Geographical and sectoral overview of the most valuable start-ups

What factors have increased the number of unicorns globally?

Our research aimed to identify the causes for the increase in the number of unicorn start-ups by analyzing the geographical and sectoral factors in two main online databases. The United States, with a traditionally strong innovation ecosystem, is leading the way in creating successful start-ups, but China, India and some European countries are also showing considerable results. The number of unicorns, referring to privately held start-ups worth more than $1 billion, is significantly influenced by qualitative factors (ecosystem development) and the size of the economy (nominal GDP). Therefore, small economies (like Israel) can only be included in the top 10 unicorn countries if their ecosystem is especially developed. The global pandemic has accelerated the digital transformation in several sectors. Fintech, e-commerce, internet, software and AI services are areas where unicorns have been able to achieve significant value growth. Introducing the attributes of these start-ups can be an inspiration for students in economics courses and can serve as illustrative examples in the related curricula.

Keywords: *start-up, unicorn, innovation ecosystems, start-up databases*

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1. Introduction

This study examines the factors that have contributed to the global growth of the most valuable start-ups in recent years. The term unicorn was coined by Aileen Lee, who in a 2013 article called privately held start-ups worth more than $1 billion "unicorns", with the notion that start-up companies of this value are as rare around the world as the one-horned fairy-tale creatures referred to. In 2022, by contrast, the number of unicorn start-ups has exceeded 1,000 according to analyses of related databases. This growth in the number of the most valuable start-ups in such a short time raises certain questions, which we address in this research. Different conditions exist in various parts of the world for the most valuable start-ups to grow. The United States (US) has traditionally a strong background in developing innovative businesses, but China has also mobilized significant resources in recent years. There is also an exciting question about in which areas Europe can play a role alongside these two great powers, and whether the old continent can also create start-ups capable of growing internationally. Our study examines how this group of start-ups is distributed globally and what local factors help start-ups to achieve such value. We also evaluate in which sectors and areas of activity the most valuable start-ups can grow and attract investor capital. Our study assessed whether the factors identified in Rodrigues and Noronha's research as critical to overcoming the global pandemic are also typical of the most valuable start-ups (Rodrigues and Noronha 2021). Given that these start-ups typically provide innovative digital services in areas such as Fintech (financial technology), E-commerce (online sales and services) or Edtech (education technology), their names are in most cases are familiar to younger generations. The group of 1,000 start-ups to be presented can therefore also be used as an interesting example and illustrative tool for higher education courses, e.g. in finance, business valuation, management or business modelling. The novelty of our topic lies in the fact that there is still little research on the characteristics of unicorn start-ups and the factors influencing their development.

2. Database and literature review

When venture capitalist Aileen Lee (2013) started using the term unicorn in relation to start-ups, it was along the following definition: "US-based tech companies started since January 2003 and most recently valued at $1 billion by private or public markets" (Lee 2013). The Cowboy Ventures team, founded by Lee, was able to identify 39 unicorn start-ups based on a database of publicly available sources, such as Crunchbase and LinkedIn. According to their analysis, on average, four unicorns were born per year in the decade before 2013.

In June 2022, the Crunchbase database (also used by Lee) listed 1,350 start-up unicorns. The database includes the estimated value of the companies, the total equity funding, the lead investors and the country and continent of incorporation (Crunchbase 2022). Crunchbase was founded in 2007 as a platform to track the start-ups that parent company TechCrunch featured in its articles. Currently, it provides

intelligent prospecting software powered by live company data. Their content includes investment and funding information, the founding members and individuals in leadership positions, mergers and acquisitions, and industry trends.

The other significant online database on unicorns is linked to the CB Insights (2022) portal, which contains the following attributes: valuation ($B), date joined the unicorn list, country and city of incorporation, industry and selected investors. The CB Insights company was founded in 2008 in New York. Their portal uses a combination of big data tools and algorithms to gather and analyze data about private companies, investors, and industries. In June 2022, the CB Insights database listed 1,164 start-up unicorns. Given that the CB Insights database contains industrial data in addition to geographic data, we relied primarily on this source in our research. The Crunchbase database was used as a secondary validation and supplement to the data. Reflecting all this, our study is a review analysis based on the databases of these two online portals, and an overview of the related literature.

The literature analysis related to unicorns is approached on the basis of the characteristics of start-ups. One of the most important values of these companies is that they are fast-growth oriented. In the related scientific literature, entrepreneurship education and international market access skills are seen as key to the survival and growth of start-ups (Csákné, Radácsi and Timár 2020). They achieve rapid growth and development with money provided by forms of financing that have no place in traditional companies (business angels, seed capital companies, crowdsourcing platforms, etc.) (Condom-Vilá 2020). These entrepreneurs are actively and constantly seeking changes or making the most appropriate strategic choices as a means of overcoming problems, leading to business success (Hormiga, Xiao and Smallbone 2018). Another important feature is that the fundamental nature of start-ups is innovation to create new products or services, which carries significant risk (Bethlendi 2019). Start-ups that are able to develop solutions that can reach global audiences in a relatively short time and with outstanding profitability are also able to create exceptional business value. Furthermore, the process of market concentration has begun over the past few years within some emerging start-up industries (Bethlendi and Szőcs 2019).

Although, the term unicorn has become part of the vernacular in the start-up world, scant research has analyzed what is driving the growth of unicorn companies. It is surprising that such an important phenomenon has received almost no scholarly attention (Jinzhi and Carrick 2019). However, unicorns such as Revolut, Miro and Grammarly are impacting the daily lives and work of more and more individuals and organizations. De Massis and colleagues explain the success of unicorns by the following four common resources: (1) Their relatively small organizational size, which facilitates strategic decision-making and the implementation of quick practical measures; (2) Their founders and leaders are usually experienced entrepreneurs, who have often dealt with high-risk situations and failures; (3) They are financed by venture capital companies, which pressure them for the quick development of new products or services; (4) The innovations offered to target audiences are digital, which can reach the market leveraged by digital platforms to be widely disseminated through social networks (De Massis, Frattini and Quillico

2016). Díaz-Santamaría and Bulchand-Gidumal identified two common success indicators: achieving significant revenue and obtaining financing. There are four factors that have a significant influence on these two ways of measuring success: the location of the start-up, the promoting partners' dedication, the age of the company, and the existence of non-promoting partners (Díaz-Santamaría and Bulchand-Gidumal 2021). Given the scarcity of literature on unicorns, it is not surprising that we could find no examples of them being used as a demonstration tool in higher education. The relationship between start-ups and universities, primarily in the context of incubation collaborations, is reflected in related research (Popov 2022; Kuznetsova 2022).

It is not yet entirely possible to evaluate the full impact of the Covid-19 pandemic. The past two years have given a boost to many digitalization-driven sectors, and unicorn start-ups have typically been able to grow in these IT-related areas. According to the research of Rodrigues and Noronha (2021), unicorns adopted business model innovation (BMI) for overcoming the effects of the crisis, by taking, at least, three new actions: the adoption of new digital platforms for communication between customers and employees; the extension of partners' networks; and adaptation for providing payment services. The adoption of new digital platforms for internal and external communication enables rapid information flows; while the extension of partners' networks contribute to the transacting costs that technology-based companies would have if they provided services that are outside the scope of their businesses; and the adaptation of providing payment services involves creating new forms of payment, the flexibilization of interest rates, and, in specific cases, credit supply for micro-entrepreneurs to keep their businesses going. So, adaptability is an essential factor for technology-based companies to explore the possibilities in different markets, and is a competence that can be refined, depending on how companies define their business models at the time of creation (Rodrigues and Noronha 2021).

The related literature mainly analyses the factors that allow unicorns to stand out from the start-up crowd. However, linked economic articles have also started to categorize unicorns in recent years: start-ups that exceed the valuation of $10 billion are called decacorns, while the entities with a valuation over $100 billion are hectocorns (Sharma 2021). In the context of our study, we will now look at the extent to which the number of unicorns has grown globally and how this growth has been distributed geographically and sectoral.

3. Factors affecting the global distribution of unicorns

The growth in the global number of unicorn start-ups is tracked and recorded year by year by the online databases presented earlier. During the global pandemic, it was already noticeable that sectors such as e-commerce, fintech services and solutions supporting home office work, have a huge growth potential. This growth volume can also be traced in the global increase in the number of start-ups becoming

unicorns, based on the databases we analyzed, and more start-ups achieved unicorn status in 2021 than in the previous decade combined.

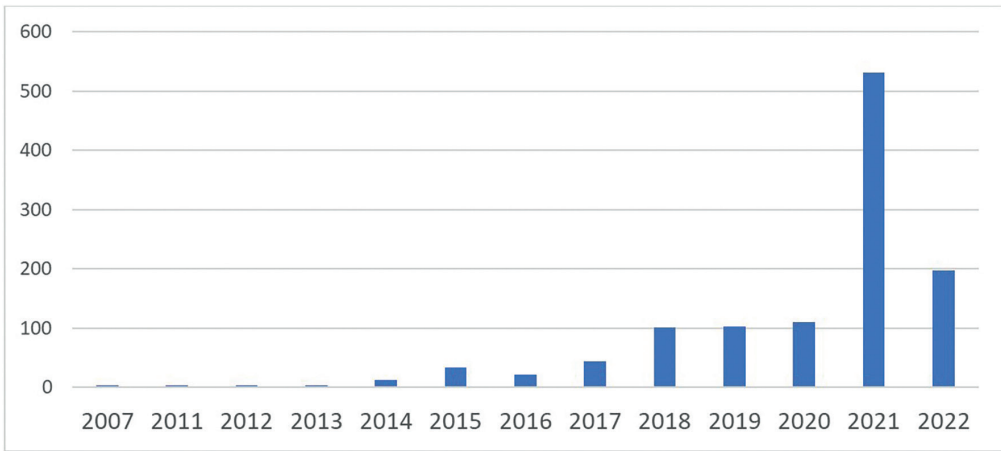

Figure 1. Number of start-ups becoming unicorns globally.
(Source: Own edition based on CB Insights database)

One factor behind this growth is the significant volume of venture capital available in global financial markets, and especially in the US. It is also worth examining whether the traditionally strongest capital markets have seen the most significant growth in unicorn numbers.

3.1. Geographical overview of the unicorn start-ups

The 1,164 unicorn start-ups included in the CB Insights database were from 49 countries in 2022. However, the top 10 unicorn "incubating" countries accounted for 88% of the most valuable start-ups. Only half of these countries are a member of the Group of Ten (G10)[1]. This suggests that the half of the G10 countries (most developed countries) are not supportive enough for growth start-ups in qualitative terms. These qualitative terms we call the start-up ecosystem, a particular region where entrepreneurs and supporting organizations collaborate to create new start-ups and drive the existing ones (Tripathi et al. 2019). Four of the top 10 incubating countries are among the largest developing countries, thus they are members of the Group of Twenty (G20). The only exception on the list is Israel, whose economy is too small in volume, and is therefore not included in the list of G20 countries.

[1] Group of Ten consists of the eleven most developed countries. See the OECD definition: https://stats.oecd.org/glossary/detail.asp?ID=7022

	Number of unicorns in 2022	G10 / 20
South Korea	14	G20
Brazil	17	G20
Canada	19	G10
Israel	22	
France	25	G10
Germany	29	G10
United Kingdom	44	G10
India	67	G20
China	174	G20
United States	623	G10

Table 1. The top 10 incubating countries and their membership in the world's largest economies (Source: Own edition based on CB Insights, Crunchbase)

In order to compete in world markets, countries need to have the capacity to support the high rates of establishment and dissolution of start-ups (Bednarzik 2000). The success of a start-up depends on a plethora of factors. Given the rapidly growing popularity and importance of entrepreneurship around the world and the high risks associated with it, it is imperative to understand what the critical factors are for the success of a start-up (Geibel and Manickam 2017).

The analysis shows that the US and China account for nearly 70% of the world's unicorns. If we examine whether the most valuable start-ups from these two economic superpowers are responsible for the dynamic growth in unicorn numbers, we can observe that the steep rise can indeed mainly be attributed to the US.

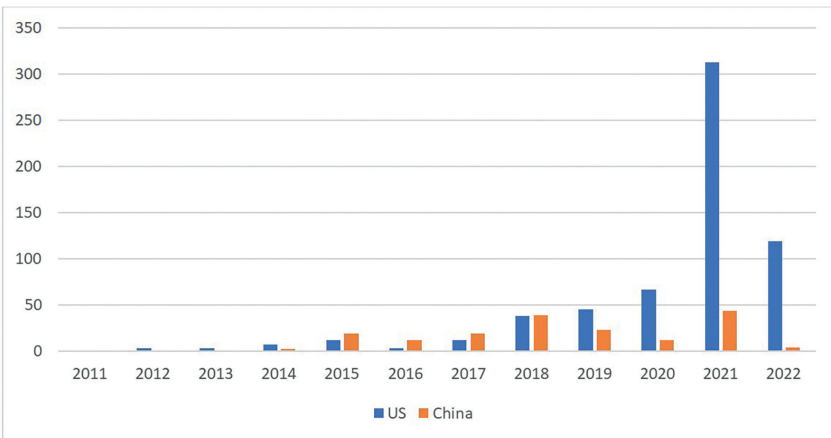

Figure 2. Number of start-ups achieving unicorn status in the US and China (Source: Own edition based on CB Insights database)

In the following, we analyze the factors explaining the difference in the number of unicorns among the top 10 unicorn countries, i.e. those where there is a strong ecosystem for such kind of development. Four indicators were used in the analysis: nominal GDP per capita, GDP per capita based on purchasing power parity, populations, and nominal GDP. Economic development was first captured by GDP per capita. Two versions of this were used: in nominal USD (Appendix 1.) and adjusted for purchasing power parity (Appendix 2.). Both explain the unicorn number only to a modest extent. The correlation was weakened by two types of outliers in the data: the two large but not so developed economies (China and India) with many unicorns, and the US, which has the highest GDP per capita but a much larger outlier in unicorn numbers.

Consequently, the size of the market must be taken into account somehow. The simplest way is by population number (Appendix 3). This indicator can barely explain the unicorn number at all. As a kind of composite indicator of economic development and market (population) size, we can consider the nominal GDP of a country in billions of USD. This indicator can explain 81% of the difference in the number of unicorns among the top 10 unicorn countries (Figure 3.).

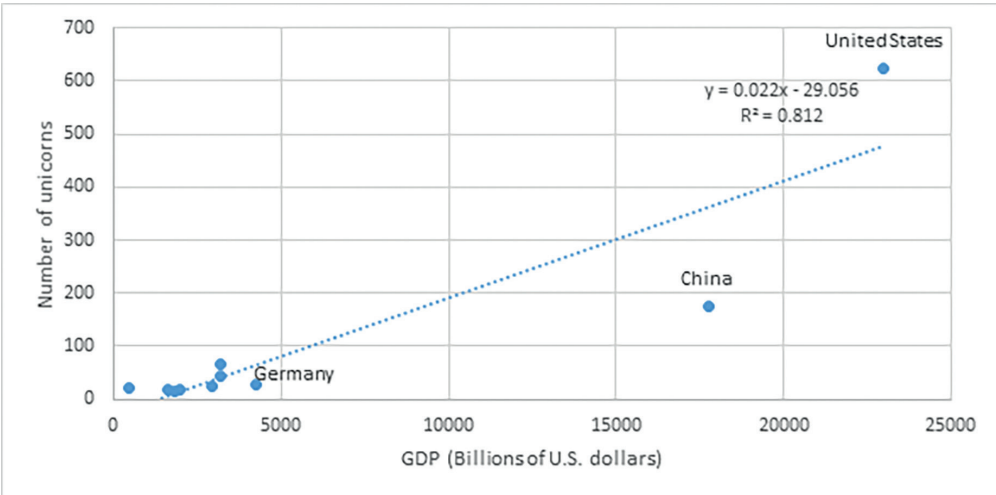

Figure 3. Nominal GDP data for the 10 countries with the largest number of unicorns (Source: Own edition based on World Economic Outlook Database, October 2022 Edition and CB Insights database 2022)

For comparison, we present the outlier G10 countries. Netherlands, Sweden, and Switzerland are successful (having developed ecosystems) at fostering unicorn development, but their economies (market) are too small, thus their numbers of unicorns have remained limited. Italy and Japan could be considered very underdeveloped in terms of their numbers of unicorns, compared with the sizes of their economy. Probably, their ecosystem is not supportive enough for growth start-ups.

	Number of unicorns	GDP 2021 (billions of USD)
Belgium	3	599
Sweden	8	636
Switzerland	6	800
Netherlands	7	1014
Italy	1	2101
Japan	6	4933

Table 2. The outlier G10 countries
(Source: Own edition based on CB Insights, Crunchbase, IMF database)

It also follows from the analysis that very small economies, such as most those in Central and Eastern Europe (CEE), are only able to incubate a unicorn start-up if they have an exceptional ecosystem.[2] Individual factors also might play a significant role in sporadic CEE successes.

Our research also examined where the world's leading start-up ecosystems are located. Currently the US ranks as the number one place, which provides the most conducive environment for entrepreneurs (Nisen 2013). According to the report of the StartupBlink online portal, 9 out of the Top 25 Global Ecosystem Cities are from the US, including the San Francisco Bay Area, New York, Boston Area, Los Angeles Area, Seattle, Washington DC Area, Austin, San Diego, and Chicago (StartupBlink 2022). Based on our database, four of the ten largest unicorn incubator cities (San Francisco, New York, Boston, Palo Alto) are also in the US, followed by Beijing, Shanghai, Bengaluru and three European capitals (London, Berlin, Paris). Large-scale exits, especially unicorn exits are among the most important drivers of start-up ecosystem development also for countries with small-scale economies (Prohorovs 2020). According to another global ranking, five of the top ten ecosystems in the world are in the US and two are in China, and the remaining three are in London, Tel Aviv and Seoul (Startupgenome 2022). It can be observed that start-up ecosystems have a positive impact on the development of unicorn start-ups.

Our study also assessed the role of available funding instruments. According to the related analysis, the global venture investment in 2021 was more than tenfold that of 2012 (Teare 2022). The NVCA Venture Monitor report also reviewed the US venture capital (VC) investment in 2021 and settled at $329.8 billion, which nearly doubled 2020's total of $166.6 billion. VC mega-deals (deals sized $100 million or larger) recorded an exceptionally robust 2021, driving $190.8 billion in deal value (PitchBook 2021). The global capital abundance in 2021 therefore also created a favourable environment for unicorns to grow.

The databases we analyzed also provide a snapshot of the market value of the unicorns we study. As of June 2022, China's Bytedance tops the list of unicorns, with

[2] Probably the Baltic ones: the very small Estonia and Lithuania have 2–2 unicorns.

a value of $140 billion, compared to Revolut at number 10, worth $33 billion. Across the more than 1,000 unicorn start-ups surveyed, the average value was $3.29 billion, with a median value of $1.6 billion. The average value of the total unicorn population is in line with the average value of unicorns in the US and China due to their high proportion. However, it is also important to point out that, on average, the United Kingdom has the most valuable start-ups of the top 10 unicorn incubating countries. In the UK, almost half of the most valuable start-ups are related to the fintech sectors.

Country	Average value of unicorns (B$)
United Kingdom	4,44
US	3,28
China	3,09
India	2,94
Germany	2,59
Canada	2,59
Brazil	2,36
France	2,28
South Korea	2,15
Israel	2,12

Table 3. Average value of unicorns in the top 10 incubating countries (Source: Own edition based on CB Insights and Crunchbase database in 2022)

Of the nearly 1,000 unicorns we surveyed, 272 had a market value of $1 billion, and more than 50% (139) of these start-ups achieved unicorn status in 2021. It is important to note that the database of unicorns is not a static set, but a list where start-ups typically enter at the $1 billion level and then move forward, and where, for example, an IPO is the end of the unicorn status. The original unicorn list compiled by Lee in 2013 also included a number of companies that have since either gone public or been acquired (e.g. Facebook, Twitter, YouTube).

To better understand the explosion in the number of unicorns, it is important to analyze the sectors and industries in which they have been able to add value. Online payments, e-commerce and cybersecurity services have been brought to the forefront by the global pandemic shutdowns. Therefore, the next step of our study was to review the sectors in which start-ups globally were able to achieve unicorn status.

3.2. Sector overview of the unicorn start-ups

Within our database, we categorized the unicorns we surveyed into 14 main sectoral groups. Globally, in 2021, fintech, internet and software services, e-commerce,

health and Artificial Intelligence (AI) were the areas where most start-ups achieved the unicorn ranking. The US accounted for more than 50% of the new unicorns in four of the five categories analyzed (Figure 4.). The only exception to this pattern was e-commerce, where the US accounted for 29.8% of new unicorns, while India and France accounted for 21.3% and 8.5% of the three largest contributors, respectively.

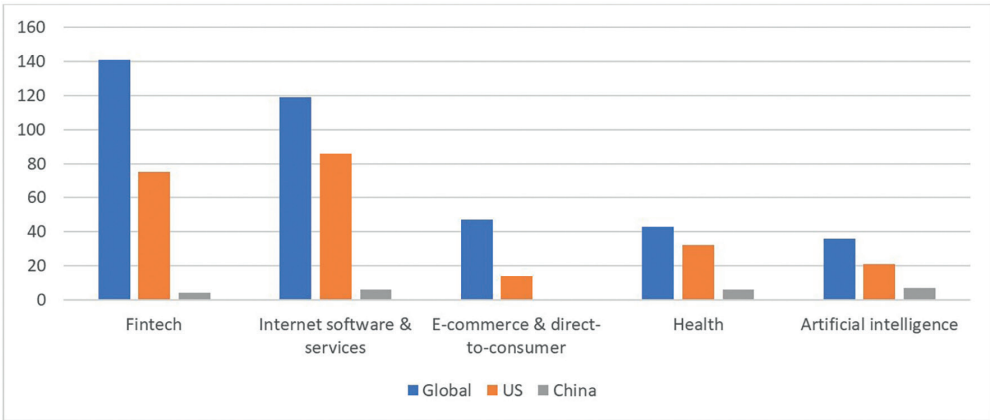

Figure 4. Sectors in which most start-ups achieved unicorn status in 2021, globally, in the US and China (Source: Own edition based on CB Insights database)

In Europe, the UK still traditionally has an ecosystem that supports the development of start-ups, and 71% of the unicorns based in London are from the fintech sector. Among European countries, even in Berlin, Germany, unicorns have found a favourable environment for growth, with e-commerce being the fastest growing topic alongside fintech. France is the third largest player in Europe, with start-ups excelling mainly also in e-commerce and fintech services. So, the European unicorns have notably been able to play a leading role in the digitization of finance and commerce.

When Lee compiled the first unicorn list in 2013, it included "start-up" companies such as Instagram, Waze, YouTube, Uber, LinkedIn and Facebook. Today, these companies have become global digital "utility providers". Therefore, it is important to see that the significant number of unicorns in the US today will have a strong influence on the companies and services we will likely use in a 10-year perspective.

The entrepreneurship literature does not have a specific guideline for dealing with the unique situation caused by the pandemic (Rodrigues and Noronha 2021). Such events are rare and have a very diverse impact on businesses in different sectors. The high negative impact of the crisis on start-ups' businesses worldwide has caused 70% of these companies to terminate employment contracts, leaving them with operational resources just sufficient to face the crisis for a few more months, as of July 2020 (Barbulescu et al. 2021). But we also witnessed, that unicorns are able to respond dynamically to adversity, especially because they can adapt BMI for making specific digital innovations as solutions to meet market needs quickly. This is because their business model is typically built around a single digital platform or

software, which is very fast and cheap to develop and promote (De Massis, Frattini and Quillico 2016). If a firm is digitally mature, it can accelerate the transition into digitalization. Companies that have a low level of digital maturity and problems of liquidity can digitalize only sales to achieve revenues and get closer to the consumer. Finally, companies with a limited level of digital maturity and high social capital can seek partners with excellent digital resources, such as unicorns, to develop partnerships (Priyono, Moin and Putri 2020).

The fastest growing sectors identified by our dataset analysis are closely related to the factors identified in Rodrigues and Noronha's research mentioned earlier (1. the adoption of new digital platforms; 2. The extension of partners' networks; 3. and adaptation for providing payment services) (Rodrigues and Noronha 2021).

Internet software, e-commerce or health service providers typically supply their customers via a digital platform or provide payment services, as in the case of fintech. Furthermore, AI providers offer solutions for managing the increasing amount of data generated by the operation of these platforms.

Partnerships are also an essential requirement for the fastest growing unicorn-dominated sectors. Fintech start-ups are both competing and collaborating with traditional financial institutions. According to the research of Brummer and Yadaw, the complementarity of fintech services in relation to banking products and access to the customer base of banks has enabled fintech start-ups to create innovative supply chains for fintech products (Brummer and Yadaw 2019). E-commerce services are also unimaginable without distributor partnerships or healthcare platforms without medical service partners.

The adaptation of payment services and openness to new solutions are now a precondition for ensuring a global presence. As unicorn start-ups become global service providers in more and more areas, it will become increasingly important to be able to pay for their services seamlessly from anywhere in the world. After all, it is now natural to transfer money using Revolut, order a taxi with Bolt, and buy clothes on SHEIN. All of these factors had an important role in growth before the emergence of the Covid-19 virus, but the closures since the pandemic have created an extraordinary situation worldwide that has amplified their effects.

At the beginning of the global pandemic, investors considered unicorn start-ups to have advantages in these factors, and so the surge in investment volumes was also likely to be a flight to the front at a time when many sectors were beginning to struggle. Based on all these aspects, the global pandemic and the economic conditions it generated have had a major impact on the rapid increase in unicorn numbers.

Although data for the year 2022 were not available at the time of writing our study, it can already be predicted that the surge experienced in 2021 will not be repeated. In 2021, 532 unicorns were born that year, amounting to more than 2 per business day. By contrast, in the second quarter of 2022, a total of 87 unicorns were registered, which is just 1.4 per business day. So far, the third quarter of 2022 has seen an even more severe decline. At the current pace, only 27 start-ups will be able to achieve unicorn status by the end of the quarter. That is less than 1 unicorn birth every other working day. So, the increase in the number of unicorns in 2021 was an aggregate effect of several factors described above.

4. Conclusion

To qualify as one of the world's most valuable start-ups, a company must have exceptional characteristics. Our analysis revealed that the surge in the number of unicorns in 2021 was driven by US-founded start-ups. We analyzed the factors explaining the difference in the number of unicorns among the top 10 unicorn countries. We found that the nominal GDP (a composite indicator of the economic development and size of a country) could well explain why the largest economic powers had the most unicorns. We also noted that the US has a number of cities and start-up support ecosystems that provide a framework for innovation and raising capital. So, the number of unicorns is significantly influenced by the dimension and performance (nominal GDP) and by qualitative factors (development of the ecosystems). Therefore, small economies can only be included in the top 10 unicorn countries if their ecosystem is especially developed. A good example is Israel, which, despite its small size and relatively small population, has been able to be a key contributor to the development of start-ups. At the same time, Italy and Japan could be considered as very underdeveloped in terms of their performance in incubating unicorns, compared with the sizes of their economies. Probably their ecosystem is not supportive enough for growth start-ups.

Another important factor was that in 2021, based on data to date, there was an outsized availability of venture capital funding and a significant level of deal investment volumes. It is important to highlight that China is the main challenger to the US in the fastest development industries. Its dynamic service sector and growing sources of venture capital make it an important competitor in the unicorn club. The third largest player is India, which has also been able to become a major player in important digitalization areas. From the old continent, the UK, Germany and France have been able to create an environment that is conducive to growth, particularly in fintech and e-commerce.

Our study also analyzed the sectoral background of these companies. Fintech and internet services are the two areas that give birth to the most unicorns, but e-commerce, health and AI-related developments are also growing dynamically. The outbreak of the global pandemic suddenly increased the value of all the services that could be provided to customers remotely, using online solutions. Rodrigues and Noronha's model linked business resilience to three main factors: the adoption of new digital platforms, the extension of partners' networks, and the adaptation for providing payment services. A significant number of the start-ups that became unicorns in 2021 will either provide solutions or payment services through a digital platform or serve these platforms, as in the case of AI. These circumstances have meant that the global pandemic has, for the most part, been more of a growth opportunity for start-ups that have become unicorns. This has not escaped the attention of investors. The global capital markets provided unprecedented levels of funding to enable the growth of start-ups in the sectors presented. However, an important question remains about whether these companies will be able to fulfil their hopes once the pandemic recedes. Complete data for 2022 are not yet available at the time of this study, but it is already clear that 2021 could be an exceptional year due to the factors described above.

Even with all this, the growth paths and innovative business models that unicorns have presented to us make them worthy of being inspiring examples. Their products and services are increasingly being used worldwide thanks to digital transformation. All these factors also offer the opportunity to use them more as illustrative examples in higher education courses in finance and economics.

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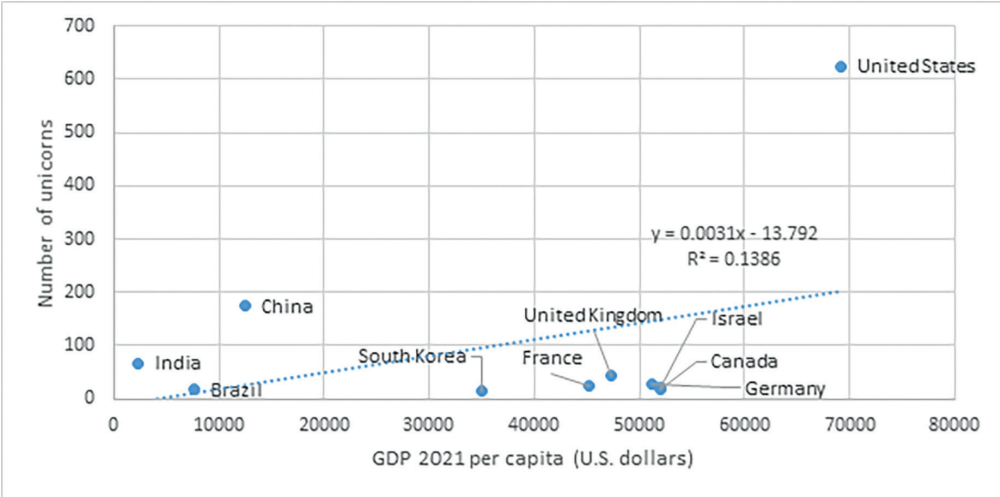
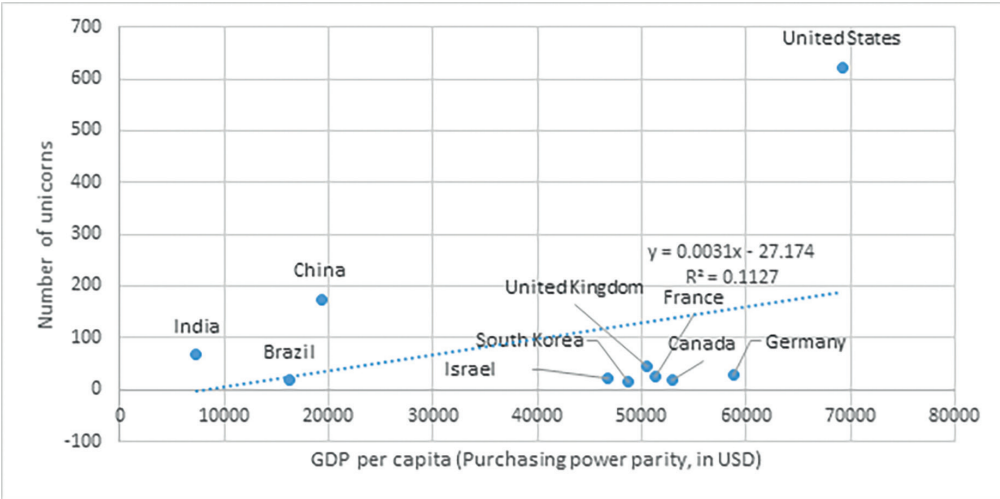
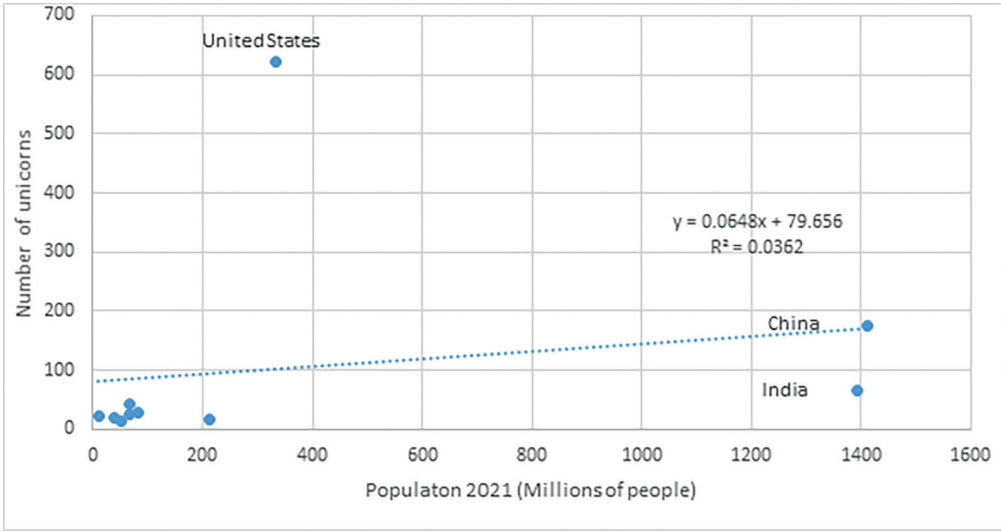
Appendix



Appendix 1. GDP per capita of the 10 countries with the largest number of unicorns. (Source: Own edition based on World Economic Outlook Database, October 2022 Edition and CB Insights database 2022)



Appendix 2. GDP per capita (purchasing power parity) of the 10 countries with the largest number of unicorns. (Source: Own edition based on World Economic Outlook Database, October 2022 Edition and CB Insights database 2022)



Appendix 3. Populations of the 10 countries with the largest number of unicorns. (Source: Own edition based on World Economic Outlook Database, October 2022 Edition and CB Insights database 2022)