European Commission

JRC TECHNICAL REPORT

In search of EU unicorns – What do we know about them?

Giuseppina Testa, Ramón Compañó, Ana Correia, Eva Rückert

2022

Joint Research Centre

EUR 30978 EN

Contact information
Name: Dr. Ramón Compañó
Email: ramon.compano@ec.europa.eu

EU Science Hub
https://ec.europa.eu/jrc

JRC127712

EUR 30978 EN

PDF ISBN 978-92-76-47058-8 ISSN 1831-9424 doi:10.2760/843368

Luxembourg: Publications Office of the European Union, 2022

How to cite this report: Giuseppina Testa, Ramón Compañó, Ana Correia, Eva Rückert, *In search of EU unicorns - What do we know about them?* EUR 30978 EN, Publications Office of the European Union, Luxembourg, 2022, ISBN 978-92-76-47058-8, doi:10.2760/ 843368, JRC127712.

Table of Contents

Abstract

This paper provides insights into the geographical and sectorial distribution of EU unicorns. Using the Unicorn club data from Dealroom up to mid-2021, it explores where they are located, how old they are and how they reached unicorn status. The analysis takes the form of a comparative study of unicorns from the EU, the US and China. We compare the three locations in terms of the age of companies at which unicorn status is reached, the number of financing rounds and the overall amount of financing raised by the time unicorn status is attained. We also profile the top investors in European unicorns and their acquisition strategies. We then look at the unicorn founders in terms of gender, place of origin and educational background. Finally, we discuss the role of government intervention, in particular of the European Innovation Council, in supporting the development of fast-growing companies.

Foreword

Before the Covid-19 crisis, many European companies seeking investment from US-based venture capital funds were forced to cross the Atlantic. Over the last decade, this led to an exodus to the US of several successful European startups when they reached their scale-up phase. In fact, 40 out of 147 EU unicorns, created in this period, relocated their headquarters abroad for access to finance reasons - 32 to the US, seven to the UK and one to Israel. Many of these companies now operate primarily from the US resulting in a huge loss for Europe in terms of jobs, intellectual property and brain drain.

But things are starting to change. US venture capital funds have begun to invest massively in firms based in Europe, attracted by their great talent, the business opportunities and reasonable valuations. In 2021 alone, US venture capital funds invested some €51 billion in European firms and US investors participated in five out of six of the largest deals in Europe. However, they are no longer operating directly from the US; by now, all main US funds have established branches in Europe, mostly in London, giving them proximity to European companies with high growth potential and facilitating their responses to new fundraising rounds. Similarly, the European venture capital industry is maturing and increasing in size and the European Institutions are contributing to this process.

This report by the Joint Research Centre, the Directorate General for Research and Innovation and the European Innovation Council and SME Executive Agency, reveals that Europe's venture capital industry is still not as mature as its US counterpart, but it is steadily improving. This is true both for private as well as public investors. The European Commission services under my responsibility are working towards public investors being anchors for long-term strategic public policy objectives, such as building a pan-European Innovation Ecosystem, technological sovereignty, digital transformation or sustainability. Here, the newly created European Innovation Council fund running under my responsibility has set up mechanisms contributing to render Europe more competitive by strengthening the innovation ecosystem.

The effects of this catching up are already visible. The number of privately held and non-exited unicorns in the EU has risen from 44 in 2020 to 89 by the end of 2021, thus doubling in one year. Similarly, the sum of privately held and exited (IPO, SPAC, acquired or merged) innovative companies with a value above $1 billion, created in Europe, has risen from 71 in 2018, 96 (2019), 118 (2020) to 147 in 2021, thus doubling in the past three years. Despite the remarkable increase, more has to be done to close the gap completely. My services are thus active in carrying out the research and analysis needed to inform the policy response to this issue as well as enabling the identification and design of concrete policy measures.

Mariya Gabriel
EU Commissioner for Innovation, Research, Culture, Education and Youth

Acknowledgements

This study would not have been possible without the guidance, encouragement, and support of many of our colleagues from JRC, RTD, and EISMEA. In particular, we would like to greatly thank James Gavigan (JRC) and Julien Ravet (RTD) who participated in this study through generously sharing their time and knowledge. We are also indebted to our JRC colleagues Clemens Dominick, Sofia Amaral-Garcia, and Peter Fako for helping us with their time, knowledge and insights. Special thanks to Niels Meyer for his superb assistance with the graphical analysis, and Tauno Ojala who made available to us "the Unicorn Club" database from Dealroom.co. We would also like to thank Dimitrios Kyriakou, Melisande Cardona, Simon Letout, Giovanna Mazzeo Ortolani for their careful examination and consideration of our study and the participants in the JRC's informal Venture Capital Group for useful feedback and comments.

The authors

Giuseppina Testa

Ramón Compañó

Ana Correia

Eva Rückert

Preface

The term "unicorn" was originally introduced in 2013 by VC investor Aileen Lee to describe a privately owned, tech or innovative company valued at over $1 billion.

While this definition is commonly used, it often does not capture adequately all firms o the unicorn type which merit being analysed together. For instance, there are companies that exited just below $1billion, but have subsequently passed the threshold or conversely companies which have exited at over $1 billion but have subsequently fallen back in valuation. There are also companies that were valued in the private market over $1 billion but exited below, others whose purported valuations could not be verified, etc. As the purpose of this report was to study dynamics of these firms, we use a prefix to distinguish between different types – i.e. **"private unicorns"** refers to privately owned, non-exited companies valued at over $1 billion and **"exited unicorns"** refers to firms that have been taken over or gone public via an IPO, SPAC, etc.

An important angle for policy makers is to monitor and understand the dynamics of EU-born unicorns that have move their headquarters abroad. To keep track of their origin, we call these EU-born companies **"European DNA unicorns"** and link them to their country of origin, too.

Throughout this paper, where appropriate, the distinction between these different categories is made explicit.

Executive summary

A unicorn is a privately owned start-up company, which has reached a valuation of $1 billion (currently about €867 million) or more. First coined in 2013 by Aileen Lee, founder of Cowboy Ventures, the term "unicorn" refers to the rarity of start-ups which achieve this status among the population of start-ups. While their numbers have risen considerably over recent years, unicorns remain still quite rare.

The number of European unicorns lags considerably behind that of the US and China. According to Dealroom data, about 68% of the current unicorns - defined as new unicorns or $1 billion exits - are based in the US and China. Despite the comparatively lower number, the EU has made significant progress over the past five years, tripling its number of unicorns since 2017 (from a cumulative total up until 2017 of 42 to 147 by 2021,Q2), signalling a big momentum increase in tech and entrepreneurial ecosystems based in the EU. The higher levels of venture capital (VC) investment that we see today in the EU compared to the start of the previous decade may largely explain this increase in the number of unicorns.

Policy context

There is a growing view that the EU should take more action to enable promising start-ups to have access to larger amounts of capital to achieve their full growth potential. The quest for such policy intervention has also been recently expressed by a group of EU unicorn companies[1]. Any policy response to this needs a good understanding of EU unicorn characteristics as well as of the drivers of and bottlenecks to their evolution. This study helps in this regard by illustrating the characteristics of unicorns (their location, sector and age), and financial pathways they have followed, including venture capital investments and acquisitions.

Main findings

Despite their growing number, unicorns remain geographically concentrated both across and within countries. EU unicorns are particularly concentrated in Germany (with a share of 30% of the total in the EU over the period 2008 to 2021, Q2), France (15%) and Sweden (14%). In the US they are primarily located in California (with a share of 54% of the US total over the same time period) with also notable clusters in the States of New York and Massachusetts (the three states accounting for 75% of the US total). In China, the municipality of Beijing (with a share of 44% of the total in China) has the largest number of unicorns followed by the Shanghai municipality, and the province of Guangdong (the share of these top three is 82% of the total in China). Within the EU, Paris, Berlin, Stockholm and Amsterdam are the main locations of EU unicorns for the period 2008 to 2021, Q2. Most of them have set up their headquarters in capitals to benefit from proximity to the centres of venture capital activity as well as for easier access to a global pool of talent. However, we also show that EU unicorns have also emerged outside of capital regions, making full use of the resources and innovation hubs spread more widely across the EU.

EU unicorns are spread across a broad range of sectors, from e-commerce to energy and financial technology. **FinTech is the dominant sector, with 28 unicorns emerging over the period 2008 to Q2-2021**. This does not come as a surprise given that FinTech has been attracting more equity investment than any other sector. According to Dealroom data, the EU saw a big increase in FinTech investment in the first half year of 2021 of 238% compared to total amount raised in 2020 – i.e. €11.5bn vs €3.4bn.

Unicorns in China are younger than US and EU unicorns. The average age of companies at the point they reach unicorn status in the EU is ten years. This contrasts with the lower average ages of their counterparts in the US and in China, which are eight and five years respectively.

The average amount raised by EU unicorns was €125m over an average of 3.2 funding rounds prior to their unicorn valuation deal, whereas the average amount raised by their counterparts in the US and China was €138m and €216m over 4 and 2.5 funding rounds, respectively. This implies that in China large rounds allow companies to reach large valuations sooner and in fewer rounds than in the EU and US. These two findings are indications that **start-ups in the US and China may have better access to capital (especially later stage) than start-ups in the EU**. This is in line with studies highlighting the lack of growth finance in Europe mainly due to the small fund size (Duruflé et al., 2018; Atomico, 2020), and to the fragmentation of the European stock markets.

[1] In April 2021, the so-called 'EU Unicorns Group' (https://unicornsgroup.eu/) proposed to Commissioner Gabriel to set up a €100 billion EU sovereign tech fund and a €10 billion EU sovereign green tech fund to address the scale-up gap.

There are several hundreds of investors in the EU, comprising corporate, governmental and private VC firms as well as many business angels and crowdfunding platforms. However, very few VC firms located in the EU are financially big enough to support high-potential start-ups to the point of reaching a $1b valuation or above. **The VC firms investing the largest deal sizes in EU unicorns are located in the US and Asia**. Three of the top 10 venture capital firms investing in EU unicorns are located in Silicon Valley, four in New York and two in London. **The most active investor in EU unicorns is Palo Alto-based Accel, which has backed 17 unicorns across the EU and is one of the most active venture capital investors in the high-growth ecosystem worldwide**.

In the EU, only 2% of unicorn founders are female, compared to 6% in the US. Regarding the size of unicorn founding teams, **the average is 3 people in the EU, compared to 2.25 in the US.** Some EU unicorn founders are "serial entrepreneurs", i.e. entrepreneurs that have had prior experience in founding companies before starting their unicorn.

40 out of our sample of 147 EU unicorns have relocated their headquarters abroad - 32 to the US, 7 to the UK and 1 to Israel.

63 out of our sample of 147 EU unicorns had taken over at least one company in the period 2008 to Q2-2021. Acquisitions were mainly driven by strategic considerations: being part of a larger enterprise with access to its capital, management skills, distribution channels, and brand.

This descriptive analysis reveals that Europe's VC industry is not as mature as the US one, but it is steadily improving. This is true both for private as well as public investors. Public investors are important as anchors for long-term strategic public policy objectives, such as technological sovereignty, digital transformation or sustainability. Here, the newly created European Innovation Council (EIC) fund offers an additional vehicle helping to make Europe more competitive by strengthening the innovation ecosystem.

1 Introduction

David Birch, a professor of Entrepreneurship, introduced the term 'gazelles' to refer to fast-growing companies[2], and since his seminar paper of 1987 (Birch, 1987) the 'entrepreneurial zoo' has not ceased to expand. In fact, in 2013 Aileen Lee –an American seed investor– analysed the entrepreneurial and tech ecosystem and spotted a rapidly growing group of 39 start-ups valued at more than $1 billion which she dubbed **'unicorns'** due to their rarity[3]. As of June 2021, 1,600 unicorn companies have emerged worldwide and the rate of emergence is steadily increasing. In the first half of 2021 alone, 283 new companies have reached "unicorn status" worldwide. Despite the increase in the number of new unicorns since 2013, it still remains a relatively rare phenomenon - only 1 in 100 companies raising a seed round "has a shot" of becoming a unicorn (Atomico et al., 2020)[4].

Unicorn companies have received a lot of attention from venture capitalists and the media[5], as well as (increasingly) from the public sector. The narrative around unicorns tends to oscillate between two extremes: "fairy tales" and "success stories". Some commentators consider belonging to the unicorn club to be a "status symbol" which helps these companies stand out in the crowd of new businesses avidly looking to hire the best talent and eager to attract the top partners and investors[6]. For example, the 'unicorn label' can be seen as a high 'category currency,' defined in Kennedy et al. (2010) as the extent to which a category has 'clear meaning and positive appeal'. As stated in Alhusaini et al. (2021), although the $1b valuation threshold was arbitrarily set, market participants show that this mark now represents a "psychological threshold that attracts potential customers, employees, and the press" (Griffin and Primack, 2015). They are regarded as "story companies", projecting a vision of what a young company could look like in the future – and sometimes it is observed that "the story drives the numbers, rather than the other way around"[7]. Moreover, another argument often presented is that unicorn companies in the beginning privilege fast-growth over profitability to achieve a big customer base quickly and attract investors, hence overlooking profits at the start. Private investors are guided by the expectation that they will be recompensed in the longer run, i.e. that they will become "the next big thing" or that "one day they will make profits"[8]. However, high-growth, high potential unicorn companies may be reinvesting their revenues back as additional means to scale-up[9] as part of a growth strategy oriented towards profits. In this context, the valuation and post-IPO performance of unicorn companies have been increasingly discussed, especially after the unsuccessful exit and poor post-IPO performance of WeWork[10]. We approach this topic in more detail later in section 6 of this paper. However, the emergence of unicorn companies in specific countries or regions of the world can be seen (at least to some extent) as a reflection of the framework conditions in places that are conducive to innovation at local and national levels. In such places, emerging unicorns have been able to count on the availability of risk capital, interconnected research and innovation ecosystems, world-class universities, talent pools, suitable regulatory policies, as well as appropriate Intellectual Property standards, among others. For this reason, **unicorns have become 'symbols of innovation-friendly' countries[11] or regions** that want to improve the business environment in the hope of fostering business creation as well as attracting foreign talent, companies and investors to the country, to generate more and better jobs.

---

[2] Fast-growing gazelle companies are defined by an annual turnover or employment growth rate of at least 20% over minimum 3 years in a row and minimum of 10 employees at the start of the growth period.

[3] https://techcrunch.com/2013/11/02/welcome-to-the-unicornclub/?guccounter=1&guce_referrer=aHR0cHM6Ly93d3cuZ29vZ2xlLmNvbS8&guce_referrer_sig=AQAAAKgNlfGGfSXUev4mmQXI87r8iV_TeAIu0cWds1IwtOm7thhxw801xNQDi8hRZ0eqMLUlcbw6Z6XgGLe1Pv1gvZmCOSMbopuuNrR3RALXR1kKjOsc-eyB8RQ5cNZdxpiY50--BxhU4HhItkevYJwhmgd2xN89LYKBvLFtQv_-ZcMk

[4] Source: Atomico in partnership with Slush and Orrick (2020), The State of European Tech 2020, https://2020.stateofeuropeantech.com/chapter/state-european-tech-2020/

[5] Atomico, TechCrunch, the Financial Times, Bloomberg, The Economist, Fortune, CBInsights or Crunchbase regularly cover aspects linked to the performance of unicorn companies in articles, studies and reports.

[6] See for example https://www.reuters.com/article/us-venture-capital-unicorns/despite-ipo-flameouts-2019-sets-record-for-u-s-unicorn-births-idUSKBN1YM22V

[7] See for example the analysis of Aswath Damodaran, a valuation expert at New York University's Stern School of Business: http://aswathdamodaran.blogspot.com/2019/09/runaway-story-or-meltdown-in-motion.html

[8] See for example https://economictimes.indiatimes.com/markets/stocks/news/profit-or-power-how-will-investors-value-ipos-of-loss-making-ventures/articleshow/83303822.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst

[9] See for instance https://www.ft.com/content/2833bb81-10f1-4869-8648-02ffb68b2f99

[10] See for example https://techcrunch.com/2021/03/15/wework-unbundles-its-products-in-an-attempt-to-make-itself-over-but-will-the-strategy-work/; https://edition.cnn.com/2019/09/26/perspectives/wework-startups-overvalued/index.html

[11] See for instance https://expresso.pt/economia/2018-06-05-Outsystems-e-o-novo-unicornio-portugues; https://startupestonia.ee/why-estonia/value-for-startups; https://www.ft.com/content/3db2b2a9-1d19-4928-91e0-d2e48c635482; https://www.iamsterdam.com/en/business/news-and-insights/news/2020/netherlands-startup-unicorns

Unicorns have sparked a discussion on the "next global champions" and their potential role in the technology sovereignty of the EU. Over the past decade, US and Chinese technology-based companies have come to dominate the top 10 list by market capitalisation (Table 1), with no EU company currently on this list. The concern is that Europe has lost the first round of the tech/digital revolution to China and the US[12] and that the absence of such strong digital players may compromise Europe's chance of benefiting from the next waves of digitalisation[13]. Many products and services of unicorn companies are now pervasive in our daily lives - in mobile payments, communication, mobility, accommodation, food, entertainment, analytics, automation of processes, etc. Hence they are changing many sectors of the economy while also shaping our lives. The EU is rich in ideas and talent but currently, for each unicorn in the EU, there are around eight unicorns in the US. This gap suggests that the EU needs to improve the framework conditions for innovation so as to become a source of more "global champions" in the future with its vision for a green and digital transition, anchored in human-centric and ethical standards.

Table 1 Top 10 global companies by market capitalization, as of 30 September 2021

Rank	Company	Sector	Country	Market Capitalization in $ billions
1	Apple	Consumer Electronics	US	2,339
2	Microsoft	Software	US	2,119
3	Saudi Arabian Oil Company	Energy	Saudi Arabia	1,987
4	Alphabet	Internet service	US	1,777
5	Amazon	Retail	US	1,664
6	Facebook	Internet service	US	957
7	Tesla	Automotive	US	777
8	Berkshire Hathaway	Conglomerate	US	620
9	Taiwan Semiconductor	Semiconductors	Taiwan	579
10	Tencent	Software	China	575

Source: Bloomberg with PwC analysis, Global Top 100 companies by market capitalisation (May 2021), https://www.pwc.com/gx/en/audit-services/publications/assets/pwc-global-top-100-companies-2021.pdf

An EU innovation policy framework is needed which is capable of fostering a fit-for-purpose, inclusive, and cohesive European innovation ecosystem. It has been suggested that the EU needs to provide not only financing, but also an environment for breakthrough companies to thrive. This includes pro-innovation regulation, enhancing research-to-innovation transfer and improving the entrepreneurship culture.

In this paper, we provide a 'snapshot' comparison of EU unicorns vis-à-vis other regions of the world, and the main sectors and top investors involved. We also look at unicorn founders, as well as their average age and gender. Finally we look at future potential members of the unicorn 'herd' and the role of the European Innovation Council (EIC) in this regard.

The paper is organised as follows. After this brief introduction of the contextual background to the study[14], the next section - Section 2 – describes our dataset and Sections 3, 4 and 5 presents our research findings. By way of conclusion, Section 6 discusses how this research relates to existing EU policies and the role of the EIC in supporting and speeding the development of companies with high growth potential. Finally, we make a brief consideration of the policy implications of this research.

[12] https://www.forbes.com/sites/zengernews/2021/03/25/exclusive-europe-must-close-huge-tech-gap-says-eu-digital-chief/
[13] https://www.ft.com/content/73213036-1dd8-11ea-97df-cc63de1d73f4
[14] See Annex A for a review of selected studies on firm growth with a particular focus on the role of venture capitalists in identifying and supporting promising start-ups.

2 Description of the data source

In this section, we provide a definition of unicorn and discuss our database.

2.1 The Unicorn Club

There are several commercial data providers on startups, including Crunchbase, CBInsights, Dealroom, Pitchbook, or Prequin. In this study we will rely on Dealroom. The dataset used in the analysis, the so-called 'Unicorn Club', is a sub-set of the Dealroom.co database (https://app.dealroom.co/dashboard). In Dealroom's Unicorn Club, a unicorn is defined as "a tech company valued at over $1 billion". More precisely, the Unicorn Club includes tech companies[15] founded since 1990 that are currently valued at over $1 billion, as well as those that have successfully completed a $1 billion+ exit. Note that the inclusion of the latter deviates from other definitions which restrict unicorns exclusively to those firm valued over $1 billion that are held in private hands.

> In this paper we use the term "unicorn" for **all** startups that have reached a value of over $1 billion. We distinguish between those which are still in private hands "private unicorns" and those which have been exited, either via IPO, SPACs or acquisitions, calling them "exited unicorns".

The Dealroom's Unicorn Club offers detailed data on European unicorns, more specifically, the following variables: location (headquarters and founding locations), sector (industries, sub-industries)[16], year founded, date of $1 billion valuation[17], number of employees, total amount raised, each round type (angel, grant, seed, series A-I, early VC, late VC, Acquisition, IPO, SPAC IPO, etc.)[18], each round amount, each round currency, each round investors. The Unicorn Club also contains information (name, gender, and education) on individuals (current and past founders) who are connected to the unicorns listed in the database. A detailed discussion of the coverage and representativeness of the database, compared to some benchmark data sources that are commonly used in the literature is provided by Retterath and Braun (2020). One outcome of the benchmarking exercise is that Dealroom has a better coverage of European start-ups than comparable data sources. As a consequence, the Unicorn Club is regarded as one of the most important databases available to researchers working with EU data[19]. The Unicorn Club is also particularly well-adapted for research as it is updated on a daily basis and is structured in an accessible way.

The dataset used for this report was downloaded in June 2021. It covers the period 1997-2021 and the core sample consists of 1,659 unicorns located in 53 different countries: 792 are companies, and the remaining ones are large companies with a corporate structure and strategy. Our analysis is restricted to companies headquartered in the US, the EU Member States and China and relates to the period 2008-2021,Q2. The European unicorn sample consists of 147 companies[20] – the whole population between the period 2008 and 2021, Q2 – the corresponding sample of 859 US unicorns and the corresponding sample of 274 Chinese unicorns. All the funding variables are cited in euros. With this comparative study we intend to shed light on the European start-up ecosystem and explore wider policy implications. We study the geographical, and sectoral distribution of unicorns in the three locations (EU, US, China), the average number of funding rounds and the average amount of the total funding received. Our comparative study also distinguishes privately owned unicorns (private unicorns) from exited unicorns (unicorns that have been acquired or listed on a public stock exchange since achieving unicorn status). As mentioned before, the three samples (EU, US, China) were manually created through the Dealroom's Unicorn club. They are representative samples, hence they do not describe the entire population as entities with no data related to the amount of funding rounds were omitted from the analysis. Companies that are rumoured to have surpassed the $1b valuation mark but have not yet confirmed this to the media or through their financial statements were excluded from our analysis.

[15] In Dealroom, "tech companies" are defined as "companies that have innovative branding or business model but are not necessarily a high tech company". Dealroom exclude few sectors such as mining companies and other traditional companies, companies that VC investors do not invest. (Personal communication, 07/10/2021)

[16] The definition of industries can be found on the Dealroom platform at https://knowledge.dealroom.co/knowledge/dealroom-industries

[17] In Dealroom, the term "valuation" is defined as the value of a company or asset immediately after a round of financing. It is also commonly referred to as "post valuation".

[18] The description of each investment founding round can be found on the Dealroom platform at https://knowledge.dealroom.co/knowledge/investment-funding-rounds

[19] It is worth mentioning here that, according to a JRC internal benchmarking exercise, Dealroom is more suitable for studies taking an EU perspective rather than making comparison across countries.

[20] The full list of EU unicorns is in Annex C.

2.2 Identifying public investors

Most analysis of VC investments does not separate government VC from private VC. This gives a misleading indication of the scale of VC investment in the EU. From a policy-maker's point of view, it is important to understand the role and positioning of government VC in financing scale-up companies.

In Dealroom's Unicorn Club investors are classified by their "type" (e.g. venture capital, business angel, private equity, corporate, angel fund, government, non-profit, etc.). However, the category of investors that are "government non-profit" is not properly defined. This means that in many cases some investors are considered to be "private" investors as they invest in private equity funds managed by independent teams alongside third-party public and private investors, although they are government entities (e.g. the French promotional bank BPIfrance). To analyse the activity of private and public investors we used the list of government venture capital (GVC) compiled manually by Dechezleprêtre and Fadic (2021). In this analysis, investors are considered to be "public" whenever governments have either direct or indirect control of their investments. These are: Bpifrance, EIT InnoEnergy, European Investment Bank, Fourth Swedish National Pension Fund, German Federal Ministry of Education and Research (BMBF), Industrifonden, KFW, Ontario Teachers' Pension Plan, Qatar Investment Authority, Swedish Energy Agency and Technical University Munich (TUM). We then classify each round of VC investment into three categories, namely purely public VC rounds (when there is only a public involvement), private VC rounds (when there is only private VC involved) and mixed VC rounds involving both public and private investors.

3 Descriptive statistics on unicorns

3.1 Where are EU unicorns located?

The population of European unicorns lags considerably behind the US and China, as can be seen in Figure 1 which shows the cumulative number of unicorns in the period 2008 – Q2,2021. About 68% of the current unicorns are based in the US and China. However, in recent years, the EU has made significant progress - while only 24 new EU unicorns existed until 2017, from 2018 to the first half year of 2021, 105 new unicorns have risen (see

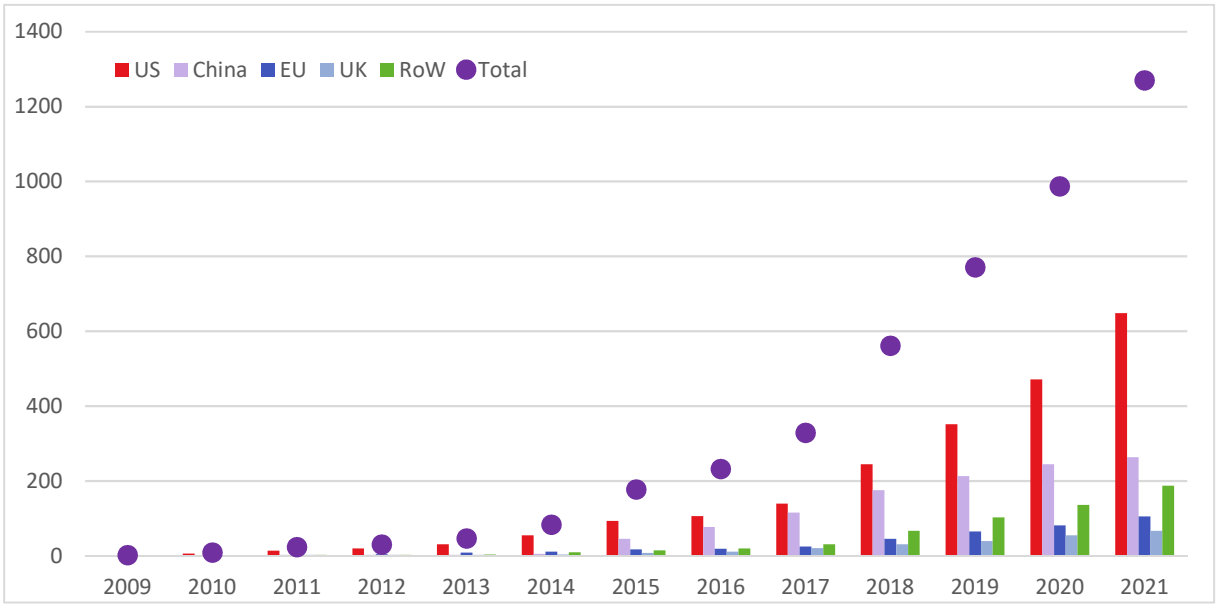


Figure 2).

In the period 2008 to Q2-2021, the European countries with most unicorns are Germany (44), France (23) and Sweden (21). On the other hand, Cyprus, Estonia, Lithuania, Latvia and Malta have one unicorn firm in their countries (Figure 4). Still, the EU lags behind the US and China in terms of the total number of unicorns by a factor of six and two respectively. In terms of the number of unicorns that have exited the private market, either through an initial public offering (IPO) or an acquisition, over the same time period, Germany (22), Sweden (16) and the Netherlands (14) have the highest number of exited unicorns, Cyprus (1) and Latvia (1) have the lowest number. There is also a significant gap in the number of exited unicorns between EU and the US, which has six times as many as unicorns as the EU (85 versus 456). However, the number of exited unicorns is higher in EU than in China (85 versus 62).

Within Europe there are notable national differences, e.g. the fact that there are fewer leading innovators in Central European and Southern European Countries than in the rest of the EU (Correia et al., 2018) is even more accentuated in the case of unicorns. For innovators in these regions, private equity and venture capital are crucial, but the VC industry is still underdeveloped in these regions. Not surprisingly, successful scale-ups had to find funding outside their countries of origin even across the Atlantic for opportunities in California or New York. A prime example is UiPath, a global software company for robotic process automation founded in Bucharest in 2005, which moved its headquarters to New York in 2015, where it obtained financing from Accel Partners and other investors for their international expansion.

The differences are not only between nations, as unicorns tend to cluster in very few specific places within countries. Within EU member states, Paris, Berlin, Stockholm and Amsterdam are the most attractive locations for EU unicorns over the period 2008 to Q2, 2021 (Figure 5). In the last semester of 2021, five companies (Back Market, Believe Digital, Ledger, Shift Technology, and Vestiaire Collective) have set up headquarters in Paris, six companies (Forto, Gorillas, Mambu, Sennder, Smava, Trade Republic) in Berlin, one (Tink) in Stockholm and two (bunq and Fastned) in Amsterdam. This has allowed them to benefit from proximity to the centres of VC activity as well as easier access to global talent. However, unicorns have also flourished outside of capitals, making full use of the resources and innovation hubs that are spread more widely across Europe. For example, in Germany thirteen companies located outside Berlin reached a $1b valuation in Munich over the period 2008 to Q2, 2021.

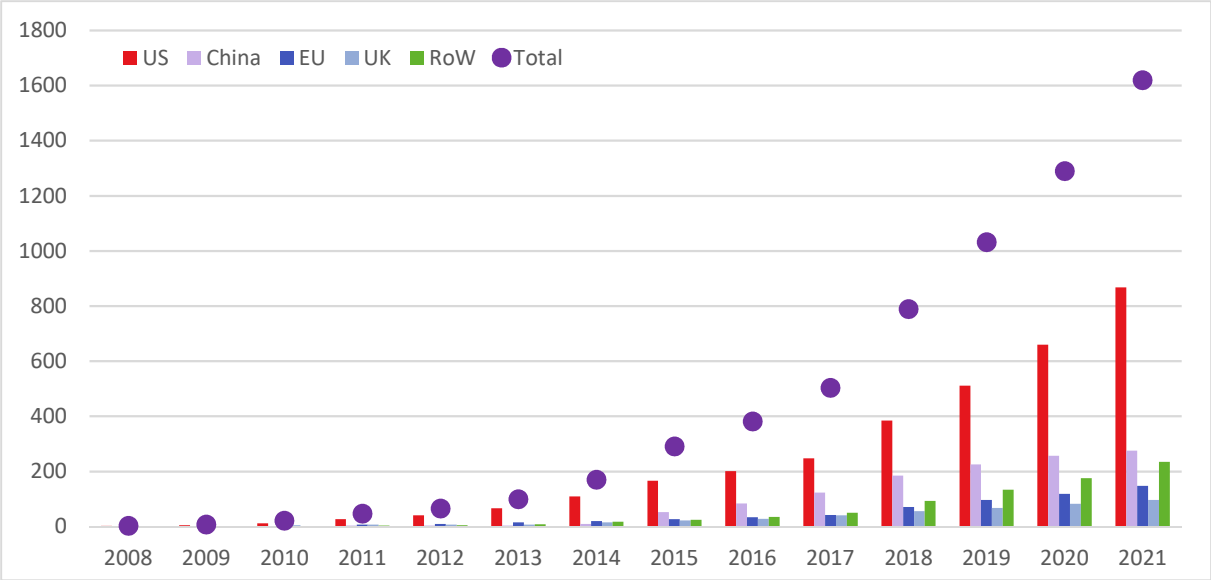


Figure 1 Unicorns (privately-owned and exited) per world region. Cumulative number in the period 2008–Q2,2021

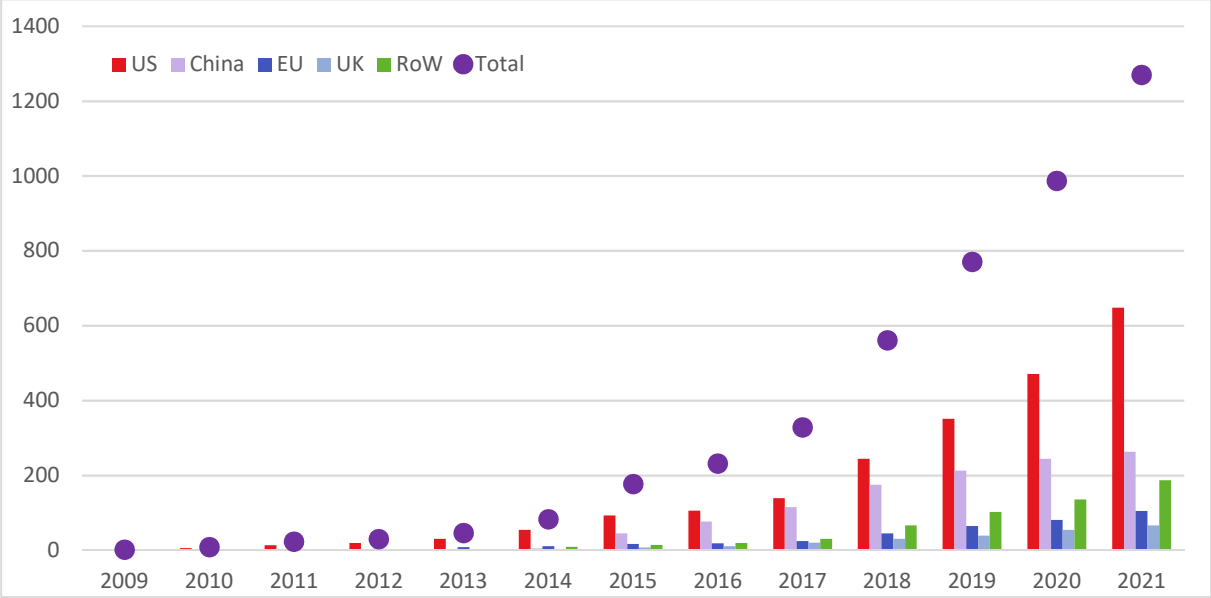


Figure 2 Newly created unicorns per world region. Cumulative number in the period 2009-Q2,2021

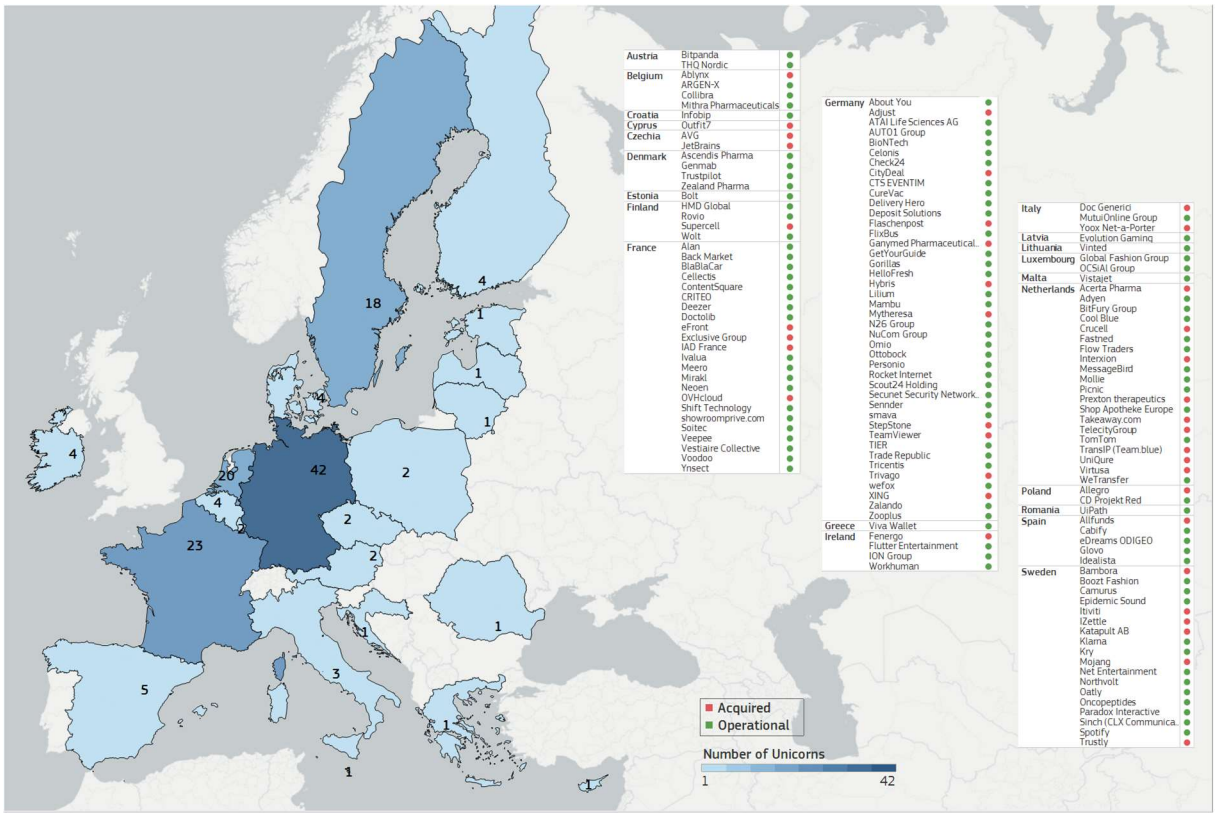


Figure 3 Geographic distribution of EU unicorns in 2021

Note: The geographic distribution of EU unicorns is set according to the unicorns headquarters.

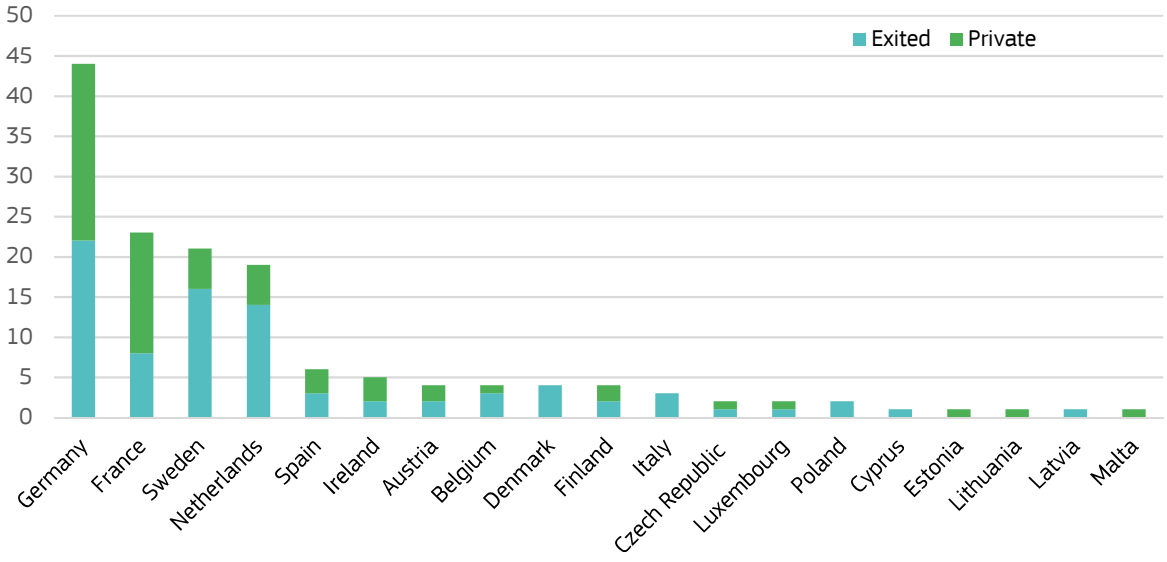


Figure 4 Geographic distribution of EU unicorns in 2008-2021Q2 by HQ country

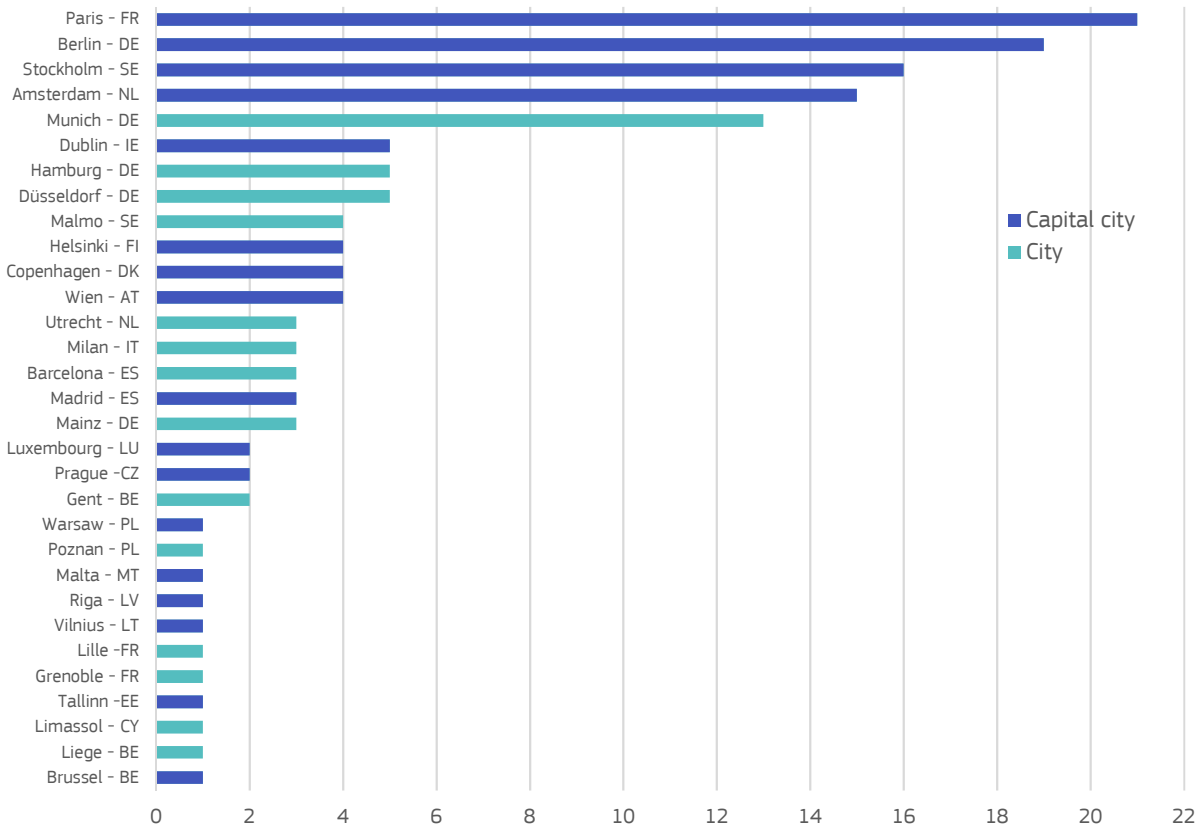


Figure 5 EU unicorns in 2008-2021Q2, by HQ city

Regional disparity seems to be a generalized pattern. European unicorns are particularly concentrated in Germany, France and Sweden. In the US they are primarily located in California with visible clusters of unicorns in New York and Massachusetts. In China, the municipality of Beijing has the largest number of unicorns followed by Shanghai, and Guangdong (Table 2). When exploring the ranking of unicorns worldwide, California, New York, Beijing and Massachusetts hosted the majority of unicorns in the US, China and Europe between 2008 and 2021, Q2. The Silicon Valley area of northern California remains the most attractive location for unicorns, followed by New York, Beijing and Massachusetts (Figure 6).

Table 2 Top hubs of unicorns, 2008-2021Q2

	Region	Top unicorn hubs	Share (% of unicorns in the region)
	**EU**	Top Member State: Germany	30%
	EU	Top 3 Member States: Germany, France, Sweden	59%
	**US**	Top State: California	54%
	US	Top 3 States: California, New York, Massachusetts	75%
	**China**	Top province/municipality: Beijing	44%
	China	Top 3 provinces/municipalities: Beijing, Shanghai, Guangdong	82%

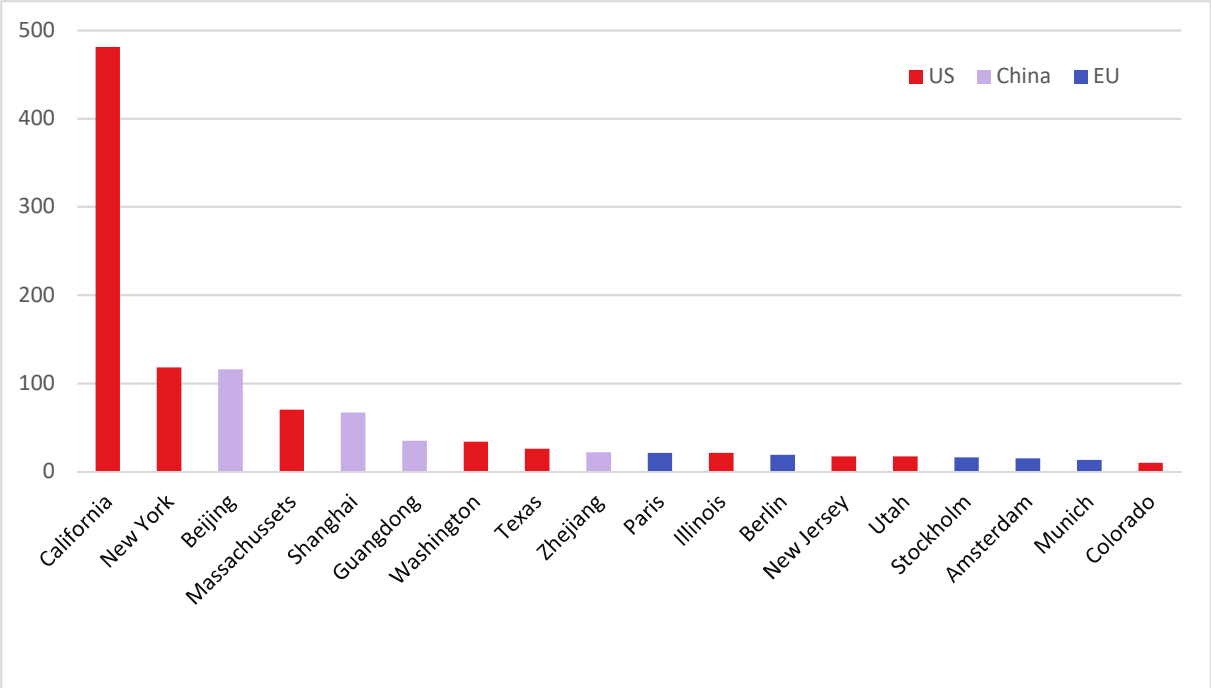


Figure 6 Top unicorn hubs worldwide, 2008-2021Q2

3.2 In which sectors do they operate?

Figure 7 shows the breakdown in the number of European, US and Chinese unicorns by sector Despite a growing presence in many sectors, as expected, unicorns are mostly concentrated in FinTech, e-commerce and market technologies with few scale-ups in hardware. However, the number of unicorns, especially in FinTech, ICT-software and Healthcare for the EU and China, lags far behind the US.

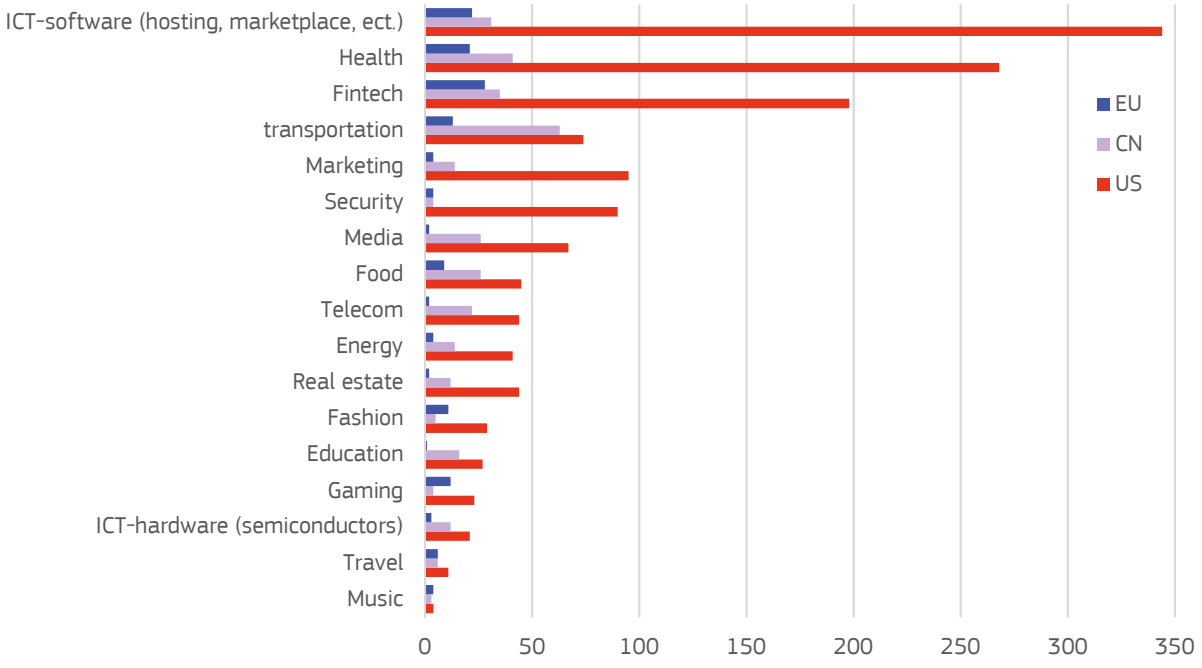


Figure 7 Unicorns in 2008-2021Q2, by sector

The EU financial sector stands out with 28 companies. FinTech related companies have been subject to massive investments over the past decade. Indeed, according to CB Insights[21], FinTech has attracted €1 out of every €5 invested. Yet, VC investments in this sector have been growing steadily over time, particularly in recent years. According to CB insights,[22] Global FinTech funding reached a new high of $33.7b in Q2-2021, up 191% year-on-year. Now, FinTech companies represented 22% of total global funding this quarter. This global trend is similar in Europe with a share of about 20%. In the period 2016-2019 investments in FinTech in the UK exceeded those of the entire EU combined (Næss-Schmidt, 2021). The FinTech sector is booming also in the EU: in the second quarter of 2021 alone, Berlin-based TradeRepublic, an asset, trading and financial management firm, received $900m in a series C investment round, Amsterdam–based Mollie, a payment service provider, $800m and Berlin–based wefox, an accounting and finance firm, $650m. FinTech unicorns are mostly located in the financial capitals of their respective countries - Stockholm (7), Paris (3), Amsterdam (4), Dublin (2), Milan (1), Madrid (1) or Vienna (1) - as illustrated in Figure 8. An interesting exception is Germany, where FinTech unicorns are not located in the 'financial capital' Frankfurt, but in Berlin (4), Hamburg (1) and München (1). The agglomeration of FinTechs in Stockholm (Bambora, IZettle, Itiviti, Katapult AB, Klarna, Tink and Trustly) also stands out. Not astonishingly, Europe's first unicorn to turn into a decacorn was Klarna, a Swedish financial service provider, established in 2005.

EU FinTech unicorns are becoming a consolidated part of the EU financial market landscape. One sign of their maturity is their international expansion and their number of employees. For instance, Klarna employs 4500 people and operates in 18 countries or N26-Bank has 1500 employees offering services in ten countries and they are very successful in their respective areas. Klarna operates "Buy now pay later" (BNPL) schemes, an alternative to traditional credit card lending. BNPL usually allows customers to split a purchase into between three and seven interest-free instalments over several months, or to pay for smaller purchases within 30 days. BNPL is often used by young customers and is becoming increasingly attractive to older generations. The UK Financial Conduct Authority found that BNPL can be a cheap, useful alternative to other forms of credit, particularly for people with weak or limited credit records who may not be approved for a long-term revolving credit line (FCA 2021).[23] A recent fundraising in Q2-2021 signals a potential change in the sector. The deal valued Klarna at $45.6b, ahead of Barclays, Credit Suisse, Deutsche Bank or other traditional banks.

[21] CBinsights, 'State of the Venture Report', Q2 2021, available at https://www.cbinsights.com/research/report/venture-trends-q2-2021/
[22] CBinsights, 'State of the Venture Report', Q2 2021, available at https://www.cbinsights.com/research/report/venture-trends-q2-2021/
[23] Financial Conduct Authority (FCA) "The Woolard Review - A review of change and innovation in the unsecured credit market", Report to the FCA Board, 2 February 2021. Available at https://www.fca.org.uk/publication/corporate/woolard-review-report.pdf

Figure 8 Location of Fintech-related EU unicorns (period 2008-2021Q2)

Venture capital is well suited for deep tech[24] companies relying heavily on R&D efforts to bring a new product to the market and then to scale up[25]. Some sectors require more R&D than others and, on average, also rely more on equity finance. This is in particular relevant for the ICT and life science sectors, where the external equity dependence ratio, measured as net stock issues to total investment, is around 60% in the high tech sectors, compared to 7% for other sectors (Brown et al., 2017). A similar pattern emerges when we focus on unicorns in specific sectors (e.g. ICT hardware and healthcare). We now look at this pattern in more detail.

For the purpose of this paper, we have grouped unicorns in the realm of information and communication technologies into those whose centre of activity is to produce hardware (ICT-HW) and those that deal with software (ICT-SW), such as hosting services, marketplace, enterprise solutions, etc. Figure 8 shows the location of these HW and SW unicorns where it is apparent that most are located in just a few countries.

Unicorns in the area of ICT hardware are rare in Europe. These deep tech companies need unique environment to emerge: in general they require large amounts of funding sustained over a long period to push their R&D to arrive to commercial products. Therefore, semiconductor firms Soitec and Hexagon are located in one of the few locations in Europe where such specific expertise is available and such startups could emerge. In the case of Soitec it is Grenoble, France's prime pole for semiconductor manufacturing, in the proximity of anchor firms like STM, academia and established research centres CEA miniatech. In the case of Hexagon it is Stockholm, home to polytechnic universities (e.g. KTH) and important ICT firms.

[24] Deep Tech refer to the category of startup companies that develop new products based on scientific discovery or meaningful engineering innovation. Prominent deep tech fields included advanced materials, advanced manufacturing, artificial intelligence, biotechnology, blockchain, robotics, photonics, electronics, or quantum computing.

[25] See Quas et al. (forthcoming) for an in-depth discussion of the role of venture capital for deep-tech companies.

The 21 software unicorns cover a wide range of applications, including the provision of enterprise software solutions, AI solutions, platform providers and others. Note there is some degree of flexibility when allocating unicorns to industrial sectors. For example, some commercial providers of start-up data consider enterprise automatization provider UiPath[26] to be a robotics firm, while for others it is a software provider.The EU has a substantial number of unicorns in gaming. As of June 2021, the following EU-based unicorns are developing and selling games for consoles, PCs and mobiles: CD Projekt Red (Warsaw) Evolution Gaming (Riga), Mojang Studios (Stockholm), Paradox Interactive (Stockholm), THQ Nordic (Vienna), Outfit7 (Limassol), Rovio (Espoo), Supercell (Helsinki) and Voodoo (Paris). Gaming is an area requiring both creativity and IT skills, two competences largely available in Europe.[27] Developing state-of the-art online games is a complex undertaking involving many actors. Evolution Gaming, for instance, employs about 12,300 persons.[28] In addition to game development, there are three firms in betting and gambling, namely Bwin (Vienna), Flutter Entertainment (Dublin) and NetEnt (Net Entertainment, Stockholm).

In light of the transition towards a low-carbon economy, **cleantech** and green technology are becoming increasingly popular amongst VC funds.[29] Cleantech solutions often require scientific advances and considerable engineering developments before they reach the market. This matches well with one of Europe's strength: the automotive industry whose biggest challenge currently is to master the transition towards sustainable mobility. In this respect, Europe can count upon three unicorns to accompany the process. Northvolt is a manufacturer of lithium-ion batteries. Swedish Northvolt is unique in its kind, with high expectations to deliver soon a large volume of batteries. For the development and the setting up of new manufacturing facilities huge investments are necessary, which are skyrocketing: the latest investment round closed mid 2021 amounted to $2.75b. Deals of such magnitude, call for the syndication of large VCs and pension funds. Deals in the automotive sector are complemented by Amsterdam-based 'Fastned' a car charging systems along the highway or Barcelona-based Wallbox also providing charging solutions for electric vehicles.

[26] Note the definition used in this study for the allocation of multinationals is the registered location of their headquarters.
[27] See Venckutė et al. (2020).
[28] Third Quarter 2021, Evolution Gaming Annual Report available at https://www.evolution.com/investors
[29] SWD(2021) 307, Progress on competitiveness of clean energy technologies, The Clean Tech funding landscape in the EU https://ec.europa.eu/energy/sites/default/files/documents/swd2021_307_en_autre_document_travail_service_part1_v2.pdf https://www3.weforum.org/docs/WEF_Bridging_the_Gap_in_European_Scale_up_Funding_2020.pdf https://www.pwc.com/gx/en/services/sustainability/assets/pwc-the-state-of-climate-tech-2020.pdf

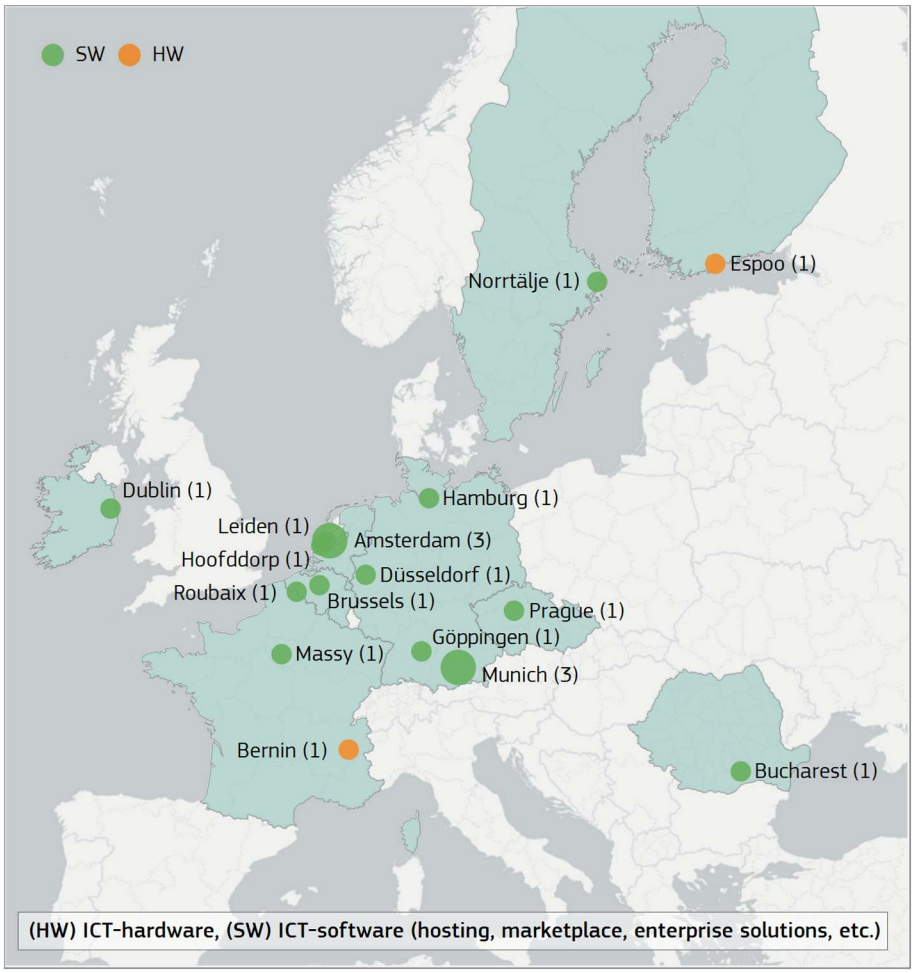


Figure 9 Location of ICT-related EU unicorns (period 2008-2021Q2)

As mentioned in the introduction, the **health care sector** has been the second largest beneficiary of VC investment. Prominent unicorns are German BioNTech and CureVac which received considerable funds to develop vaccines against the Covid virus. But e-health companies also benefitted; a recent example is the $312m series D round into Stockholm-based 'Kry'. The geographical distribution of health-related unicorns in the EU are worth mentioning: unicorns are located in Belgium (3), Denmark (3), France (3), Germany (4) Italy (1), The Netherlands (4) and Sweden (3). However, and more interestingly, transnational clusters seems to appear. One of them is in the Öresund region, where health-related competences seem to span on both sides in Copenhagen and in Malmö. Similarly, there is considerable notable concentration of health based unicorn on both sides of the Dutch-Belgium border.

Figure 10 Location of health-related EU unicorns (period 2008-2021Q2)

3.3 How long does it take to become a Unicorn?

On average, it took ten years for EU unicorns to reach a $1b valuation from the year they were founded. For this average we took the ensemble of all unicorns in the reporting period 2008 to the 2021Q2 and calculated the year of $1b valuation minus their year of foundation. This finding is fully consistent with the recent McKinsey's study on Europe's top 10,000 start-ups (Baroudy et al., 2021) which also found the ten years figure.

Interestingly, there are notable differences between regions. When comparing the mean age at unicorn status across EU, the US and China, there are statistically significant differences. In the US, the average age of a company at unicorn status is eight years, while it is five years in China (Figure 11). The average age is also significantly lower in China for both private and exited unicorns, which means that **unicorns in China are notably younger than US and EU unicorns**.

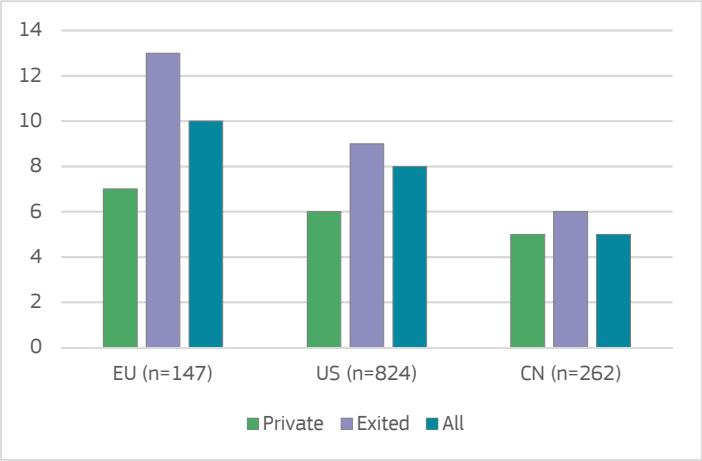


Figure 11 EU unicorns in 2008-2021Q2, by age (in years)

Needless to say that there is a wide average age distribution among unicorns. For example if we look at the private unicorns founded since 2000 (Table 4), there is a fairly wide variation. In 2018, ATAI Life Sciences reached unicorn status only three years after its foundation. At the other end of the scale, it took Czech firm Jet Brains twenty years to reach a billion dollar valuation, in 2020. It may be argued that the reason is that these two companies operate is different sectors and locations. While this is true, considerable variations in age still remain, **even when comparing peers in the same sector.** Founded in 2015, takeway service Glovo took 4 years to become a unicorn in the EU, but five years later its competitor Gorillas took only one year.

Regional differences are smaller, but do also exist, when comparing the time it took for (privately held) unicorns to get acquired or going public. As Figure 12 shows, **the average time to exit in the EU is 10 years for an IPO and 9.5 years for acquisitions or buyouts**. In contrast, US unicorns spend 8 years on average to exit via an IPO and 10 years on average to exit via an acquisition. Chinese unicorns reach an exit event much earlier than EU and US unicorns: they spend 7 and 6 years on average to exit via an IPO and an acquisition, respectively. When looking at the evolution of the average time to exit into the public market with a successful IPO over the period 2016-2020, we observe that it has increased from 15 to 20.5 years for EU unicorns, and from 8 to 10 years for US unicorns. On the other hand, the average time to exit via an IPO has decreased from 11 to 6 years for Chinese unicorns (figures not reported here for sake of brevity). **One possible explanation for this increase in the average time to exit in the EU and US can be found in the cost of reaching a dominant position in an existing market which, according to Kenney and Zysman (2019), has risen significantly especially for software-based companies**. This is despite the fact that launching software-based start-ups is much cheaper than before, which in its turn attracts more actors competing for a dominant position.

Table 3 Time from foundation date to $1b valuation for EU private unicorns

NAME	HQ country	YEAR FOUNDED	DATE OF $1b valuation	Age
Gorillas	DE	2020	2021	1
NuCom Group	DE	2017	2018	1
TIER	DE	2018	2020	2
ATAI Life Sciences AG	DE	2018	2021	3
Alan	FR	2016	2019	3
Northvolt	SE	2016	2019	3
Trade Republic	DE	2018	2021	3
Meero	FR	2016	2019	3
Glovo	ES	2015	2019	4
HMD Global	FI	2016	2020	4
Picnic	NL	2015	2019	4
About You	DE	2014	2018	4
Wefox	DE	2015	2019	4
GoStudent	AT	2016	2021	5
Bolt	EE	2013	2018	5

N26 Group	DE	2013	2018	5
Lilium	DE	2015	2020	5
Forto	DE	2016	2021	5
Kry	SE	2014	2020	6
Personio	DE	2015	2021	6
Sennder	DE	2015	2021	6
Doctolib	FR	2013	2019	6
Wolt	FI	2014	2020	6
Omio	DE	2012	2018	6
Wallbox	ES	2015	2021	6
Celonis	DE	2011	2018	7
Bitpanda	AT	2014	2021	7
BitFury Group	NL	2011	2018	7
Voodoo	FR	2013	2020	7
Cabify	ES	2011	2018	7
Scalable Capital	DE	2014	2021	7
Ledger	FR	2014	2021	7
Back Market	FR	2014	2021	7
Shift Technology	FR	2013	2021	8
Klarna	SE	2005	2013	8
Deposit Solutions	DE	2011	2019	8
FlixBus	DE	2011	2019	8
MessageBird	NL	2011	2020	9
BlaBlaCar	FR	2006	2015	9
bunq	NL	2012	2021	9
Mirakl	FR	2011	2020	9
Tricentis	DE	2007	2017	10
BrowserStack	IE	2011	2021	10
GetYourGuide	DE	2009	2019	10
OCSiAl Group	LU	2009	2019	10
Mambu	DE	2011	2021	10
Collibra	BE	2008	2019	11
Vinted	LT	2008	2019	11
Epidemic Sound	SE	2009	2021	12
Deezer	FR	2006	2018	12
Vestiaire Collective	FR	2009	2021	12
Vistajet	MT	2004	2017	13
Veepee	FR	2001	2015	14
smava	DE	2007	2021	14
Exclusive Group	FR	2003	2018	15
Mollie	NL	2004	2020	16
Ivalua	FR	2000	2019	19
JetBrains	CZ	2000	2020	20

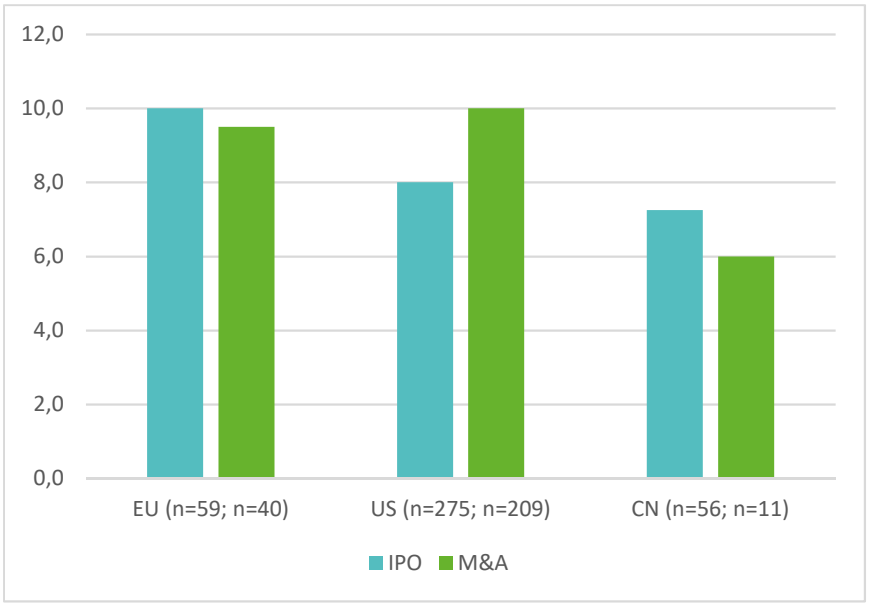


Figure 12 Time from foundation date to exit for EU, US and CN private unicorns in the period 2018-2021Q2

3.4 "EU DNA" unicorns

As mentioned before, in this paper we have attributed the geographical location of a unicorn based on its headquarters, not the country of origin or the nationality of the founders. However, in our database, there are examples of **"EU DNA" unicorns, i.e. unicorns initially founded in a European country that subsequently moved their headquarters abroad because of easier access to capital, market size or the intense network of investors and entrepreneurs**[30]. More precisely, we have identified 40 European unicorns that have relocated their headquarters abroad (32 to the US, 7 to the UK and 1 to Israel). These include companies such as Bureau van Dijk, Just Eat, Skype, UiPath, Transferwise, Veloxis Pharmaceuticals and others (see Table 4). For example, TransferWise, a FinTech business, was created in Estonia by the Estonians Kristo Kaarmann and Taavet Hinrikus but relocated to the UK. Another example is UiPath, a global software company founded in Romania by two Romanian entrepreneurs and headquartered in New York City. Interestingly, both TransferWise[31] and Uipath continue keeping a very strong presence in Estonia and Bucharest, respectively. UiPath is also an excellent example of what has been described in the literature as the phenomenon of 'the New Argonauts', i.e. individuals who have left their own country and return later to their home country, where they reinvest their wealth, learning and expertise and networks (Saxenian, 2006). It is interesting to note that we have found not a single case of a US born unicorn that moved to the EU.

Table 4 EU unicorns that moved their headquarters abroad

Unicorn	Founding location	Short company description	HQ	Valuation (USD bn)	Founded in	Number of employees
Aircall	FR	A cloud-based call center and phone system of choice for modern businesses	US	1.0	2014	471
Bureau van Dijk	BE	the experts in private company information	UK	3.3	1991	1126
Business Objects	FR	Enterprise software company specializing in business intelligence	US	4.6	1990	2620

[30] It is beyond the scope of this report to examine in depth the various motivations for relocation. The aim of this section is to illustrate the emergent phenomenon of the "dual companies" among European unicorns.

[31] TransferWise has their largest office with over 1,000 people in Estonia see https://wise.com/community/nextgeneration

ContentSquare	FR	Optimize your Web and Mobile UX	US	2.8	2012	892
Dataiku	FR	Designs and develops software solutions	US	1.4	2013	526
Elastic	NL	Builds software to make data usable in real time and at scale for search, logging, security, and analytics use cases	US	9.7	2012	2167
Episerver	SE	Episerver connects digital commerce and digital marketing to help organizations create unique digital experiences for their customers, with measurable business results	US	1.1	1994	645
Farfetch	PT	Online luxury fashion retail platform	UK	2.9	2007	3232
Feedzai	PT	The market leader in fighting financial crime with AI	US	1.0	2009	456
FleetMatics	IE	SaaS-based GPS tracking system to extract real time data on vehicles	US	2.4	2004	342
Flywire	ES	Vertical-specific technology that allows organizations to optimize the payment experience for their customers while eliminating operational challenges	US	3.5	2011	519
Getaround	FR	Peer-to-peer car sharing marketplace	US	2	2011	365
Infobip	HR	Full-stack Communications Platform as a Service (CPaaS), with private cloud infrastructure and zero-hop connectivity to telecoms globally	UK	1	2006	2307
Intercom	IE	Customer communication and support service for businesses	US	1	2011	926
Just Eat	DK	Online food order and delivery service	UK	10	2001	6947
Kaseya	IE	Leading provider of complete IT infrastructure management solutions for managed service providers (MSPs)	US	2	2000	1120
King.com	SE	Interactive entertainment company that provides online games for global portals, websites, and other media companies	UK	6	2003	2705
Kyriba	FR	Provides cloud based treasury and payment automation solutions	US	1	2000	871
Letgo	ES	Second-hand shopping app to help users buy and sell locally	US	1	2015	321
LogMeIn	HU	Remote connectivity and collaboration solutions	US	4	2003	4117

MySQL	SE	Open source database that supports scalable web-based and embedded database applications	US	1	1995	246
Neo4j	SE	Graph database platform that allows to build intelligent applications and machine learning workflows	US	2	2007	506
OutSystems	PT	Low-code platform where users can build enterprise apps and apps development quick and fast	US	1	2001	1617
Pipedrive	EE	Develops web-based customer relationship management and sales pipeline management software solutions	US	2	2010	710
Playtech	EE	Online gaming software supplier offering cutting-edge, value-added solutions to the industry's leading operators	Israel	550	1999	1993
Printful	LV	A global leader in print-on-demand and drop shipping services for scaling brands and enterprise-level businesses	US	1	2013	632
Qlik Technologies	SE	Data analytics tools	US	3	1993	2533
Sitecore	DK	Provides web content and customer experience management solutions	US	1	1999	1392
Skype	EE	Messaging and VOIP service, owned by Microsoft	US	9	2003	1063
Talend	FR	Big data and cloud integration	US	2	2005	1476
Talkdesk	PT	World's leading cloud-based call center software solution	US	3	2011	1478
Tradeshift	DK	Cloud-based business network connecting buyers and suppliers	US	1	2009	744
UiPath	RO	Designs and develops robotic process automation software	US	35	2005	3036
Unity Technologies	DK	Providing a game development platform for developers and studios	US	24	2004	4723
Varonis Systems	DE	Offers a software suite to protect file and email servers from cyber attacks, data breaches, and insider threats	US	4	2005	1622
Veloxis Pharmaceuticals	DK	Speciality pharmaceutical company focused on the development and commercialization of Envarsus	US	1	2002	72
Virta Health	FI	Delivers treatment to safely and sustainably reverse type 2 diabetes and other chronic metabolic diseases without	US	2	2014	285

		the use of medications or surgery				
Wise	EE	Money transfer platform	UK	5	2011	1892
Zego	EE	Global insurtech business providing flexible commercial insurance for businesses & professionals	UK	1	2016	290
Zendesk	DK	Cloud-based customer service platform	US	16	2007	3814

Note: All unicorns, the values of the post-money valuations and the number of employees listed in the table are retrieved from Dealroom (cut-off date: 29 June 2021).

We have also identified unicorns whose founders have an EU nationality and/or who decided to start, establish, or moved their headquarters to the UK or the US (see Table 6). For example, Farfetch's Portuguese founder, José Neves, started the online luxury fashion platform in Portugal, with its headquarters currently in the United Kingdom. Unity technologies, a game development platform, was founded in Copenhagen in 2005 by David Helgason, Nicholas Francis and Joachim Ante, and is currently San-Francisco-based. The Irish brothers John and Patrick Collision founded Stripe in the United States after studying at Harvard University and the Massachusetts Institute of Technology (MIT). Stripe is currently one of the highest valued private unicorns which builds payments infrastructure for the internet. One of Udacity's co-founders is an immigrant from Germany that started Udacity, an online education company based in the United States.

Table 5 Examples of Immigrant-founded unicorns and International students who became founders of unicorns

Unicorn	Type of EU DNA	Short company description	HQ	Latest Valuation (USD bn)	Founded in	Number of employees
1. Shazam	Co-founder Germany Company born in the UK	App to identify any music playing around you	UK	1	2000	n.a.
2. Eventbrite	Co-founder France studied at Cornell Univ. Company born in the US	Self-service ticketing platform for events	US	1.5	2006	1075
3. Symphony Communication Services	Founder France Company born in the US	Integrated messaging platform	US	1	2014	346
4. Tango	Co-founder France Co-founder studied at Stanford Univ. Company born in the US	Mobile messaging service	US	1.1	2009	128
5. Oscar Health Insurance	Co-founder Germany Co-founder studies at Harvard (MBA) Company born in the US	Health insurance	US	3.2	2012	973
6. Palantir Technologies	Co-founder Germany Co-founder studied at Stanford Univ. Company born in the US	Software to connect data, technologies, people and environments	US	1.1	2004	2510
7. Udacity	Co-founder Germany Company born in the UK	Online education company	US	1.1	2011	2112
8. Ginkgo Bioworks	Co-founder Ireland Co-founder studied at the MIT Company born in the US	Design custom microbes for customers across multiple markets	US	1	2009	264
9. Stripe	Founders Ireland Founders studied in Harvard and the MIT Company born in the US	Build economic infrastructure for the internet	US	35	2010	2134
10. Compass	Co-founder Ireland Company born in the US	Technology-driven real estate platform	US	4.4	2012	n.d.
11. OfferUp	Co-founder France Co-founder studied at the Univ. Of Washington Company born in the US	Online classifieds	US	1.2	2011	326
12. AppNexus	Co-founder NL Company born in the US	Cloud-based software for online advertising	US	2	2007	n.a.
13. Warby Parker	Co-founder Sweden, Co-founder born in Sweden, raised in San Diego Co-founder studied at UC Berkeley, Wharthon School	Online prescription glasses and sunglasses	US	1.2	2010	1322

Source: European Commission (2020), Science, Research and Innovation Performance of the EU 2020, based on multiple sources: Craft (accessed in December 2019), CB Insights, Crunchbase, LinkedIn profiles, companies' websites, the National Foundation for American Policy (2018), online news and media articles. Note: Information displayed in the figure is not exhaustive, so if corrections are needed please contact the authors. Figure displays unicorns ordered by country alphabetic order.

Generally speaking, EU DNA unicorn companies and (co-)founders tend to keep strong connections 'back home', which also benefits the country of origin. Onnetti and Pisoni (2016) investigated the growing phenomenon of dual companies, particularly high-tech start-up companies founded in European countries before relocating their headquarters to outside of the EU, notably the United States. They found that these high-tech companies typically maintain a presence (such as R&D labs) in their home country which benefits from positive externalities such as new job creation. The study concluded that 13% of European scaleups follow this 'dual model', and that for 83% of them their destination is the United States (in particular Silicon Valley), a trend already mentioned in this chapter. For those that relocate within Europe, the United Kingdom is the top choice. In this context, there

are also positive externalities to the 'home country' even when headquarters are relocated. This hypothesis holds true in the cases listed below (Table 7). Benefits to the country of origin can include employing highly skilled professionals, as in the Tradeshift Frontiers Innovation Lab in Copenhagen or Stripe's new engineering hub in Dublin, participating as angels or seed investors in new start-ups, such as the founders of Talkdesk and TransferWise, sponsoring digital education in less developed regions, like UiPath in Romania, or Farfetch's founder, José Neves, who created a Foundation to promote a knowledge society in Portugal, etc.

Table 6 Local Spill-over effects

Spill-over effects	Unicorn's name	Key features
Job creation (Offices and subsidiaries in the home country)	Farfetch	1500+ employees in Portugal
	Transferwise	700+ employees in Estonia
	Letgo	100+ employees in Spain
	Stripe	100+ employees in Ireland
	UiPath	700+ employees in Romania
Support of the start-up ecosystem (advice and mentoring from founders, seed and early-stage capital)	OfferUp	Co-founder is an advisor of start-ups in the Netherlands
	TalkDesk	Co-founder is an early-stage investor in Portugal
	Transferwise	Participation in seed capital fund for innovations including in secondary education in Estonia
R&D and Innovation hubs (e.g. Launch of tech hubs in the home country)	TradeShift	Tradeshift Frontiers Innovation Lab in Denmark
	Farfetch	Technology and operations campus ("Fuse Valley") in Matosinhos, Portugal
	Stripe	Engineering hub in Dublin
	UiPath	Immersion lab in Bucharest
	Intercom	Large R&D team based at its Dublin office
Education and Research (e.g. Education and cutting-edge research)	TradeShift	Sponsors a PhD program in Machine Learning in a Danish university
	UiPath	Foundation supports digital education in Romania
	Transferwise	Support NGO Eesti 2.0 and practical mentoring to its students from TransferWise Co-founder and other
	Farfetch	The founder José Neves has started a Foundation in Portugal to promote a knowledge society

Source: DG Research and Innovation, Unit of the Chief Economist - R&I Strategy & Foresight, based on ORBIS database as of September 2019, companies' websites, online news and media articles. The information displayed in the table is not exhaustive and might be outdated at the time of publication of the report. In case you identify any mistakes in the data please do not hesitate to contact the authors.

4 Unicorn Founders

This section builds on the findings from the 2020 edition of the European Commission "Science, Research and Innovation Performance of the EU" report, and the H2020 KNOWINN project led by the OECD.

4.1 Gender of Founders

Despite some progress, a pronounced gender gap remains in the creation of innovative start-ups. Overall, female start-up founders remain under-represented in the creation of start-ups despite having doubled their representation from 8% in 2000 to 16% in 2016[32]. Lassébie et al. (2019) show that the gender gap in innovative high-potential start-ups is thus much larger than the gender gap in entrepreneurship in general. Moreover, a study by the Global Entrepreneurship Monitor[33] indicated that Europe has the lowest female involvement, only 6%, in the early stages of entrepreneurial activities. Rossetti et al. (2018) also found a gender imbalance in the Start-up Europe initiative, where 90% of digital start-ups supported by the Start-up Europe Initiative had a male founder. This figure was found to increase with the age and the development stage of the firm.

When considering the economic and social benefits of gender balance in economic activities, understanding the reasons for the gap in female-founded start-ups is an issue that deserves policymakers' attention. Verheul and Thurik (2006) showed that higher female engagement in entrepreneurial activities can improve the quality of entrepreneurship as it increases firms' creativity and ultimately their innovation activities. Moreover, it also offers the potential for greater diversity in consumer insights, leading to the introduction of new products and processes. The economic and social benefits being clear, Lássebie et al. (2019) summarise some of the potential explanations for the gender gap in innovative entrepreneurship in the literature. Gender differences in STEM education may explain why male founders have been more present in STEM-related (and also more tech fields) than women. Furthermore, since venture capital tends to be more associated with STEM areas, this could also hint at the existing gender funding gap of innovative start-ups.

Also, as illustrated in Lássebie et al. (2019), Guzman and Kacperczyk (2019) and Greene et al. (2003), there may be factors of a sociological nature. For instance, some studies have documented differences in the personality traits ascribed to women and those attributed to the entrepreneur. This refers to, for instance, risk-taking behaviour and confidence in a negotiation. Increasing the number of female role models and mentors can raise the interest of women in the entrepreneurial path from an early age, and also balance out differences in aspirations. At the EU level, the Women TechEU[34] is a new initiative of the European Union funded under the European Innovation Ecosystems work programme of Horizon Europe. The scheme offers first-class coaching and mentoring to female founders, as well as targeted funding to help take their business to the next level.

As a result, it comes as no surprise that a gender gap is also prevalent in the founding teams of unicorn companies. Out of the universe of unicorn firms, the CRUNCHBASE database contains data on 1171 founders from 485 companies. The results of the analysis of the H2020 KNOWINN project indicate that the average number of founders per company is around 2.5, and on average only 6% of founders are women. There are however differences by major economy:

- **EU**: on average, there are 3 founders per company (94 total founders). 2% of founders are women.
- **US**: on average, there are 2.25 founders per company (731 total founders). 6% of founders are women.
- **UK**: on average, there are 1.8 founders per company (44 total founders). 2% of founders are women.

4.2 Alma Mater of Unicorn Founders

There is general consensus that being well-educated increases the likelihood of founding a successful venture and of securing funding. The Ewing Marion Kauffman Foundation (2008) found that US-born engineering and technology company founders tend to be well-educated – 92% of US-born tech founders held bachelor's degrees, while 31% held master's degrees, and 10% had a PhD. Ratzinger et al. (2018) looked into 4953 digital start-ups and concluded that teams with a founder that has a technical education are more likely to secure equity investment and to exit and that teams with a founder that has doctoral level business education are less likely to remain self-financed and have a higher probability of securing

[32]OECD estimates based on Lassébie et al. (2019) and computed from Crunchbase data
[33]https://www.gemconsortium.org/file/open?fileId=50405
[34]https://eic.ec.europa.eu/eic-funding-opportunities/european-innovation-ecosystems/women-techeu_en

equity investment. Other research[35] stresses that even though there are a number of cases where founders had dropped out of high school or college to found a successful venture, these remain indeed rare occurrences in Europe.

Founders of unicorns studied in approximately 400 different universities. Around **12% of founders studied in universities in Europe**. Virtually **all founders have at least a university degree** (BA); approximately half of the founders have a professional degree (Master's, MBA, JD); and around 12% have a doctorate degree (Figure 13).

- Virtually **all founders have at least an undergraduate degree from Europe and the US**
- In the **US**, around 40% of founders have a Master's degree while in the **EU** that number is around 65%.
- In the **US**, around 13% of founders have a Doctorate degree while in the **EU** the number is around 7%.

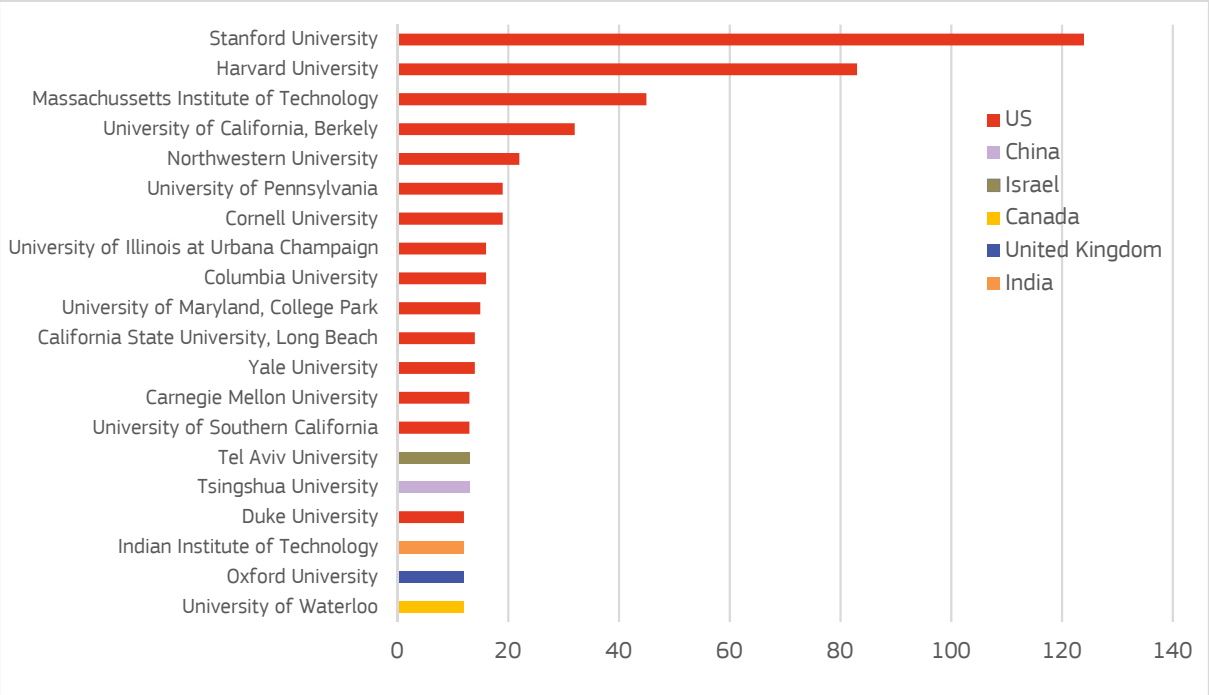


Figure 13 Alma mater of unicorn founders

Source: H2020 KNOWINN Project, OECD calculations based on crunchbase.com, CB Insights Global Unicorn Club, Pitchbook, Fortune, EU-Startups website (2000-2019).
Note: Top 20 universities worldwide by number of founders that attended the university (regardless of the degree obtained) The firms listed consist on mainly on unrealized unicorns, e.g. firms that have not gone through an IPO.

[35]https://medium.com/samaipata-ventures/sv-reports-2-5-how-educated-are-european-startup-founders-ef568f1e6d1f

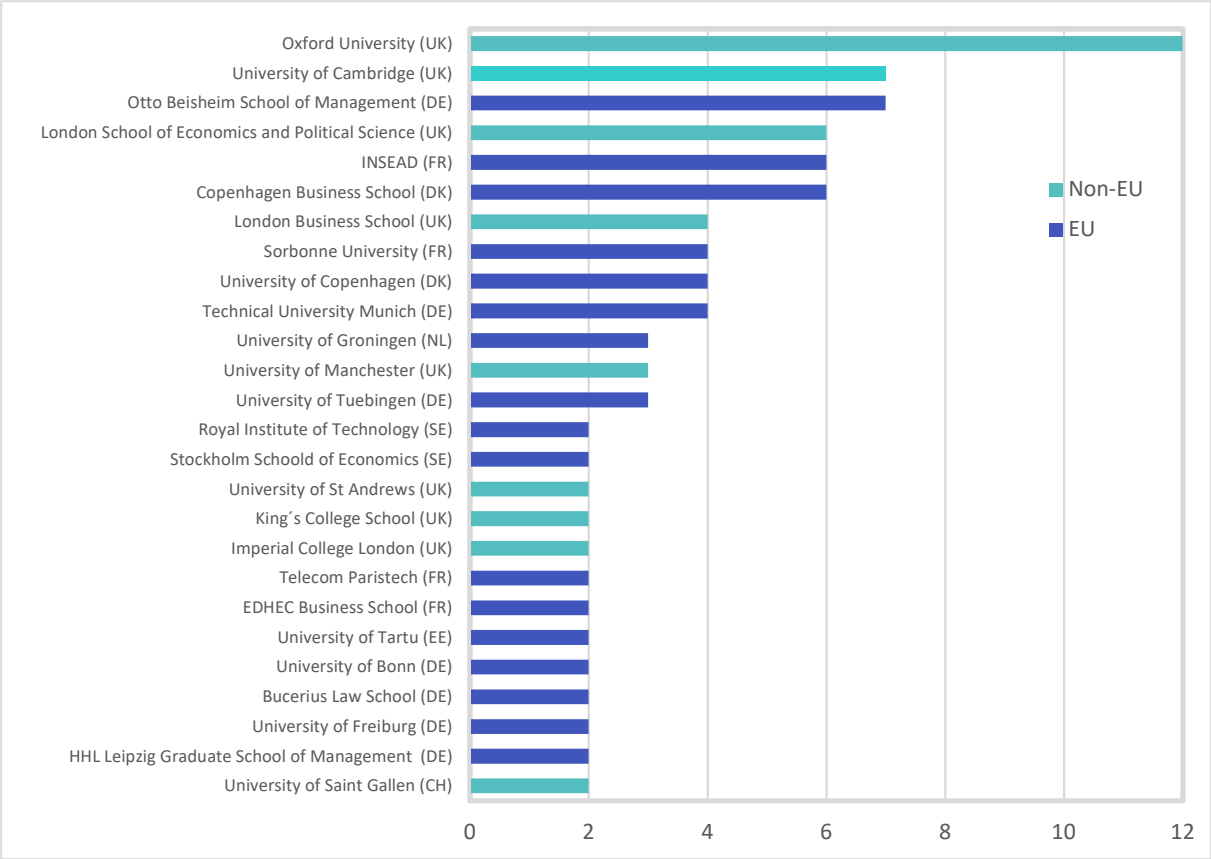


Figure 14 Top European universities attended by unicorn founders (regardless of the degree obtained)

Source: H2020 KNOWINN Project, OECD calculations based on crunchbase.com, CB Insights Global Unicorn Club, Pitchbook, Fortune, EU-Startups website (2000-2019).
Note: The firms listed consist on mainly on unrealized unicorns, e.g. firms that have not gone through an IPO.

About half of the founders obtained their highest degree in STEM fields such as mathematics, computer science, biology, etc. About 25% of the founders have degrees in business and economics while the remaining 25% have liberal arts degrees. Eight out of ten founders that have a PhD were in science and engineering.

4.3 Past Entrepreneurial Experiences

Overall, research supports the idea that **serial founders of start-ups tend to be more successful than first-time entrepreneurs**. For example, Gomper et al. (2006) found that entrepreneurs who were successful (i.e. success measured by starting a company that eventually went public) had a 30% chance of succeeding in their next company. This stands in contrast to a 18% chance of first-time founders succeeding, and a 20% chance of succeeding of entrepreneurs who had previously failed. Tamaseb (2021) book´s research came to the conclusion that 'repeat founders' were more likely to reach unicorn status. Accordingly, at least some entrepreneurial experience such as building a company, a side or a small project, makes these founders more likely to build billion-dollar companies than those that have not had some sort of entrepreneurial path in the past. The Harvard Business Review lists a few examples supporting the argument that failure and entrepreneurial experience matters for unicorn success[36]. For instance, "Snapchat's cofounders, Evan Spiegel and Bobby Murphy, started working together on a website for students called Future Freshman, among other projects, while at Stanford University. They attempted nearly 34 projects that failed before developing an iPhone app called Picaboo, which was subsequently

[36]https://hbr.org/2016/03/what-big-companies-can-learn-from-the-success-of-the-unicorns

rebranded as Snapchat. Similarly, Apoorva Mehta, a former Amazon engineer and founder of Instacart, tried up to 20 different business models that failed before hitting the right one." Travis Kalanickalso had started other ventures (Scour, a peer-to-peer search engine, and Red Swoosh, a content delivery system) before co-founding UBER[37]. Lei Jun, Xiaomi's founder and CEO, is also a serial entrepreneur (e.g. founder of Joyo, a portal for Windows software downloads)[38].

The findings of the H2020 KNOWINN project show that in Europe past founding experience seems to be less of a determinant factor than in the United States or other parts of the world:

- In the **US**, one out of three founders (~30%) had previous experience founding other companies.
- In **Europe**, one out of six founders (~15%) had previous experience founding other companies.
- For **other parts of the world**, around 39% had previous experience founding other companies.

[37]https://www.new-corner.com/headstrong-serial-entrepreneur-travis-kalanick-ceo-co-founder-uber/
[38]https://www.techinasia.com/xiaomi-lei-jun-story

5 How Unicorns scale to reach a $1b valuation

Raising finance is an ongoing process throughout the life cycle of a firm. Firms raise different types of finance and different amounts of finance at different points in their development stages. In a start-up, the classic approach to funding a company is to solicit loans and investments from friends, family and the founder's personal savings. Companies with significant growth potential are generally funded by venture capitalists (VCs), regardless of their stage of development. In many cases, and especially in later stages, venture capitalists are also involved to conduct "due diligence" assessments, and management expertise. In this section we investigate the various financial pathways employed by unicorns, including venture capital investment, acceleration and acquisitions to achieve their unicorn status.

5.1 Equity investment

Venture capital is a form of investment for early-stage, innovative companies with high growth potential. VCs also offer non-financial support to help a company commercialise and grow. Scale-up companies face barriers when looking for finance to scale-up for a number of reasons. According to Gigler (2018), they require investors with the right technical capabilities to assess the market prospects for a variety of technological solutions and the ability to support the venture not only with funds, but also with the appropriate network and expertise. This is particularly true for technological start-ups, i.e. those serving for instance artificial intelligence (AI) and distributed ledger technologies (blockchain) which are considered too complex for many investors.

According to our analysis, VCs invested on average €125m per unicorn in the EU, €138m in the US and €125m in China during the period 2008 and Q2, 2021 (all sample in Figure 15). When looking at privately-owned unicorns only, the average EU unicorn has raised slightly more than the average US unicorn (€131m versus €128m) over about the same funding rounds prior to reaching unicorn status. Contrary to the average amount raised by the European and US unicorns, for the same cohort of Chinese unicorns, the average amount raised was €204m over 2.5 funding rounds prior to their unicorn valuation deal. **This implies that in China large rounds allow companies to reach large valuations sooner and in fewer rounds than in the EU and US**.

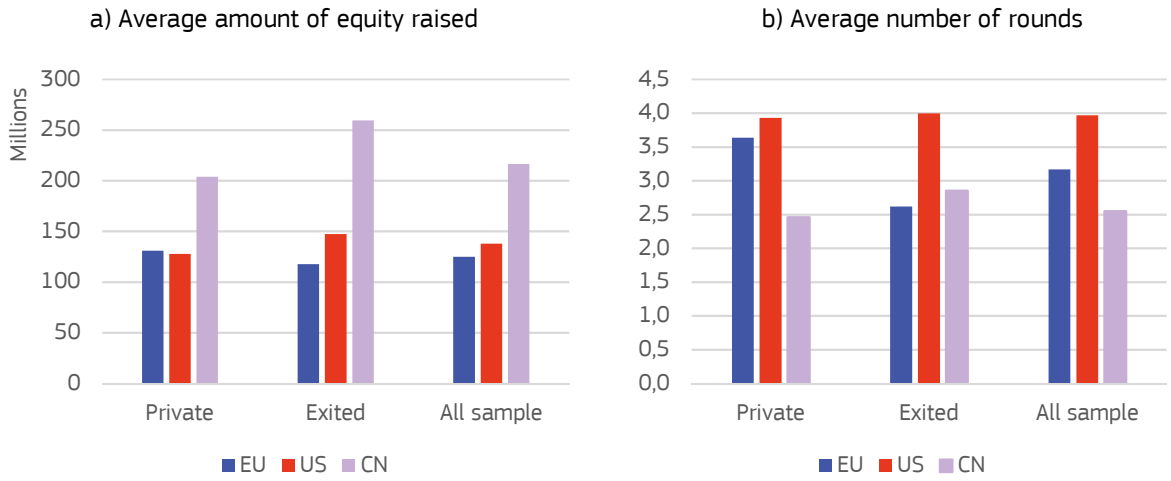


Figure 15 Average amount of equity raised and average number of rounds prior to unicorn status over the period 2008-2021Q2

Over the same time period, the average amount invested in US and Chinese "exited" unicorns was higher than the average amount invested in EU "exited" unicorns, **suggesting a possible low number of IPOs and merger and acquisitions occurring in the EU**. Indeed, increasingly, large corporates but also traditional firms all over the world are spending higher amounts to acquire technology start-ups on the promise to be better prepared for the future. According to financial market data provider Refinitiv,[39] the value for M&A operations in

[39] https://www.refinitiv.com/en

the first three quarters 2021 amounted to $878b worldwide. This is 144% higher than in the same period of the year before.

5.2 Top investors: unicorn hunters

Investors play an important and multifaceted role in the growth trajectory of promising start-ups. They do not only select those companies that have the best potential for growth (i.e. 'picking winners') but also help develop the chosen ventures, by providing management expertise and access to resources other than financial (i.e. a 'coaching' role). There are hundreds of investors in the EU, but very few can identify high-potential start-ups and help guide them to a $1b valuation.

Three of the top 10 venture capital firms investing in EU unicorns are located in the heart of Silicon Valley (Palo Alto, San Francisco and Menlo Park) (Figure 16). Four of the top 10 investors on the list are located in New York, and two firms are based in London. Accel has been the most active investor into EU unicorns. Based in Palo Alto, the firm has backed 14 unicorns across the EU and is one of the most active venture capital investors in the global high-growth ecosystem. Accel seeks primarily to invest in companies operating in the commercial products, the healthcare, mobile and infrastructure sectors (e.g. Kry, MessageBird, Sennder, Shift Technology). Insight Partners and Index Ventures, headquartered in New York and San Francisco respectively, are the second largest unicorn investors, having backed 11 European unicorns (e.g. Deliveroo Hero, Collibra, and Adyen). Their funds can make investments from early-stage to growth-stage technology and software companies. Investing in nine European unicorns, DST Global is the third most prolific investors in the EU unicorns. It prefers investing in later-stage, high-growth companies operating in the Internet sector (e.g. Gorilla, Spotify, Klarna).

When focusing on the major European investors by number of companies invested in, HVCapital ranks in the top ten investors in EU unicorns. Based in Munich, HV Capital invests mainly in software-based companies at various stages of growth. It is followed by Idinvest Partner, a private equity and venture capital firm based in Paris. It has a particular focus on the IT sector which include Deezer, Criteo and others. It has also artificial intelligence companies in their portfolio such as Neurala.

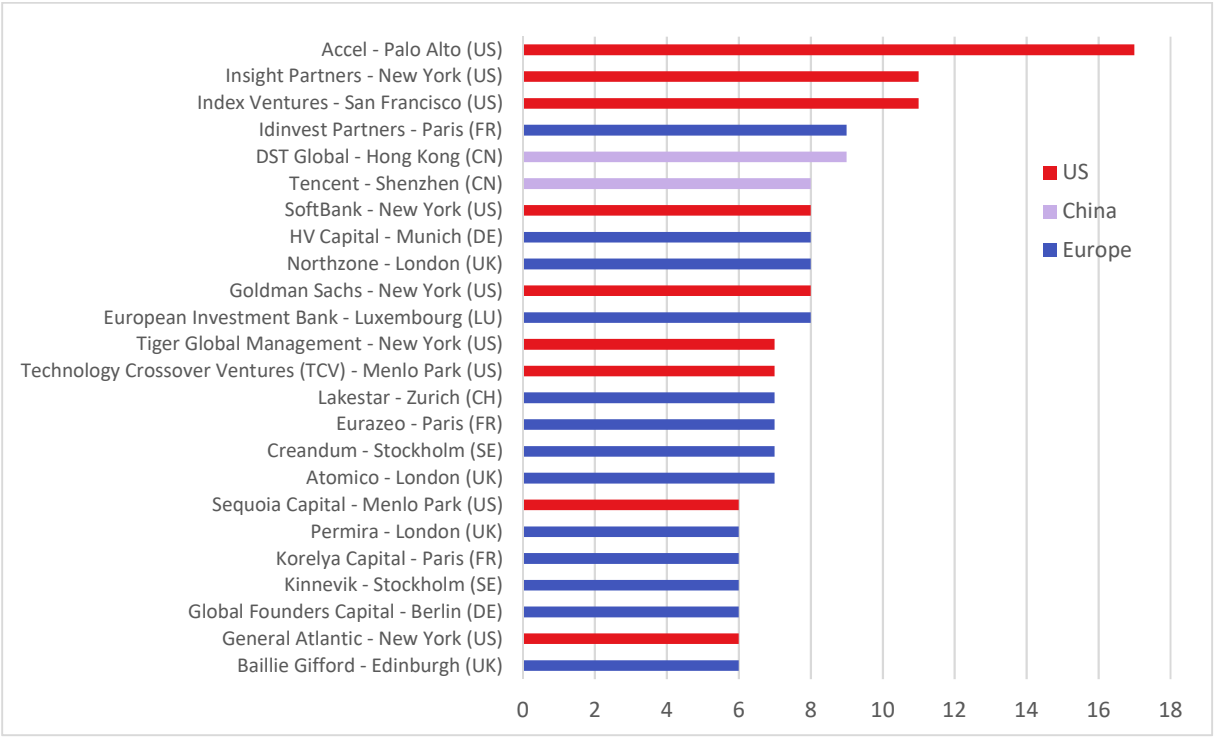


Figure 16 Top investors by number of EU unicorns invested in over the period 2008-2021Q2

A rather different picture emerges when the amount invested is considered (see Figure 17). For the period 2008-Q2,2021 Tencent, based in China, invested the largest amount of capital in European unicorns. Indeed, in 2016 Tencent bought Supercell for the huge amount of 8.6 billion US dollar. Headquartered in London,

Permira is the second top investors in terms of amount invested, followed by MCI Capital based in Warsaw, which invested in the acquisition of Allegro for about 3.25 billion US dollar[40]. It also emerges that a significant amount of the capital invested in European unicorns came from US investors. SoftBank, Hellman and Friedman, Goldman Sachs are the first three top US investors in EU unicorns. This may reflect the priority of US investors to focus on large, later stage deals and at the same time their ability to attract European start-ups because they may represent cheaper investment alternatives to their more highly valued US based counterparts.

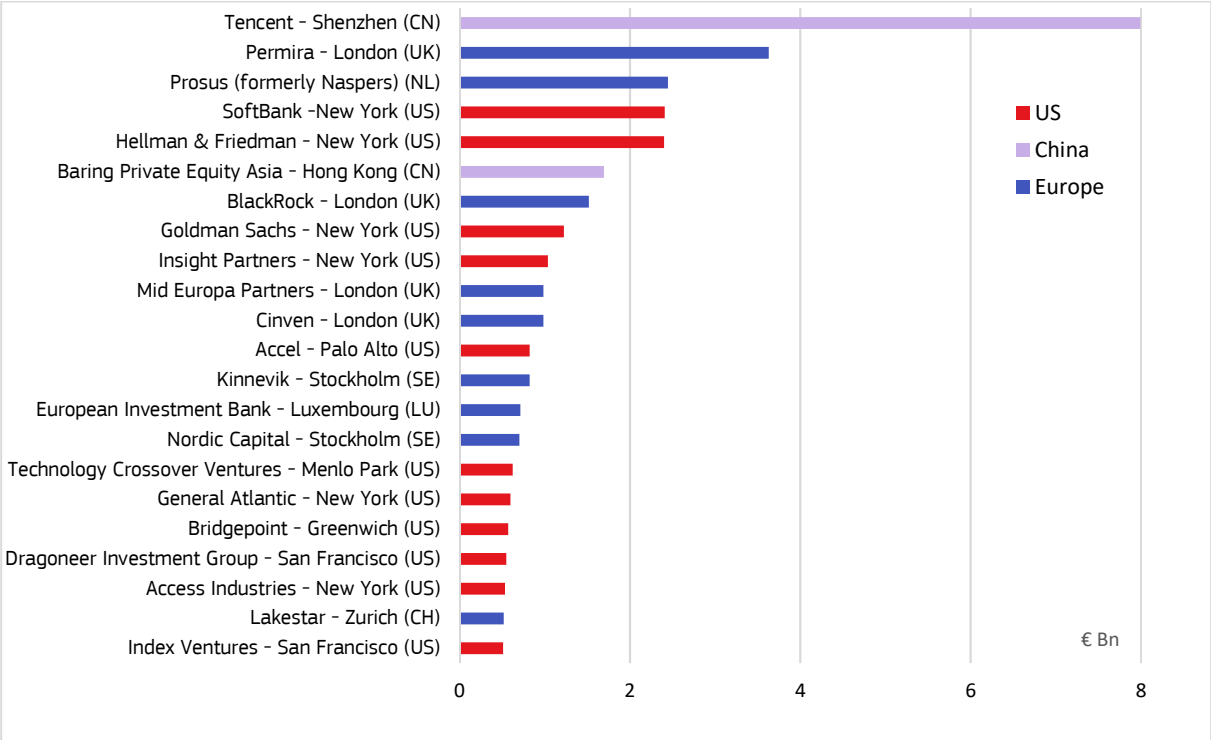


Figure 17 Top investors by amount invested in over the period 2008-2021Q2

Table 7 Top European investors by number of unicorns invested in over the period 2008-2021Q2

Investor	Country	Investor Type	Company Count	Assets under Management (if available)
HV Capital	DE	Venture Capital	8	€1.7bn
Idinvest Partners	FR	Private Equity	7	€2bn (2007)
Creandum	SE	Venture Capital	6	€400M
Global Founders Capital	DE	Venture Capital	6	$1bn
Eurazeo	FR	Private Equity	6	€21.8bn
Kinnevik	SE	Venture Capital	6	$25.8bn
Korelya Capital	FR	Venture Capital	6	€300M
Heartcore Capital	DK	Venture Capital	4	€350M
Bpifrance	FR	Venture Capital / Public	4	€9bn

[40] See Press releases | Grupa MCI

Cherry Ventures	DE	Venture Capital	4	n.a.

Figure 18 shows that the share of public VC solely (both in terms of rounds and amount invested) is very small. Public sector funds were involved in just 5% of total VC investments, whereas private sector VCs were involved in more than 89% of all investments in EU unicorns between 2008 and Q2-2021. The remaining 6% are mixed public-private deals.

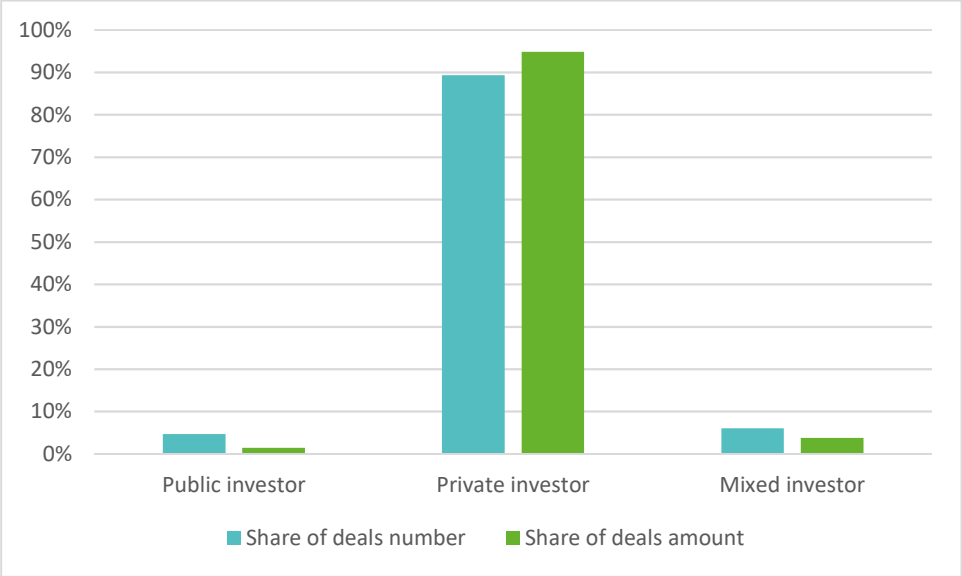


Figure 18 Share of deals and amount invested by investor type

When looking at the share of investments in unicorns by stages of financing[41], private investors play an important role in different parts of the funding spectrum. On the other hand, public-private co-investment appears to be the dominant form of public venture capital investment in the seed and later stages (see Fig. 19).

a) Share of deals number

b) Share of deals amount

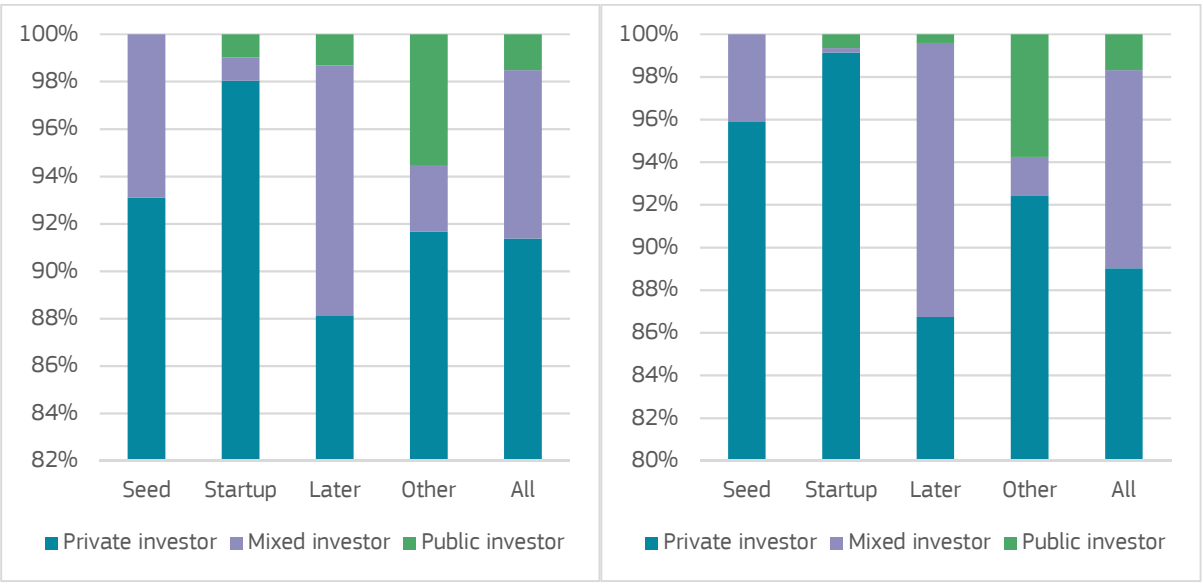


Figure 19 Role of different types of investors at different stages of financing

[41] Start-up stage refers to the rounds of investment labelled in Dealroom as "Early VC" and "Series A". Later stage refers to "Late VC" investments, including "Series B", "Series C", "Series D", "Series E", "Series G", "Series H", and "Series I". Other includes "Growth Equity" and "Media for Equity".

5.3 The relationship between VC firms and EU unicorns

In this section, we focus on the intricate network of VC firms and EU unicorns. In order to portray geographically the VC investments as links of our network, we use the location of the headquarters of EU unicorns, and the VC firms in investing in the unicorns. To enhance visibility, the relationships between EU unicorns and their investors are visualised in two graphs: 1) international network, i.e. VC investments into EU unicorns from VC firms headquartered in non-European cities, 2) European network, i.e. VC investments into EU unicorns from VC firms located in European cities. The results of these exercises are illustrated in Figures 20, and 21 where unicorns are drawn as blue circles and VC firms as red triangles.

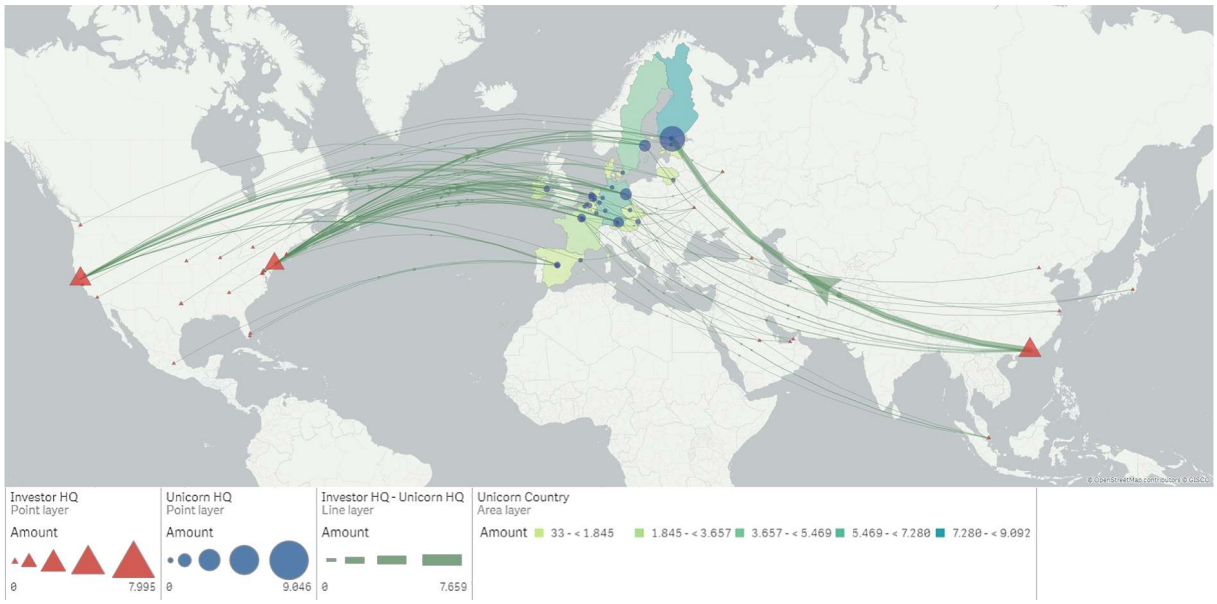


Figure 20 International network, from 2008-Q2,2021

Investment flows towards EU unicorns are represented by links, endowed with directional arrows to discern start from end. The size of both circles and triangles are proportional to the cumulative investments received by the area in the 2008-2021 period. The size of a link reflects the intensity of the investment channel between two given cities. EU unicorns are fully embedded in international networks. As mentioned in the previous subsection, the largest VC firms – in terms of amount invested – that invest in EU unicorns are located in China, UK, the Netherlands and the US. Figure 20 shows the main investments in EU unicorns over the period 2008-Q2, 2021. Looking at their investment behaviour, we can observe an overlap in investments between those top firms. For example, we can see the successful investments from DST Global (located in Hong Kong) and Goldman Sachs (based in New York) in companies including Spotify, and Wolt. Moreover, in line with our expectations, international VC investments have targeted the major European VC hubs (e.g. Paris, Berlin, Stockholm, etc.).

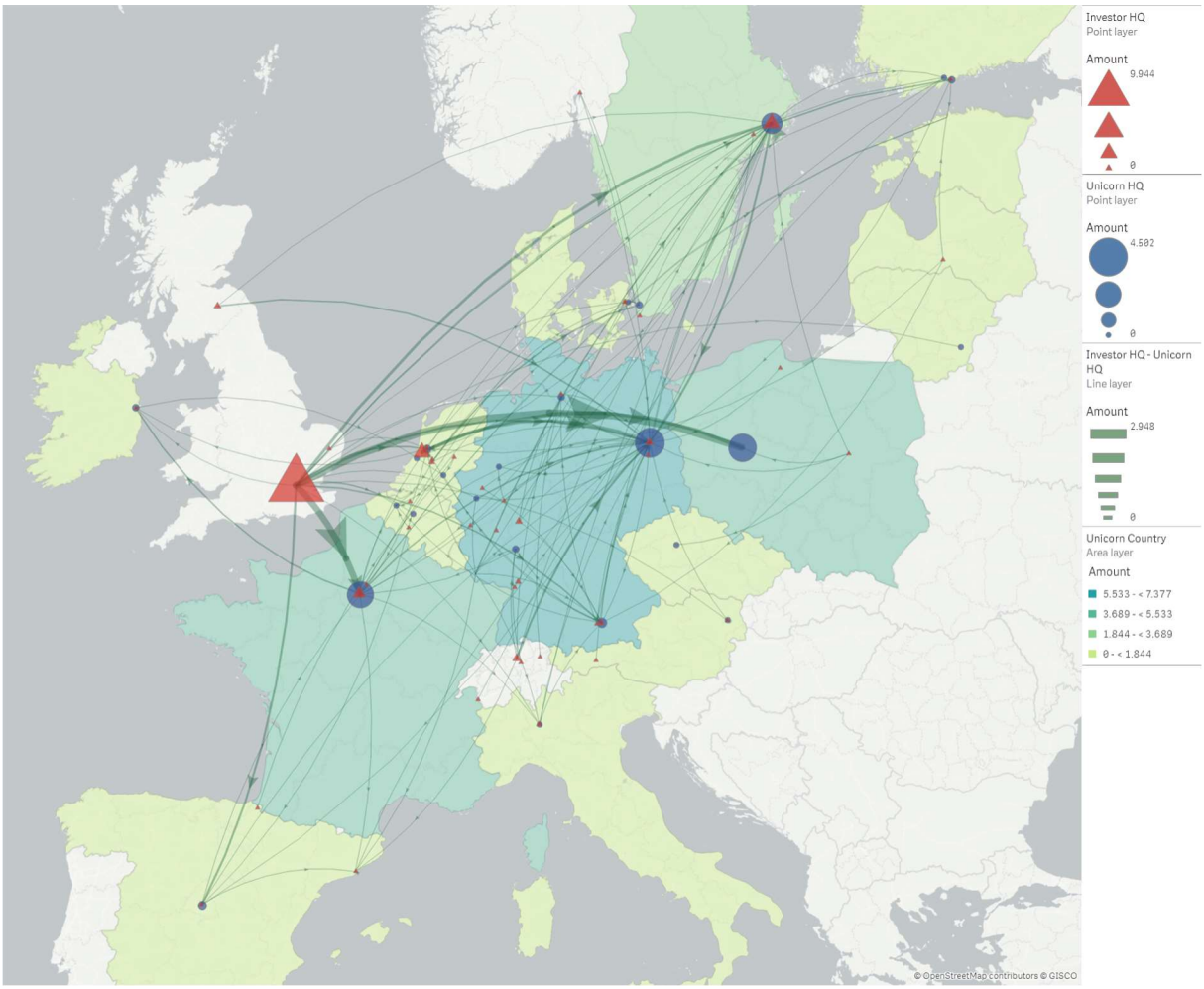


Figure 21 European network, from 2008-Q2,2021

While it is always difficult to understand the reasons behind such flows of VC investments into EU unicorns, it is plausible that as the more innovative start-ups begin to outgrow the resources of their local networks, they actively replace and extend their networks, which both creates the opportunity and demand for higher level of innovation. Figure 21 shows the interaction between VC firms headquartered in Europe and EU unicorns over the period 2008-Q2, 2021. It confirms the observations made in section 3.1. First, VC investments are mainly concentrated in few European hotspots, such as Paris, Berlin, or Stockholm. Eastern European countries are underrepresented with some notable exceptions, such as the Polish unicorn Allegro attracting about €3 billion from abroad.[42] Note also that Bucharest-born UiPath does not appear in the figure, as their headquarters are located in New York. Second, London has a prominent role in the venture capital funding of EU unicorns. This is in part due to the maturity of the VC sector in the UK, compared to other European countries, and in part to the fact that most of VC firms are located in London. Note here that most European branches of foreign VC firms (mostly from the US) are located in London. Within the EU, the domestic VCs are mostly located in the capital cities and mostly invest nationally. Stockholm and Amsterdam are exceptions, given that Sweden and the Netherlands have a developed VC structure, but relatively small internal markets, so that theses VCs firms look for attractive business opportunities also outside of their national boundaries.

5.4 Growth by acquisition

Acquiring a start-up is an effective way for corporates to get access to technological knowledge and develop quickly in a particular technical area. Mergers and acquisitions, however, are not risk free. Many acquisitions

[42] The Polish online trading firm Allegro was acquired by Prosus in January 2008 for $2.0 billion, and then acquired jointly by Cinven, Permira and Mid Europa Partners in Oct 2016 for $3.3 billion.

have suffered from the loss or demotivation of key staff, or have failed to realize their expected potential for other reasons. Nevertheless, a few companies claim spectacular successes amongst their acquisitions. The common factors seem to be prior experience of the markets in which the new technology would be used, and a compatible culture between the two organizations. In what follows, we will discuss and examine the acquisitions made by our European unicorns along two important dimensions, 1) where the acquired company was physically located and 2) its sector of economic activity.

63 out of a total of 147 EU unicorns had taken over at least one company over in the period 2008 to Q2-2021. In particular, Xing had acquired nine (9) others, Blablacar (8), Hexagon and StepStone (7), THQ Nordic, Veepee and Just Eat Takeaway (6), Glovo, Criteo, and Klarna (5), Tink, Bambora, MessageBird, TelecityGroup and Paradox Interactive (4), Trivago, Idealista, Sinch and ION Group (3).

Table 9 show the take-over targets of EU unicorns which have been acquiring six or more companies. Xing, a social networking site based in Hamburg (Germany) made better use of their existing expertise by acquiring job recruitment, social platform and event companies in German speaking areas such as Austria and Switzerland. Veepee, a French retailer company, in contrast, acquired several companies located in Spain, Belgium, or the UK operating in the same sector of activity with the aim to expand its business. Similarly, Hexagon AB, an IT company, focused on expanding its information technology business through a series of acquisitions. In Veepee and Hexagon AB's business strategy, the location of their partners was not so important. It is also important to note here that none of our EU unicorns acquired foreign companies over the time period considered.

Table 8 Examples of acquisitions made by EU unicorns

Unicorn	*Acquisitions*			
	Company's name	*City*	*Country*	*Sector*
Xing, Hamburg (DE), Social Media	Aimando	Munich	DE	event tech
	Asap.industries GmbH	Umkirck	DE	jobs recruitment
	BuddyBroker	Zurich	CH	jobs recruitment
	Honeypot	Berlin	DE	jobs recruitment
	InterNations	Munich	DE	media
	Jobbörse.com	Aschaffenburg	DE	jobs recruitment
	Kununu	Vienna	AT	health
	Prescreen	Vienna	AT	jobs recruitment
	Xing Events (old Amiando)	Munich	DE	event tech
Blablacar, Paris (FR), Travel, mobility	Autoshop	Budapest	HU	transportation
	Beepcar	Brussels	BE	travel
	Busfor	Katowice	PL	travel
	carpooling.com	Paris	FR	travel
	LESS	Chelles	FR	transportation
	Ouibus	Vitry-sur-Seine	FR	travel
	Podorozhniki	Kiev	UA	transportation
	Superdojazd	n.a.	PL	transportation
Hexagon AB, Stockholm (SE), Semiconductors	AMendate	Paderbom	DE	energy
	Bricsys	Gent	BE	enterprise software
	Immersal	Helsinki	FI	media
	Luciad	Leuven	BE	transportation
	Nextsense	Graz	AT	enterprise software
	SPRING Technologies	Paris	FR	enterprise software
	TACTICAWARE	South Moravia	CZ	security
StepStone, Dusseldorf (DE), Job recruitment	Mya Systems	Munich	DE	jobs recruitment
	Studydrive	Berlin	DE	education
	Turijobs	Barcelona	ES	jobs recruitment
	Universum	Stockholm	SE	jobs recruitment
	Yourcareergroup.com	Dusseldorf	DE	jobs recruitment
	IctJob	Brussels	BE	jobs recruitment
	Jobsite	Portsmouth	UK	jobs recruitment
THQ Nordic, Vienna (AT), Gaming	Bugbear Entertainment	Helsinki	FI	gaming
	Carmageddon	Worthing	UK	gaming
	Coffe Stain Studios	Skavde	SE	gaming
	Massive Miniteam	Cologne	DE	gaming
	Purple Lam Studios	Wien	AT	gaming
	Warhorse Studios	Prague	CZ	gaming
Veepe, Saint-Denis (FR), fashion	Designers and Friends	Copenhagen	DK	fashion
	Le Petit Ballon	Paris	FR	food
	Privalia	Barcelona	ES	fashion
	QaShops	Seville	ES	marketing
	vente-exclusive	Sint-Pieters-Leeuw	BE	fashion
	Zlote Wyprzedaze	Peterborough	UK	fashion
Just Eat Takeaway, Amsterdam (NL), food delivery	BGMENU.com	Sofia	BG	food
	Bistro.sk	Bratislava	SK	food
	Foodarena	Zurich	CH	food
	Foodora	Berlin	DE	food
	Lieferheld	Berlin	DE	food
	Pizza.de	Duisburg	DE	food

6 Policy discussion

In this section, we provide a number of reflections that serve to feed the policy discussion on unicorns, tackling issues on how unicorns are valued, why this matters and how the ongoing debate around valuation can inform public VCs, such as the EIC and its fund, or finding a growth strategy that fits its goals and values.

The public VC perspective. Scaling start-ups and SMEs requires considerable investments. Even though the policy debate focuses on closing the finance gap in Europe relative to the US and China, the perspectives of public VCs relative to private VCs are bound to be fundamentally different. Outside of the world of VCs, the term "unicorn" can be viewed as a marketing or branding stunt to attract private and institutional investors, including very wealthy people in order to reassure them that there are substantial gains involved when investing in high risk ventures. A unicorn is rare, but investments will pay off eventually because just one unicorn in the portfolio significantly alters the return on investment (ROI). Hence "unicorns" can be viewed as a 'gamble' for people who seek high gains or a better (average) ROI at a lower cost compared to the going rate; what these high risk investors are seeking is an average ROI, or a better deal, that surpasses that of public shares and other more regulated investments. Some observers express scepticism on the valuation of unicorns, used by VC investors for receiving preferred stock preferences payable on a sale of the company. To these scholars, unicorn valuations are just unreliable measures, notably due to the common practice among VC investors to price VC financings as if they are purchasing common stock when they are acquiring preferred stock with downside economic protections.

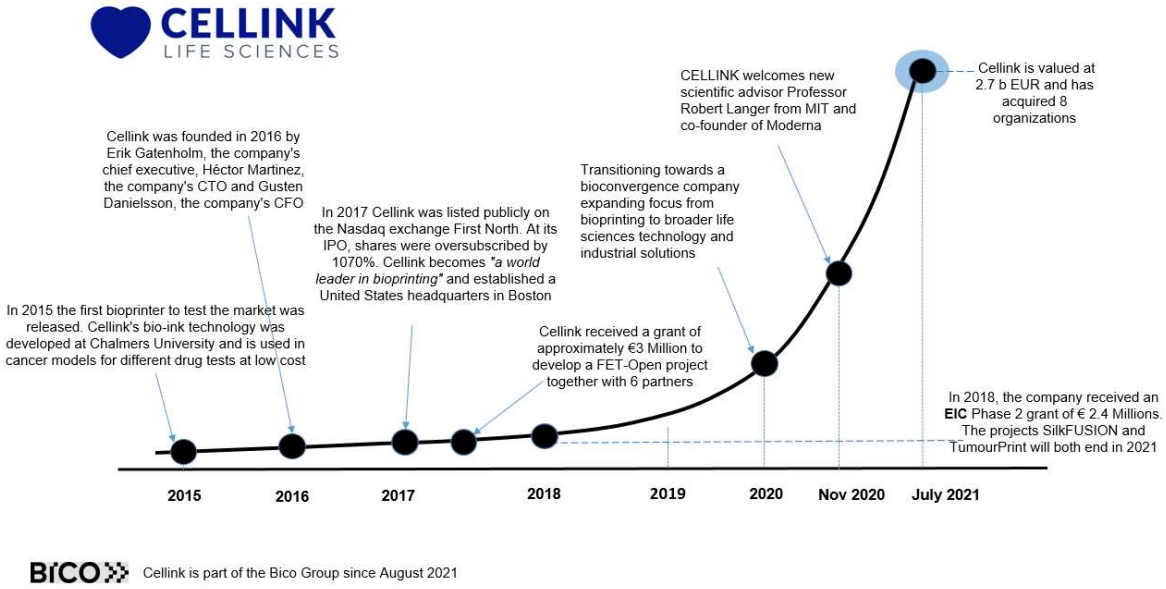
Nevertheless, from the public perspective this investment strategy is also interesting, since any return generated in the public interest might also be higher than that of traditional investments such as grants in a funding environment that becomes more and more limited, and which might offer a higher leverage effect by crowding in private investors. The newly established EIC fund[43], owned by the European Commission, not only intends to bridge the equity funding gaps at early stage (seed, first rounds) but also targets the crowding in of other investors, providing investment opportunities for VCs and other funds.

Measuring the success of public investments. For many observers, growth is one of the most important and dominant factors concerning a start-up's valuation by investors. Whereas the expected market multiple of investments is about ten in the VC market, the EIC as public VC set itself the target of a market multiple of roughly three. In addition, just as many other VCs, it creates value through connections with specialised mentors, ecosystems and additional investment opportunities. As opposed to purely private operators, the EIC Fund also has policy targets in line with Commission priorities such as "deep tech" innovations with high R&D intensity as well as a focus on Health, Green Deal (e.g. clean energy, climate action, future mobility) and Digital Transformation, advanced engineering, life sciences and space, as stated in the EIC Fund Investment Guidelines (Horizon Europe Compartment).[44]

The role of public funds in unicorn development. The first EIC supported "unicorn" Cellink exemplifies a success story that shows the value of public funds in attracting follow up private and public investment with an organic growth strategy. Reaching a multi-billion dollar valuation only six years after its foundation qualifies it as a start-up unicorn that used its public listing to expand into multiple markets, including the US, and to subsequently grow by acquisitions and forming a group that unites a portfolio of companies that focus on life sciences technology and industrial solutions.

[43] Annex B gives more details of the EIC fund.
[44] https://eic.ec.europa.eu/system/files/2021-05/EIC%20Fund%20Investment%20Guidelines%20-%20Horizon%20Europe.pdf

Figure 22 A story of growth: Cellink



Hence growth remains one of the most important factors when it comes to value a start-up and a venture's growth strategy drives its valuation, whether public or private. In the purely market setting, many investors set present growth rates equal to value and profitability in the future, as returns on investment are being postponed in favour of an aggressive growth strategy. Hence, investors speculate that today's unicorns will turn into highly profitable companies in the future, like Facebook, for example. Such strategies are not only pursued by platform-based business models, but seem to be pursued by many unicorns (Bock & Hackober, 2020).

Including corporate VC in the picture. The pattern emerging about the costs and benefits of unicorns is complex and despite the widespread view that their valuations and private financing is not sustainable in the long-term, the number of unicorns keeps on growing. As the tour de force of unicorns continues in Europe and particularly in the United States, alternative funding models appear, also those mixing private with public funds. Still, independent VCs and corporate VCs (CVCs) play a crucial role in the creation of unicorns, but increasingly public investors design partnership models to co-finance company growth. Corporate VC investors have a positive influence on the likelihood that a venture becomes a unicorn (Bock & Hackober, 2020) and provide guidance, strategic and operational support, production resources, market access, etc. This additional CVC support, which independent VCs are unable to provide, is mostly sector specific. For instance in the biotech sector, CVCs backed ventures are associated with greater publication and patenting output compared to their peers supported by independent VCs (Alvarez-Garrido & Dushnitsky, 2016). As a matter of example, CVC are shown to accelerate the necessary steps for the products to be approved by the US Federal Drug Administration (FDA). Generally speaking, the question arises how to enhance the working relationship in the triangle of public, independent and corporate VCs.

Adequateness of valuations. Apart from the drivers of valuations that define the unicorn status and supportive actions, scepticism is being expressed about the adequateness of valuations of unicorns. To some scholars, unicorn valuations are unreliable as purchases are priced as common stocks whilst investors are in fact acquiring preferred stock with downside economic protection (Bartlett, 2016). Likewise, although there are numerous valuation methodologies available, there are a number of obstacles that obscure the understanding and analysis of the financial structure of unicorns. Equity is not uniform across high growth, high-risk companies and each equity round comes with a variety of different rights and obligations that are written into non-disclosed contracts between investors and the senior management of the company.

Overvaluation. Gornall & Strebulaev (2020) show that certain practices, such as granting investors in later financing rounds special liquidation rights, inflate the actual value of a company. For example, it could be the case that a company experienced a below average performance in a given year prior to an envisaged IPO and therefore changes the pay-out structure for an upcoming financing round so as to attract investors. Such a deal

would lead to an overvaluation of the company. The authors study the overvaluation of a selected sample of US unicorns and have created a detailed database of contracts, or more specifically of certificates of incorporation (COI), that was created with the help of financial legal experts. They show that almost half of the unicorns in their sample are overvalued in terms of true or fair market value.

Potential long-term negative effects. In a purely market setting, the cost for aggressive and inorganic growth strategies for 'add-on' acquisitions are driving the level of valuations. Investors who accept growth rates as a proxy for value favour this strategy. However, these growth strategies come at a cost. Some authors, such as Kenney & Zysman (2019), warn about the dangers interrelated with the immense capital flows reaching scale ups, such as undesirable market distortions. In a 'winner takes all' logic, it is imperative for a start-up to grow as quickly as possible to occupy market space before an incumbent firm can introduce a competitive product. Particularly digital markets follow a 'winner takes all' pattern, famous examples include Google for search engines and advertising or Amazon for e-commerce.

Kenney & Zysman (2019) argue that VC backed loss-making companies can continue to operate and undercut incumbents for far longer than previously – effectively creating disruption without generating profit. Arguably, these firms are destroying economic value. This new dynamic has social consequences, and more concerning, a drive towards disruptions without social benefit.

Hence the question is arising whether large VC firms with deep pockets are hindering entrepreneurship and innovation in a region whilst conglomeration is increasing. However, market observers more favourable towards VC investments point towards the speed at which today's born-global start-ups are growing, about twice as fast as those founded a decade ago, and the need to finance such intense growth cycles so as to remain competitive in key markets. But does rapid growth lead to greater long-term success? According to Goetz (2016), there is no relationship between the amount raised prior to an IPO and growth in market cap afterwards. On the contrary, they find that the age of the company at IPO to be a better indicator: companies that go public between the age of six and 10 years generate 95% of all value created post-IPO (Goetz, 2016).

7 Conclusions

The EU is lagging behind US and China in scale-ups and its unicorn count, although its performance has been impressive in recent years. According to Dealroom's Unicorn Club, the number of unicorns in EU reached 105 in Q2-2021, after being virtually non-existent at the start of previous decade. Since 2018, cumulative numbers of unicorns in EU have roughly tripled, and the aggregate value has increased six fold. This can be attributed to the significant increase in VC capital flowing into each stage of the European VC ecosystem, resulting in the growth of valuations.

Germany, France and Sweden are the main unicorn-producing nations in the EU. However, unicorns are also appearing in other EU member states such as Estonia, Latvia and Lithuania. Berlin, Paris and Stockholm are the most attractive location for EU unicorns. This clearly suggests that unicorns and venture capital are geographically concentrated in certain member states, and within member states in large cities and so are a source of inequality within the EU.

EU unicorns are spread across a broad range of sectors, from e-commerce to energy, and financial technologies. FinTech is the most prominent sector, with thirteen companies operating in this space – few unicorns in hardware and AI. This may reveal a lack of large EU-based VC funds able to make "big ticket" investments and investments in sectors that have large capital needs and have a longer time to exit (e.g. AI, clean tech).

The average age of EU unicorns is 10 years, while the average age of a company at unicorns status is 8 years in the US and 5 years in China. The average age is also significantly lower in China for both private and exited unicorns, implying that unicorns in China are younger than US and EU unicorns. The average amount of venture capital raised by EU unicorns is lower than the average amount of VC raised by US and Chinese's unicorns. In other words, Chinese companies are able to raise large funding rounds which also allow them to reach large valuations sooner and in fewer rounds compared with other counterparts.

This study also discussed the acquisitions of other start-ups by European unicorns. This revels how, rather than diversifying their growth strategies, EU unicorns tend to acquire start-ups operating in the same sector in the attempt of taking further control of their own sector.

Against this backdrop there is now a growing view that the EU should take action to help promising start-ups to achieve their full potential. The need for intervention has been also supported by a group of EU unicorn companies which has recently proposed the Commissioner Gabriel to set up a €100 billion EU sovereign tech fund and a €10 billion EU sovereign green tech fund to address the scale-up gap. The current EU policies are very targeted on innovative start-ups; they are focused on early-stage funding, i.e. innovation/pre-commercial stage and early funding stage. But they will not stimulate start-ups across countries. They are also very fragmented at regional and national levels. In lights of this, governments should play a role in the supply of venture capital, establishing funds to invest in larger deals, and in peripheral regions, that private sector VCs avoid.

Despite recent high numbers of unicorns, the EU lags behind US and China. The economic motivations of such gap can be explained both by "supply-side" factors and "demand-side" factors. While the supply-factors has been widely explored in this report, regarding the demand-side factors, our analysis recognises that simply increasing the supply of finance will not be effective unless there will be also an effort to increase entrepreneurial activity, both technology start-ups and growth businesses. As such, policies need to be engaged with their own entrepreneurial ecosystem, i.e. need to be able to identify and address what resources are missing from their own ecosystems. It is only through an understanding of their ecosystem and success factors that "major" policies related to industrial innovation can be truly relevant to the reality companies live and experience. While this study focuses on unicorns, it very effectively illuminates potential areas for research in a wider context. .

References

Acs, Z.J. & Audretsch, D.B., 1990, *Innovation and Small Firms*, Cambridge, MA: MIT University Press.

Alhusaini, Badryah and Hendricks, Bradley E. and Landsman, Wayne R., Firm Categorization and IPO Price Formation: Evidence From Unicorns (May 1, 2021). Available at SSRN: https://ssrn.com/abstract=3663722 or http://dx.doi.org/10.2139/ssrn.3663722

Alvarez-Garrido, E., & Dushnitsky, G. (2016). Are entrepreneurial venture's innovation rates sensitive to investor complementary assets? Comparing biotech ventures backed by corporate and independent VCs *Strategic Management Journal.* Vol. 37, No. 5, pp. 819-834.

Anderson, S., Chandy, R. and Zia, B. (2018). Pathways to Profits: the impact of Marketing versus Finance Skills on Business Performance. Management Science, Vol. 64, Issue 12. Pp. 5461-5959.

Ashton, K. (2009). That "Internet of Things" thing, RFiD Journal, Vol. 22, Issue 7. Pp. 97-114.

Atomico (2020). The State of European Tech Report 2020. The State of European Tech by Atomico

Baum, J. A. C., and Silverman, B. S. (2004). Picking winners or building them? Alliance, intellectual, and human capital as selection criteria in venture financing and performance of biotechnology startups. *Journal of Business Venturing*, *19* (3), pp. 411–436. https://doi.org/10.1016/S0883-9026(03)00038-7

Baroudy, K., Handel, P., Hürxkens, A., Marsman, B., Strålin, T. & Vriesendorp, J. (2021). Winning formula: How Europe' s top tech start-ups get it right. Technology, Media & Telecommunications Practice, McKinsey & Company.

Bartlett, R. P. (2016). A founders' guide to unicorn creation: how liquidation preferences in M&A transactions affect start-up valuation. Chapter 6 in Research Handbook on Mergers and Acquisitions Edited by Hill, C. A. & Solomon, S. D. pp. 123-153.E

Birch, David G.W., Job Creation in America (1987), How Our Smallest Companies Put the Most People to Work University of Illinois at Urbana-Champaign's Academy for Entrepreneurial Leadership Historical Research Reference in Entrepreneurship, Available at SSRN: https://ssrn.com/abstract=1496185

Bengtsson, O., & Hsu, D. H. (2015). Ethnic matching in the U.S. venture capital market. *Journal of Business Venturing*, *30*(2), 338–354. https://doi.org/10.1016/j.jbusvent.2014.09.001

Bottazzi, G., Secchi, A., & Tamagni, F., 2014. Financial constraints and firm dynamics. Small Business Economics, 42, 99–116

Bock, C. & Hackober, C. (2020). Unicorns—what drives multibillion-dollar valuations? Business Research. Vol 13, No.3, pp. 949-984

Brown, J. R., Martinsson, G., Petersen, B. C. (2017). "Stock markets, credit markets, and technology-led growth". *Journal of Financial Intermediation*. Vol. 32 (2017) Pages 45-59, ISSN 1042-9573, https://doi.org/10.1016/j.jfi.2016.07.002.

Brush, C. G., Greene, P., Balachandra, L., & Davis, A. (2018). The gender gap in venture capital- progress, problems, and perspectives. *Venture Capital*, *20*(2), 115–136.

Butters, J. & Lintner, J., 1945, Effect of federal taxes on growing enterprises. Boston, Harvard University.

Carpenter, R. E., & Petersen, B. C. (2002). Capital Market Imperfections, High-Tech Investment, and New Equity Financing. *Economic Journal*, *112*(477), F54–F72. https://doi.org/10.1111/1468-0297.00683

Catalini, C., Guzman, J, Stern S. (2019). Hidden in plain sight: venture growth with or without venture capital. NBER Working Paper No. 26521, https://www.nber.org/papers/w26521

Colombo, M. G., D'Adda, D., & Quas, A. (2019). The geography of venture capital and entrepreneurial ventures' demand for external equity. *Research Policy*, *48*(5), 1150–1170.

Chemmanur, T. J. and Loutskina, E. (2006). The Role of Venture Capital Backing in Initial Public Offerings: Certification, Screening, or Market Power? EFA 2005 Moscow Meetings Paper, http://dx.doi.org/10.2139/ssrn.604882

Chemmanur, T. J., Krishnan, K., & Nandy, D. K. (2011). How does Venture Capital Financing Improve Efficiency in Private Firms? A Look Beneath the Surface. *Review of Financial Studies*, *24*(12), 4037–4090. https://doi.org/10.2139/ssrn.1025322

Durufle, G., Hellmann, T. & Wilson, K. (2017). From Start-up to scale-up: examining public policies for the financing of high-growth ventures. Bruegel Working Paper Issue 04.

Dushnitsky, G. and Lenox, M. J. (2005). When do firms undertake R&D by investing in new ventures? Strategic Management Journal, Vol. 26, pp. 947-965

European Commission (2020), Science, Research and Innovation Performance of the EU 2020, https://op.europa.eu/en/publication-detail/-/publication/07a0d2b8-8ac6-11eb-b85c-01aa75ed71a1/language-en

European Commission (2017), Study on Transatlantic Dynamics of New High Growth Innovative Firms.

European Commission (2013), https://ec.europa.eu/docsroom/documents/13413/attachments/2/translations/en/renditions/native

Fadic, M. & Dechezlepretre, A. (2021). Can government venture capital help bring research to the market. OECD Working Paper Series DSTI/CIIE (2021)12.

Flachenecker, F., Gavigan, J., Goenaga Beldarrain, X., Pasi, G., Preziosi, N., Stamenov, B., & Testa, G. (2020). *High Growth Enterprises: demographics, finance and policy measures. European Commission*. https://doi.org/10.2760/34219

Gigler, S. (2018). Financing the Deep Tech Revolution: How investors assess risks in Key Enabling Technologies (KETs) InnovFin Advisory EIB / European Commission

Goetz, J. (2016). How unicorns grow. Harvard Business Review. Available at. How Unicorns Grow (hbr.org)

Gompers, P A. (1995). Optimal Investment, Monitoring and the Staging of Venture Capital. The Journal of Finance. Vol. 50, No. 5, pp.1461-1489.

Gompers, P., Lerner, J. (2001). The Venture Capital Revolution. Journal of Economic Perspectives. Vol. 15 (2), pp. 145-168.

Gompers, P., Kovner, A., Lerner, J., &Scharfstein, D. S. (2006). Skill vs. luck in entrepreneurship and venture capital: evidence from serial entrepreneurs.

Gompers, P. A., Gornall, W., Kaplan, S. N., & Strebulaev, I. (2016). *How Do Venture Capitalists Make Decisions?* Cambridge, MA. https://doi.org/10.3386/w22587.

Gompers, P. A., Mukharlvamov, V., Yuhai, X. (2016). The cost of friendship. Journal of Financial Economics, Vol. 119, Issue 3, March 2016, p. 626-644.

Gornall, W. & Strebulaev, Ilya A. (2019). Squaring venture capital valuations with reality. *Journal of Financial Economics*

Greene, P. G., Hart, M., Gatewood, E., Brush, C., Carter, N. (2004). Women entrepreneurs: moving front and center: an overview of research and theory. USASBE White paper.

Griffin, E., & Primack, D. (2015). The age of unicorns. Fortune. Available at: https://fortune.com/2015/01/22/the-age-of-unicorns/

Guzman, J., Kacperczyk, A. (2019). Gender gap in entrepreneurship, Research Policy, Volume 48, Issue 7, 2019, pp. 1666-1680, ISSN 0048-7333, https://doi.org/10.1016/j.respol.2019

Hellman, T & Puri, M. (2000). The interaction between product market and financing strategy: The role of venture capital. The Review of Financial Studies, Vol. 13, No. 4, pp. 959-984.

Homburg. C., Vollmayr, J. and Hahn, A. (2014). Firm Value Creation through Major Channel Expansions: Evidence from an Event Study in the United States, Germany, and China. Journal of Marketing, Vol. 78, No. 3, pp.38-61.

Hoenig, D., & Henkel, J. (2015). Quality signals? the role of patents, alliances, and team experience in venture capital financing. *Research Policy*, *44*(5), 1049–1064.

Kaplan, S. N., & Strömberg, P. (2001). Venture Capitalists As Principals: Contracting, Screening, and Monitoring. *American Economic Review*, *91*(2), 426–430. https://doi.org/10.3386/w8202.

Kenney, M. & Zysman, J. (2019) Unicorns, Cheshire cats, and the new dilemmas of entrepreneurial finance, *Venture Capital*, 21:1, 35-50, DOI: 10.1080/13691066.2018.1517430.

Kennedy, M. T., Lo, J. Y. and Lounsbury, M. (2010). 'Category currency: the changing value of conformity as a function of ongoing meaning construction'. In Hsu, G., Negro, G. and Koçak, Ö. (Eds), Categories in Markets: Origins and Evolution (Research in the Sociology of Organizations, Volume 31). Bingley: Emerald Group Publishing, 369–97.

Kortum, S. & Lerner, J. (2000). Assessing the Contribution of Venture Capital to Innovation. *Le*, Vol. 31, No. 4, pp. 674-692.

Knight, R. M. & Gilbertson, D. W. (1994). Criteria used by venture capitalists: a cross-country analysis. Victoria University of Wellington, Working Paper Series 8/93.

Lassébie, J., Sakha, S., Kozluk, T., Menon, C., Breschi, S. and Johnstone, N. (2019), Levelling the playing field: Dissecting the gender gap in the funding of startups, OECD Science, Technology and Industry Policy Papers, No. 73, OECD Publishing, Paris: https://doi. org/10.1787/7ddddd07-en

Lee, So-E., Mideum, C. and Seongchecol, K. (2017). How and what to study about IoT: Research trends and future directions from the perspective of social science. Telecommunication Policy. Vol. 41, Issue 10, pp. 1056-1067.

Lerner, J. (2002). When Bureaucrats Meet Entrepreneurs: The Design of Effective "Public Venture Capital" Programmes. *Economic Journal*, *112*(477), F73–F84. https://doi.org/10.1111/1468-0297.00684

Lerner, J. & Nanda, R. (2020). Venture Capital's Role in Financing Innovation: What We Know and How Much We Still Need to Learn. Harvard Business School Entrepreneurial Management. Working Paper No. 20-131, Harvard Business School Finance Working Paper No. 20-131, Available at SSRN: https://ssrn.com/abstract=3633054 or http://dx.doi.org/10.2139/ssrn.3633054

Næss-Schmidt, S., Bjarke J. J., Skovgaard Kjærulff, C., Nielsen, A. (2021). 'Study on equity investments in Europe: Mind the gap', Publications Office of the European Union, 2021, ISBN 978-92-76-28648-6, doi: 10.2777/001375

Onetti A. and Pisoni, A. (2016), Dual companies: is internationalization funding driven?, Conference Proceedings of the Annual R&D Management Conference - 2016 From Science to Society: Innovation and Value Creation, Cambridge, 3-6 July 2016.

Quas, A., Mason, C., Compañó, R., Gavigan, J., Testa, G. (forthcoming). Tackling the Scale-up gap. JRC Science for Policy Report.

Ratzinger, D., Amess, K., Greenman, A. et al. The impact of digital start-up founders' higher education on reaching equity investment milestones. J TechnolTransf 43, 760–778 (2018).

Retterath, A. & Braun, R. (2020). Benchmarking Venture Capital Databases. SSRN Electronic Journal

Rossetti, F., Nepelski, D. and Cardona, M, The Startup Europe Ecosystem (2018). Analysis of the Startup Europe projects and of their beneficiaries, EUR 29134 EN, Publications Office of the European Union, Luxembourg, ISBN 978-92-79-80358-1, doi:10.2760/78946, JRC110945

Saxenian, A. & Sabel, C. (2008). Roepke lecture in economic geography venture capital in the "periphery": The new argonauts, global search, and local institution building. Economic Geography. Vol. 84, No. 4, pp. 379-394

Storey, D. J. and Greene, F. (2010) Small Business and Entrepreneurship, Harlow, Prentice Hall.

Sundararajan, Arun (2016). 'The Sharing Economy: The End of Employment and the Rise of Crowd-Based Capitalism'. The MIT Press. JSTOR, www.jstor.org/stable/j.ctt1c2cqh3. Accessed 28 July 2021.

Simon, J. P. (2016). 'How to catch a unicorn. An exploration of the universe of tech companies with high market capitalisation'. Institute for Prospective Technological Studies. JRC Technical Report. EUR 27822 EN. doi:10.2791/893975

Tamaseb, Ali (2021), Super Founders: What Data Reveals About Billion-Dollar Startups

The Ewing Marion Kauffman Foundation (2008), Educationand Tech Entrepreneurship, https://www.kauffman.org/wp-content/uploads/2009/04/education_tech_ent_061108.pdf

Verheul, A.V., Stel, R. and Thurik, R. (2006), Explaining female and male entrepreneurship at the country level, Entrepreneurship & Regional Development, 18 (2) (2006), pp. 151- 183.

Venckutė, M., Berg Mulvik, I. and Lucas, B. (2020). Creativity – a transversal skill for lifelong learning. An overview of existing concepts and practices., Bacigalupo, M., Cachia, R. and Kampylis, P. editor(s), EUR 30479 EN, Publications Office of the European Union, Luxembourg, 2020, ISBN 978-92-76-26938-0, doi:10.2760/493073, JRC122016.

List of figures

List of tables

Annex A: Literature review of related studies

Very few companies with high growth potential become unicorns, since they provide mainly specialized 'niche' products with no obvious or spectacular synergies with other markets. There is limited literature on how the majority of these companies grow and their longer term survival. In this section we first look at the main firm characteristics associated with high growth and then, for the purpose of this paper, review selected studies to highlight the role of venture capitalists (VCs) in financing of companies with high growth potential. Moreover, we also discuss some of the potential reasons behind the rise of unicorn companies in the aftermath of the global financial crisis.

A1. Firm growth

A large number of studies have sought to identify the factors related to high growth. In the first place, High-Growth Firm literature tends to refer to the distinctive characteristics of the founder(s). Indeed, most studies have focused on motivation, gender, education, sector experience, prior management experience, prior start-up experience, unemployment and team- versus solo-starts. However, according to Storey and Greene (2010) "perhaps with the exception of education, age, gender and employment status of the founder, the link between pre-start-up factors and new/small business performance is difficult to identify. Furthermore, these four factors provide only a modest insight into the performance of the new/small business." Story and Greene (2010) summarise the evidence on the role of the factors, as listed in Table A1.

Table A1. Factors related to firm growth

	Positive impact	Negative impact	Unclear impact
Pre-start-up factors	Prime age	Unemployment	Team entrepreneurship
	Higher education		Prior management experience
	Males		Prior sectoral experience
	Personality (indirect effects)		In business before
At start-up factors	Limited company		Family
	Location		Initial size
			Sector
			Formal business plan
Post-start-up factors			Entrepreneurial skills
			Strategy
			External environment
			Equity financing
			Innovation

Source: Storey and Greene (2010)

A2. Equity/Venture Capital financing and Firm growth

While there is an extensive body of literature discussing firm growth and its determinants, there is relatively little research that examines the growth of companies with the potential to become large very quickly. The lack of a theoretical background is astonishing as understanding how start-ups grow, especially new technology-based firms, is a key factor for investors. In most industries, promising start-ups are a small fraction of the start-up population that, when properly funded, account for a surprisingly large fraction of innovation, and employment (Acs and Audreutsch, 1990; Flachenecker et al., 2020). Research suggests that many small innovative companies, even those with promising growth opportunities, find it extremely difficult to raise capital from investors and that they have to finance their growth mostly through retained earnings, thus limiting the speed of growth (Butters and Lintner, 1945; Carpenter and Petesen, 2002). By the same token, Bottazzi et al. (2014) find that financial constraints, proxied by credit ratings, prevent young high potential firms from seizing attractive growth opportunities and affects negatively the growth prospects of already slow-growing firms, especially if they are old.

Professional equity providers such as Venture Capitalists (VCs) have the ability to support start-ups to overcome their resource constraints (Gompers 1995; Kaplan and Stromberg 2001). VCs identify and select those start-ups in view of their potential for success. In addition to financial support, they can offer additional services, such as providing management expertise, access to networks (e.g., Baum et al., 2000), advice in internal

processes, e.g. in human resources, and legal issues (e.g., Dushnitsky and Lenox, 2005), or marketing (e.g., Anderson et al., 2018; Homburg et al., 2014). Indeed, some studies suggest that companies backed by private VCs typically outperform their peers because private VCs are able to provide promising start-ups with financial resources and non-financial services (Baum & Silverman, 2004; among others).

Unfortunately, VCs invest only in a handful of rigorously selected promising start-ups, often in narrow industries (Lerner, 2002) and geographical areas (Colombo et al, 2019) and within selective professional and educational networks (Gompers et al, 2016). According to Lerner (2002), most VCs invest in high-tech companies evaluating their intellectual property, the skills of the management team, and size of the potential market. This is also confirmed by Hoening & Henkel (2015) who find that patent applications, affiliation with prominent organizations and the characteristics of their managerial team positively affect a start-up's ability to attract venture capital financing.

Based on a survey of VCs in North America, Europe and Asia, Knight and Gilbertson (1994) find that VCs in the US place a greater emphasis on a high financial return and liquidity, rather than on the existence of a prototype or proven market acceptance compared to their counterparts in Europe or Asia. By contrast, the European and Asian VCs consider a "high-technology" venture as having a negative influence on funding. Colombo et al. (2019), among others, discuss how the geography of venture capital and the location of entrepreneurial ventures affects the ability of firms to seek external equity finance. Using a sample of 533 European high-tech companies, they find that such companies are more likely to seek external equity finance when the local availability of VC is high. Thus, the likelihood of accessing external equity finance decreases with distance and vanishes when national borders are crossed. Other studies indicate that VC investors tend to allocate resources on the base of a 'homophily principle'[45] (Brush et al., 2018), which sometimes can result in bias against categories such as female and ethnic entrepreneurs (Bengtsson & Hsu, 2015). Gompers et al (2016), for example, find that VCs who share the same ethnic, educational, or career background are more likely to syndicate with each other. For example, getting a degree from the same university increases the likelihood of two VCs working together by 33%.

The relationship between venture capital and firm growth is further examined by Gompers and Lerner (2001) whose evidence suggests that VCs help entrepreneurial firms to invest more than they would otherwise, to grow quicker, and sustain performance in the long term, even after going public. Chemmanur and Loutskina (2005) find that VCs attract a more and higher quality market participants such as underwriters, institutional investors, and analysts to an IPO, thus obtaining a higher valuation for the IPOs of firms backed by them. They also find that venture capitalists are able to either select better quality firms to back (screening), or help create such higher quality firms by adding value to them (monitoring) in the pre-IPO stage.

Catalini et al. (2019) find a positive relationship between the likelihood of receiving venture capital and a firm's characteristics such as being registered as a corporation, being incorporated in the US state of Delaware, having a short name, or having filed patents. Kortum and Lerner (2000) confirm previous findings, showing that venture-backed firms are responsible for a disproportionate number of patents and new technologies. Hellmann and Puri (2000) find that venture-backed companies bring more radical innovations to market faster than lower-growth firms that rely on other types of finance. Other studies such as Chemmanur, Krishnan and Nandy (2009) show that VC-backed firms in the US have higher levels of productivity compared to non VC-backed firms..

A3. How unicorns first came into being

But how did unicorn companies first come into being? Several enabling conditions may explain the rise of unicorn companies in the aftermath of the 2008 Great Recession. Below we discuss only three potential factors.

First, the **evolution of the Internet and rapid user base growth**. The introduction and establishment of the Internet and its supporting infrastructure up until the early 2000s were followed by a new wave that created applications, programs and services on the Internet[46]. In addition, the appearance of the iPhone in 2007 and the release of the Android operating system in 2008 meant the global expansion of personal devices and apps. As a result, disruptive IT-centred companies emerged in the market to explore the opportunities of the mobile internet wave, relying on increased connectivity and higher-speed networks, strong network effects and demand-side economies of scale and scope (Simon, 2016). Very young at the time, companies such as Facebook, Airbnb and Uber became the 'face' of this new era and quickly reached high valuations and the

[45] Homophily describes the tendency of individuals to associate and bond with similar others. Homophily is observed in a vast array of network studies and comprise different type of categories including age, gender, class, and organizational role.

[46] https://www.wsj.com/articles/the-next-wave-in-the-internets-evolution-1459811618

famous unicorn status. Facebook made use of the powerful network effects of the digital age to become the leading social media network worldwide, while Airbnb and Uber focused on creating digital marketplaces connecting communities (owners and renters, and passengers and drivers, respectively) and reducing transaction costs. They also became iconic examples of the rise of the "Sharing Economy", a term that gained traction following the 2008 global financial crisis, reflecting the decline in consumer trust in the corporate world (European Commission, 2013) and the need for new business models for sharing and collaboration[47]. However, the sectors where unicorns operate are no longer restricted to online marketplaces, social media or e-commerce. In fact, now one in five unicorns are FinTechs, followed by ecommerce, (digital) health, cybersecurity and artificial intelligence. [48]

This mirrors the fact that we are currently in the wave of the so-called 'Internet-of-things' (IoT), a term first used by entrepreneur Kevin Ashton (Ashton, 2009; Lee et al., 2017), one of the founders of the Auto-ID Center at MIT, to refer to "*connecting any device (so long as it has an on/off switch) to the Internet and to other connected devices"*[49] and generating data. This results from the convergence of technologies such as sensors, computing, real-time analytics and artificial intelligence, just to name a few. It has opened new doors for consumer and industrial applications. Romanian unicorn UiPath is an example of a well-known company operating in this new space that uses Robotic Process Automation (RPA) to help manage these new IoT capabilities.

Second, **the greater availability of venture capital**. According to Dealroom[50], global venture capital investments have reached an all-time high in 2021 following a similar net money flow to other alternative investment vehicles, propelled by historically low interest rates. Lerner and Nanda (2020) report as well that since 2010 both the amount of capital deployed worldwide by venture capital investors and the number of start-ups receiving funding have increased tremendously. Accordingly, **new configurations of financial intermediaries** have been created at the early stage namely accelerators, crowdfunding, and "super angel" investors. In addition, the authors argue that mutual funds, hedge funds, corporations, and sovereign wealth funds have channelled large amounts of capital into more mature, but still private, venture capital-backed firms. As mentioned above, the evolution of the Internet was a driving force for new business opportunities in the software and consumer services sector. Hence venture capitalists were also attracted by this trend as in principle it would be more likely that they would receive the return on their investment faster when compared to sectors with long R&D cycles such as biopharmaceutical or health start-ups. On top of that, software & services were experiencing spectacular user base growth rates due to strong network effects enabled by the internet and the mobile internet wave, offering a high scalability potential.

Third, **stock market fuelling optimism around tech**. Since the aftermath of the Great Recession, the NASDAQ composite Stock Market Index[51], mostly composed of tech companies, has been on the rise (Figure 2). As stock prices factor in expectations (opposed to pure performance), this upward trend signalled the market interest in the tech sector. Interestingly, the Great Lockdown does not seem to have impacted this trend: on the contrary, 24 new unicorns have emerged just in 2021, 50% more relative to 2019 (16 new unicorns).

[47]See for example https://www.weforum.org/agenda/2019/01/does-the-sharing-economy-truly-know-how-to-share/
[48] CBinsights "State of Venture Report" Q2/2021, https://www.cbinsights.com/research/report/venture-trends-q2-2021/
[49] https://www.ibm.com/blogs/internet-of-things/what-is-the-iot/
[50] https://dealroom.co/blog/global-venture-capital-is-crushing-records-in-h1-2021
[51]Nasdaq has typically a high concentration of companies in the technology sector, including many young and fast-growing companies.

Figure A1 NASDAQ Composite Stock Market Index, 45 year Historical Chart

Source: Adapted by the authors from https://www.macrotrends.net/1320/nasdaq-historical-chart
Note: NASDAQ Composite stock market index since 1971. Historical data is inflation-adjusted using the headline Consumer Price Index (CPI) and each data point represents the month-end closing value. The current price of the NASDAQ Composite Index is as of 28 June 2021. Global recessions are identified also based on World Bank (2020). "Great Lockdown" name attribution to the pandemic-related economic crisis comes from IMF (2020)52.

[52] https://www.imf.org/en/Publications/WEO/Issues/2020/04/14/weo-april-2020

Annex B: The European Innovation Council Fund

B1. European Innovation Council (EIC): betting on game-changing start-ups!

The EIC moved from being a pilot to a fully-fledged EIC in April 2021. The EIC is the only European one-stop shop for breakthrough, deep-tech and market-creating innovators who want to scale their business. This unique opportunity includes targeted funding from idea to investment and has the following main strands with a total budget of over €10 b:

- Pathfinder – for advanced research on emerging technologies
- Transition from lab to commercial setting
- Accelerator & EIC Fund to scale up innovations by start-ups/SMEs
- Business Acceleration Services (coaches, corporates, investors, etc.)

The EIC Accelerator manages equity investments in start-ups and SMEs that have the potential to grow and to scale-up to become **unicorns made in Europe**. The investment strategy of the fund is to provide patient capital in the form of equity and quasi-equity at early stage from EUR 0.5 to 15 million. The **EIC Fund is a dedicated venture capital fund** that is owned by the European Commission, hence the Commission acts as a public VC, that bridges equity funding gaps at early stage (seed, first rounds) and crowds in other investors, providing investment opportunities for VCs and other funds. The Commission targets minority ownerships stakes (from 10 to 25%) and investments have a long average perspective typically ranging from 7 to 10 years with a maximum of 15 years.

The Commission reserves itself the right to hold a blocking minority in case of strategic interest for the EU. Furthermore, the Commission may reserve follow-on capital to invest in subsequent series.

Initiated in June 2020, the EIC Fund is already processing a high volume of investments and is currently building a portfolio of 159 early-stage deep-tech companies worth EUR 680 million with an average investment of EUR 4.3 million.

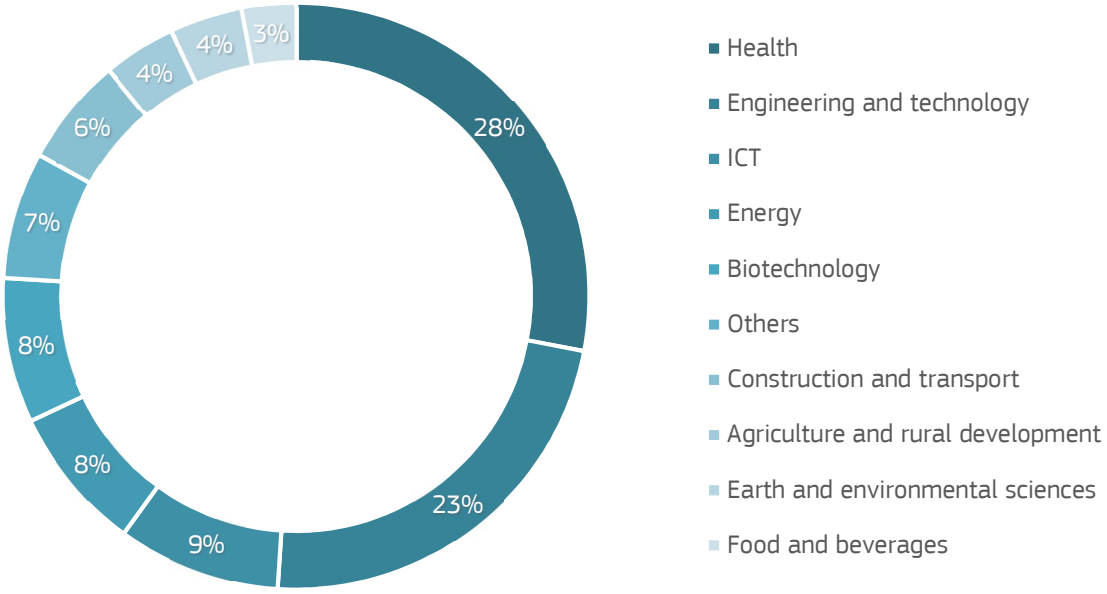


Figure B1. Sectoral distribution of EIC Fund portfolio

Source: EIC Fund

The Fund has a focus on investing in the health sector (28%) and in engineering and technology (23%). Other compartments include ICT (9%), Energy (8%) and Biotechnology (8%).

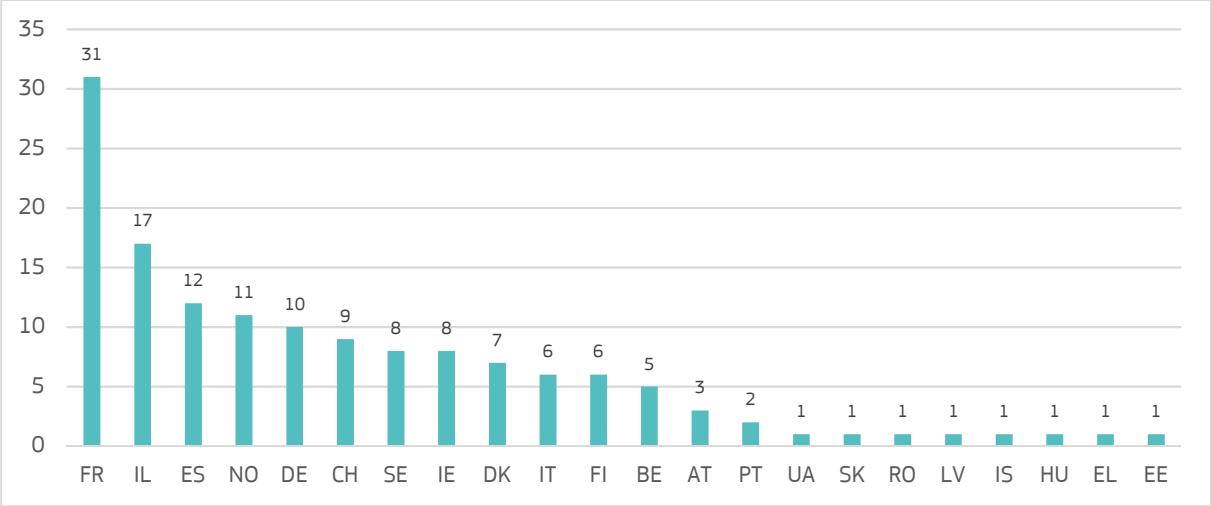


Figure B2. Country distribution of EIC Fund portfolio

Source: EIC Fund

Currently, the country with the most EIC Fund backed companies is France with 31 investment deals. Israel and Spain hold 17 and 16 companies that receive blended finance, respectively.

Apart from finance, the EIC is committed to build ecosystems and communities that are arguably as important as capital to foster the emergence of European unicorns. This challenge goes beyond simply replicating the success of Silicon Valley or Kendall Square, but to build a unique European innovation ecosystem that crowds in other investors such as VCs, corporates and leading researcher as well as other institutional partners of the European ecosystem around Horizon Europe (EIT, ERC, etc.).

B2. The EIC Centaurs and unicorns

The EIC vision of bringing together the main innovation actors to create a European innovation one-stop shop is attracting attention in the start-up community. This is reflected in the high number of start-ups that apply for EIC funding and support services. In 2020 almost 14000 start-ups applied and since the inception of the EIC Fund, about 700 start-ups from all over Europe applied for blended finance, fulling the demand for European level equity to fund early stage innovative ventures.

Apart from going through numerous funding rounds, the EIC centaurs also received public grants at an early stage of development. To date and according to data collected by Dealroom,[53] the EIC supported over 91 "centaurs", i.e. EIC companies with a valuation of over EUR 100 million and two unicorns[54], namely Cellink and Bioarctic, both originating from Sweden, where the former relocated to the US.

[53] Due to the non-representativeness and reports in the news, the results are likely to be an underrepresentation of the value of EIC companies.

[54] In the version used for the descriptive analysis, downloaded in June 2021, the database does not contain information on Cellink and Bioartic as they reached the unicorn status in July 2021.

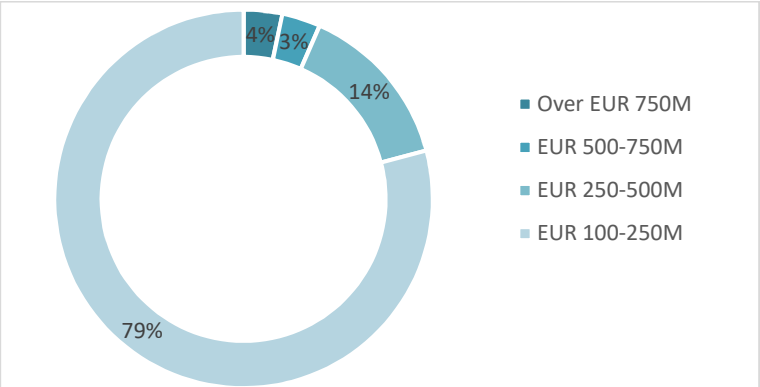


Figure B3. EIC Centaurs valuations
Source: Dealroom data

When looking at the valuation of EIC centaurs, it becomes apparent that nearly 80% of those for which data on current valuation is available are valued between EUR 100-250 million and hence still have a long way to go before reaching unicorn status. A further 14% are valued between EUR 100-250 million and the remaining top 6 centaurs have a valuation over EUR 500 million – of which 3 have a valuation over EUR 750 million . The below table shows the two unicorn companies and the top EIC centaurs in terms of valuation.

Table B1. Top 10 EIC supported companies

Company	Valuation (€m)	HQ	CITY	Industry/technology
Cellink	2700 - 2700 €m	United States	Boston	Health/biotech
Bioarctic	1326 - 1326 €m	Sweden	Stockholm	Health/ biotech
Verbit.ai	909 - 909 €m	United States	New York	AI
Hailo	909 - 909 €m	Israel	Tel-Aviv	Semiconductors
Azelio	781 - 781 €m	Sweden	Gothenburg	Energy
Arcam	636 - 636 €m	Sweden	Gothenburg	Health/semiconductors
Innovafeed	560 - 840 €m	France	Paris	Food
Bonesupport	517 - 517 €m	Sweden	Lund	Health/Medtech
Sword Health	455 - 455 €m	United States	New York	Health
Relex Solutions	409 - 409 €m	Finland	Helsingfors	Enterprise software/ Logistics

Source: Dealroom data

These success stories of EIC unicorns and the centaurs and their journey dates back some years before the official launch of the fully-fledged EIC. Business support activities back in 2014 were adapted together with the transformation of existing instruments designed to support European SMEs to pave the way for future EIC beneficiaries. These early unicorns and centaurs mostly received European grants and were themselves able to attract follow-up investment, including equity, that led to growth and scaling up. It does not come as a big surprise that the two first EIC unicorns come from Sweden, a country well known for its thriving innovation ecosystem. Sweden has already produced numerous famous unicorns and has embraced private equity and (public) VC as part of its innovation strategy. Whereas Bioarctic cannot be described as start-up or young company, i.e. with less than 6 years of age from birth or foundation, Cellink falls into this category. The companies were founded in 2003 and 2016 respectively.

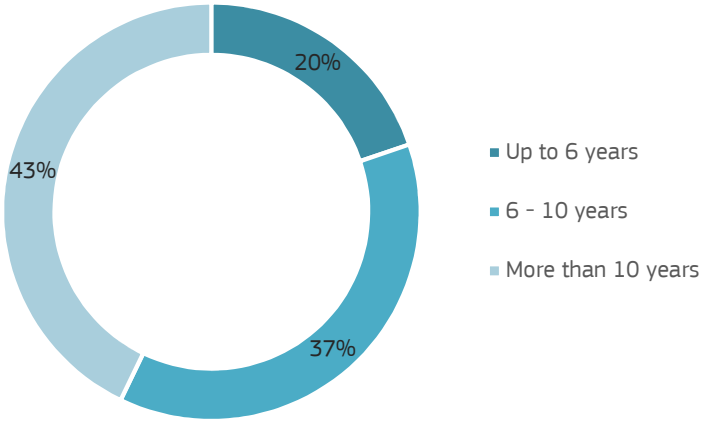


Figure B4. EIC Centaurs age

Source: Dealroom data

About 20% of the EIC centaurs are start-ups and 37% are already more mature. The remaining 43% centaurs are established companies with more than 10 years of business experience.

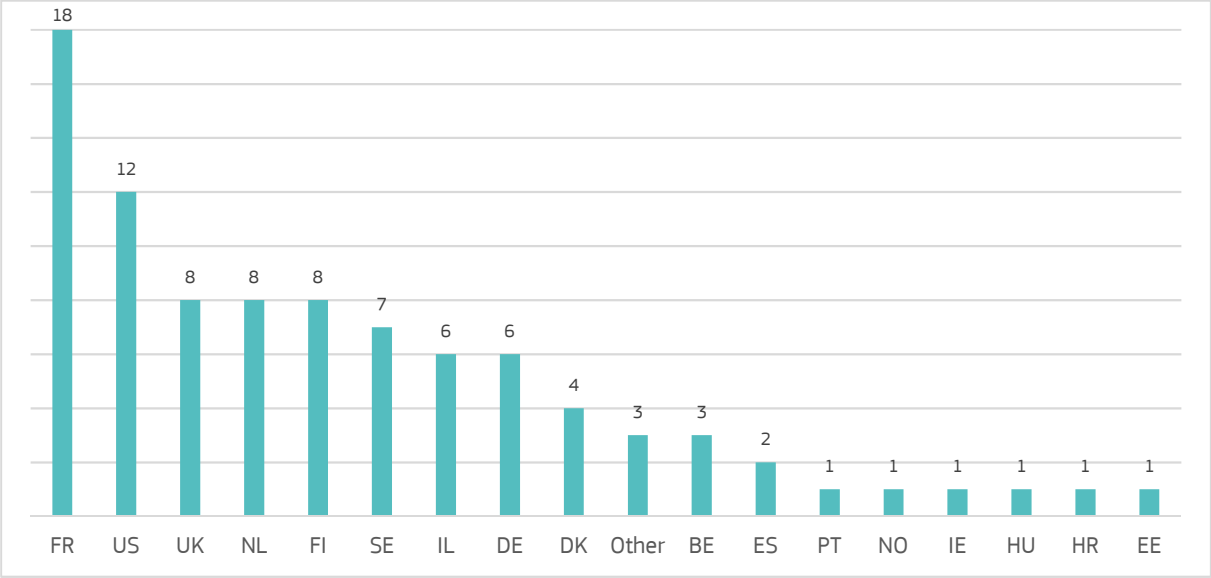


Figure B5. Country distribution of EIC centaurs

Source: Dealroom data

Apart from Sweden and the usual suspects for equity investment, i.e. the US and the UK, France stands out as the new kid on the block. With 18 EIC centaurs, mostly established and scaled in Paris, France has given rise to some of the most promising companies in Europe

Annex C: The full list of EU unicorns

These fast-growing companies, all headquartered in the EU and worth over a billion dollars, male up the EU's current unicorn club.

Company Name	Year Founded	Year of $1b Valuation	Sector	Head Office Location	Status
Ablynx	2001	2018	health	Gent	Exited
About You	2014	2018	fashion	Hamburg	Active
Acerta Pharma	2011	2016	health	Oss	Exited
Adjust	2012	2019	marketing	Berlin	Exited
Adyen	2006	2013	fintech	Amsterdam	Exited
Alan	2016	2019	fintech	Paris	Active
Allegro	1999	2008	Other	Poznan	Exited
Allfunds	2000	2017	fintech	Alcobendas	Exited
ARGEN-X	2008	2018	health	Gent	Exited
Ascendis Pharma	2006	2019	health	Hellerup	Exited
ATAI Life Sciences AG	2018	2021	health	Munich	Active
AUTO1 Group	2012	2017	transportation	Berlin	Exited
AVG	1991	2012	security	Prague	Exited
Back Market	2014	2021	home living	Paris	Active
Bambora	2015	2017	fintech	Stockholm	Exited
Believe Digital	2005	2021	music	Paris	Exited
BioNTech	2008	2019	health	Mainz	Exited
BitFury Group	2011	2018	semiconductors	Amsterdam	Active
Bitpanda	2014	2021	fintech	Vienna	Active
BlaBlaCar	2006	2015	travel & transportation	Paris	Active
Bolt	2013	2018	food & transportation	Tallinn	Active
Boozt	2006	2020	fashion	Malmö	Exited
BrowserStack	2011	2021	telecom	Dublin	Active
bunq	2012	2021	fintech	Amsterdam	Active
bwin	2011	2011	gaming	Wien	Exited
Cabify	2011	2018	transportation	Madrid	Active
Camurus	1991	2020	health	Skåne län	Exited
CD Projekt Red	2002	2016	gaming	Warsaw	Exited
Cellectis	1999	2020	health	Paris	Exited
Celonis	2011	2018	enterprise software	Munich	Active
Check24	1999	2018	Other	Munich	Active
CityDeal	2009	2010	marketing & enterprise software	Berlin	Exited
Collibra	2008	2019	enterprise software	Brussel	Active

CRITEO	2005	2013	marketing	Paris	Exited
Crucell	1993	2009	health	Leiden	Exited
CTS EVENTIM	1999	2018	Other	Bremen	Exited
CureVac	2000	2015	health	Tübingen	Exited
Deezer	2006	2018	music	Paris	Active
Delivery Hero	2011	2015	food	Berlin	Exited
Deposit Solutions	2011	2019	fintech	Hamburg	Active
Doc Generici	1996	2019	health	Milan	Exited
Doctolib	2013	2019	health	Paris	Active
eDreams ODIGEO	2000	2014	travel	Barcelona	Exited
eFront	1999	2019	fintech	Paris	Exited
Epidemic Sound	2009	2021	music	Stockholm	Active
Evolution Gaming	2006	2018	gaming	Riga	Exited
Exclusive Group	2003	2018	security	Paris	Active
Fastned	2012	2021	energy & transportation	Amsterdam	Exited
Fenergo	2009	2021	fintech	Dublin	Exited
Flaschenpost	2016	2020	food	Münster	Exited
FlixBus	2011	2019	travel & transportation	Munich	Active
Flow Traders	2004	2015	fintech	Amsterdam	Exited
Forto	2016	2021	transportation	Berlin	Active
Ganymed Pharmaceuticals	2001	2016	health	Mainz	Exited
Genmab	1999	2018	health	Copenhagen	Exited
GetYourGuide	2009	2019	travel	Berlin	Active
Global Fashion Group	2011	2015	fashion	Sennengerbierg	Exited
Glovo	2015	2019	food & transportation	Barcelona	Active
Gorillas	2020	2021	food	Berlin	Active
GoStudent	2016	2021	education	Wien	Active
HelloFresh	2011	2015	food	Berlin	Exited
Hexagon AB	1992	2010	semiconductors	Stockholm	Exited
HMD Global	2016	2020	telecom	Espoo	Active
HomeToGo	2014	2018	travel	Berlin	Exited
Hybris	1997	2013	enterprise software	Munich	Exited
IAD France	2008	2021	real estate	Lieusaint	Exited
Idealista	2000	2020	real estate	Madrid	Exited
Interxion	1998	2018	hosting	Hoofddorp	Exited
ION Group	1998	2019	fintech	Dublin	Active
Itiviti	2016	2021	fintech	Stockholm	Exited
Ivalua	2000	2019	enterprise software	Massy	Active
IZettle	2010	2018	fintech	Stockholm	Exited

JetBrains	2000	2020	enterprise software	Prague	Active
Just Eat Takeaway	2000	2016	food	Amsterdam	Exited
Katapult AB	2012	2020	fintech	Stockholm	Exited
Klarna	2005	2013	fintech	Stockholm	Active
Kry	2014	2020	health	Stockholm	Active
Ledger	2014	2021	fintech	Paris	Active
Lilium	2015	2020	transportation	Weßling	Active
Mambu	2011	2021	fintech	Berlin	Active
Meero	2016	2019	media	Paris	Active
MessageBird	2011	2020	telecom	Amsterdam	Active
Mirakl	2011	2020	marketing	Paris	Active
Mithra Pharmaceuticals	1999	2019	health	Liège	Exited
Mojang Studios	2010	2014	gaming	Stockholm	Exited
Mollie	2004	2020	fintech	Amsterdam	Active
MutuiOnline Group	1999	2019	fintech	Milan	Exited
Mytheresa	2006	2021	fashion	Aschheim	Exited
N26 Group	2013	2018	fintech	Berlin	Active
Neoen	2008	2018	energy	Paris	Exited
NetEnt (Net Entertainment)	1996	2017	gaming	Stockholm	Exited
Northvolt	2016	2019	energy	Stockholm	Active
NuCom Group	2017	2018	Other	Munich	Active
Oatly	1990	2020	food	Malmö	Active
OCSiAl Group	2009	2019	energy	Leudelange	Active
Omio	2012	2018	travel	Berlin	Active
Oncopeptides	2000	2020	health	Stockholm	Exited
Outfit7	2009	2017	gaming	Limassol	Exited
OVHcloud	1999	2016	telecom & hosting	Roubaix	Active
Paradox Interactive	1999	2017	gaming	Stockholm	Exited
Personio	2015	2021	enterprise software	Munich	Active
Picnic	2015	2019	food	Amsterdam	Active
Prexton therapeutics	2012	2018	health	Oss	Exited
RevolutionRace	2013	2021	travel	Borås Västra	Exited
Rocket Internet	2007	2014	marketing	Berlin	Exited
Rovio	2003	2012	gaming	Espoo	Exited
Scalable Capital	2014	2021	fintech	Munich	Active
Scout24 Holding	1999	2013	real estate & transportation	Munich	Exited
Secunet Security Networks	1997	2019	security	Essen	Exited
Sennder	2015	2021	transportation	Berlin	Active
Shift Technology	2013	2021	security	Paris	Active
Shop Apotheke Europe	2001	2020	health	Venlo	Exited

showroomprive.com	2006	2017	fashion	Sucy-en-Brie	Exited
Sinch (CLX Communications)	2008	2019	enterprise software	Norrtälje	Exited
smava	2007	2021	fintech	Berlin	Active
Soitec	1992	2018	semiconductors	Bernin	Exited
Spotify	2006	2011	music & media	Stockholm	Exited
StepStone	1996	2018	enterprise software	Düsseldorf	Exited
Supercell	2010	2013	gaming	Helsinki	Exited
TeamViewer	2005	2014	enterprise software	Göppingen	Exited
TelecityGroup	1997	2016	hosting	Amsterdam	Exited
THQ Nordic	2011	2018	gaming	Vienna	Exited
TIER	2018	2020	transportation	Berlin	Active
Tink	2012	2021	fintech	Stockholm	Exited
TomTom	1991	2018	transportation	Amsterdam	Exited
Trade Republic	2018	2021	fintech	Berlin	Active
TransIP (Team.blue)	2003	2019	hosting	Leiden	Exited
Tricentis	2007	2017	enterprise software	Hamburg	Active
Trivago	2005	2012	travel	Düsseldorf	Exited
Trustly	2008	2020	fintech	Stockholm	Exited
Trustpilot	2007	2021	fashion	Copenhagen	Exited
UniQure	2012	2019	health	Amsterdam	Exited
Veepee	2001	2015	fashion	Saint-Denis	Active
Vestiaire Collective	2009	2021	fashion	Paris	Active
Vinted	2008	2019	fashion	Vilnius	Active
Virtusa	1996	2018	fintech	Utrecht	Exited
Vistajet	2004	2017	travel & transportation	?al Luqa	Active
Voodoo	2013	2020	gaming	Paris	Active
Wallbox	2015	2021	energy	Barcelona	Active
wefox	2015	2019	fintech	Berlin	Active
Wolt	2014	2020	Other	Helsinki	Active
Workhuman	1999	2020	enterprise software	Dublin	Active
XING	2003	2020	media	Hamburg	Exited
Yoox Net-a-Porter	2000	2016	fashion	Milan	Exited
Zalando	2008	2013	fashion	Berlin	Exited
Zealand Pharma	1998	2019	health	Søborg	Exited
Zooplus	1999	2018	food & home living	Munich	Exited

GETTING IN TOUCH WITH THE EU

In person

All over the European Union there are hundreds of Europe Direct information centres. You can find the address of the centre nearest you at: https://europa.eu/european-union/contact_en

On the phone or by email

Europe Direct is a service that answers your questions about the European Union. You can contact this service:

- by freephone: 00 800 6 7 8 9 10 11 (certain operators may charge for these calls),

- at the following standard number: +32 22999696, or

- by electronic mail via: https://europa.eu/european-union/contact_en

FINDING INFORMATION ABOUT THE EU

Online

Information about the European Union in all the official languages of the EU is available on the Europa website at: https://europa.eu/european-union/index_en

EU publications

You can download or order free and priced EU publications from EU Bookshop at: https://publications.europa.eu/en/publications. Multiple copies of free publications may be obtained by contacting Europe Direct or your local information centre (see https://europa.eu/european-union/contact_en).

KJ-NA-30978-EN-N

The European Commission's science and knowledge service

Joint Research Centre

JRC Mission

As the science and knowledge service of the European Commission, the Joint Research Centre's mission is to support EU policies with independent evidence throughout the whole policy cycle.

EU Science Hub
ec.europa.eu/jrc

@EU_ScienceHub

EU Science Hub - Joint Research Centre

EU Science, Research and Innovation

EU Science Hub

Publications Office of the European Union

doi:10.2760/843368

ISBN 978-92-76-47058-8