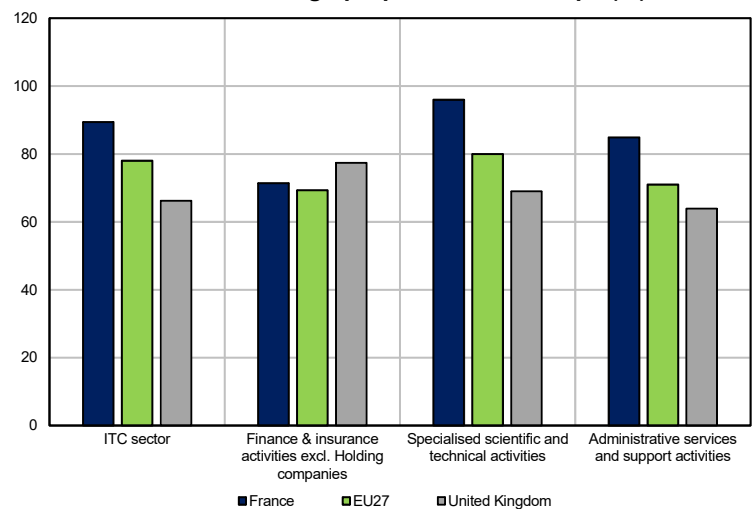


Venture capital and development of French start-ups

Fayçal Hafied, Chakir Rachiq, Guillaume Roulleau

- There are typically four stages in the development of a start-up: incubation, seed funding, implementation, and growth. Start-ups often face cash flow difficulties between the implementation and growth phases, resulting in a high death rate. An analysis of the three-year survival rate of companies operating in the ICT and specialised scientific and technical sectors shows that this phenomenon, known as the "Valley of Death", exists in France, although it seems less prevalent than in other countries.
- Start-ups are a particularly uncertain asset class for investors. The structure of their balance sheets (high share of intangible assets) and the lack of historical profits make it difficult to use traditional financial valuation techniques, resulting in a high level of information asymmetry between investors and entrepreneurs, which makes effective cooperation difficult.
- Traditional financing through bank loans is difficult to put in place in the absence of tangible collateral on a start-up's balance sheet. This is why specialised investors known as venture capitalists step in to provide equity financing. The availability and selectivity of venture capital funding determine whether start-ups can effectively grow and the magnitude of the "Valley of Death".
- In France, start-up financing difficulties seem to be less severe than elsewhere in Europe (EU27 and UK). Bpifrance has been the primary catalyst for the growth of French venture capital. France has a vibrant pool of start-ups and is now ranked first in the EU27 in terms of fundraising for rounds under €100m, followed by Germany. However, France, as well as continental Europe, are slightly lagging behind when it comes to financing late stages rounds (segment corresponding to the growth phase), which are crucial for start-ups to scale up and reach a critical size.

3-year survival rate of companies in intangible-asset-intensive sectors with a high proportion of start-ups (%)



Source: Eurostat.

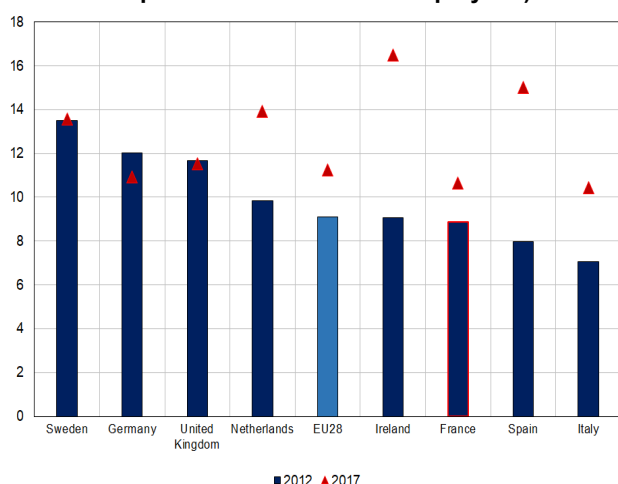
How to read this chart: 89% of French companies with more than 10 employees created in 2015 and operating in the ICT sector were still active in 2018.

1. The concept of start-up encompasses high-growth and R&D-intensive companies

1.1 Two categories of companies to define the concept of a start-up

Start-ups do not coincide with any statistical category. However, they can be understood by cross-referencing different and better-defined concepts. "High-growth enterprise" is a concept used by Eurostat and the OECD, which does not include an age criterion. It is defined as "an enterprise with average annualised growth in number of employees greater than 10% per year over a three-year period and having at least 10 employees in the beginning of the growth". Among these high-growth enterprises, an enterprise is said to be a "gazelle" if it is young, i.e. four to five years old at the end of the growth period.

Chart 1: Share of high-growth enterprises (% of active companies with at least 10 employees)¹



Source: Eurostat.

How to read this chart: 8.9% of French companies with more than 10 employees experienced strong growth in 2012, compared with 10.7% in 2017.

Scope: companies with 10 or more employees in the market economy excluding agriculture, holding companies and services primarily provided to households (section B to N excluding K642 of NACE rev. 2).

Note: For the 2012 average, the share of high-growth enterprises in 2013 for Finland and 2014 for Greece is used. For the 2017 average, the share of high-growth enterprises in 2016 is used for Cyprus.

In 2017, high-growth enterprises accounted for 10.7%

of companies with more than ten employees in France (compared with 10.9% in Germany and 11.5% in the United Kingdom), a significant increase between 2012 and 2017 (1.7 points; see Chart 1). However, they represented only 9.4% of employment in companies with more than ten employees (compared with 13.6% in Germany and 19.3% in the United Kingdom), i.e. less than the European Union average (15.2%). The size of these companies is thus significantly smaller in France than elsewhere. A large proportion of them (16.6%) operate in the ICT sector.²

In France, a more administrative approach to understanding the scope of start-ups is based on a company's eligibility for the Innovative Start-Up (JEI) scheme. This was launched in 2004 to support innovation through tax breaks and exemptions from employers' social security contributions for staff involved in R&D. The scheme targets SMEs less than eight years old with a strong R&D component.³ In 2017, there were 3,202 JEIs (three times more than when the scheme was created). These were mostly in the service sector (45% of JEIs operate in the ICT sector and 39% in specialised scientific and technical activities).⁴

1.2 French start-ups have a higher survival rate than in other European countries

There are currently no internationally comparable statistics on the survival of start-ups, regardless of the definition used. However, we can compare the survival rate of companies operating in sectors where there is a very high proportion of innovative start-ups and high-growth enterprises. For example, in the ICT sector, France ranks second among its immediate neighbours (Belgium, Spain, Italy, the UK and Sweden) with a three-year survival rate of 89.4%, behind Belgium (90.0%) and ahead of the UK (66.2%).⁵ As regards specialised scientific and technical activities, French companies remain in business longer than those of its immediate neighbours.

- (1) Share of high-growth enterprises in terms of employment: number of HGEs divided by the number of active enterprises with at least 10 employees – percentage.
- (2) J.-B. Champion *et al.* (2018), "High growth enterprises: an increase of 540,000 employees in three years", *Insee Première*, no. 1718, November.
- (3) To be eligible, a company must meet several criteria: it must (i) be new, i.e. not the result of a restructuring of an existing company; (ii) it must be an SME (less than 250 employees and a turnover of less than €50 million or a balance sheet of less than €43 million); (iii) be independent; (iv) be less than 8 years old; and lastly (v) have an intensive R&D activity, representing at least 15% of its tax-deductible expenses.
- (4) Source: ACOSS (JEI 2015 database), Insee, Directorate General for Enterprise (DGE).
- (5) Source: Eurostat.

2. Start-up financing suffers from information asymmetry and a high degree of uncertainty about future earnings

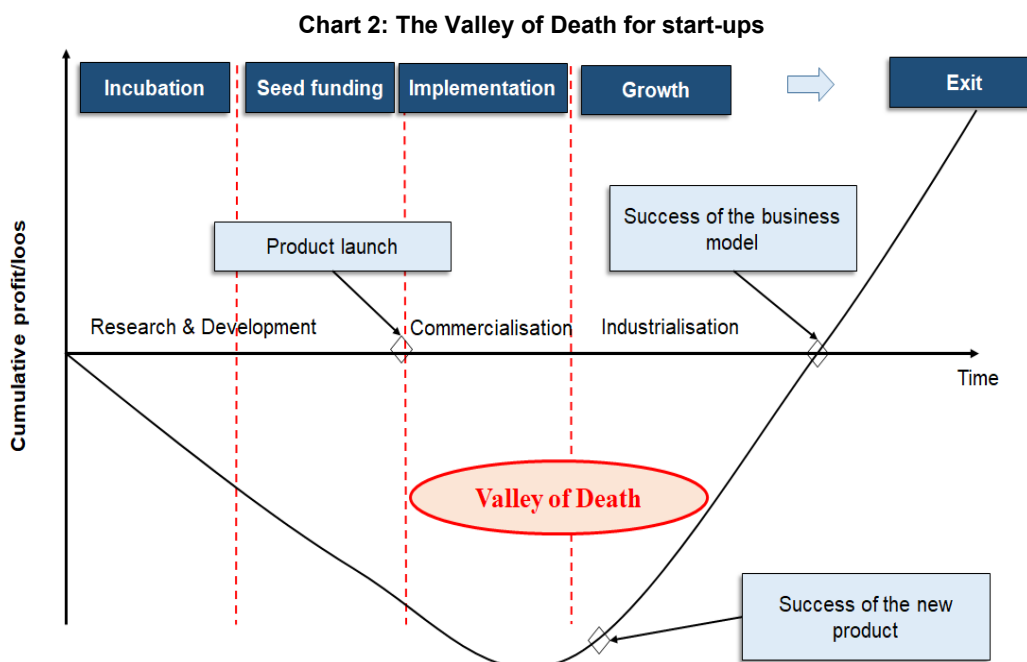
2.1 Start-ups, which are mainly made up of intangible assets, are difficult for investors to value

Start-ups' balance sheets are dominated by intangible assets (patents, software, human capital) whose value "sunk" i.e. they involve irrecoverable costs,⁶ unlike that of tangible assets (plants, machinery, land, etc.).⁷ Intangible assets also lead to more uncertain returns,⁸ and this uncertainty creates a strong information asymmetry. Traditional debt instruments offered by banks, which take tangible assets as collateral, are ill-suited when it comes to financing intangible assets. The information asymmetry related to these assets is present both prior to the investment decision (bad projects could manage to raise funds, hence the risk of adverse selection) and afterwards (imprudent

management of the funds raised, resulting in moral hazard).

2.2 These characteristics of start-ups make it difficult to finance them and leave them vulnerable during the marketing phase of their product

Difficulties in accessing outside funding result in a high mortality rate among start-ups at the point where they are attempting to industrialise their production (after the first three phases of development, i.e. incubation, seed funding and the beginning of the implementation phase).⁹ This phase of start-up development, located between the implementation phase and growth periods and marked by high mortality, is known as the "Valley of Death" (see Chart 2).



Source : DG Trésor, based on Ortman, J., (2016), "The Rise of angel investing", Kauffman Foundation.

Incubation: Prototype development; the company does not exist or has only just been set up: its business model is not established.

Seed funding: The prototype has been developed and launched on the market; generation of initial income.

Implementation: The company needs additional funds to scale up and perfect the offering.

Growth: The company expands its product offering and industrialises its production process, which opens up new markets and allows it to expand internationally.

Exit: Several possibilities: (i) acquisition, (ii) new round of financing (new investors or reinvestment of previous shareholders during an equity financing round), (iii) IPO.

(6) A patent under development, for example, has little or no net asset value.

(7) For a machine, for example, it is sufficient to have the purchase price and assign a linear depreciation coefficient over time taking into account its wear and tear to assess a new depreciated value.

(8) Haskel, J. and Westlake, S. (2017), "Capitalism Without Capital: The Rise of the Intangible Economy", Princeton University Press.

(9) CAE (2016), "Strengthening French Venture Capital", *Les notes du conseil d'analyse économique*, no. 33.

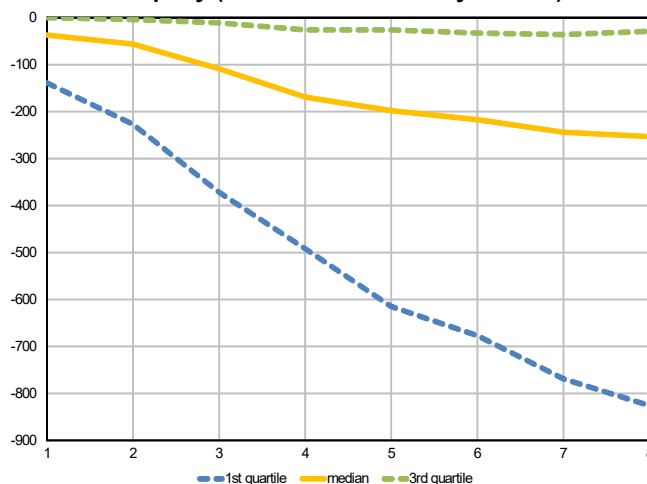
The difficulty that start-ups have in financing the development of their operational activities is reflected in their cash burn rate. The "Valley of Death"

phenomenon is characterised by negative cash flow during the start-up's first few financial years (see Box 1).

Box 1: The Valley of Death phenomenon as reflected in changes in start-ups' net cash flow

Individual data on French companies in the FICUS-FARE database shows a sharp increase in the cash burn rate between the second and fifth year of existence of innovative start-ups set up between 2004^a and 2008. The net cash burn rate^b is relatively modest in the first two years, then increases rapidly between the second and fifth years, and tends to stabilise after that. The chart below shows the net cash position of French start-ups by age of company (see Chart 3).

Chart 3: Net cash position of French start-ups by age of company (In thousands of € at year-end)



Source: FICUS-FARE, JEI database (ACOSS, 2004-2016), DG Trésor calculations.

Scope: The profile is estimated on the basis of a sample of 2,000 companies that were set up between 2004 and 2008 and observed during the first eight years of existence. All of them benefitted at least once during the observation period from the JEI scheme. Net cash is defined here as cash on hand (amounts held in cash and bank balances) – share capital (shareholders' contribution at the start of the activity) – debt (loans and bond issues) and thus makes it possible to take into account cash contributions during the life of the JEI.

- a. The evaluation was conducted starting in 2004, when Decree No. 2004-581 of 21 June 2004 was enacted, establishing an exemption from employer social security contributions for Innovative Start-Ups (JEIs), which is the concept retained in the absence of a statistical definition of a start-up.
- b. Net cash is defined here as cash on hand (amounts held in cash and bank balances) – share capital (shareholders' contribution at the start of the activity) – debt (loans and bond issues). It takes into account cash contributions during the life of the JEI.

3. Venture capital addresses the financing needs of start-ups

3.1 Investment in start-ups calls for a specialised instrument: venture capital

The monitoring costs required to eliminate information asymmetries¹⁰ can only be minimized through close follow up of equity investments, with the investor sitting on the company's board. Venture capital meets this requirement. Prior to the investment decision, venture capitalists jointly appraise their fund allocation decisions ("syndicated funding rounds")¹¹ to share

information and diversify risk by increasing the number of equity investments.¹² After the allocation of funds and to limit the risk of cash mismanagement, investment contracts include clauses allowing investors to increase their equity stake at a later round of funding, symmetrically decreasing that of the entrepreneurs if operational targets have not been achieved. This allows investors to ensure that operations are properly executed, in accordance with the business plan

(10) Winton A. and V. Yerramilli (2008), "Entrepreneurial Finance: Banks versus Venture Capital", *Journal of Financial Economics*, 88, p. 51-79.

(11) J. Lerner (1994), "The syndication of Venture Capital Investments", *Financial Management*, vol. 23, no. 3, p. 16-27.

(12) D. J. Cumming (2006), "The Determinants of Venture Capital Portfolio Size: Empirical Evidence", *Journal of Business*, vol. 79, no. 3, p. 1083-1126.

validated at the moment of the investment¹³ The funds are allocated in successive rounds, i.e. such a method of investment is called "stage financing",¹⁴ which keeps pressure on entrepreneurs, as investors may decide not to reinvest later.

In practice, the venture capital industry involves a

diverse set of stakeholders throughout a start-up's growth path, thus defining a "funding continuum" (see Table 1). A distinction is made between those involved in the early stage of the start-up's development (crowdfunding, business angels¹⁵), and those involved at a later stage (specialised venture capital companies, corporate venture funds¹⁶).

Table 1: The funding continuum for start-ups and the rationale for sequential investment in successive rounds

Development state	Incubation	Seed funding	Implementation	Growth	Exit
Origin of funds	Entrepreneurs' friends and family (love money), competitions, 0% loans	Business angels, public authorities (subsidies), calls for private savings (crowdfunding, seed money)	Early stage venture capital companies, corporate venture funds backed by a large group	Late stage venture capital companies, corporate venture funds backed by a large group	
Funding round, corresponding amount and average amounts invested	Pre-seed (€20–50k)	Seed round (€50–500k)	Series A and B ^a (€500k–10m)	Serie C and beyond – €10–30m, the ticket for Series C and D – €30–100m beyond Series D (Growth equity for tickets above €100m)	

a. The letter of the series corresponds to the order of the round, excluding the seed round. Thus, a series A corresponds to the first round. A series B corresponds to a second round and a series F to the sixth round.

Source: DG Trésor based on CAE (2016).

Lastly, a company may be financed through a takeover by a group (directly or through its corporate venture

fund), which may lead to a risk of predation (see Box 2).

(13) C. Casamatta (2003), "Financing and Advising: Optimal Financial Contracts with Venture Capitalists", *Journal of Finance*, vol. 18, p. 1097-1137.

(14) Cornelli F. and O. Yosha (2003), "Stage financing and the role of convertible securities", *Review of Economics Studies*, vol. 70, p. 1-32. Bienz C. and J. Hirsh (2012), "The Dynamics of Venture Capital Contracts", *Review of Finance*, vol. 16, p. 247-267.

(15) Individual non-expert investors who take a stake through digital funding platforms in return for a share of the outcome or the product (cf. Belleflamme P., Lambert T. and A. Schwienbacher (2014), "Crowdfunding: Tapping the Right Crowd", *Journal of Business Venturing*, vol. 29, p. 585-609).

(16) Individual professional investors, sometimes organised in networks to share information (cf. San José A., Roure J. A. and R. Aernoudt (2005), "Business Angels academies: unleashing the potential for Business Angel investment, *Venture Capital*", vol. 7, n°4, p. 149-165), who take equity stakes and provide strategic advice to entrepreneurs (cf. R. Sorheim (2003), "The pre-investment behaviour of business angels: a social capital approach", *Venture capital* 5(4), 337-364).

Box 2: Do equity investments in French start-ups reflect a killer intention?

While some studies emphasise the positive effect of SME takeovers by a group on the performance, R&D and productivity of the companies acquired,^a other start-up acquisitions are carried out with the aim of suppressing the innovation undertaken by the target, which could constitute a threat to the acquirer. This risk of "killer acquisition" has recently been acknowledged by the European competition authorities.^b A recent paper^c estimates that "predatory acquisitions" account for 6.4% of takeovers in the US pharmaceutical sector.

A specific analysis^d has been carried out to assess the impact of a financial investment on the performance of a start-up in France. By defining the scope of start-ups as companies that have been awarded funding under the JEI scheme at least once in France, the performance gap between acquired and independent start-ups is quantified. However, these two groups of companies are not necessarily comparable: acquired start-ups have, even before the acquisition of a stake by a group, very specific characteristics (more staff, more capital, etc.) which may bias any ex-post comparison. These potential biases are corrected by econometric tools (difference in differences method with propensity score matching).

The analysis concludes that start-up acquisitions have no impact on the company's R&D performance (ratio of R&D expenditure to workforce), but significantly improve other performance indicators with, on average, two years after the acquisition, a significant increase in turnover (+38%), headcount (+12%) as well as exports (+44%). Thus, an acquisition accelerates the innovation's industrialisation process carried out by the start-up.

These estimates also indirectly quantify the prevalence of "predatory acquisitions" among French start-ups. It is estimated that less than 6% of these acquisitions were motivated by such a goal.

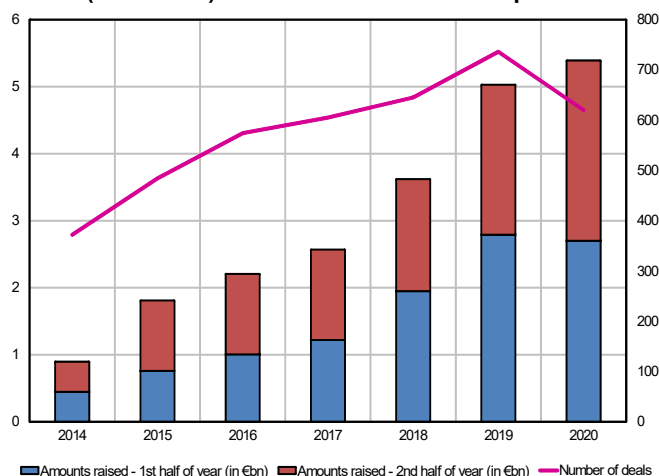
- a. A. Gazaniol (2014), "Quel impact des fusions/acquisitions sur les performances des entreprises rachetées ?", *DG Trésor working document*.
- b. The European Commission has recently announced its willingness to examine proposed acquisitions upon referral by national authorities on the basis of Article 22 of the EC Merger Regulation (regulation 139/2004), including those that do not meet the national notification thresholds, thus taking into account start-ups whose size is normally too small to fall within the scope of these thresholds (see French Competition Authority, Communication of 15 September 2020).
- c. Cunningham C., Ederer F. and Ma, S. (2019), "Killer Acquisitions", *SSRN Working papers*.
- d. Roulleau G., Hafied F. and C. Rachiq (2021), "Prises de participation financière dans les start-ups françaises: prédation ou développement ?", *DG Trésor working document* no. 2021/1, February.

In recent years, the venture capital industry has grown significantly under the impetus of Bpifrance,¹⁷ which encompasses a broad spectrum of start-up financing.¹⁸ In 2020, funding rounds by start-ups raised €5.4bn, a 198% increase since 2015 (see Chart 4). This puts France in second place in Europe¹⁹ (including the United Kingdom), despite some shortcomings in the late-stage segment in absolute terms (in 2020, the

cumulative amount of funds raised above €50m totalled €6.5bn in the United Kingdom, €3.7bn in Germany and only €2.4bn in France),²⁰ although the country is catching up (89% up on 2019).²¹ These positive results are due in particular to the proactive approach of the Tech Plan, which helped to safeguard fundraising during the pandemic.

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- (17) In 2019, Bpifrance continued to lead the pack as one of the most active funds in Europe and ranked third in Europe in terms of the number of participations in Series A and B rounds, with 20 deals (see *Crunchbase News*, (2020), "European Venture Report: VC Dollars Rise In 2019").
 - (18) Bpifrance's offering addresses all the gaps in the innovation financing market, using instruments that are calibrated both at sectoral level (Fonds Ambition Numérique, Innobio Fund) and at the level of the various stages of development (French Tech Seed Fund, Large Venture Fund).
 - (19) Behind the UK (€12.71bn raised by UK start-ups in 1,136 deals) and ahead of Germany (€5.25bn raised by German start-ups in 372 deals).
 - (20) EY, (2020), "Baromètre du capital-risque en France".
 - (21) The mandate given to Philippe Tibi by the Minister for the Economy should make it possible to channel €6bn of savings managed by insurance and asset management companies into venture capital with a view to setting up funds of critical size that can invest more substantial amounts from 2020 onwards (P. Tibi (2019), "Financer la quatrième révolution industrielle, Lever le verrou du financement des entreprises technologiques").

Chart 4: Total venture capital raised by start-ups in France (2015-2019) and number of deals completed



Source: EY (2021), "Baromètre du capital-risque en France".

How to read this chart: The right vertical axis indicates the total amount of venture capital raised in €bn by French start-ups over the period under consideration. The left vertical axis corresponds to the number of venture capital deals.

3.2 European venture capital nevertheless lags far behind the US and Asian venture capital industries

From an international perspective, European venture capital falls far short of US venture capital, both in terms of amounts and numbers of deals. In 2019, European start-ups (\$34bn in 2,893 deals) raised just

over one-quarter of what US start-ups achieved (\$126bn raised in 8,712 deals) and about half of that of Asian start-ups (\$56.8bn raised in 2,645 deals). The lack of access to venture capital mainly relates to major late-stage financing. The median size of a late-stage fundraising round in Q3 2020 was twice as large in the US as in Europe (including the UK).²² This is due in particular to the smaller assets of pension funds in Europe and the greater risk aversion of European institutional investors, who are underexposed to tech stocks (7% of the assets of life insurance investment funds in France, compared with 19% of the assets of US stakeholders, for example).²³ This reduced allocation can be partly attributed to prudential rules applicable to insurers, which penalise investments in unlisted shares. These are subject to very high capital charges under the Solvency 2 prudential framework. Insurers must be able to absorb a 49% loss of value on the unquoted shares they hold, which is much stricter than what is required for other asset classes. The weakness of the late-stage segment implies a risk of breaking the capital link of promising start-ups with early-stage funding in Europe – which are then encouraged to raise larger amounts from non-European investors. This may result in a European drop-out²⁴ in terms of the number of unicorns.²⁵

(22) KPMG (2020), Venture Pulse, Q3.

(23) P. Tibi (2019), *Ibid.*

(24) As of October 2020, the EU27 had 33 unicorns out of a worldwide total of 491 (i.e. 7% of the total). These included 12 in Germany and 7 in France (to date: Blablacar, Deezer, Doctolib, OVH, Meero, Miraki, Voodoo). It is worth noting that the United Kingdom, the leading European venture capital market, had 23 unicorns, more than France and Germany combined. The United States had 236 unicorns (or 48% of unicorns worldwide) and China 119 unicorns (24%) (see *CB Insights*, October 2020, "The Global Unicorn Club").

(25) A unicorn is an unlisted (i.e. privately-funded) company valued at \$1bn (see European Commission, (2016) "How to Catch a Unicorn", JRC Technical Reports).

Publisher:

Ministère de l'Économie, des
Finances, et de la Relance
Direction générale du Trésor
139, rue de Bercy
75575 Paris CEDEX 12

Publication manager:

Agnès Bénassy-Quéré

Editor in chief:

Jean-Luc Schneider
(01 44 87 18 51)
tresor-eco@dgtresor.gouv.fr

English translation:

Centre de traduction
des ministères économique
et financier

Layout:

Maryse Dos Santos
ISSN 1962-400X
eISSN 2417-9698

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