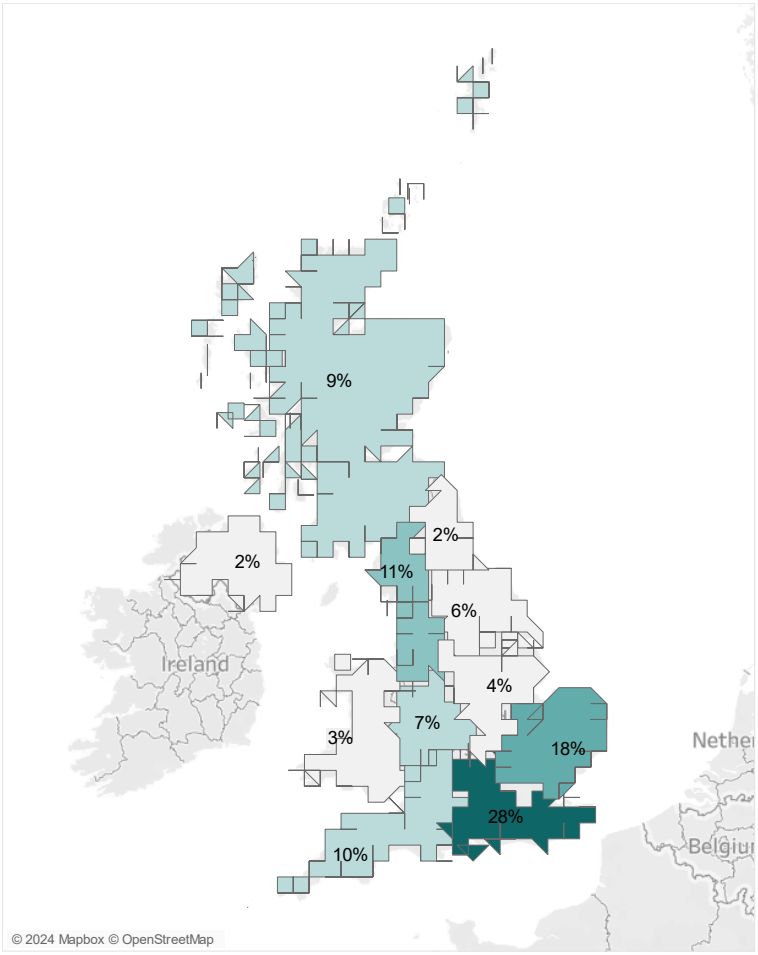
Key Takeaways

- The concentration of AI companies in the UK remains heavily skewed towards London, the South East, and the East of England, accounting for 75% of registered office locations and 74% of trading locations. However, there is growing AI activity outside these areas, with Scotland and the North West jointly holding the fourth largest share of AI companies in 2023.
- There is a notable regional variation in AI sector focus. While London, the South East, and East of England dominate in financial services, R&D, marketing, and entertainment AI, other regions show more activity in automotive, transportation, manufacturing, energy, utilities, and agricultural technology AI applications.
- The UK AI sector has a strong international presence, with 65% of surveyed companies engaging in exports (up 14 percentage points from the 2022 study). Of these, 60% generate at least 40% of their revenues from exports, and 75% expect their exports to increase in the next 12-18 months. The US plays a significant role, accounting for over half of the UK's internationally headquartered AI companies and more than three-quarters of AI-related employment, revenue, and GVA generated by international companies.

3.1. AI Activity by UK Region

The 2022 study suggested high concentrations of AI companies in London, the South East and the East of England. Unlike other sectoral analyses, the concentration within these three regions did not change significantly when trading addresses were included in the location analysis. In 2023 the regional profile of registered offices remains largely unchanged. London, the South East and the East of England still account for 75% of registered office locations.

Figure 3.1 – AI Registered Office Locations



London	53%
South East (England)	13%
East of England	8%
North West (England)	5%
South West (England)	5%
Scotland	4%
West Midlands (England)	3%
Yorkshire and The Humber	3%
East Midlands (England)	2%
Wales	1%
North East (England)	1%
Northern Ireland	1%

Source: Glass.ai, Bureau van Dijk

The concentration of AI companies in the south and east of England is likely due to several factors that have influenced UK AI sector development to date including, for example, prominent UK AI sectors (e.g., within financial and wider professional services) and the significant role of Venture Capital (VC) and Private Equity (PE) funding, believed to be more accessible in London. Survey findings support the assertion that access to investment is more of a barrier outside of London. Weighted survey responses suggest that companies in the North East, Wales, the North West and Yorkshire and the Humber see access to equity investment as a barrier to growth[16]. In-depth interviews also pointed to market-driven regional disparities in the AI sector, with London and a few other hubs perceived to be focal points for the sector.

"The danger is that we are largely concentrated in London and the South East (...) We need more resilience and breadth of activity."

Academic Stakeholder

[16] Weighted survey proportions of 7%, 6%, 6% and 5% respectively. London = 3%.

Nevertheless, 2023 location data does also point to growth in AI activity outside of London and the South East. Scotland, the South West and the North West each account for between 4% – 5% of AI companies in 2023.

Between 2022 and 2023 11% of new company incorporations have been in the North West and 10% have been in the West Midlands (n=13 and 11 respectively). This includes companies such as Mycardium AI (precision cardiac diagnostics), Mindgard (AI assurance)[17], Wondle (computer vision & image processing) and Provenir (machine learning for finance and professional services). Healthcare, strategy and consulting and computer vision and image processing account for over half of these new company incorporations outside of London.

One fifth of AI companies incorporated in 2023 are located outside of London, the South East and the East of England.

3.2. Regional AI Activity by Sector

Previous analysis of company sector classifications suggested that outside of London, the South East and East of England, there is more regional activity in automotive and transportation, manufacturing, energy and utilities and agricultural technology. Corresponding analysis for 2023 shows a similar breakdown of sectoral activity across regions, with energy and utilities, automotive and transportation, manufacturing and agriculture among the most prominent AI sectors in other regions. London, the South East and the East of England account for 84% of financial services AI companies and for approximately 80% of AI companies involved in R&D, marketing and advertising, and entertainment and media.

[17] Mindgard is a spinout from the University of Lancaster. It has changed its registered office address to London since data was collected.

Figure 3.2 – AI Sectoral Activity Across Regions

	London, South East, East of England	Other Regions
Financial Services	84%	16%
Research and Development	81%	19%
Marketing and Advertising	78%	22%
Entertainment and Media	78%	22%
Logistics and Supply Chain	75%	25%
Life Sciences and Biotech	75%	25%
Education and Training	75%	25%
Environmental and Sustainability	75%	25%
Professional Services	74%	26%
Information Technology	73%	27%
Telecommunications	73%	27%
Healthcare and Wellness	72%	28%
Retail and E-commerce	71%	29%
Travel and Hospitality	71%	29%
Consumer Goods	71%	29%
Construction and Real Estate	71%	29%
Aerospace and Defense	70%	30%
Security and Investigations	67%	33%
Agriculture and Food	65%	35%
Manufacturing	59%	41%
Energy and Utilities	59%	41%
Automotive and Transportation	55%	45%

Source: Glass.ai, Perspective Economics

3.3. International Activity

Approximately 9% of companies identified in the 2023 study were internationally headquartered (n=316) – a similar share of companies as in the 2022 study (also 9%). As in 2022, the US accounts for the largest share of internationally headquartered companies (53%, n=168), followed by India, Germany, France and Canada which each account for between 11 and 13 companies (~4%).

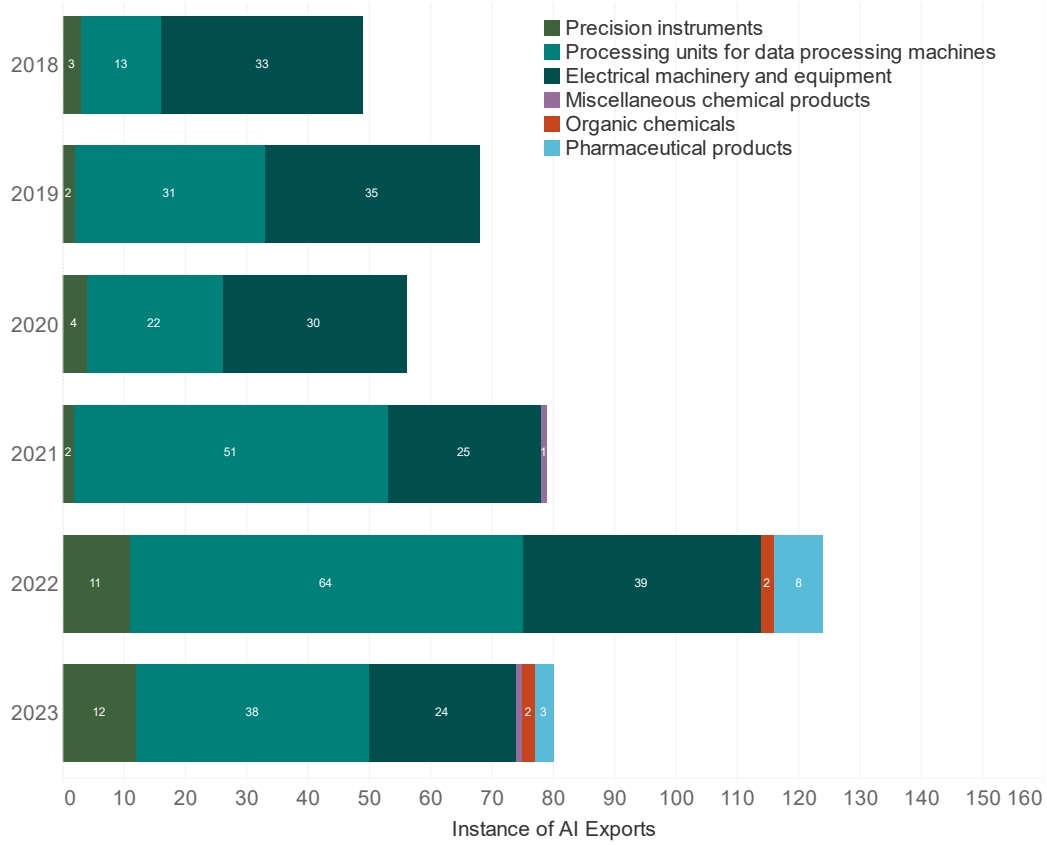
US companies play a significant role in the UK AI sector. As well as accounting for over half of all internationally headquartered companies, US firms account for more than three quarters of all AI related employment, revenue and GVA generated by international companies. Further analysis regarding the economic contribution of international companies is provided in Section 6 – Market Dynamics.

3.3.1. AI Exports

Sixty-five percent of survey respondents indicated that they exported – an increase of 14 percentage points compared to responses in 2022[18]. Of those, approximately 60% of respondents generate at least 40% of company revenues from export activity and 75% of respondents think their exports will increase in the next 12-18 months. Of those who indicated that they do not export (35% of respondents, n=85), 58% have plans to start exporting in the next 12-18 months.

Export trade data compiled for a sample of the largest dedicated AI companies also points to increased levels of AI export activity[19]. Since 2018 this sample of companies has increased export activity by 63%[20]. Data processing units, electrical machinery and equipment (e.g., printed circuits) and precision instruments have been among the most frequently exported commodities.

Figure 3.3 – Instance of Exporting Among Dedicated AI Companies (2018 – 2023)



Source: HMRC UK Trade Info, Perspective Economics

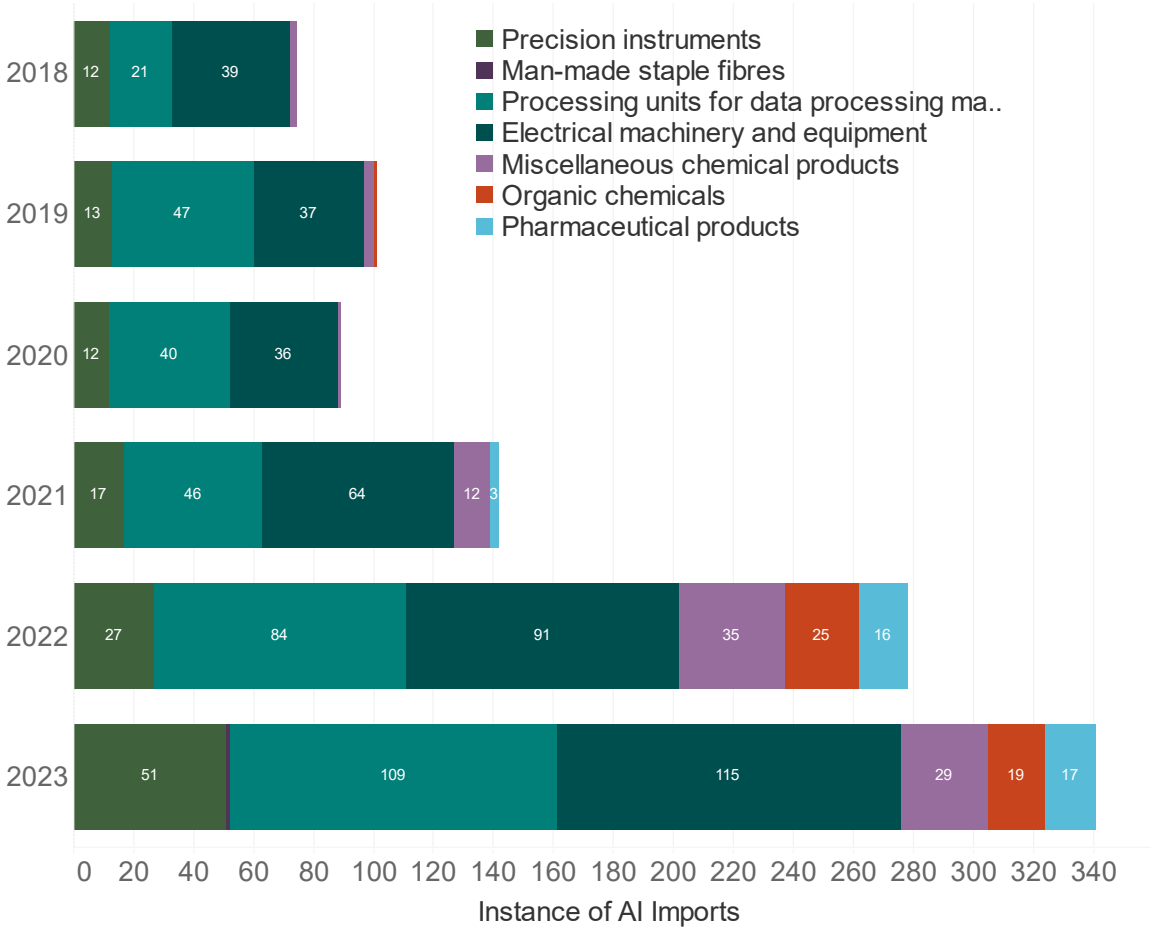
[18] Where 51% of all survey respondents indicated that they exported.
[19] A UK Trade Info trader search for each of the top 50 dedicated companies by revenue returned trade data for 12 companies.
[20] Figure reflects the increase in instance of exporting i.e., a count of each time a company exports items under specified commodity codes in any given month. HS2 commodity code descriptions include: Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles; Miscellaneous chemical products; Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof; Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; parts and accessories thereof; Organic chemicals; Pharmaceutical products. Publicly accessible trade data does not allow for analysis of trade quantities or values by trader given commercial sensitivities.

When asked about barriers to exporting, of the 65% (n=155) of survey respondents who indicated that they had some experience of exporting, 32% pointed to competition with exports from other countries, 30% cited lack of knowledge or networks for international markets, 25% cited regulatory barriers and a similar proportion highlighted lack of finance or insurance for exporting (23%). The top four barriers to exporting remain consistent across the different types of companies, i.e., those focused on AI products and services.

3.3.2. AI Imports

Using HMRC UK Trade Info data for the same subset of larger dedicated AI companies also points to increased import activity, particularly imports of processing units, electrical machinery and equipment and optical measuring instruments[21]. Companies involved in automation, R&D and life sciences – such as Oxbotica, Wayve and Exscientia AI – account for much of the recent increase in import activity among this subset of companies.

Figure 3.4 – Instance of Importing Among Dedicated AI Companies (2018 – 2023)



Source: HMRC UK Trade Info, Perspective Economics

[21] Survey questions in 2022 and 2023 focussed intentionally on export activity and did not include similar import-related questions. As such, equivalent analysis of company perspectives on importing cannot be produced.

4. Economic Contribution of UK AI Companies

This section presents updated estimates of the economic profile and contribution of AI companies to the UK economy in 2023. Findings are based on modelling using reported company data (where available) and survey responses.

Key Takeaways

- AI companies generated over £14bn in revenues in 2023, with diversified companies accounting for 68% (£9.7bn) and dedicated AI companies accounting for 32% (£4.5bn). Notably, 80% of all UK AI revenues (£11.4bn) were generated by large firms, which make up only 4% of all companies identified.
- An estimated 64,500 Full Time Equivalents are employed in AI-related activity, an increase of approximately 29% from 2022 to 2023. Findings suggest a potential trend towards polarisation in the industry, with large companies and micro companies increasing their share of employment, while small and medium-sized firms may be facing a squeeze.
- The Gross Value Added (GVA) of dedicated AI companies increased by 20% from 2022 to 2023, reaching £1.2bn. However, around 30% of dedicated companies with known GVA coverage reported negative GVA in 2023.
- On average, dedicated AI companies employ 14 people, generate £2m in revenues and contribute £550k in GVA. The average diversified AI company employs 23 people, generates £6m in revenue and contributes £3m in GVA.

4.1. Estimated Revenue

Estimates produced for this 2023 study indicate that UK AI companies generated a total of more than £14bn in revenues. While revenues among dedicated AI companies are down slightly, from £5.2bn in 2022 to £4.5bn in 2023, AI-related revenues among diversified companies are notably higher at (£9.7bn compared to £5.4bn in 2022)[22]. Six of the top 20 dedicated companies have lower estimated revenues in 2023 than they did in 2022.

[22] Note: AI revenue for diversified companies is estimated based on the proportion of AI-related activity within the companies. These proportions are based on survey data and AI employment estimates.

Table 4.1 – Revenue Estimates

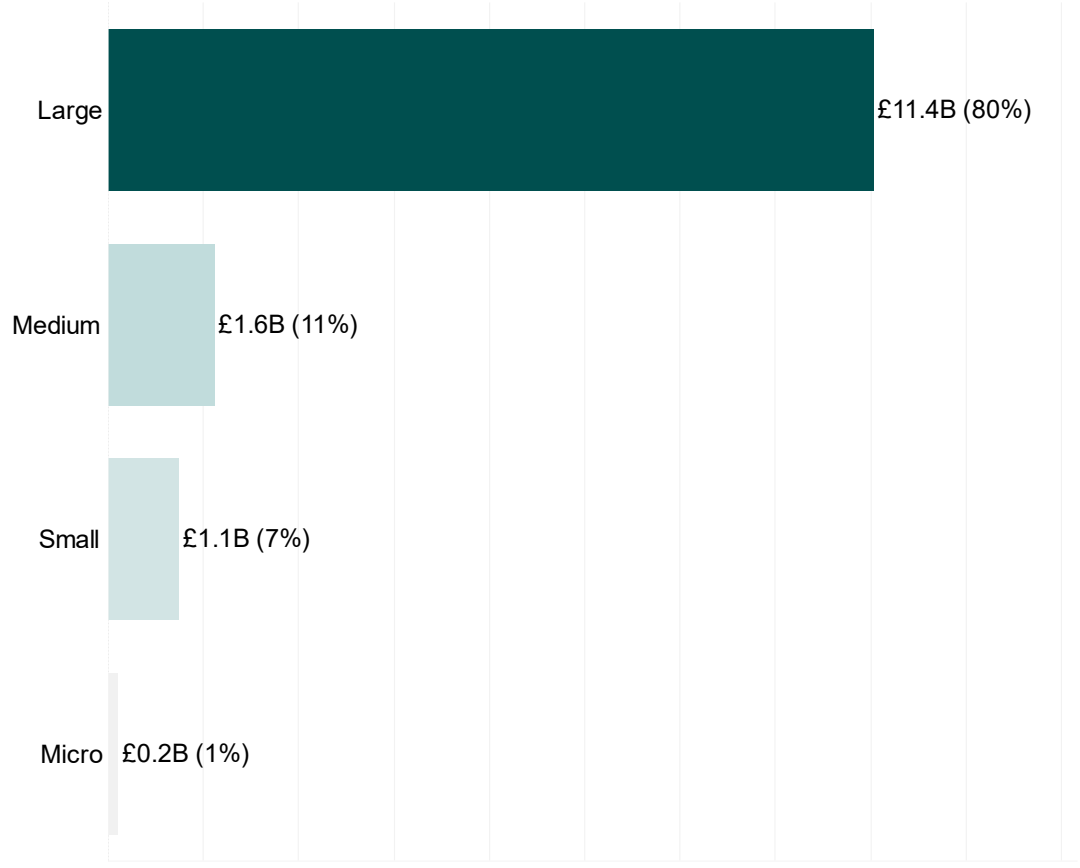
Type	Estimated AI Related Revenue (2022)	Estimated AI Related Revenue (2023)
Dedicated	£5.2bn (49%)	£4.5bn (32%)
Diversified	£5.4bn (51%)	£9.7bn (68%)
Total	**£10.6bn**	**£14.2bn**

Source: Bureau van Dijk, Perspective Economics

4.1.1. Revenue by Company Size

Estimates suggest that 80% of all UK AI revenues (£11.4bn) are generated by large firms which make up 4% of all companies identified. This share is not significantly higher than the share of revenues generated by large cyber security firms (74%). Small and medium sized companies account for a smaller share of revenues in 2023 (18%, £2.7bn) than they did in 2022 (26%, £2.8bn).

Figure 4.1 – Revenue Estimates by Firm Size



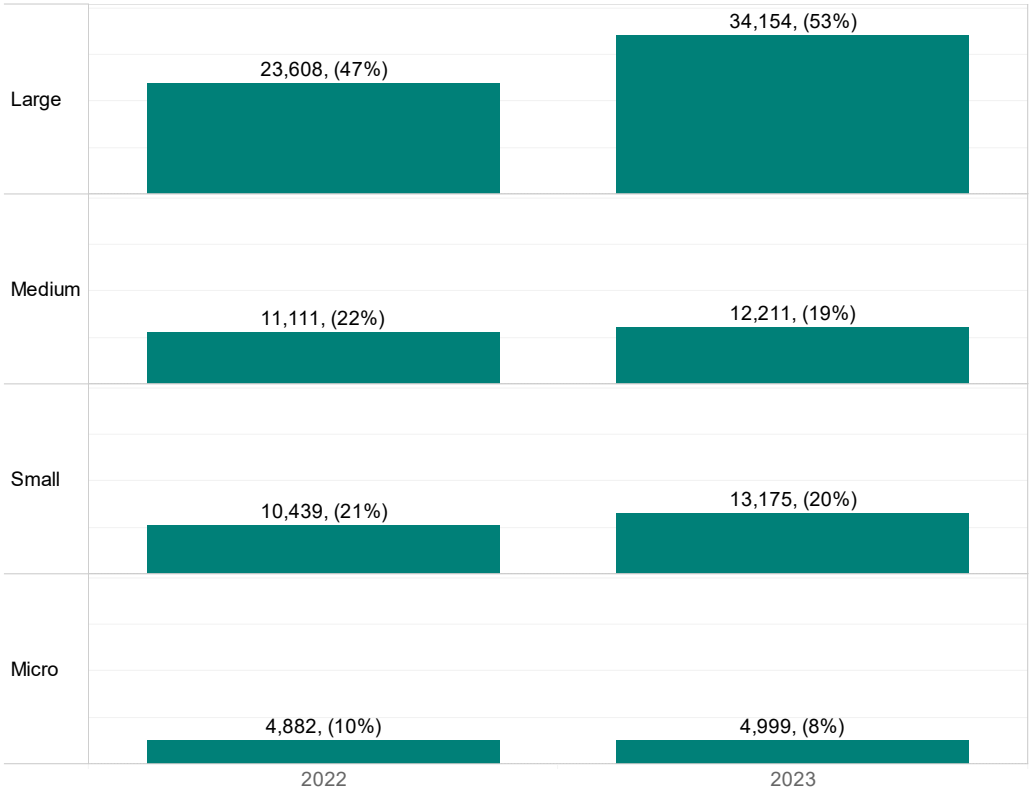
Source: Perspective Economics, Base: £14.2bn

4.2. Estimated Employment

In 2022, a total of 50,040 Full Time Equivalents (FTEs) were employed across both dedicated and diversified AI companies[23]. In 2023, total AI-related employment has increased by ~29% to 64,539 (+14,499).

Approximately 47% of employment is within dedicated AI companies and 53% is within diversified companies (n=30,247 and 34,292 respectively). For diversified companies, figures are estimates of AI-related employment, and suggest that the share of employment within diversified AI companies is 6 percentage points higher in 2023[24]. In 2023 large AI companies have also grown their share of total employment by 6 percentage points. The share of employment within small and medium sized companies has fallen in 2023, pointing to a potential squeeze on small and medium sized firms.

Figure 4.2 – Employment by Company Size (2022 – 2023)



Source: Glass.ai, Perspective Economics

[23] Estimates assume that 100% of employment within dedicated AI companies is AI-related and therefore included. Estimates of AI-related employment within diversified AI companies are calculated using a combination of web-intelligence and survey responses.

[24] 47% of employment within diversified companies in 2022 and 53% of employment in diversified companies in 2023.

Table 4.2 overleaf provides a summary of firm counts, estimated AI employment and revenue by core capability.

Table 4.2 – Headline Metrics by Capability[25]

Capabilities	Ded-Div	Firm Count	AI Employment	AI GVA (m)
Model Development	Dedicated	227	4,700	£1,141
	Diversified	112	6,000	£1,465
	Total	339	10,700	£2,606
Strategy and Consulting	Dedicated	233	3,300	£75
	Diversified	260	14,300	£1,722
	Total	493	17,600	£1,797
Machine Learning (Financial Services)	Dedicated	304	4,800	£143
	Diversified	219	3,300	£590
	Total	523	8,100	£732
Autonomous Systems	Dedicated	168	3,000	-£3
	Diversified	136	2,200	£354
	Total	304	5,200	£351
Computer Vision and Image Processing	Dedicated	508	5,300	-£14
	Diversified	331	4,700	£231
	Total	839	10,000	£217
AI Assurance	Dedicated	29	400	£11
	Diversified	20	400	£57
	Total	49	900	£68
Machine Learning (Retail)	Dedicated	27	300	£17
	Diversified	21	300	£22
	Total	48	600	£38
Natural Language Processing	Dedicated	232	2,100	£15
	Diversified	89	500	£19
	Total	321	2,700	£33
Machine Learning (Logistics & Supply Chain)	Dedicated	29	300	£3
	Diversified	24	500	£24
	Total	53	700	£27
Speech and Audio Processing	Dedicated	39	500	£2
	Diversified	18	100	£5
	Total	57	600	£8
Skills and Training	Dedicated	14	300	£3
	Diversified	12	20	-£0.048
	Total	26	320	£3
Machine Learning (Energy)	Dedicated	27	300	£1
	Diversified	27	100	£0.7
	Total	54	500	£2
Machine Learning (Education)	Dedicated	28	200	-£0.4
	Diversified	29	100	£0.9
	Total	57	400	£0.5

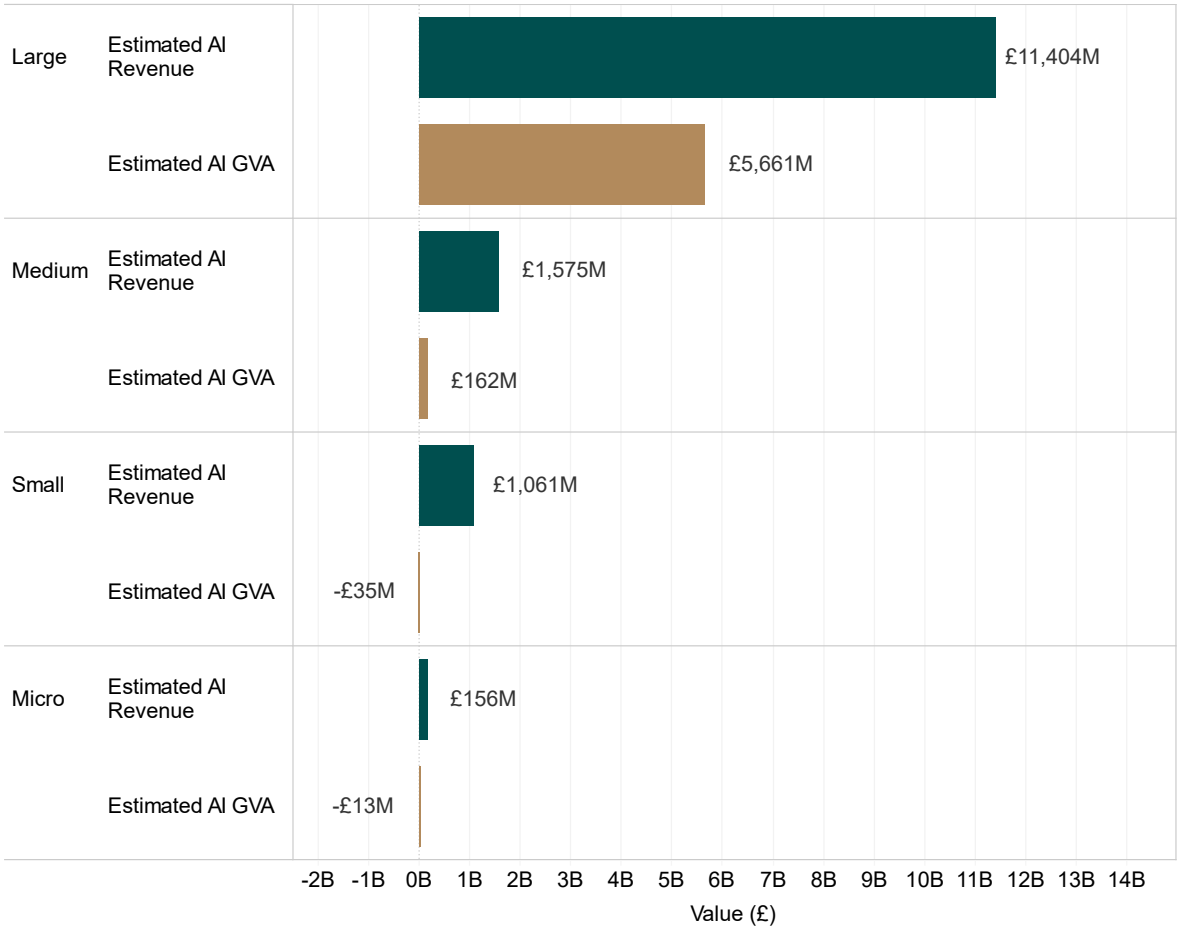
[25] Employment rounded to nearest 100 and GVA rounded to nearest million – totals may not sum.

Machine Learning (Healthcare)	Dedicated	339	4,700	-£177
	Diversified	211	1,800	£68
	Total	550	6,400	-£109

4.3. Estimated Gross Value Added

Modelled data for 2,204 dedicated AI companies suggests that aggregate GVA has increased from £1.0bn in 2022 to £1.2bn (+20%, £0.2bn). Figure 4.3 provides a summary of 2023 estimates of revenue and GVA for companies of different sizes.

Figure 4.3 – Revenue and GVA by Company Size



Source: Perspective Economics

Of the 235 companies with known GVA coverage[26], 70 have negative GVA in 2023 compared to 67 in the 2022 study (2% of dedicated companies in 2023 compared to 3.5% in 2022). AI companies may have negative GVA when they are, for example, using external investment to support development of new technologies and research resulting in operational losses that are greater than the positive GVA attributable to wages and salaries.

[26] 235 companies within the 2023 dataset reported full accounts including figures for operating profit, remuneration, amortization and depreciation. This data was used together with survey data to produce estimates of AI related revenue for every company in the 2023 dataset.

4.4. Summary of Economic Contribution

Revenue

- Estimates suggest that UK AI companies generated more than £14bn in revenues, with 68% of this generated by diversified companies and 32% by dedicated AI companies.
- Approximately 80% (£11.4bn) of UK AI revenue is generated by large firms, despite them making up 4% of the identified companies. The estimates also indicate that small and medium sized companies account for an 8% lower share of revenues in 2023 than they did in 2022.

Employment

- In 2023, a total of 64,539 FTEs were employed across both dedicated and diversified AI companies, rising by ~29% since 2022. Approximately 47% of these employees are in dedicated AI companies and 53% are in diversified companies.
- Employment figures by company size point show that large AI companies account for 53% of employment (6 percentage points higher than in 2022). The data also suggests that there is a potential squeeze on small and medium-sized AI firms with their share of employment falling between 2022 and 2023.

GVA

- Modelled data for the dedicated AI companies suggests that aggregate GVA has increased by 20% between 2022 and 2023, however, 2% of the dedicated companies with known GVA coverage have negative GVA.

5. Investment in UK AI Companies

This section provides findings from analysis of the investment raising activity of UK AI companies included in the study. It draws on investment data from the Beauhurst platform, which tracks announced and unannounced investments in high-growth UK companies, together with findings from qualitative interviews with AI investors and relevant AI survey business responses[27].

Key Takeaways

- In 2023 the value of investment in AI companies fell by half (53%) reflecting the overall drop in investment across the wider high-growth ecosystem. However, the volume of deals remained relatively stable, potentially denoting better value for investors.
- The average deal size for AI companies in 2023 aligned with pre-pandemic investment levels, again consistent with the wider high-growth ecosystem following what are deemed to be exceptional annual totals in 2021 and 2022.
- Investment in AI companies is heavily concentrated in London, which secured more than 70% (£822 million) of total equity investment in 2023.

5.1. Investment to Date

AI companies raised £2.4bn in equity investment in 2022, with an average deal size of £4.6m (527 deals). Record highs in 2022 were driven by several large deals, including a £210m deal raised by peer-to-peer lending platform Lendable in March – the largest single equity deal raised by an AI company between 2021 and 2023.

Companies at the growth stage accounted for eight of the top 10 fundraisings in 2022. Among them, Improbable, a London-based virtual software company, raised a total of £203m via one £115m fundraising in April and a £88.1m fundraising in October 2022.

According to investment data provider Beauhurst, the boost in investment in 2022 is likely due to several factors. The introduction of government stimulus measures targeted at supporting businesses led to increased investment across the high-growth ecosystem. This assertion was supported within qualitative interviews with strategic stakeholders and businesses who were keen to see initiatives such as the British Business Bank's Seed

[27] Beauhurst algorithms collect information from Companies House, business websites and news articles. Data is also provided via data partnerships with granting bodies, investors, advisors and universities. Data is manually verified by Beauhurst staff members.

Enterprise Investment Scheme (SEIS) and Enterprise Investment Scheme (SIS) sustained and expanded to ensure that strong levels of early-stage AI investments are maintained.

In addition, advancement of technology and AI over the years has increased popularity and demand among individuals and businesses – evident in investment raising activity within sectors such as application software, SaaS, and data analytics. In 2022, companies within these sectors participated in 403, 233, and 203 fundraising deals respectively.

These sectors were also the most prominent areas for international investment (foreign investors contributed to 70% of deals in application software) and were also highlighted as areas of focus in qualitative interviews with investors.

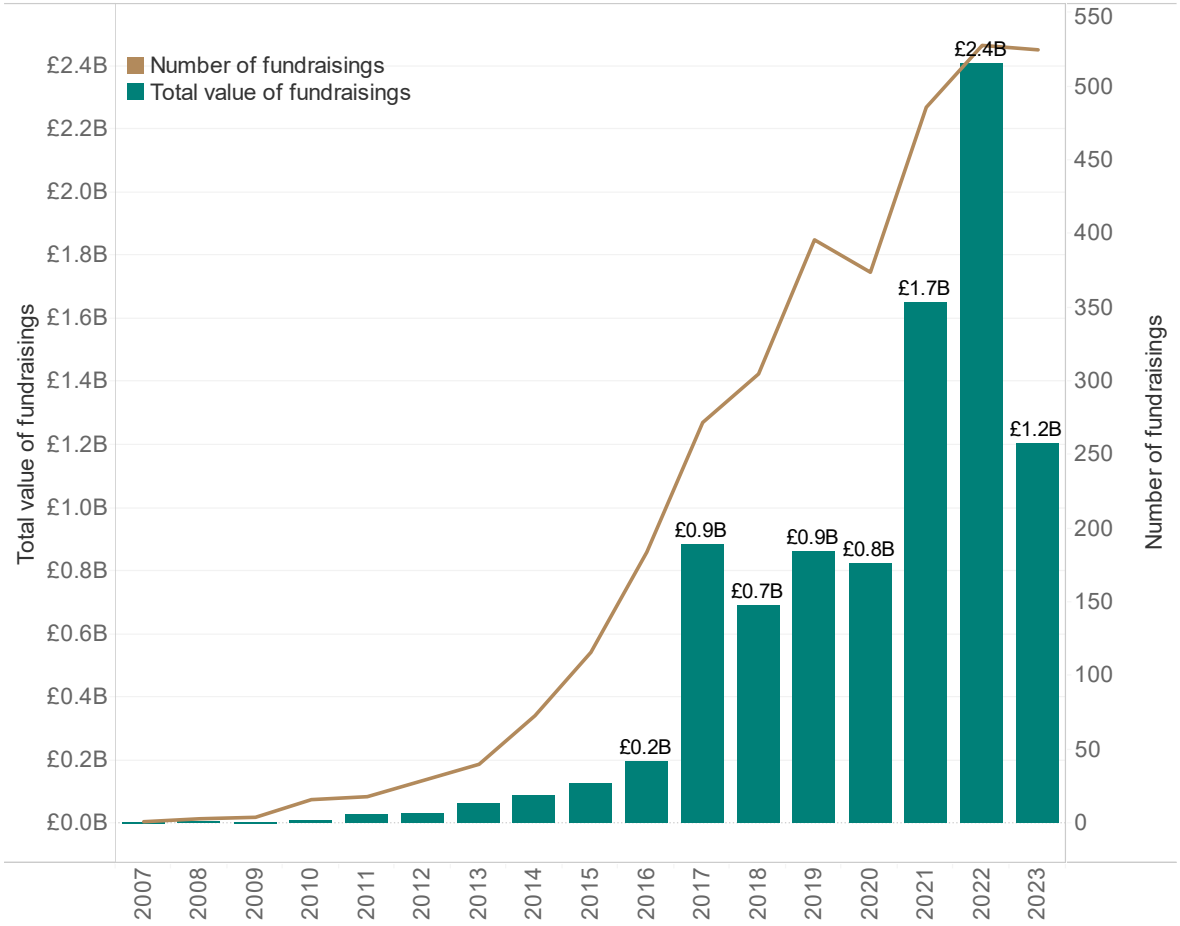
"Through our experience of investing, we often look at three specific themes: AI in the enterprise, AI for security applications, and how AI is shaping the world of emerging technologies."

AI investor interviewee

In 2023 the value of investment in AI companies fell by 50% to £1.2bn, yet the volume of deals remained relatively stable (-1%) potentially denoting better value for investors. The average deal size for AI companies decreased from £4.6m in 2022 to £2.3m in 2023, aligning with pre-pandemic investment levels.

This decrease reflects the overall drop in investment across the wider high-growth ecosystem and marks a return to pre-pandemic investment levels, following what are deemed to be exceptional annual totals in 2021 and 2022. An increase in interest rates and over deployment in 2021 and 2022 contributed to a more cautious fundraising landscape in 2023.

Figure 5.1 – Equity Fundraising Timeseries



Source: Beauhurst

However, between January and July 2024 AI companies raised £1.5bn in equity investment via 150 fundraising deals – already surpassing the total raised in 2023 and indicating that although AI companies may not reach the highs of 2022, investment in this area remains strong. Investor interviews confirmed that positive sentiment was returning to segments of the investment market.

"Private Equity (PE) is beginning to pick up, and fundraising has freed up a bit – Limited Partners (LPs) are back writing cheques again. [However], *there are a lot of zombie VC backed businesses doing down rounds*[28] *and looking for exits. PE isn't coming to the rescue unless* [the business] *can show a very quick path to profitability."*

AI investor interviewee

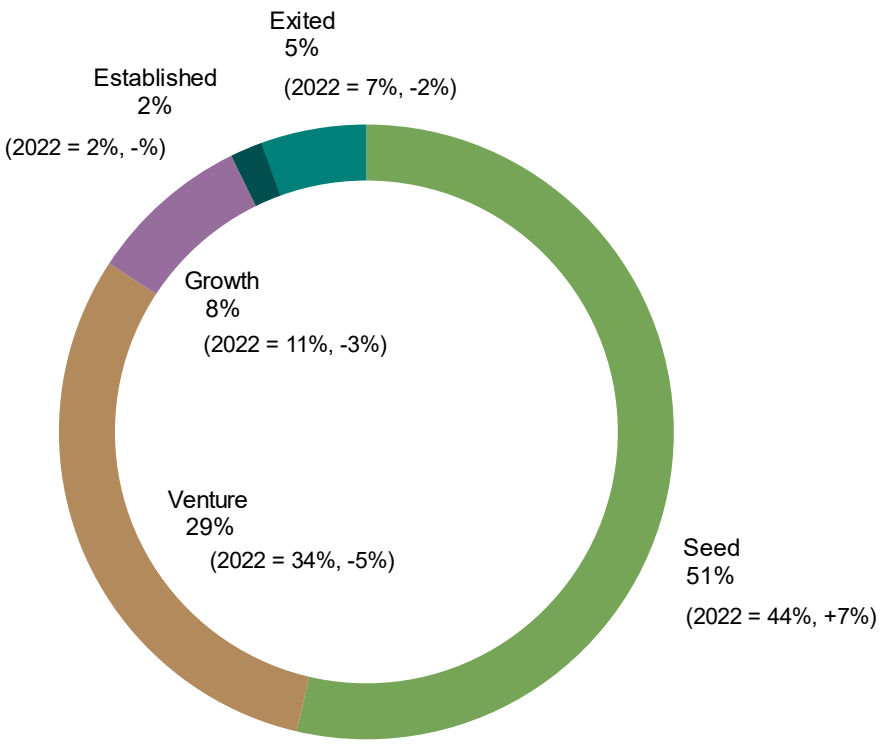
[28] Where the value of a business at a time of investment is below the value of that same business during a previous funding round.

5.2. Investment Profile

Businesses seeking investment can be classified into stages based on their growth and development: seed, venture, growth, and established. Seed-stage companies are generally newly formed start-ups with few employees and low valuations, often seeking their initial investment round. Venture-stage companies have typically spent years honing their business models and technologies, building an established reputation, and securing investment and valuation in the millions. Companies in the growth stage have been active for over five years, have regulatory approval, and are likely to bring in significant revenue and investment. Established companies have been trading for over 15 years and have a track record of profitability or significant annual turnover after more than five years.

Changes in the proportion of firms at different stages of evolution between 2022 and 2023 support qualitative views of a relatively strong start-up landscape (+7% of firms in 2023) experiencing scale-up challenges (lower Venture and Growth percentages in 2023), and with less scope for exit in 2023 (-2% of firms in 2023).

Figure 5.2 – Dedicated AI Company Stage of Evolution (vs 2022)[29]



Source: Beauhurst

[29] Note: percentages do not sum to 100% because proportions for 'Dead' and 'Zombie' companies are not shown.

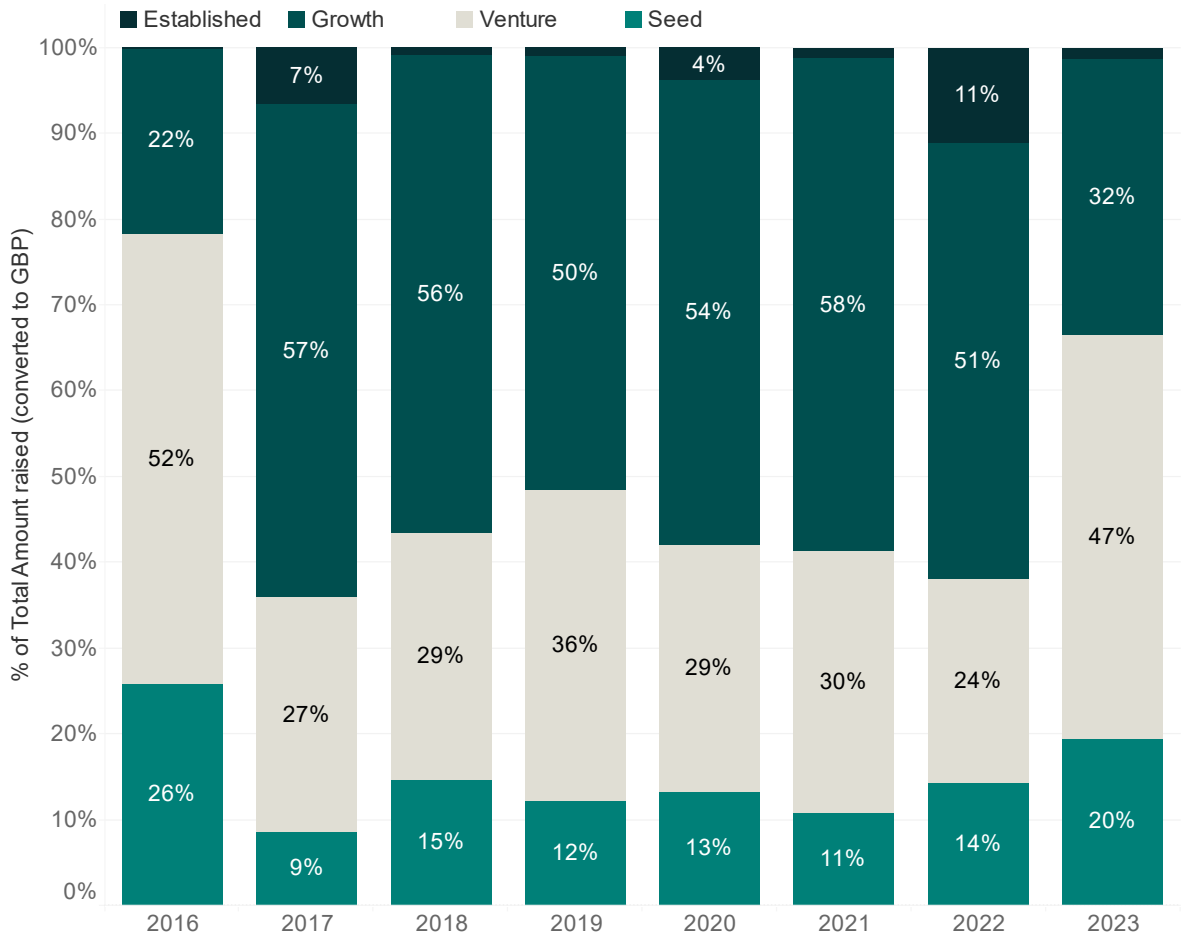
Changes in the percentage of firms at different stages between 2022 and 2023 are reflective of findings from qualitative interviews. These highlighted a well-established ecosystem for early-stage AI investment via VCs and government-backed initiatives, but also pointed to a critical gap in growth-stage financing (Series B and beyond). Investors interviewed to inform that study felt that the gap in growth-stage financing forces promising UK start-ups to seek investment in the US or other markets, leading to a potential talent drain and loss of innovative capacity.

"A £2 million round in the UK is probably the same sort of risk and time to completion as a $10 million round in the US. Because they have more money, they are more relaxed about what they invest in, and how many hoops the founders would have to jump through. We have an early-stage company in our portfolio – they didn't have massive traction. We did a small fundraise with them, and then the founder went to San Francisco for two weeks and essentially raised $10 million in the space of 2 months."

AI investor interviewee

Analysis of fundraisings by stage of evolution shows that the share of investment in Growth stage companies fell from around half in 2022 to less than a third in 2023 (Figure 5.3).

Figure 5.3 – Share of Fundraising by Stage of Evolution (Dedicated Only | 2016 – 2023)



Source: Beauhurst (17,450 fundraisings)

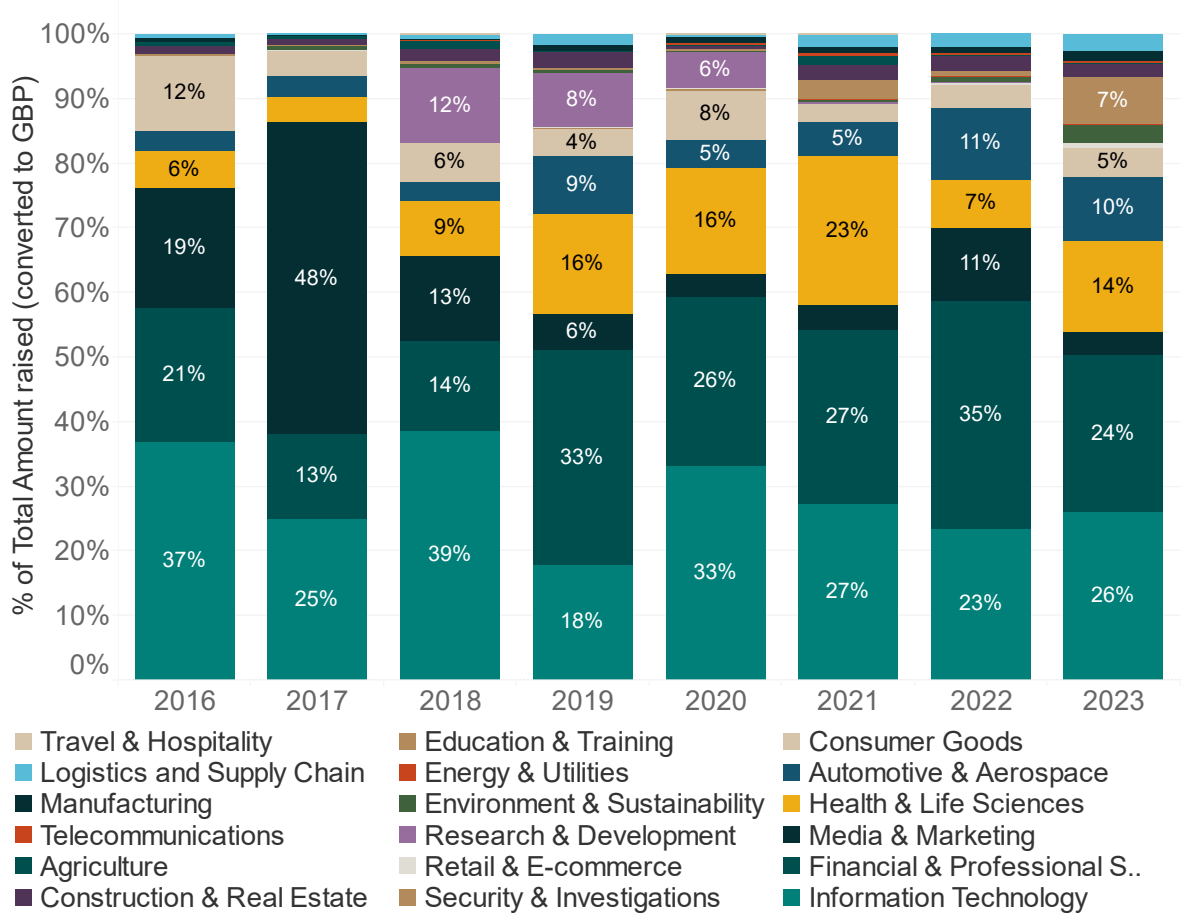
"The [early-stage] *funding is there, but for growth, companies need Series A funds capable of investing £2 million to £3 million in businesses with significant market share, proven success, and half a million to a million in annual recurring revenue (ARR), primarily in the UK market. American investors tend to value revenue generated in the UK less than that in the States, discounting it by 50% to 75% as they seek signals of scalability in the US market. Revenue from the US is considered a stronger indicator of potential success."*

AI investor interviewee

5.3. Investment by Sector

Companies operating in the information technology and financial & professional services sectors have consistently secured the highest proportion of fundraising, typically raising more than have of total investments each year. Companies involved in automotive & aerospace and health & life sciences have typically secured between a fifth and one third of total investments, with companies in other sectors securing much lower shares of investment, including for example agriculture, construction, manufacturing and environment & sustainability.

Figure 5.4 – Share of Fundraising by Sector (Dedicated Only | 2016 – 2023)

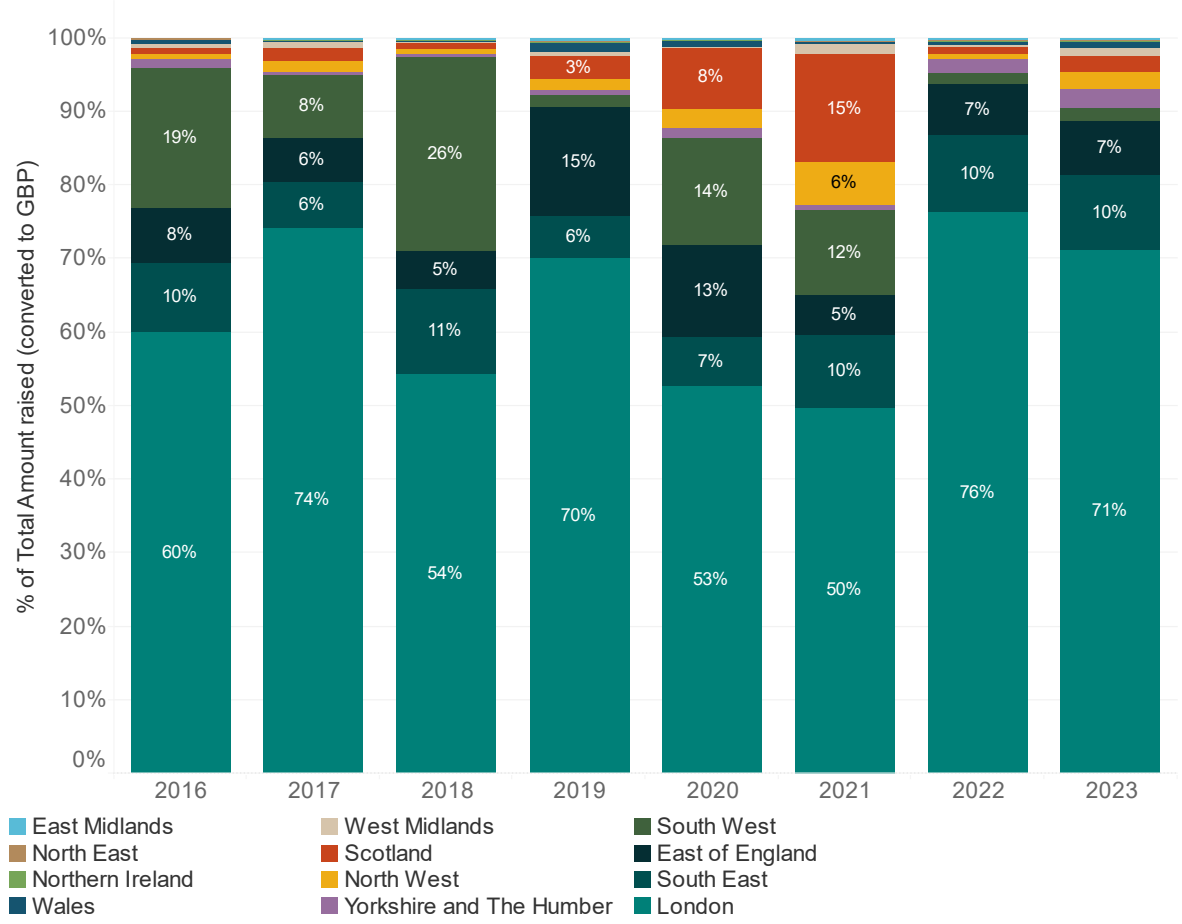


Source: Beauhurst (17,450 fundraisings)

5.4. Investment by Region

Investment in AI companies is largely concentrated in the southern regions. AI companies headquartered in London secured £822m (72%) in total equity investment in 2023, highlighting the city's popularity amongst AI companies and underscoring the capital's position as a leading investment hub. The South East and East of England secured 10% and 7% of total funding respectively.

Figure 5.5 – Share of Fundraising by Region (Dedicated Only | 2016 – 2023)



Source: Beauhurst (17,450 fundraisings)

According to investment data provider Beauhurst, London's dense cluster of AI companies, robust financial networks, population density, and access to talent are key contributors to its popularity among startups and investors. In contrast, businesses based in the East Midlands (0.14%) and Northern Ireland (0.01%) received the lowest proportion of investment in 2023. These figures are symptomatic of the limited presence of AI companies outside the capital and access to fewer funding opportunities. As mentioned in Section 3, survey findings and in-depth interviews also suggest that companies outside London are more likely to see access to equity investment as a barrier to growth.

Within qualitative interviews, investors were keen to see policy supports that could help UK AI businesses (particularly SMEs) offer globally competitive compensation packages. They felt this could take the form of better coordination, awareness raising and / or targeting of existing supports available at regional or local levels.

6. AI Market Dynamics

This 2023 study seeks to provide deeper insight into a series of questions that explore the dynamics of the market for AI products and services in the UK. Specifically, this section uses data on revenue, employment, location, mergers and acquisitions and investment, together with survey data to respond to the following questions:

- What are the levels of market concentration in the provision of AI products, services and infrastructure?
  - To what extent does the AI sector reflect oligopolistic or monopolistic competition dynamics? How might this change in the future?
  - What are the barriers and / or enablers to competition in the UK AI sector?
  - Does the AI sector see significant vertical integration and what impact does this have on competition?
  - Are larger AI providers enacting predatory merger and acquisition practices that discourage growth in smaller or newer AI companies?
- Are UK AI businesses able to compete effectively in the global market? Are there areas where the UK has a comparative advantage?
  - To what extent are key AI supply chains reliant on imports and global investment?
- What does the future of the AI sector look like? Is this likely to be positive or negative for the UK economy and consumers?

Key Takeaways

- Despite accounting for only 9% of AI companies in the UK, internationally headquartered firms account for 47% of AI-related revenues and 33% of AI employment. This suggests international companies play an outsized role in the UK's AI sector.
- The top 10 AI companies in the UK account for 61% of the sector's total Gross Value Added (GVA), indicating a high degree of concentration among a small number of large players.
- Despite risks regarding international dependencies and market concentration, the outlook for AI in the UK is positive given notable growth in AI related revenues and employment over the past 18 months, and a vibrant ecosystem of partnerships between leading dedicated AI companies, UK academic institutions, UK government and other publicly funded UK organisations.

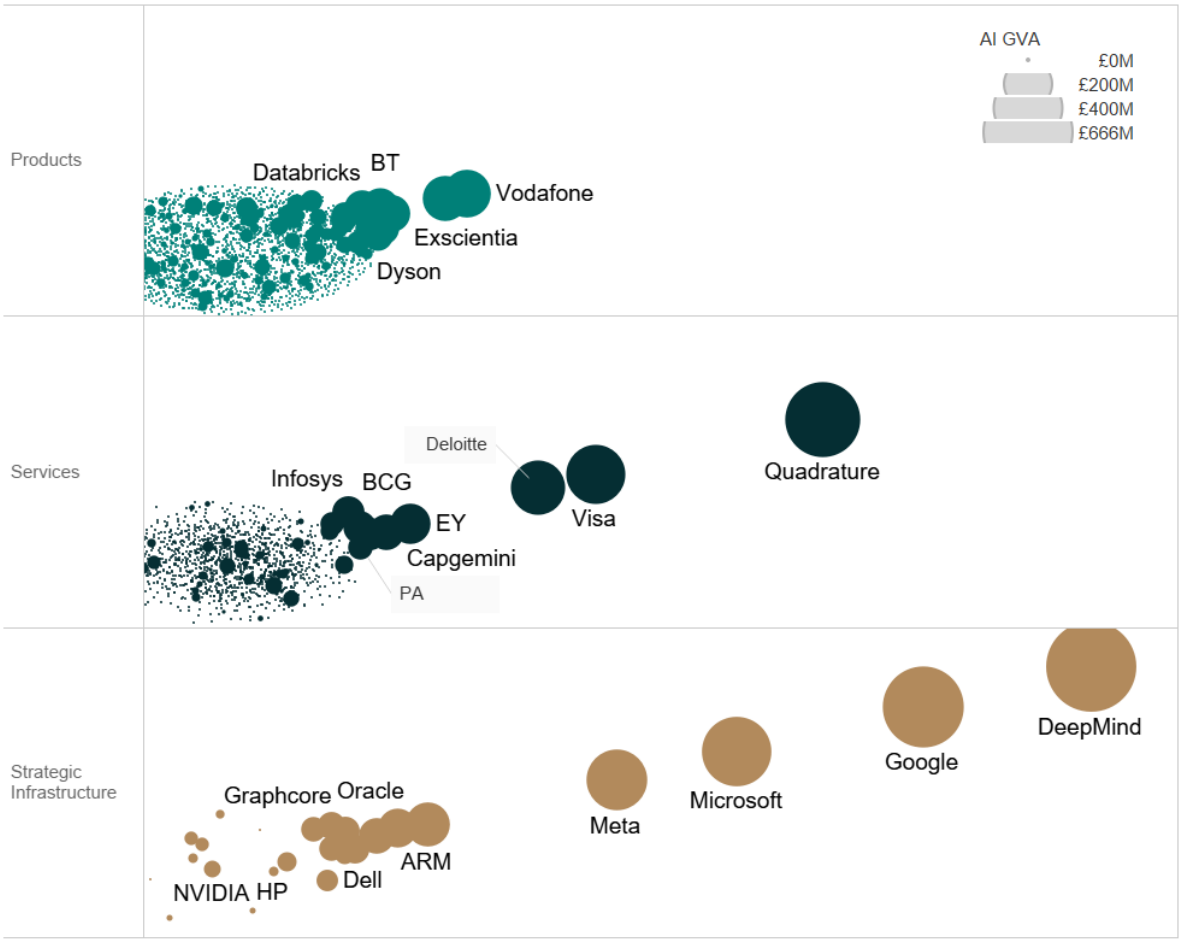
6.1. UK AI Market Structure

Companies operating within the AI market in the UK can be grouped into three main segments as follows:

1. Strategic Infrastructure Providers: a small number of strategically significant AI companies (<1% of all companies identified), most of which add considerable value to the UK economy through their AI activities relative to other market segments (42% of total GVA). Example companies include Google, Microsoft, Deepmind and Meta. This segment also includes other strategic infrastructure providers such as OpenAI and Anthropic, although the current scale of UK operations (and therefore GVA) is smaller.
2. AI Product Developers: a majority (65%) of companies, almost 86% of which are small or micro, involved mainly in computer vision and image processing and / or broader machine learning within the health and professional services sectors. Contributing just over 25% of sector GVA.
3. AI Service Providers: just over one third of companies identified, 89% of which are small or micro, involved mainly in provision of strategy and consulting or machine learning enabled services across sectors. Contributing just under one third of sector GVA.

Across all three segments, a small number of companies account for a majority of GVA (Figure 6.1). However, whereas large companies make up less than 4% of the total in the product and service provider segments, they account for more than 80% of strategic infrastructure providers. As such, strategic infrastructure providers make a disproportionate contribution to UK AI sector value added and therefore to the future performance of the sector in the UK.

Figure 6.1 – UK AI GVA Contributions



Source: Perspective Economics (GVA depicted on X and Y axis)

Further analysis of descriptive information illustrates the significant role that the UK's science base plays within the AI sector. A total of 238 dedicated AI companies are described as having some involvement in research. This equates to over 10% of all dedicated AI companies and these companies account for 42% of total GVA generated by dedicated AI companies (£0.5bn).

6.2. Market Concentration

Globally the AI market has seen substantive levels of integration between 2022 and 2023. In January 2023 Microsoft deepened its partnership with OpenAI in a multi-year, $10bn investment that would secure a 49% stake in the company. According to Microsoft, it's investment would *"accelerate AI breakthroughs to ensure these benefits are broadly shared with the world"*[30].

However, according to the UK Competition and Markets Authority (CMA), *"misuse of AI and other algorithmic systems, whether intentionally or not, can create risks to competition by*

[30] https://blogs.microsoft.com/blog/2023/01/23/microsoftandopenaiextendpartnership/

exacerbating or taking advantage of existing problems and weaknesses in markets"[31]. For example, recommendation systems could distort competition by giving undue prominence to one market participant over another, AI systems could enable price-setting based on tacit collusion, or market incumbents could use AI to heighten barriers to market entry. In the US, regulators (the Department of Justice and Federal Trade Commission) recently agreed an approach to an antitrust investigation into Microsoft, OpenAI and AI chipmaker Nvidia given concerns over their dominance of the AI space[32].

Across different segments of the market (dedicated, diversified and total market) analysis of revenue and employment data consistently returns Herfindahl-Hirschman Index (HHI) figures that are reflective of a competitive market in the UK[33]. While the presence of larger companies such as Microsoft, Google and Meta points to marginally greater concentration within the diversified segment of the sector, HHI calculations overall suggest good levels of competition.

Table 6.1 – HHI Calculations

AI Market Segment	HHI (Revenue)	HHI (Employment)	Result
Dedicated	364.6	45.5	Competitive
Diversified	551.5	195.8	Competitive
All	252.0	65.3	Competitive

Source: Perspective Economics

However, HHI calculations are recognised as offering a relatively narrow view of market concentration. With respect to this analysis, HHI calculations are also limited because they are based on estimated UK revenues and may not therefore reflect the totality of revenues attributable to the UK. Given these limitations, the study has also considered a range of other metrics to understand the extent to which the UK AI market shows potential for reduced competition in future.

6.2.1. Alternative Measures of Concentration

Analysis of shares of AI related revenues, employment and GVA among the top 10 companies shows that these companies account for almost half of total UK market revenues, one fifth of total AI related employment and almost two thirds of GVA. Value added is the most concentrated measure, particularly within the dedicated segment where the top 10 companies account for 81% of GVA (Table 6.2).

[31] CMA AI Strategic Update (2024), available at https://www.gov.uk/government/publications/cma-ai-strategic-update/cma-ai-strategic-update
[32] https://www.nytimes.com/2024/06/05/technology/nvidia-microsoft-openai-antitrust-doj-ftc.html
[33] Revenue shares were used to calculate HHI figures for dedicated, diversified and total AI market segments (n=365, 552 and 252 respectively). HHI figures of less than 1,500 are indicative of a competitive market.

Table 6.2 – Alternative Measures of Concentration

Metric	Segment	Total	Top 10	% Top 10
AI Revenues	Dedicated	£4.5bn	£2.2bn	48%
	Diversified	£9.7bn	£4.5bn	47%
	All	£14.2bn	£6.7bn	47%
AI Employment	Dedicated	30,200	4,300	14%
	Diversified	34,300	13,000	38%
	All	64,500	13,400	21%
GVA	Dedicated	£1.6bn	£1.3bn	81%
	Diversified	£4.6bn	£2.5bn	55%
	All	£6.2bn	£3.8bn	62%

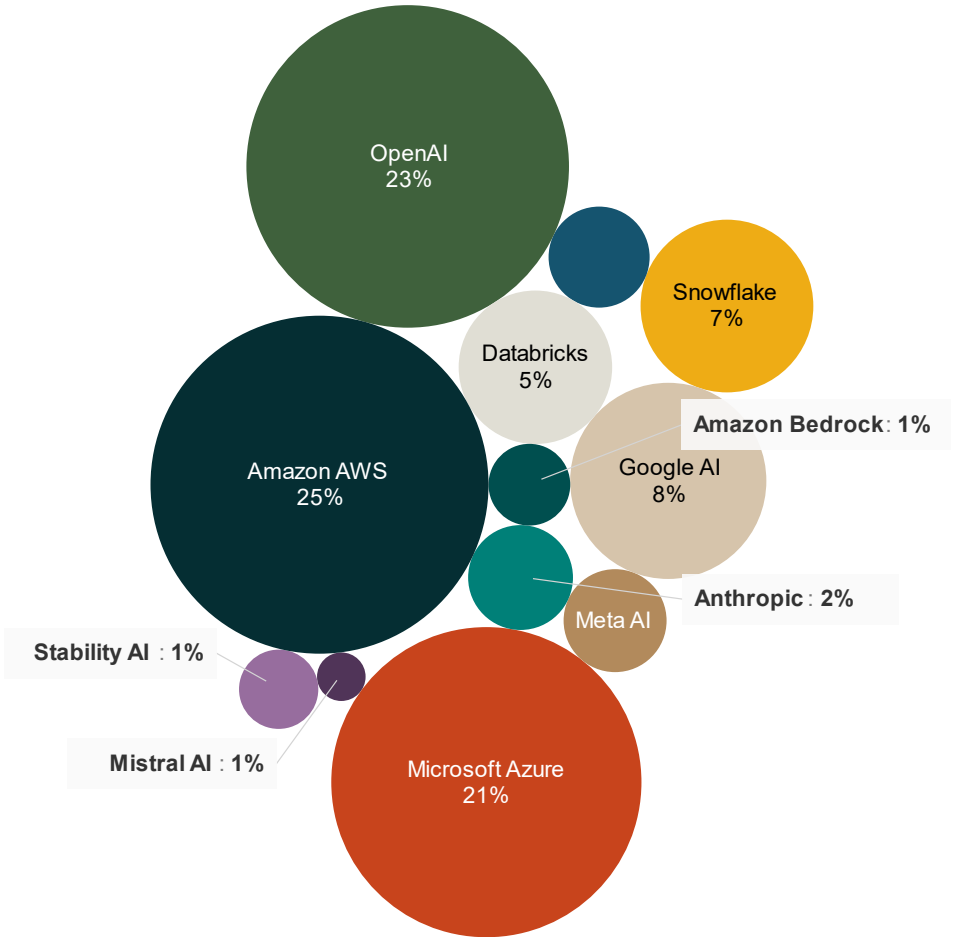
Source: Perspective Economics (excludes instances of negative GVA, figures may not sum due to rounding)

In contrast, the top 10 dedicated companies account for just 14% of AI employment, pointing to high levels of competition for workers among dedicated UK AI companies.

6.2.2. AI Infrastructure Concentration

Web intelligence emphasises the extent to which just a few prominent US providers dominate the AI infrastructure landscape. For example, between one fifth and one quarter of companies for which web intelligence was available (n=1,313) use AWS, OpenAI and / or Azure (Figure 6.2).

Figure 6.2 – AI Infrastructure Mentions



Source: Glass.ai (n=1,313)

6.3. Finance & Investment Dynamics

Levels of investment into the development of market-leading AI companies in recent years have been extremely high, to the extent that only a handful of global corporates have the means to fund leading-edge development efforts. Microsoft invested $10bn in OpenAI in early 2023[34], Google and Amazon invested $6.5bn in Anthropic in mid-2023[35] and most recently Meta announced that it would increase capital expenditure, incur higher infrastructure operating costs and expect higher payroll costs due to more, higher-cost technical roles[36].

While these are well documented high-profile examples, business survey responses show that AI development investment requirements are relative. A significant proportion of business survey respondents highlighted access to investment or other forms of external finance as a barrier to growth (53% and 32% respectively, n=297). Qualitative interviews

[34] https://www.forbes.com/sites/qai/2023/01/27/microsoft-confirms-its-10-billion-investment-into-chatgpt-changing-how-microsoft-competes-with-google-apple-and-other-tech-giants/
[35] https://www.forbes.com/sites/qai/2023/10/31/google-invests-in-anthropic-for-2-billion-as-ai-race-heats-up/
[36] https://investor.fb.com/investor-news/press-release-details/2024/Meta-Reports-Fourth-Quarter-and-Full-Year-2023-Results-Initiates-Quarterly-Dividend/default.aspx

also provided evidence that investment in the UK represents a potential barrier to AI sector growth.

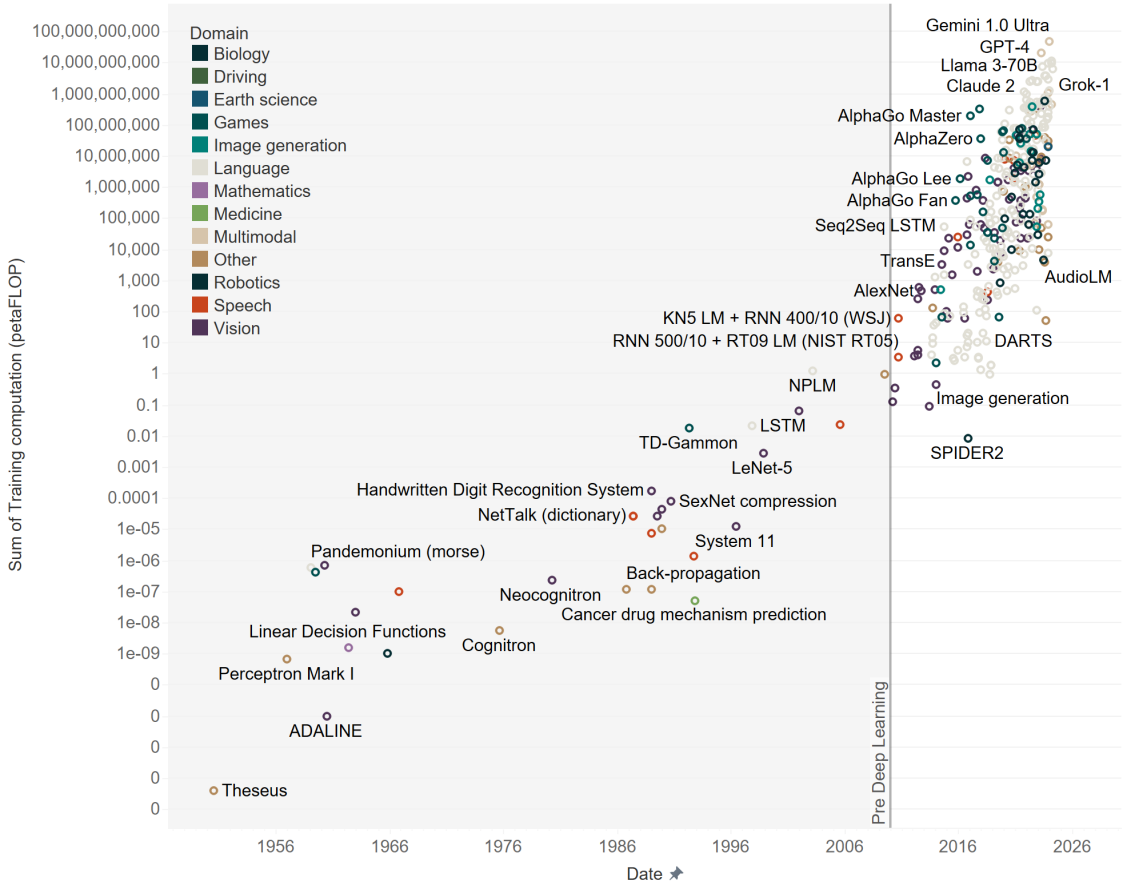
"We don't have enough capital from UK pensions to support innovation technology and that's a big challenge. Again, the government has acknowledged that it's a challenge. Mansion House reform is designed to do that. But there's a great level of urgency needed. If we don't act quickly, the UK will quickly be left behind in terms of development, and we don't want to have a brain drain of technical talent leave because the resources, at least in terms of the capital, are not there."

AI investor interviewee

6.3.1. Cost of AI Infrastructure & Operations

High development costs are easy to understand considering the level of computing power and investment of high-cost employee time required to develop AI products and services. Data captured by the EPOCH research institute[37] highlights the exponential growth in computing power required to train the most sophisticated AI models (Figure 6.3).

Figure 6.3 – Computing Power for AI-System Development



Source: EPOCH Research Institute (Notable Models)

[37] https://epochai.org/

Since the start of 2022, 196 new AI models have been developed – almost one quarter of the total number of models developed since 1950 – and 103 new AI models were developed in 2023 alone.

The scale, cost and pace of AI development are also seen as challenges to growth and competition among UK AI companies. One fifth of survey respondents cited AI procurement and operation costs as having significantly affected the company's ability to meet its business goals over the past 12 months. Of those indicating that procurement costs were a barrier, 93% described themselves as AI product developers. Over three quarters (76%) reported needing more training data, 72% have needed better security measures, and more than three fifths have required better network infrastructure and / or more local storage capacity (71% and 60% respectively).

Across the AI business and stakeholder qualitative interviews, a lack of AI infrastructure was commonly raised as a potential barrier to future sector growth. Specifically, this included the cost of, and access to compute resources, availability of and access to data centres and supercomputers, energy costs, and access to training data.

"People talk about AI like it's one big thing, but it's powered by data and cloud computing, it needs a lot of silicon and energy – if you're bad at any of these, you're bad at AI."

AI business interviewee

One of the main issues identified was the cost and limited access to compute resources, particularly for universities and smaller businesses. These resources were important for AI developers to be able to process and analyse large datasets. There was a sense that these organisations lacked the financial resources to invest in expensive hardware and software required for AI development and deployment.

A lack of access to data centres and supercomputers was specifically mentioned in this context. Some of the AI business interviewees explained that this made them heavily reliant on other countries for resources and data, with the US being commonly mentioned.

"[There are] *so many products coming out of the US and they have such better funding. They can move at much faster speeds. Also, the products that we rely on to develop our own services are backed by AI components that are from the US."*

AI business interviewee

Smaller businesses also reported that a lack of compute resources hindered their ability to compete with larger businesses and limited their potential for innovation.

"There are tons of really important stuff happening, but working in this space is expensive, thus out of reach for small companies."

AI business interviewee

6.3.2. Role of International Investment

Beauhurst data suggests that UK AI companies have some dependency on international investment. While UK funders make most investments in UK AI companies, international funders, including Microsoft, Nvidia, Softbank and Andreessen Horowitz account for 60% of value among the top 20 fundraisings. Example investments made by these international funders are provided in Table 6.3 below, and suggest that the focus of international investment is not concentrated in any one sector or type of AI company.

Table 6.3 – Example International Investments

Funder	UK Company (Top 3 Investments)	Sector
M12 (Microsoft)	Wayve	Automotive & Transportation
M12 (Microsoft)	Graphcore	Information Technology
M12 (Microsoft)	Hazy	Financial Services
Nvidia	Wayve	Automotive & Transportation
Nvidia	Synthesia	Education & Training
Nvidia	Charm Therapeutics	Life Science & Biotech
Softbank	Improbable	Entertainment & Media
Softbank	Exscientia	Life Science & Biotech
Softbank	Peak	Information Technology

Source: Beauhurst

6.4. Significance of International Companies

Across both dedicated and diversified segments, nine percent of companies are internationally headquartered. Despite accounting for a relatively small share of the total number of companies, internationally owned companies account for almost half of AI related revenues (47%) and one third of AI employment (Table 6.4). Diversified, typically larger, international companies account for a notable share of AI employment, suggesting that these companies are both an important source of AI employment, while also putting upward pressure on the cost of AI talent.

Table 6.4 – Significance of Internationally Owned Companies

	Total	Intl HQ	Percentage Intl HQ
Dedicated Firms	2,204	162	7%
Diversified Firms	1,509	154	10%
All Firms	3,713	316	9%
Dedicated AI Revenues	£4.5bn	£0.4bn	9%
Diversified AI Revenues	£9.7bn	£6.3bn	65%
Total AI Revenues	£14.2bn	£6.7bn	47%
Dedicated AI Employment	30,247	3,003	10%
Diversified AI Employment	34,292	18,364	54%
Total AI Employment	64,539	21,367	33%

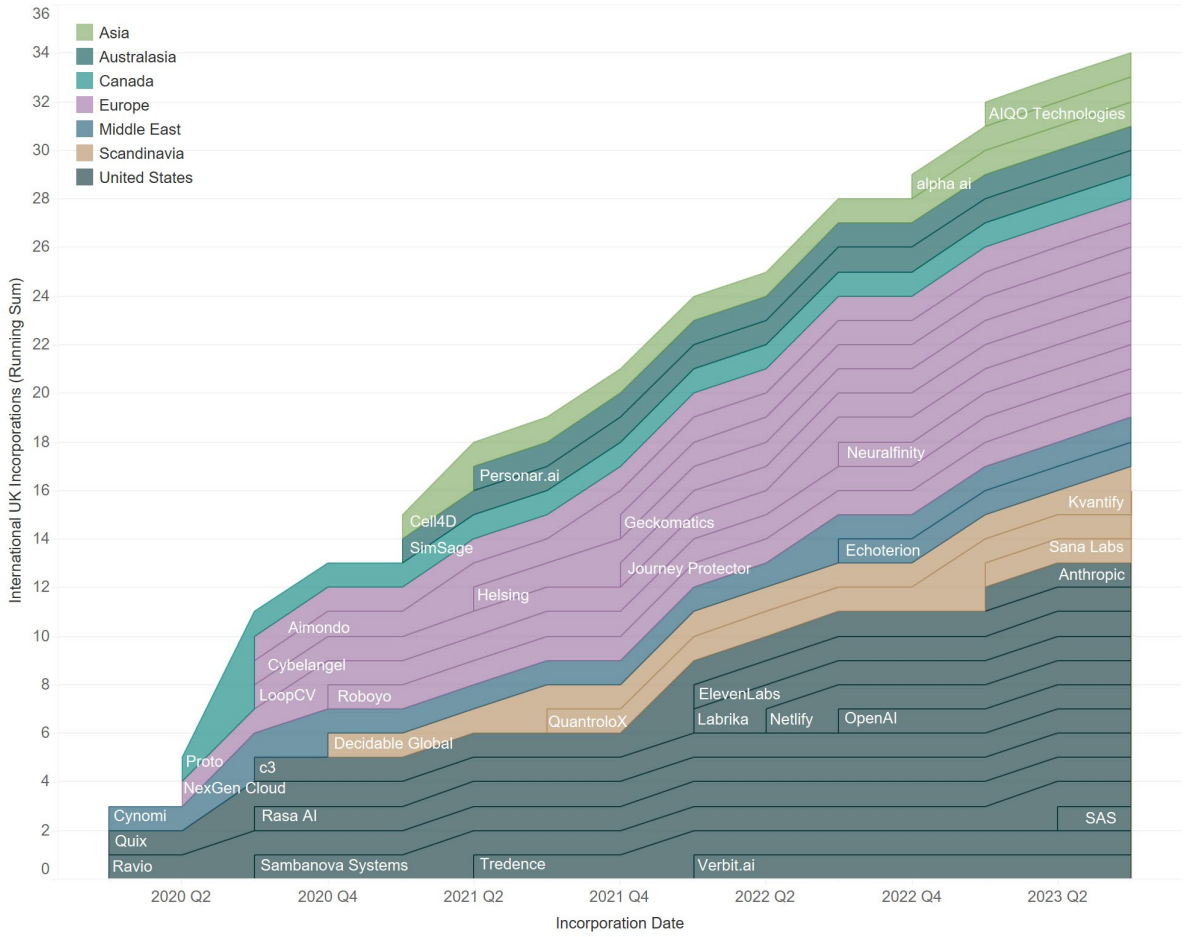
Source: Perspective Economics

Within the past three years (2020 – 2023) several internationally significant AI companies have established a UK presence. Examples include OpenAI, ElevenLabs, Anthropic, X.ai and Helsing (Figure 6.4)[38]. The current scale of these companies in the UK varies, from micro to medium sized[39], and the scale and purpose of their UK operations is continuing to evolve. Job post data suggests that development of AI assurance and safety functions is a focus of UK-based operations. For example, OpenAI recently recruited for a European AI Safety Policy Lead in London, Anthropic has recruited for Risk Management and Compliance roles, Meta has recruited for 'Integrity Operations Project Managers' and Google has recruited for senior safety and risk management roles.

While the scale of globally strategic AI companies' operations in the UK will vary, with appropriate policy interventions, the focus of their UK operations could be a lever to support the growth of UK niches such as AI assurance.

[38] X.ai is not shown in Figure 6.4 because while the company does have a UK office it is not yet registered in the UK.
[39] X.ai (7), Anthropic (40), OpenAI (77), Helsing (89), ElevenLabs (115)

Figure 6.4 – International UK Incorporations



Source: Perspective Economics

Data on inward investment into the UK shows that there were almost 200 AI-related investments between 2019 and 2023. Half of these investments have been by information technology companies (n=96) and of those, almost one fifth (19%, n=18) were made in 2023. Significant inward investment projects include Microsoft (£2.5bn investment into new datacentres and AI safety and research activities)[40], C3.ai (relocation of EMEA headquarters to London)[41] and Lambda Automatica (expansion of R&D and new products)[42].

6.5. Mergers & Acquisitions

Analysis by investment data provided Beauhurst, produced to inform this study, shows that UK AI companies have participated in an increasing number of mergers and acquisitions since 2018, with a total of 58 acquisitions occurring between 2018 and 2023. M&A activity peaked in 2022 (22 acquisitions), driven by the potential that AI technology has to improve businesses operations across sectors (horizontal acquisitions). The total value of M&A deals

[40] https://www.gov.uk/government/news/boost-for-uk-ai-as-microsoft-unveils-25-billion-investment
[41] https://c3.ai/c3-ai-relocates-emea-headquarters-to-central-london/
[42] https://marathon.vc/blog/lambda-automata-raises-eur6-million-to-defend-western-democracies

has also continued to grow, peaking at £362m in 2023 including, most notably, BioNTech's acquisition of InstaDeep. M&A deal values in 2023 were 68% higher compared to 2022.

Between 2018 and 2023, just under 80% of M&A deals were horizontal (i.e., between companies at similar stages of production and / or operating within different supply chains). At the time of writing, data does not show high volumes of vertical deals in which larger UK AI companies are acquiring smaller firms. Most AI acquisitions have occurred at seed or venture stage, likely to be partly due to the nascent character of the sector, but also driven by the desire to take ownership of intellectual property (IP). Examples of horizontal AI sector deals include:

2021	• Nottingham-based company Ideagen, which specialises in compliance software, acquired Ai XPRT for £2.00m. Ai XPRT has developed a platform that has automated the auditing of financial disclosure reports, compliance checks documents and reviews for due diligence. Ideagen plans to use Ai XPRT to accelerate its product development and implement it within its cloud service architecture to enhance its AI capabilities. • Northamptonshire-based Rahko was acquired by US biotechnology company Odyssey Therapeutics. Rahko uses its quantum machine learning platform to discover drugs quicker and more cost-effectively. Odyssey will add Ranko's drug discovery platform to its own to enable faster and more efficient drug discovery.
2022	• Spotify acquired Sonantic for £78.1m in 2022. Sonatic develops software that utilises machine learning to create artificial voices. This will help Spotify to create new user experiences, such as giving users context about upcoming recommendations when they aren't looking at their screens.
2023	• German pharmaceutical and biotechnology firm Bayer acquired Edinburgh-based Blackford Analysis. Blackford Analysis has developed an AI imaging platform that can analyse large sets of images. Bayer plans to use this platform to implement AI technology into its radiology offerings, which will aid in diagnosis and increase the volume of examinations carried out. • BioNTech completed its acquisition of InstaDeep to enhance its AI-driven drug discovery and development capabilities. InstaDeep, now a London-based subsidiary of BioNTech, continued to serve global clients across various industries while adding 290 professionals to BioNTech's team. The transaction, valued at around €500 million, supported BioNTech's strategic growth in AI and ML for next-gen immunotherapies and vaccines.

The upward trend in AI M&A activity looks set to continue into 2024.

6.6. Access to Talent

One quarter of AI business survey respondents indicated that a lack of technical skills posed a significant barrier to future growth. Decisions by globally strategic AI companies to locate in the UK suggests that the UK is an attractive place for accessing AI talent, yet competition for talent is intense and regionally disparate.

Qualitative research indicated that the AI sector faced similar challenges to other technology sectors in the UK, including similar skills gaps and shortages, high salary demands, and access to international talent. Stakeholders from industry and academia, as well as some of the interviewed businesses, noted that the UK's education system was not keeping pace with skills demands from industry. This was considered a more acute challenge for AI businesses than other technology businesses, given the rapid pace of change of AI technologies. Smaller AI businesses reported finding salary demands for AI talent particularly difficult and felt that they were frequently being outcompeted on salary by dominant big tech firms, whether headquartered in the UK or abroad.

> "We need to support the movement of people between university and industry in ways we haven't seen before … not just losing them to big tech. We need a closer working relationship."
>
> Public Sector Stakeholder

> "A lot of people gain experience and skills in UK AI sector then leave for other countries. More and more people are returning back home. It has become a significantly more prominent issue over the last 5 years. Other countries are trying to get their best AI talent back home."
>
> AI Business

Some businesses that relied on bringing in talent and skills from abroad noted that this had become more difficult following the UK leaving the EU, and the COVID-19 pandemic, with subsequent changes to visa requirements and increased waiting times to access talent from abroad.

> "Since Brexit and COVID-19, it's been harder to recruit people, so productivity has been hit."
>
> AI business

Smaller businesses highlighted apprenticeships as having an especially important role in the AI sector. The main benefits noted for apprenticeships in this context was that they were that they were more affordable, allowed people to enter the AI labour market at a younger age (rather than waiting for them to go through a higher education route), and allowed people to develop practical skills on the job, thereby ensuring their skills matched the employer's or industry's needs.

AI job post data shows that over half of the AI roles advertised in 2023 were London-based. Manchester, Bristol and Cambridge are the next most common locations for AI roles.

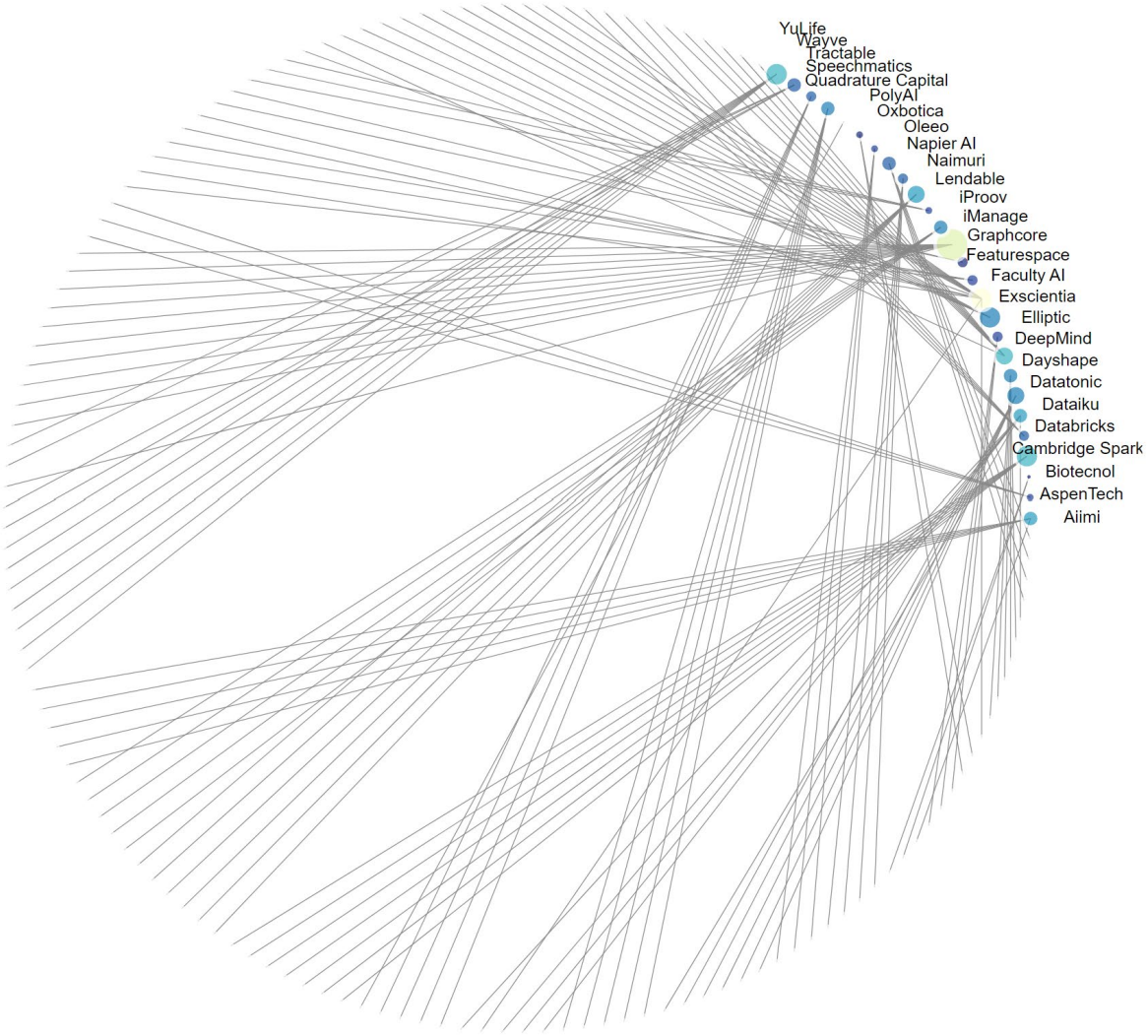
Together these locations account for more than two thirds of all unique jobs posted in 2023. The concentration of demand in London is consistent with Beauhurst findings regarding the concentration of AI investment, which is also London-centric. According to labour market analytics platform Lightcast, the median advertised salary for an Artificial Intelligence Engineer in London is £87.5k – 17% above the UK figure. In turn, the median UK-wide salary for AI Engineers in 2023 (£75k) was approximately double the overall median salary (~£35k).

There are clearly strong market incentives for AI companies to build their operations in London, meaning that stronger policy supports may be required if economic benefits of AI are to be more evenly realised across UK regions.

6.7. AI Collaboration

Web data on partnerships among leading dedicated AI companies points to a vibrant AI ecosystem – 27 of the largest dedicated AI companies have collaborated with ~130 partners spanning a range of organisations including academic institutions (e.g., Universities of Cambridge, Oxford, Bristol, Warwick, Essex and UCL), corporates (e.g., HSBC, Merk, Sanofi, Bristol Myers Squibb, Asda, Ocado, AIG, Bupa), government departments and other publicly funded organisations (e.g., the NHS, Transport for London and the BBC).

Figure 6.5 – AI Ecosystem Partnerships (Illustrative)



Source: Perspective Economics