DATA-BRIEF

Where is Europe's AI workforce coming from?

Immigration, Emigration & Transborder Movement of AI talent

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Stiftung Neue Verantwortung is now interface

Since 2014, our team has worked on building an independent think tank and publishing well-researched analysis for everyone who wants to understand or shape technology policy in Germany. If we have learned something over the last ten years, it is that the challenges posed by technology cannot be tackled by any country alone, especially when it comes to Europe. This is why our experts have not only focused on Germany during the past years, but also started working across Europe to provide expertise and policy ideas on AI, platform regulation, cyber security, government surveillance or semiconductor strategies.

For 2024 and beyond, we have set ourselves ambitious goals. We will further expand our research beyond Germany and develop SNV into a fully-fledged European Think Tank. We will also be tapping into new research areas and offering policy insights to a wider audience in Europe, recruiting new talent as well as building expert communities and networks in the process. Still, one of the most visible steps for this year is our new name that can be more easily pronounced by our growing international community.

Rest assured, our experts will still continue to engage with Germany’s policy debates in a profound manner. Most importantly, we will remain independent, critical and focused on producing cutting-edge policy research and proposals in the public interest. With this new strategy, we just want to build a bigger house for a wider community.

Please reach out to us with questions and ideas at this stage.

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Executive Summary

The global competition for Artificial Intelligence (AI) talent is intensifying. Jurisdictions and businesses alike recognize the importance of having the human resources to develop, implement, and control one of the economically, socially, and politically most transformative technologies of our age. Countries from the US through the European Union to China are striving to enhance their AI talent pools. For instance, in October, President Joe Biden signed an executive order aimed at easing immigration rules to allow more AI experts to study and work in the United States[1]. Similarly, China plans to attract talent by establishing AI academies in Beijing and Shanghai[2]. Companies like Google and Microsoft have expressed their support for this initiative. Meanwhile, businesses such as Microsoft, Aleph Alpha, and Tencent are also vying for top AI talent to maintain their competitive edge.

Prioritizing AI expertise has also become a recurring theme in European policymakers' recent statements. EU Commission President Ursula von der Leyen, who has just been reelected for a second term, has advocated for a concerted effort to tackle labour market challenges, highlighting critical issues such as skills and labour shortages. Von der Leyen's political guidelines for the European Comisssion aim to foster AI talent in Europe by providing the necessary infrastructure and public-private partnerships to support researchers. Efforts will be made to attract and retain top talent through strengthened collaboration between academia and industry, and a strategic plan will be proposed to improve STEM education and increase female participation in these fields.[3] Recently, the French President stated his guidelines “to make France an AI powerhouse, by attracting top talent.”[4] Wherever one looks, policymakers are making concrete efforts to increase the domestic AI talent pool and to attract and retain AI specialists.

But even though the global competition for AI talent has intensified, European policymakers and relevant researchers still lack crucial information about the expert pool the region is seeking. This makes their task of designing appropriate policies much more difficult, to the point where they risk neglecting the actual dynamics of the labor market. This data brief is therefore meant as a resource to understand the AI talent landscape in Europe and beyond. Most notably, we answered the following questions:

1 https://www.forbes.com/sites/stuartanderson/2023/11/07/biden-executive-order-on-ai-could-help-immigrant-professionals/

2 https://www.business-standard.com/technology/tech-news/tech-competition-china-wants-ai-academies-to-keep-tech-talent-supply-going-124052100465_1.html

3 https://commission.europa.eu/about-european-commission/president-elect-ursula-von-der-leyen_en

4 https://www.elysee.fr/en/emmanuel-macron/2024/05/22/gathering-of-frances-top-ai-talents

- Where does the AI talent pool in Europe originate from?
- Which countries is Europe losing its talent to?
- What percentage of the countries' AI talent pool is international talent?
- What is the educational background of AI talent?

We need to answer these questions and others before we can chart out effective policies to nurture, attract, and retain AI talent in Europe. Two distinct approaches can be employed when analyzing the AI talent in a region. The first approach centers on attracting AI professionals to the area, while the second stresses the importance of nurturing and developing local talent. The overarching goal of both approaches is to retain such talent, thereby enhancing the region's competitive edge. This data brief focuses on the first approach, aiming to explore in depth the diversity in geographical and educational backgrounds of the AI talent attracted to Europe.

This report reveals several critical insights into the AI talent landscape in Europe. European countries are losing significant AI talent, both national and international, to the United States. India is emerging as a primary source of AI talent for Europe, with many AI professionals in countries like Ireland and the United Kingdom having received their undergraduate degrees in India. Northern and Western European countries display a higher proportion of international AI talent compared to Southern and Eastern Europe, with Luxembourg and Switzerland particularly notable for their diverse talent pools. European AI professionals tend to have more advanced degrees than those in other regions, with a significant proportion holding at least a master's degree. This trend contrasts with the United States and India, where more AI professionals hold only bachelor's degrees.

While our data allows for some speculation about the reasons behind these emerging trends, we aim to follow up this report with qualitative research to understand the causes behind these patterns.

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Introduction

The rapid advancements in Artificial Intelligence (AI)—evident in technological breakthroughs, widespread adoption, and significant impacts on daily life—mirror the unprecedented pace of technological progress and serve as a vital metric for assessing a country or region's innovative capabilities, economic strength, and geopolitical influence. The European Union (EU), with its access to a highly

educated AI talent pool and its regulatory leadership, is strategically positioned to lead in responsible AI innovation, especially following the recent passage of the EU AI Act. Experts agree that the success of AI innovation heavily relies on the availability of skilled talent. Europe possesses diverse AI talent from various geographical and educational backgrounds, uniquely positioning the region [5] to excel in AI innovation and regulation. At the same time, the global demand for AI talent has increased fivefold since 2015[6], intensifying competition for well-trained AI experts worldwide. Consequently, prioritizing AI expertise has become a recurring theme in European policymakers' recent statements.

Of course, Europe is not starting from scratch when it comes to AI talent. It boasts a per-capita concentration of AI experts that surpasses that of the United States by 30% and nearly triples that of China[7]. This impressive statistic underscores Europe's pivotal contribution to the AI domain, highlighting the substantial pool of talent already present within its borders. And yet, even if Europe has a lot to show in terms of AI talent, the narrative does not end here. Two critical challenges emerge that require strategic attention to strengthen Europe's capabilities in AI innovation. The first challenge is the escalating global demand for AI talent. This demand has intensified, yet the talent pool remains concentrated in specific cities in the United States and India, with very few European cities emerging as AI talent hotspots. This surge in demand underscores a pressing need for Europe to preserve its existing pool of AI experts and expand it significantly. The European nations must be prepared to engage in fierce competition, adopting strategies that are both attractive to potential talent abroad and conducive to nurturing homegrown expertise.

Simultaneously, the second challenge revolves around the depth of understanding among policymakers of Europe's own AI talent ecosystem. This is a rapidly evolving sector, characterized by a constant influx of new talent and high migration rates. Mapping migration within EU countries is particularly challenging due to variations in labour market measurements across member states. Furthermore, AI talent is often subsumed under the broader category of STEM (Science, Technology, Engineering, and Mathematics) talent, rather than being recognized as a distinct and specialized field. Despite having a substantial talent pool, a noticeable knowledge gap exists concerning the dynamics of talent flow, development, and retention within the region. This gap makes it more challenging to formulate and implement effective policies to enhance the attractiveness of Europe as a destination for AI professionals and ensure the retention of homegrown talent. Or, to put it another way: If one wants AI specialists to come or to stay, we need to know what

5 https://www.ox.ac.uk/news/2023-10-09-expert-comment-ai-demand-booming-right-skills-and-technology-glue-guys

6 https://www.ox.ac.uk/news/2023-10-09-expert-comment-ai-demand-booming-right-skills-and-technology-glue-guys

7 https://atlas.sequoiacap.com/a-talented-home-for-ai/

the factors are that determine their careers in the AI sector. To get to the bottom of these factors, we first need to collect, understand, and classify the relevant data.

Two distinct perspectives can be employed when analyzing the AI talent in a region. The first approach centers on attracting AI professionals to the area, while the second stresses the importance of nurturing and developing local talent. The overarching goal of both approaches is to retain such talent, thereby enhancing the region's competitive edge. This data brief focuses on the first strategy, aiming to explore in depth the diversity in geographical and educational backgrounds of the AI talent attracted to Europe. It builds on our previous analysis, which examined empirical evidence showcasing talent flows into and out of top AI PhD programs in Germany.

Our analysis offers insights into AI talent flows, their geographical diversity, and educational backgrounds. The following sections will present the data we have gathered and analyzed through interactive visualizations. We address questions such as:

- Where is AI talent migrating from? What proportion of the talent consists of skilled foreign nationals?
- How much of the talent comes from outside the EU?
- What percentage of the countries' AI talent pool is international talent?
- What is the highest degree of education attained by AI talent in various countries?

Determining the exact causes of these talent flows from quantitative data alone is challenging; our report lays a strong groundwork for further exploration. Our insights are potentially helpful for various purposes, whether for research, gaining a deeper understanding of industry opportunities, or developing and implementing evidence-based strategies and policies. They build a strong baseline understanding of the AI landscape in Europe for stakeholders influencing AI policy directly or indirectly. This data brief concludes with open questions and aspects that have emerged from the data analysis, which provide starting points for further research projects.

Dataset

This data brief maps the landscape of AI Talent, focusing on geographical and educational backgrounds in the EU and beyond. The data and preliminary analysis for this report has been provided by LinkedIn.

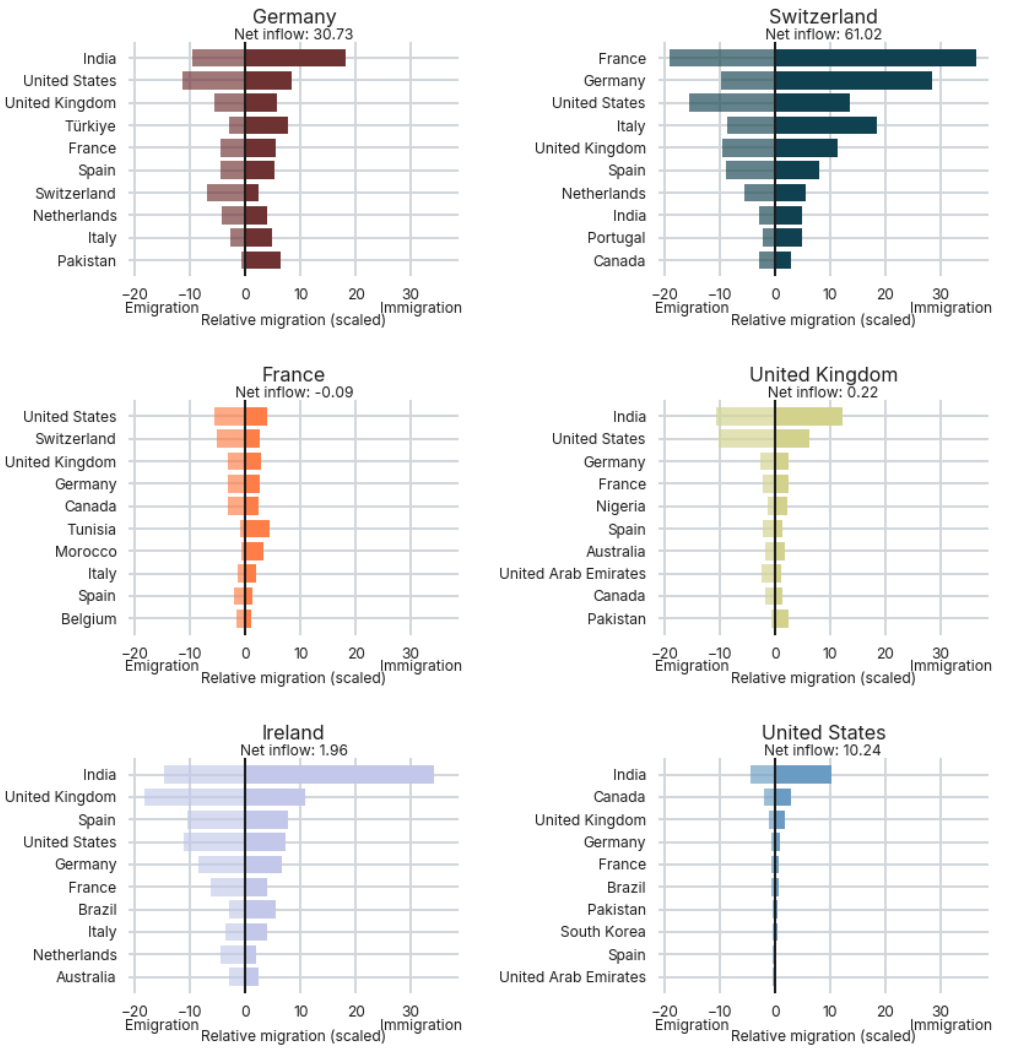
LinkedIn used its own definition of AI talent based on a combination of skills and job roles one reports on their LinkedIn profiles. It classifies members with at least 2

AI skills on their profile and/or in an AI occupation as AI talent. Charts 1-4 of this data brief are based on LinkedIn data, where we explore the geographical origin of AI talent based on where they attained their undergraduate degrees as well as the highest degree attained, from sub-bachelor's to Ph.D.

To explore the exact ways we have analyzed this data, please look at the detailed methodology section at the end of this data brief.

Findings

Chart 1: AI Talent Migration



Source: LinkedIn, 2024

What you see:

These charts show migration rates based on the locations people shared in their LinkedIn profiles. The right bar shows where AI talent is immigrating from, and the left bar shows where AI talent is emigrating to. In this chart, the countries listed on the y-axis represent the previous working locations of individuals, not their nationalities. This is a key distinction between this chart and the following one (Chart 2). In this chart, we focus exclusively on previous working locations, whereas Chart 2 examines the origin based on the locations where individuals obtained their undergraduate degrees.

The data covers AI talent movement from January 1st, 2024 to June 5th, 2024. The immigration and emigration rates are calculated per 10,000 LinkedIn members in each country. For example, relative immigration from India to Germany of 18 means that for every 10,000 LinkedIn members in Germany, 18 AI professionals moved there from India during this period. This method allows for easier comparison between countries with different population sizes.

For each country, we display the top ten countries by migration flow, which sums the absolute numbers of inflow and outflow. On top of each graph, you can see the net flow of AI talent in each country.

What it means:

This chart highlights the dynamic movement of AI talent among major players in the AI landscape, with transitions occurring at various career stages. Switzerland and Germany have the highest immigration of AI talent from other countries. Only France, among the six countries studied, is experiencing a brain drain with more emigration than immigration.

Switzerland emerges as a significant attractor of international AI talent, predominantly from European countries. Notably, it draws substantial talent from France, Germany, and Italy, which is most likely related to the official languages of Switzerland as well as to geographical proximity.

Germany is experiencing a notable outflow of AI talent to the UK, Switzerland, and especially the US.

There is a lot of movement of AI talent from India to Germany, the UK, Ireland, and the US. To explore this movement further, we've added an additional chart in the appendix that looks at the distribution of Indian AI talent in Europe. However, this trend is not mirrored in Switzerland and France, potentially due to language

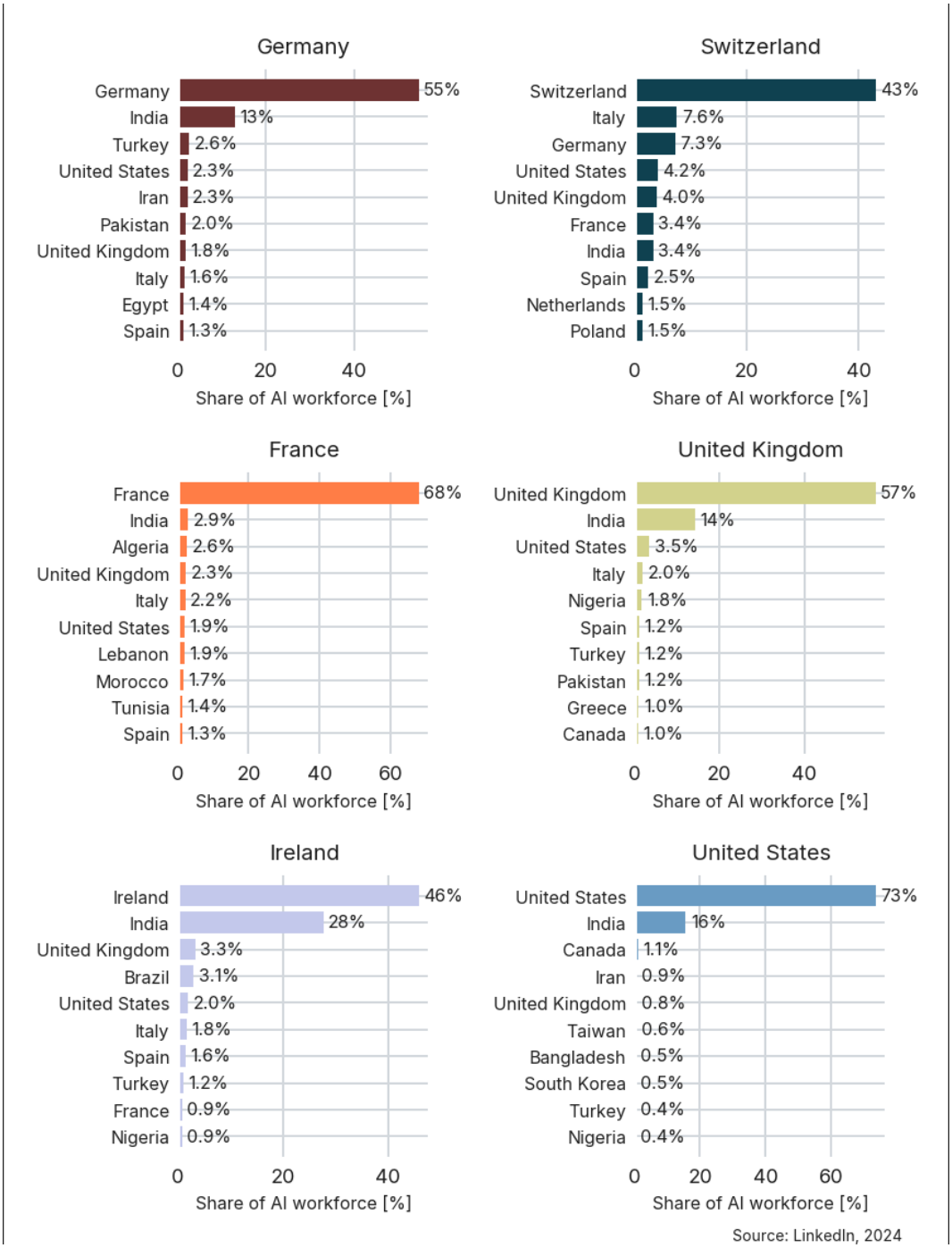
barriers and professional networks that are less accessible to Indian talent. Conversely, India experiences a significant inflow of AI professionals from Germany, the UK, Ireland, and the US. This reverse migration is likely driven by Indian professionals returning after completing their studies or switching jobs, motivated by India's booming tech sector and strong cultural and familial ties. Since we are looking at immigration and emigration based on locations shared on LinkedIn, it is difficult to distinguish between Indian nationals returning from other countries and foreign nationals moving to India for work. This is an important distinction to keep in mind while analyzing this chart.

The United States stands out as a primary destination for AI talent from Europe, probably attracted by its leading tech companies, renowned universities, and extensive research facilities. The UK, in particular, sees a substantial outflow of its AI talent to the US.

Pakistan, while a significant supplier of AI talent to the US, the UK, and Germany, struggles to attract much talent itself, at least from the countries we have studied.

Chart 2: Origin of AI Talent by Country

(Based on the location of their Undergraduate Degree)



For a complete presentation of this graph, please see the online version of this publication.
https://www.interface-eu.org/publications/where-is-europes-ai-workforce-coming-from

Note: This interactive chart allows you to compare data for 50 countries, both within the European Union and globally, as well as aggregated data for the EU.

What you see:

This chart offers insights into the origins of the AI workforce across various countries, based on the assumption that the location of their undergraduate degrees

represents their country of origin. This assumption is generally reliable, as most individuals pursue early education in their home country. OECD data supports this, indicating that only 8% of bachelor's degree students in OECD countries are international. However, notable exceptions exist, which are addressed in detail in this paper's methodology section. Compared to Chart 1, where we looked at migration in the workforce in 2024, the focus here is on the educational background.

What it means:

The dependence on international talent within the AI sector shows remarkable variation across different countries, despite the largest group of AI talent in most analyzed countries being “homegrown”. For example, nearly half of Germany's AI workforce attained their undergraduate degrees from foreign institutions, highlighting a significant reliance on international education, and the ability to attract foreign talent. In contrast, France benefits from a more domestically oriented talent pool, with nearly 70% of its AI professionals having completed their undergraduate studies within the country.

The migration trends of AI talent do not mirror broader demographic movements in countries like Germany. In 2021, 1.3 million people moved to the country, mostly from other European Union countries, with Romania, Poland, and Bulgaria being the top sources. However, these countries are not significant sources of AI talent. When looking only at labour migration, a pattern similar to the one in our chart emerges. Germany's labour and migration policies have long focused on attracting academic professionals, exemplified by the Blue CardEU introduced in 2012 for highly skilled non-EU workers. By the end of 2023, the country had issued 113,000 Blue CardsEU, a 26% increase from the previous year. The majority of Blue CardEU holders were from India (33,000), Russia (10,000), and Turkey (8,000). To qualify, individuals need a university degree and a job offer with a minimum salary, [8] whereas EU nationals can migrate with minimum administrative hurdles.

In France, on the other hand, the AI workforce significantly consists of individuals from French-speaking former colonies such as Algeria, Morocco, and Lebanon. The direct comparison of undergraduate degrees as an indicator of origin might be less effective here due to the closely linked higher education systems between these countries and France, characterized by unique educational pathways like "prepas" and "Grande Ecoles" that are uncommon elsewhere. This streamlined acceptance of their qualifications might attract more international talent from these countries to

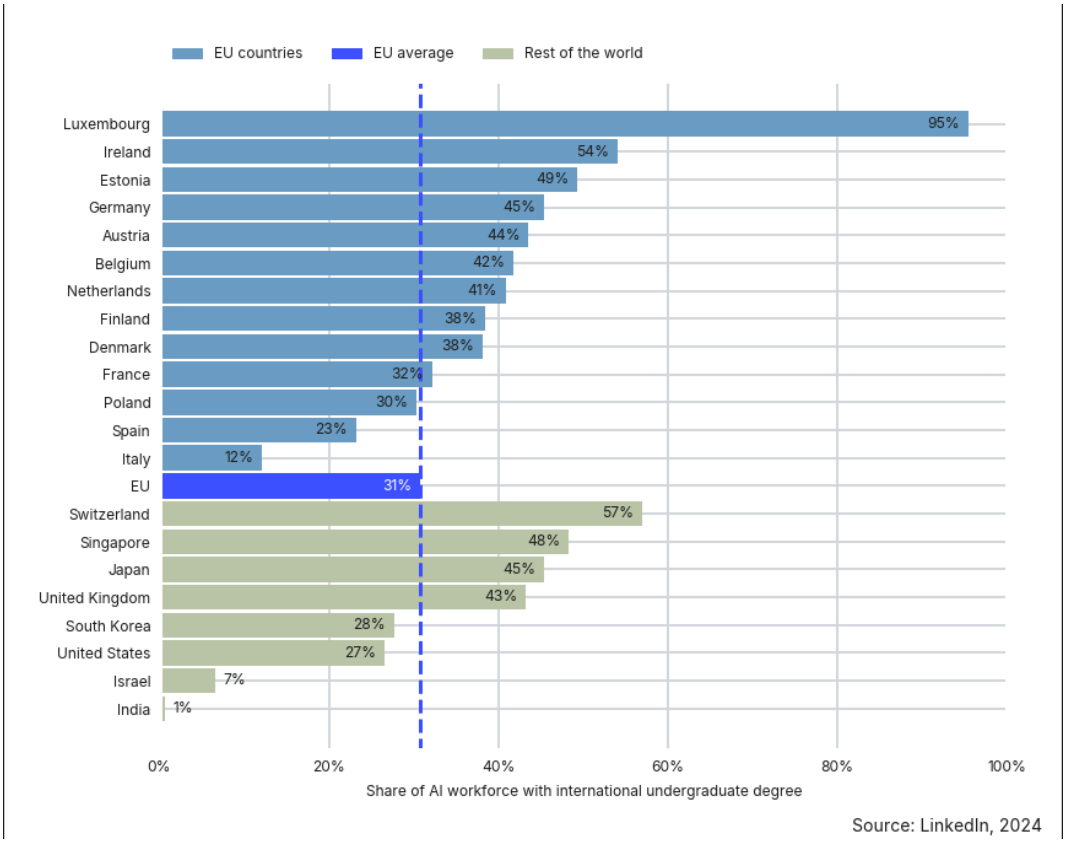
8 https://www.destatis.de/DE/Presse/Pressemitteilungen/2024/05/PD24_177_125.html

France at the undergraduate level. By highlighting these examples, we demonstrate that the migration of AI talent cannot be simplified to general migration patterns. Various factors, including education systems and language, significantly impact migration trends.

A noteworthy aspect is the significant contribution of Indian-educated professionals to the AI talent pool in many European countries. Ireland stands out in this context, with 28% of its AI workforce having completed their undergraduate studies in India. Ireland's appeal could be further magnified by its status as the biggest country with English as one of its official state language in the EU post-Brexit, coupled with a thriving tech sector, with companies such as OpenAI opening their first EU office in Dublin last year. Similarly, 14% of the United Kingdom's AI talent also comes from India.

Once again, language seems to play an important role in attracting AI talent as native English-speaking countries like Ireland, the United Kingdom, and the United States attract the largest share of Indian talent. Similarly, Switzerland (with its official languages including German, French and Italian) attracts foreign AI talent from Germany, France and Italy. It would be interesting to explore what attracts so many Indians to Germany and, in general, the factors other than common language that attract AI talent to some countries or cities.

Chart 3: International Representation in AI Workforces



What you see:

This chart shows the proportion of AI professionals in various countries who received their undergraduate education abroad, suggesting the extent of international talent within each country's AI workforce, as we assume that most people get their undergraduate degree in their country of origin. The (EU) average is calculated by taking into account the population size of each member country, ensuring that larger countries have a proportionally greater impact on the average. However, this calculation excludes Malta as the LinkedIn data did not include this country for data quality standards. Therefore, the EU average is derived using data from all other member states.

What it means:

This chart shows the makeup of AI workforces in different countries, revealing insights into international talent migration and its impact on the AI sector. It highlights how countries vary in their reliance on international talent, influenced by

education systems, immigration policies, and global demand for AI skills.

Countries in Northern and Western Europe display a higher proportion of international AI talent compared to Southern Europe. These differences may reflect varying economic opportunities, sectoral demands, and the overall appeal of different regions as destinations for international professionals.
Luxembourg, within the EU, and Switzerland, outside the EU, stand out for their diverse talent pools. Luxembourg relies almost entirely on talent with foreign degrees. Over 47% of its entire population of 660.000 are foreign nationals[9] . For a small country like Luxembourg, it is also likely that a large share of nationals get their degree internationally and return later. Italy, Israel and India rely almost exclusively on their national talent for their AI workforce. Population sizes could be playing an important role in the trends in these statistics.

Liberal immigration policies and attractive work environments, such as in Ireland and Switzerland, might contribute to successfully drawing a significant share of their AI workforce from abroad. This success might be linked to policies that facilitate the integration of international professionals, including visa arrangements and work permits that are favorable to highly skilled workers. Other factors could include the presence of companies that hire international talent, and well-paid job opportunities.

In total, the AI talent in the EU is slightly more international than in the United States. Looking at Europe as a region, including the United Kingdom and Switzerland, the observation is even stronger. The five countries with the highest share of foreign talent are all relatively small countries that either have one or more highly-ranked universities and/or are home to big AI and tech companies. Estonia stands out for its efforts to attract talent, potentially through its e-residencies, digital nomad visas, and double taxation agreements with over 60 countries, including France, Germany, Spain, and the UK, ensuring e-residents are not taxed twice on the same income. Approximately 21% of Estonian adults hold a master's degree. Over 78% speak at least one foreign language, and 35% speak at least two, with English being the most commonly spoken foreign language. Additionally, Estonia is highly digitally literate. IT is a compulsory subject in schools, with children starting to learn programming at age seven. According to Haridussilm, a government body reporting on education statistics, 28% of Estonian graduates study STEM subjects[10] .

Comparing the share of foreign talent in AI to the share of foreign talent in the general workforce, our data (not mentioned in the charts) indicates that AI talent is

9 https://adem.public.lu/en/marche-emploi-luxembourg/panorama-marche-emploi.html
10 https://www.raconteur.net/global-business/watw-estonia

much more international. For instance, in Germany in June 2023, around 15% of all employees were foreign nationals[11], whereas our data shows that 45% of AI talent had a foreign undergraduate degree. We acknowledge that the assumption we are making in this paper (the country where someone earns their undergraduate degree is their country of origin), does not always hold true. Despite that, the large disparity between these numbers—15% versus 45%—is too significant to be attributed solely to this difference. This suggests that AI talent in Germany is indeed much more international.

Similarly, in the UK in 2022, the share of foreign-born workers has been 19%[12], whereas 47% of the AI talent has foreign undergraduate degrees. The EU-27 average in 2020 was around 13% foreign-born employees overall[13], significantly lower than our number of 37% of AI talent with foreign undergraduate degrees. This substantial gap further supports the trend that AI talent is significantly more international compared to the general workforce in Europe.

The chart could further hint at the role of educational systems in attracting international students who later join the local AI workforce. For instance, the high share of international talent in the AI sectors of countries with prestigious universities and research institutions might reflect the effectiveness of these institutions in attracting and retaining global talent. We investigate this further in Chart 5.

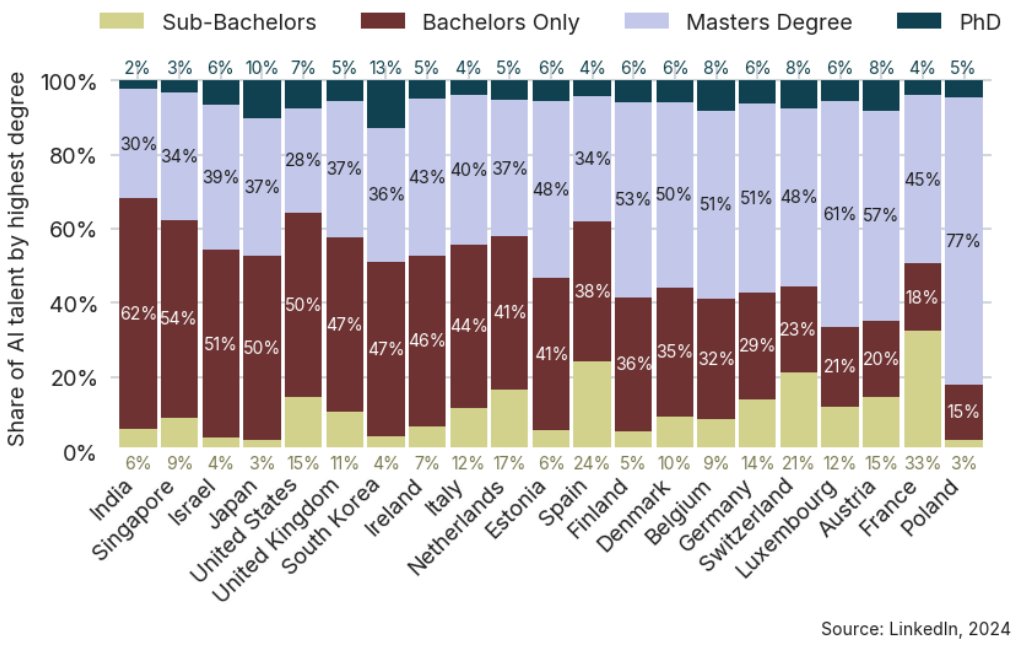
These observations raise important questions for further research: How do national policies, industry needs, and educational systems converge to influence the composition of AI talent within a country? What lessons can be learned from countries like Ireland in attracting international talent, and how can other nations adapt these strategies to bolster their own AI sectors? Additionally, exploring the long-term impacts of such diverse talent compositions on innovation, economic growth, and technological leadership in the AI domain would provide valuable insights into the strategic development of the global AI industry.

11 https://statistik.arbeitsagentur.de/SiteGlobals/Forms/Suche/Einzelheftsuche_Formular.html?nn=1523064&topic_f=beschaeftigung-sozbe-bo-heft

12 https://migrationobservatory.ox.ac.uk/resources/briefings/migrants-in-the-uk-labour-market-an-overview/

13 https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Main_obstacles_for_foreign-born_people_to_enter_the_labour_market

Chart 4: Highest degree held by AI talent in different countries



Source: LinkedIn, 2024

What you see:

This chart shows the highest academic degree attained by AI professionals across different countries, with significant variations in the level of education. Members without self-reported degrees are excluded. Sub-bachelor's degrees include high-school diplomas, apprenticeship degrees, and associate's degrees exclusively. The countries are sorted by the share of AI talent whose highest degree is a Bachelor's, from highest to lowest.

What it means:

The composition of AI workforces in terms of educational qualifications reveals significant variations across countries, shedding light on the diverse pathways into the AI sector and the potential implications for innovation, industry needs, and policymaking.

AI talent in Europe, on average, holds more advanced degrees with more people having at least a Master's degree, compared to other regions. Other reports confirm this, as a report by Sequoia states that seven in ten AI talent in Europe have a master's degree or PhD and slightly more have over a decade of experience—well

above the figures for engineers as a whole.[14]

There's an interesting trend in our data where countries such as Israel, Japan, South Korea, and the United States simultaneously have above average undergraduate and PhD holding AI talent. This means that relatively few people in the AI workforce hold a Master's degree. This could be because, in the US, for example, people often start PhDs directly after their undergraduate degree and don't attend a separate Master's program.

Other countries, like India, have a majority of their AI workforce with only a Bachelor's degree. The United States and Singapore also have a significant share of their AI workforce with just bachelor's degrees. This significant reliance on Bachelor's degrees could hint at a more practical orientation within the AI sectors of these nations, valuing on-the-job learning and applied skills over advanced academic credentials. Such a trend underscores the importance of practical experience and possibly reflects a cultural inclination towards "learning by doing."

This observation raises an interesting point about the duration and nature of undergraduate education across different countries. For example, engineering and certain other undergraduate programs typically span four years in India and the United States, which is longer than the duration of similar programs in some other countries. This extended period of undergraduate education might not just provide a depth of academic knowledge but also allow for internships, projects, and other practical learning opportunities that are highly relevant to the AI industry. Therefore, it's plausible that the sector's preference for Bachelor's degrees in these countries is not solely a matter of academic level but also relates to the comprehensive nature and length of the educational programs.

Contrastingly, European talent's academic qualifications highlight the emphasis on advanced research capabilities. France presents an intriguing case with the lowest share of Bachelor's degrees and one of the highest of sub-bachelor's qualifications among the countries in the chart. The French AI talent pipeline is distinctively shaped by the Grande Ecoles system, offering education equivalent to a Master's degree without a preceding Bachelor's degree. This system is preceded by preparatory classes (prepas), potentially recognized as sub-Bachelor's degrees, illustrating an alternative, highly specialized pathway into AI careers.

Poland emerges as another interesting case where most of the AI talent has a master's degree (74%), more than any other country in our data. This warrants further exploration of AI education in the country as some countries offer subject

14 https://atlas.sequoiacap.com/a-talented-home-for-ai/

degrees only at master's levels.

It is important to keep in mind that some differences could be attributed to different norms of self-reporting degrees or special kinds of degrees that might not be matched by LinkedIn. These countries' educational systems and job market demands might influence these trends.

These findings underscore the diversity of educational backgrounds in the AI workforce, reflecting not just national educational philosophies but also the evolving demands of the AI industry. They suggest that there is no one-size-fits-all approach to preparing individuals for careers in AI, with different countries leveraging their unique educational strengths to meet the needs of this dynamic sector.

The data invites further exploration into how different educational systems and policies influence the development of AI talent. For instance, examining the impact of Ph.D.-level education on innovation within the AI sector or how bachelor-focused pathways support the rapid expansion of the AI workforce can provide valuable insights. Additionally, understanding the role of cultural and systemic factors in shaping these educational trajectories offers crucial lessons for policymakers and educators worldwide aiming to cultivate a robust and innovative AI talent pool with specialized pathway into AI careers.

Conclusion

After analyzing the inflow and outflow of AI talent in Europe, and examining the educational backgrounds, and geographical origins, one thing is clear: attracting and retaining this highly sought-after talent is a global challenge. In this tug-of-war of AI talent, countries are looking to hire talent from abroad, as it is faster than training new talent.

In light of this fast-moving competition, this data brief serves as a resource for European policymakers and academics, providing them with valuable insights to develop effective strategies for attracting, retaining, and optimizing AI talent, thereby contributing to the EU's position as a leader in the global AI landscape. Various critical insights emerge from this data brief:

- European countries are experiencing a significant loss of both national AI talent and the international talent they nurture to the United States. This trend underscores the need for Europe to implement stronger retention strategies to keep its AI professionals within the continent.
- India is rapidly emerging as a primary source of AI talent for European countries and globally. A substantial number of AI professionals in Europe have received their undergraduate degrees in India, particularly in countries like Ireland and the United Kingdom. This trend highlights the role of global talent pipelines in bolstering the AI workforce in Europe.

- Countries in Northern and Western Europe display a higher proportion of international AI talent compared to Southern and Eastern Europe. Luxembourg and Switzerland stand out for their diverse talent pools, with Luxembourg relying almost entirely on talent with foreign degrees.
- On average, the AI talent in European countries hold more advanced degrees than in other world regions, with a significant proportion holding at least a Master's degree. This contrasts with other regions like the United States and India, where a larger share of AI professionals hold only a Bachelor's degree. This emphasis on advanced education in Europe may be linked to the region's strong academic institutions and research-oriented educational systems, or labour markets traditionally requiring higher educational qualifications.

While these findings provide valuable insights, it is important to recognize that the data does not establish causal relationships. However, it suggests several factors that influence the attractiveness of regions for AI talent:

- **Strong Educational Institutions**: Having renowned educational institutions with robust research facilities attracts significant international talent. This is evident in the case of Cambridge, which has become a hotspot for AI talent despite its small size.
- **Language**: Language is a critical factor. Countries where English is an official language or widely spoken, such as the United States and the United Kingdom, attract a considerable amount of global talent.
- **Tech Ecosystems**: Strong tech ecosystems, characterized by a concentration of tech companies, startups, and research institutions, also draw international talent. The presence of a vibrant tech industry creates an environment conducive to innovation and professional growth.
- **Cultural and Political Histories**: Cultural and political histories play a role in talent attraction. For instance, France continues to attract a significant amount of AI talent from countries that gained their independence from France during the last century, likely due to similar education systems and shared language.

Building on the insights from this data brief, our future research will focus on understanding the factors that make certain cities and countries hotspots for AI talent. We will not only explore the attraction of AI talent but also look into retention strategies for sustained innovation in Europe.

We hope that this data brief will guide the development of targeted, well-informed policy frameworks addressing the evolving needs of the AI sector and enable stakeholders to make strategic choices that bolster the growth and sustainability of Europe's AI landscape.

Methodology

This section details the methodology of how we have used the LinkedIn dataset (May 2024).

Definition of AI talent:

A LinkedIn member is considered AI talent if they have explicitly added at least two AI skills to their profile and/or are employed in an AI job.

Members self-report skills on LinkedIn. LinkedIn tracks more than 41,000 distinct, standardized skills, which are coded and classified into 250 skill groupings by expert taxonomists. The top skills that make up the AI skill grouping are machine learning, natural language processing, data structures, artificial intelligence, computer vision, image processing, deep learning, TensorFlow, Pandas (software), and OpenCV, among others. Any person with these skills is considered AI talent.

Alternatively, people can be classified as AI talent based on their job titles. LinkedIn standardizes members' titles into around 15,000 occupations. These occupations are further grouped into about 3,600 categories called "occupation representatives," which serve as umbrella terms for roles with a common specialty, regardless of seniority.

An "AI" job, or AI occupation representative in LinkedIn's terms, is a category that requires high competency in AI skills. LinkedIn determines whether AI skills are common in a specific occupation representative through skills penetration. Examples of such occupations include (but are not limited to): Machine Learning Engineer, Artificial Intelligence Specialist, Data Scientist, Computer Vision Engineer, etc.

Country Selection:

For Chart 1, LinkedIn provided data on the six countries that are shown. In Chart 3 and 4 we chose a subset of countries that were most relevant.

LinkedIn's data on migration based on undergraduate degrees for Charts 2 and 3 includes all EU countries except Bulgaria and Slovakia, and all additional OECD countries except Colombia. We also have data on Argentina, Brazil, Costa Rica, India, Indonesia, Saudi Arabia, Singapore, South Africa, the United Arab Emirates, and Uruguay.

For Chart 4, LinkedIn data does not include Malta but has data for Bulgaria and Slovakia.

LinkedIn applies minimum thresholds for labour force coverage, total membership size, and the number of monthly AI hires to exclude countries where the data may not be representative.

General Limitations

Using Undergraduate Degrees as Origin Proxies

The country of an individual's undergraduate degree serves as a proxy for their origin, based on the assumption that most people pursue their early education in their country of origin. This method is generally reliable; for instance, OECD data[15] cases. Nonetheless, we acknowledge outliers like Australia and New Zealand, where the share of international undergraduates peaks at 28%, which could be due to English being their official language. Further evidence supports this hypothesis: the UK (18%) and Austria (17%) have high percentages of international undergraduates, contrasting with lower percentages in Southern European countries like Italy (4%) and Spain (2%). A case that challenges this hypothesis is the United States, where, despite the English language being the medium of education, only 4% of students at the undergraduate level are international students. For detailed statistics, please refer to the OECD report "Education at a Glance 2020."[16] Not all countries of origin in our dataset are OECD countries. In our analysis, we verified a low percentage of international students from the most relevant countries. In India, for example, the percentage of international students at the undergraduate level is less than 0.5%.[17]

When interpreting our findings, we take into account the variances in international student percentages across different countries. These variances can influence the perceived origin of AI talent. For example, our analysis may reveal that a percentage of AI professionals working in Ireland received their degrees in the UK. Given the UK's high proportion of international students (18%), a fraction of this group might actually originate from other countries. We believe that these effects do not substantially alter the primary insights regarding key source countries for AI talent.

Self-Reporting

The LinkedIn data primarily relies on self-reported information from its users. This approach has two inherent limitations: individuals may either not be present on a given career network or may use the network but provide incomplete or inaccurate information. In Chart 2, for example, we only see LinkedIn members who have provided a Bachelor's degree on LinkedIn. These limitations can introduce selection effects that skew our results. Even though we select countries with large coverage, the likelihood of having a profile can vary based on the country of origin or highest

15 https://www.oecd-ilibrary.org/education/education-at-a-glance-2020_69096873-en

16 https://www.oecd-ilibrary.org/education/education-at-a-glance-2020_69096873-en

17 https://brill.com/display/book/9789463511612/BP000055.xml

attained degrees. For example, Chinese professionals working on AI in France might be undercounted if they are less likely to create profiles, than French nationals in France.

Furthermore, individuals from different backgrounds may have varying habits regarding skill self-reporting, which can affect the identification of AI talent. Despite these limitations, LinkedIn, with over 1 billion members globally, offers the most comprehensive global dataset on career paths to analyze AI talent flows in Europe and beyond.

This limitation is further mitigated in this paper's context, as we are mainly examining a more technologically advanced segment of the global workforce. These individuals typically possess the digital literacy and necessary equipment to create and maintain profiles on professional career websites. They often bear the benefits of self-reporting their skills.

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For a complete presentation of this graph, please see the online version of this publication.
https://www.interface-eu.org/publications/where-is-europes-ai-workforce-coming-from

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