

Report submitted to the French Minister
for the Economy and Finance

Financing the Fourth Industrial Revolution

Solving the financing grid-lock
for technology companies

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Summary

1. Large-scale investments in disruptive technologies: a vital issue in terms of France's sovereignty and crucial to our future prosperity

In the fourth industrial revolution, Europe lags far behind the United States and China

According to several key performance indicators, the European Union accounts for nearly a quarter of the world's GDP but only 10% of its emerging technology¹.

As regards newly-founded companies, money raised by European start-ups accounted for only 10% of global fundraising in 2018, well behind the United States (53%) and China (27%, up from 10% in 2013)². Of the world's 372 unicorns³ at mid-July 2019⁴, 182 were American, 94 were Chinese and only 45 were European⁵.

In terms of companies that are well established in their market, the 2018 Forbes' list of the 100 largest listed digital companies⁶ includes 49 American companies, 14 Chinese ones and only 12 European ones, of which only one was French (Dassault Systèmes)⁷.

Industrial power: a prerequisite for political leadership

France was the second home of the first industrial revolutions, behind the UK but ahead of the other major European countries. They served as the source of France's current economic power and its ability to maintain considerable political influence. The major empires of the 18th and 19th centuries that failed to embark on this industrial and technological adventure have been consigned to history⁸. Many of our current large corporations are both originators and heirs of this global leadership. This arises from the fact that France has stayed close to the technology frontier.

As a result, investing in disruptive technologies is of critical importance for our country. The aim is to be amongst the leaders of the "fourth industrial revolution". By harnessing cognitive power⁹, the current revolution promises huge productivity gains. It started at the end of the last century with new information and communication technologies and is now entering its decisive phase. France wants to be a major player in this revolution, continuing its long, preeminent tradition in industry and science.

Our country can indeed continue to play a leading role in this new revolution. There is a great deal at stake. Firstly, ensuring that technological leaders of the 21st century can flourish in France. Secondly, guaranteeing prosperity for French citizens, because their living standards depend on

¹ Global R&D investment, across all sectors, provides a more positive picture. The EU's share amounted to \$350 billion (19% of the global total) in 2016, as opposed to \$476 billion for the United States and \$371 billion for China. Source: UNESCO, "How much does your country invest in R&D?" (2018).

² Source: KPMG, "Venture Pulse Q4 2018", data provided by PitchBook.

³ Unlisted start-ups valued at more than \$1 billion.

⁴ Source: CB Insights, "The Global Unicorn Club". List continually updated.

⁵ Including only five French unicorns: BlaBlaCar, Deezer, Doctolib, Meero and OVH.

⁶ Source: Forbes, "Top 100 Digital Companies 2018".

⁷ Similar result in the Thomson-Reuters ranking.

⁸ The Empire of China, the Mughal Empire and the Ottoman Empire, despite a first-rate scientific tradition.

⁹ In the same way that the first two revolutions harnessed mechanical power, cognitive power will be harnessed through such means as artificial intelligence, robotics, the internet of things, self-driving vehicles and biotech.

collectively harnessing modern production means. The lesson from the last 40 years is that success is never a given.

The average age of the CAC 40 companies is over 100 years. This is an indication of the quality, the level of technological investment¹⁰ and the resilience of our large corporations. However, only one “young”¹¹ technology company – Dassault Systèmes – has joined the elite ranks of French capitalism. By contrast, the technology sector represents around 30% of the S&P 500’s market capitalisation in the United States¹² due to Google, Apple, Facebook, Amazon and Microsoft. These companies are less than 40 years old.

Innovation is crucial for France's prosperity

Alongside capital and labour, productivity is a key factor for GDP growth – and thus for the prosperity of a nation and its citizens – provided that effective redistribution mechanisms are in place. History has a great deal to teach us in this respect. Productivity gains are traditionally associated with technological progress. There are three key advantages in developing and financing the most productive companies, as shown by the discussions around France's new digital services tax:

- ◆ Increasing the tax and social security base
- ◆ Keeping technology-generated rents, paid by consumers to the shareholders of large digital companies, within the borders of that State
- ◆ Developing a high level of employment. In the United States, high-growth start-ups account for almost 50% of new jobs¹³

France has many advantages

France's assets put it in the running to be a leader of the fourth industrial revolution:

- ◆ High-level fundamental research, with France ranking 7th in the world by number of scientific publications (3.2% of the total between 2014 and 2016)¹⁴
- ◆ Total R&D expenditure of around \$60 billion, the sixth-highest in the world (3.5% of the total in 2016)¹⁵
- ◆ Large numbers of talented engineers and scientists, with almost 50,000 engineering degrees and PhDs awarded every year¹⁶ by world-renowned universities and engineering schools (Pierre et Marie Curie, Paris-Saclay, Strasbourg, Grenoble Alpes, Montpellier and Aix-Marseille universities, Ecole Polytechnique, Mines ParisTech, CentraleSupélec, Télécom ParisTech, ESPCI ParisTech etc.). The cost of employing these specialists is up to 50% lower than in Silicon Valley, particularly because of France's research tax credit¹⁷

¹⁰ 41 French companies accounted for 3.7% (\$29 billion) of total R&D expenditure by the world's 1,000 largest companies. Source: Strategy&, "Global Innovation 1000" (November 2018). Figures for the most recent financial year ending 30 June 2018.

¹¹ Less than 40 years old.

¹² Source: S&P Dow Jones Indices, as at 31 January 2019. The figure includes the contribution of the GICS "Information Technology" and "Communication Services" sectors.

¹³ Source: Fondation Kauffman, "The Economic Impact of High-Growth Firms" (June 2016).

¹⁴ Source: French Ministry of Higher Education, Research and Innovation, "*L'Etat de l'enseignement supérieur et de la recherche en France no. 11*" ("The state of higher education and research in France, No. 11") (July 2018).

¹⁵ Source: UNESCO, "How much does your country invest in R&D?" (2018).

¹⁶ Source: French Ministry of Higher Education, Research and Innovation.

¹⁷ Source: Le Figaro, "*Le cri d'alarme d'un Français de la Silicon Valley*" ("The warning cry of a Frenchman in Silicon Valley") (February 2014).

- ◆ A robust entrepreneurial culture, with 60% of 18-29 year olds wanting to set up their own company¹⁸ and almost 1,400 start-ups having secured Series A funding in the last five years¹⁹
- ◆ A strong industrial tradition and many elite large corporations that have become global or European leaders in their sector, such as Air Liquide, Airbus, BNP Paribas, Bouygues, Capgemini, Carrefour, Danone, Dassault-Systèmes, Engie, Essilor, Legrand, L'Oréal, LVMH, Michelin, Orange, PSA, Publicis, Renault, Safran, Sanofi, Saint-Gobain, Schneider Electric, Sodexo, Total, Valeo, Veolia and VINCI
- ◆ Abundant financial savings, with household savings exceeding €5 trillion²⁰
- ◆ Last but not least, membership in the European Union, which allows our firms to take advantage of the Single Market in the world's leading economic region, the free movement of talent, the freedom of establishment within the EU, involvement in major technological and scientific projects, and access to inexpensive funding due to a stable and well-respected currency. France has the capacity to be Europe's premier technology hub

However, France's results in terms of technology start-ups is not a reflection of this strong position. Our opinion is that funding difficulties are a key limiting factor. We believe that those difficulties result from a twofold market failure.

2. A twofold market failure, due to a lack of capital and expertise in deploying capital effectively

An insufficiently large domestic commercial market and shortcomings in market infrastructure and regulations are frequently cited as the biggest roadblocks for French technology companies. The former has not prevented Israel or Sweden from achieving notable success, and although the latter is sometimes troublesome²¹, it is not critical at an operational level. We believe that, in terms of initial public offerings, **the key issue is the existence of a broad and deep financial market. Accordingly, we have focused on the essence of a stock market: a venue bringing together supply (issuers) and demand (investors) for shares.**

For technology companies, there is a twofold market failure: there are few shares available to buy and low potential demand.

Insufficient supply of shares

As regards the supply of shares, start-ups generally have no difficulty financing their early stages of development. France has a promising pool of technology companies. However, their growth is curtailed by a lack of late-stage funding (fundraising of over €30-40 million).

French venture capital funds are smaller than their main foreign rivals. The largest French funds have between €200 million and €300 million under management. Because of investment diversification rules, French funds are rarely able to contribute more than €30 million to a given funding round, whereas the final round enabling a company to achieve unicorn status generally exceeds €100 million.

¹⁸ Source: OpinionWay survey for Salon des Entrepreneurs (January 2017).

¹⁹ Source: EY, "Venture Capital Barometer" for France. Series A: first fundraising round in which a venture capital fund takes part.

²⁰ Source: Banque de France, "Rapport de l'Observatoire de l'épargne réglementée 2017" ("Report by the tax-assisted savings observatory 2017"). Figures at end-2017.

²¹ Particularly as regards capital increases.

As a result, at the critical stage of their international development, companies have three options: grow their business with the support of foreign venture capital funds²², sell out before they have reached maturity, or an initial public offering (IPO).

In reality, an IPO is often a last resort for companies that have not yet matured and have been unable to raise money from venture capital funds or find a trade buyer. As a result, the median market cap of French tech companies introduced in the last three years has been €57 million²³. By comparison, the median market cap of tech companies at the time of their introduction on the NASDAQ and NYSE in 2018 was \$608 million for the 214 companies analysed by Crunchbase.

Initial public offerings are fairly rare in France. When they take place, they do not generally raise enough funds to transform the issuing company.

Very weak informed demand for shares in listed technology companies

As regards demand for shares, France is the largest asset management market in continental Europe, with almost €4 trillion in assets under management (AuM)²⁴. That strength is reflected in the global asset manager league table²⁵, which features four French firms in the top 30: Amundi, Natixis Investment Managers, AXA Investment Managers and BNP Paribas Asset Management.

However, looking at the world's top 30²⁶ open-end “global tech” funds in terms of AuM, we see that European funds play only a minor role, and that no French funds at all appear. Global tech funds have one thing in common: they are managed by technology specialists, who make investment decisions based on their convictions and understanding of innovative companies’ novel business models. Their absence in Paris explains why the best French companies choose to list exclusively on NASDAQ²⁷.

France also has no²⁸ “crossover” or “pre-IPO” funds, which are generally managed by asset managers and invest in start-ups at the time of the fundraising round preceding their IPO. They play a key role of accompanying companies on the path to an IPO – helping them with governance issues, understanding the expectations of stock market investors, determining their valuation, and presenting the company to the asset manager’s other funds – and ensuring that the IPO is a success by investing their own money and sending a validation signal that is well understood by the market.

This situation is caused by French institutional investors – which grant large volumes of investment mandates to French asset managers – being under-exposed to the tech sector.

For example, let us look at insurance companies, because of their share in households’ financial savings (40% of the total) and because we have accurate figures for this area²⁹. As part of their asset allocation role, they grant mandates to asset managers. On a “look-through” basis (i.e. taking into account the underlying assets of collective investment products), the general funds of life insurance and mixed insurance companies had equity investments of €230 billion, 11.3% of their

²² Such as Index Ventures, General Atlantic and NEA.

²³ Source: Thomson Reuters Eikon, 4 October 2018.

²⁴ Source: Association Française de Gestion (AFG), the French asset management association.

²⁵ Source: IPE, "Top 400 asset managers 2019". Figures at 31 December 2018.

²⁶ Source: Morningstar. The league table only takes into account open-end funds, not mandates or ETFs. Information about mandates is not publicly available. However, when an asset manager has been granted a mandate, it often replicates that mandate via an open-end fund. Lastly, ETFs are passively managed, and so fall outside the scope of this report.

²⁷ Since Dassault Systèmes in 1996, no technology company has been IPO-ed on the French market with a valuation of over €1 billion. All such companies have chosen to list in the Nasdaq, following the example of Business Objects in 1994: Criteo (2013), DBV Technologies (2014), Cellectis (2015) and Talend (2016).

²⁸ With the exception of Sofinnova's Crossover Fund (€275 million) raised in April 2018, which focuses on biotech companies.

²⁹ Tax-assisted savings products are probably even more under-invested in tech stocks.

total assets under management (€2.034 trillion at end-2017)³⁰. Of their investments in listed equities, only €8.9 billion were in the tech sector, i.e. 6.9% of the listed equities held by those institutions³¹. Meanwhile, the tech sector accounts for 19% of the MSCI World index³². The vast majority of these companies' exposure to the tech sector is achieved through geographical, not thematic, allocations. **It is therefore not actively managed by technology specialists.**

3. A strategic recommendation: transform investments in the tech sector through more late-stage and global tech funds managing a total of €20 billion

Simultaneously address both market failures

Our strategic aim is to have world-class, innovative technology companies located in France. The standard development model for such companies involves initially raising large amounts of money from venture capital firms, then an IPO on a stock exchange, currently NASDAQ or one in Asia. We want Paris to become Europe's hub for tech stock listings³³.

We recommend addressing both market failures **simultaneously**. Informed demand for shares needs to be increased immediately, even though there will be a two- to five-year wait for an increase in the supply of shares from listable French start-ups. Teams investing in listed shares need to be given time to build up their operations, develop a track record, attract new money and contribute to France's technology ecosystem. In this way, competent and recognised investors will be present in the market when the next cycle of IPOs begins.

To increase the number of tech companies that are candidates for an IPO in France, a competitive group of late-stage funds – each with more than €1 billion under management – and large global tech listed equity funds is required

In our view, therefore, the lack of late-stage funds is leading to an insufficient supply of shares, and listed equity funds based in France do not have sufficient expertise to generate demand for such shares when they do become available. We recommend bolstering both supply and demand:

- ◆ **By inviting institutional investors to support the venture capital funds focused on the late-stage segment and based in France** so that such funds can achieve the critical mass needed to take part in very large start-up fundraising rounds. Critical mass in this area is around €800 million to €1 billion of AuM. Some French teams with strong track records are in the process of raising such amounts. **The aim is for France to have 10 late-stage funds with AuM of at least €1 billion each within three years**
- ◆ **By encouraging the emergence of global tech listed equity funds, whose management teams are primarily based in France.** We use the terms "global tech" because the funds will of course be investing in technology companies listed on stock exchanges around the world, given that the tech sector has a global playing field. A fund cannot professionally value a French tech company without being exposed to its US, Chinese, Japanese or South Korean competitors. Since France does not currently have a sufficiently large number of sound listed tech companies, these funds will initially invest more in foreign companies. The skills that asset managers acquire through these investments will make them credible

³⁰ A consequence of Solvency 2. However, we are looking at tech investments relative to listed equity investments as a whole.

³¹ Source: ACPR at our request.

³² Source: MSCI World Index at 31 December 2018.

³³ However, Paris will not be the sole listing venue for most French companies. Nasdaq will remain very attractive because of the depth of the market and the quality of investors trading on that exchange. Our aim is to encourage dual listings by having a pool of liquidity located in France.

contacts for French company managers in future IPOs³⁴. When the late-stage investments have had their effect, the balance of portfolios will naturally shift towards French companies. It should be noted that these funds will not have any benchmarking obligation. Constraints in terms of position sizes will prevent them from owning large volumes of shares in companies that do not fit our criteria, such as the foreign tech giants³⁵

To set up global tech funds, attract money and develop expertise

To create global tech funds, money and expertise are required. More specifically, France needs to attract around €10 billion and recruit 50 asset managers in three years' time. To rank among the world's top 30 global tech funds, AuM of at least €1 billion are required.

This is the figure that allows a fund to be part of the ecosystem, including playing the role of cornerstone investor in IPOs with valuations of around €1 billion, or simply to be allocated shares in deals, particularly those taking place outside of France. It is also the figure that generates a level of fees allowing an asset manager to recruit a team of 5-10 specialist managers dedicated to the fund.

If France wants a solid base of shareholders in tech companies, both at national and international level, it needs 5-10 global tech funds. This will make the French financial place very appealing, allowing it to attract listings of other European tech companies and making Paris the venue for the "European NASDAQ". This target may appear ambitious given the current situation. But it is actually modest given that the €2 trillion in assets managed by insurers' general funds and those funds' under-exposure to tech stocks (€9 billion). It is even more modest in comparison with the €4 trillion managed by French asset managers in total.

Attract money from institutional and retail investors to global tech funds

The €10 billion that we believe should be invested in global tech funds could be attracted in two ways.

- ◆ Through mandates granted by public- and private-sector asset allocators to French asset managers, either directly, as certain major insurers already do in France, or via several French funds in which public money would be invested
- ◆ Through investments by private individuals³⁶ in funds that replicate the strategies of institutional mandates, via unit-linked life insurance and employee savings plans, based on original models that have already attracted a large amount of money. These funds could be specialist technology funds for informed investors, or diversified funds with a "French Tech Investment" label and an actively managed technology sub-fund for employee savings plans

In our view, some €2 billion could be attracted from private individuals, which means that €8 billion would have to come from institutional investors.

Available expertise

Expertise already exists in France, within both large and small asset management companies. There is also a great deal of expertise in London, often among French nationals. The requisite

³⁴ This is not the case today, according to the evidence we collected.

³⁵ Google, Microsoft, Facebook, Apple and Amazon, amongst others.

³⁶ According to an Odoxa-Linxea survey for Les Echos on "French people's relationship with the stockmarket and savings products" published in March 2019, for French people prepared to invest or invest more in the stockmarket, "growth sectors such as new technologies and biotech" hold the most appeal, with 47% of people showing interest in them.

know-how could be obtained through requests for proposals (subject to a residence requirement) offering long-term visibility³⁷.

4. Develop an ideological and cultural narrative in which there is a “burning need” to invest in the tech sector in order to win the battle of ideas

Under-investment in the tech sector is the result of certain habits encouraged by prudential standards that ignore the strategic function of risky asset classes over the long term. It is impossible to lay the foundations for a nation’s industrial future through exclusively capital-guaranteed financial products³⁸. It is therefore important to continually remind the French public – who are inclined to think that history has come to an end and that the hierarchy of living standards between countries is set in stone –about the lessons of political history and economic theory.

We therefore recommend expressing and acting on a strong political will, portraying the development and funding of French tech companies as a “burning need”. This is a logical extension of the desire to make France a “start-up nation”. French Tech needs to be promoted as a major investment theme, like socially responsible investment (SRI) and solidarity-based investment. This is a vital part of the process, so that participants in the financial ecosystem will rally to this grand cause.

It is also important to specify that investing in the tech sector is not a charitable act in support of a public policy. **We want to repair a market failure using market mechanisms.** Although past performance does not of course guarantee future performance, it shows that tech investments can deliver attractive financial returns for investors. This also holds over the long term: imagine the return delivered by an equity portfolio in 1950 that excluded the automotive, healthcare and aerospace sectors!

³⁷ The Pictet asset managers recently recruited by Natixis IM are located in France.

³⁸ 62% of French household wealth is held in capital-guaranteed products (non-unit-linked life insurance plans and bank deposits, including tax-assisted accounts such as the Livret A and Plan d'épargne logement or PEL). Source: Banque de France, *"Rapport de l'Observatoire de l'épargne réglementée 2017"* ("Report by the tax-assisted savings observatory 2017"). Figures at end-2017.

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Introduction

Bruno Le Maire, Minister for the Economy and Finance, has tasked us with putting forward ways to boost market-based funding of French technology companies. The tech sector is very capital-intensive, and the story of the world's leading technology companies testifies to the fact that they all went through multiple fundraising rounds. That story is now being written mainly in the United States and China.

However, France wants to be a major player in the fourth industrial revolution. Part of its strategy is to make it easier for companies to access large amounts of funding on an ongoing basis. For this reason, we wish to promote ideas and processes that would considerably increase the number of IPOs and the amount of capital raised by innovative France-based companies.

These types of transactions do not take place in a vacuum. An IPO is one stage in a structured process of corporate growth. **To understand the subject properly, we must therefore look at both "upstream" financing (generally through venture capital) and the financial market funding ecosystem.**

Regulation is a key issue, but falls outside the scope of our remit

Regulation of savings is a key issue. Funding for European companies is hampered by regulations that restrict the deployment of capital and the operation of equity markets:

- ◆ The Solvency 2 directive³⁹ encourages insurance companies to reduce their exposure to equities for prudential reasons
- ◆ One of the initial aims of MiFID2 was to manage conflicts of interest between asset managers and their clients. An unintended consequence of this has been a significant reduction in research budgets and coverage of small- and mid-cap stocks⁴⁰

However, we have chosen not to focus on regulation, and instead **assume no change in the regulatory environment**, for two main reasons:

- ◆ These issues are very well-known and described⁴¹. The public authorities are well aware of them and are actively negotiating with their European partners to improve the situation. We cannot add any value in this respect⁴²
- ◆ The funding difficulties of high-tech companies date back further than the introduction of these regulations. Dassault Systèmes floated in 1996. It is the most recent French IPO of a tech company valued at more than €1 billion

³⁹ By introducing greater capital adequacy requirements for this asset class.

⁴⁰ According to a survey of 55 asset managers, 61% have curtailed the number of research analysts they use by between 20% and 70%. Source: Liquidnet, "Unbundling Research: Canary in the Coalmine" (December 2018), quoted in the *Financial Times* article "Mifid II has thrown up several unintended consequences" (January 2019).

⁴¹ See in particular Nathalie Oriol and Fabrice Pansard, "*La directive Solvency II: quels impacts pour les marchés et le financement de l'économie ?*" (Solvency II directive: what will be its impact on markets and the financing of the economy?"), Conseil d'Analyse Economique. "*Rapport sur le financement de l'économie dans le nouveau contexte réglementaire*" ("Report on the financing of the economy in the new regulatory context"), La Documentation Française, pp.153-174, 2013, 978-2-11-009301-1; Severinson, C. and J. Yermo (2012), "The Effect of Solvency Regulations and Accounting Standards on Long-Term Investing: Implications for Insurers and Pension Funds", OECD Working Papers on Finance, Insurance and Private Pensions, no. 30, OECD, Paris.

⁴² It is also hoped that the EU's capital markets union initiative will address the adverse side-effects of current regulations.

Focus on market failures

This is to say that our funding problems have deep-seated and national causes, on which we can take action. In our view, they are the result of a twofold market failure, i.e. the small number of companies suitable for listing, and limited expertise in managing tech-focused investment portfolios. We believe that the problem can be solved through proactive public policy combined with reasonable, profitable private-sector investment. Finally, we believe that market failures should be corrected with market mechanisms, not with large-scale injections of public money. These form the foundations of our recommendations.

1. Large-scale investments in disruptive technologies: a vital issue in terms of France's sovereignty and crucial to our future prosperity

1.1. In the fourth industrial revolution, Europe lags far behind the United States and China

According to several key performance indicators, the European Union accounts for 22%⁴³ of the world's GDP but only 10% of its **emerging** technology⁴⁴.

As regards newly-founded companies, money raised by European start-ups accounted for only 10% of global fundraising in 2018, well behind the United States (53%) and China (27%, up from 10% in 2013)⁴⁵. Of the world's 372 unicorns⁴⁶ at mid-July 2019⁴⁷, 182 were American, 94 Chinese and only 45 European⁴⁸.

In terms of companies that are well established in their market, the 2018 Forbes list of the 100 largest listed digital companies⁴⁹ includes 49 American companies, 14 Chinese ones and only 12 European ones, of which only one was French (Dassault Systèmes).⁵⁰

1.2. Industrial power: a prerequisite for political leadership

France was the second home of the first industrial revolutions, behind the UK but ahead of the other major European countries. They served as the source of France's current economic power and its ability to maintain considerable political influence. However, several great empires have disappeared because they were unwilling or unable to challenge the dogma on which their power was based. The legacy of the Renaissance was exclusively European, as was the victory of liberal political philosophies and the free flow of ideas. The industrial revolution was also a consequence of this huge intellectual transformation. It enabled the West to enjoy massive productivity growth and dual-use technologies, giving it a decisive military advantage that demographic giants such as the Chinese, Mughal and Ottoman empires could not withstand, despite their long and brilliant scientific traditions.

Many of our current large corporations are both originators and heirs of this global leadership. This results from the fact that France has stayed close to the technology frontier. For example, the process for liquefying air was originally developed by Air Liquide, and numerous innovators in the automotive sector in the early 20th century were French, whose successors include PSA, Renault, Valeo and Michelin. The same is true in the aerospace sector (Airbus) and many other industries (chemicals, energy, environmental, etc.).

As a result, investing in disruptive technologies is of critical importance for our country. The aim is to be amongst the leaders of the "fourth industrial revolution". By harnessing cognitive power⁵¹, the current revolution promises huge productivity gains. It started at the end of the last century

⁴³ The figures are 24% for the US and 15% for China. Source: IMF, "World Economic Outlook Database" (April 2018). GDP in current dollars.

⁴⁴ Global R&D investment, across all sectors, provides a more positive picture. The EU's share amounted to \$350 billion (19% of the global total) in 2016, as opposed to \$476 billion for the United States and \$371 billion for China. Source: UNESCO, "How much does your country invest in R&D?" (2018).

⁴⁵ Source: KPMG, "Venture Pulse Q4 2018", data provided by PitchBook.

⁴⁶ Unlisted start-ups valued at more than \$1 billion.

⁴⁷ Source: CB Insights, "The Global Unicorn Club". List continually updated.

⁴⁸ Including only five French unicorns: BlaBlaCar, Deezer, Doctolib, Meero and OVH.

⁴⁹ Source: Forbes, Top 100 Digital Companies 2018.

⁵⁰ Similar result in the Thomson-Reuters ranking.

⁵¹ In the same way that the first two revolutions harnessed mechanical power, cognitive power will be harnessed through such means as artificial intelligence, robotics, the internet of things, self-driving vehicles and biotech.

with new information and communication technologies and is now entering a decisive phase. France wants to be part of this revolution, continuing its long preeminent tradition in industry and science.

Our country can indeed continue to play a leading role in this new revolution. There is a great deal at stake. Firstly, ensuring that the economic and technological leaders of the 21st century can flourish in France. Secondly, guaranteeing prosperity for French citizens, because their living standards depend on collectively harnessing modern production means. The lesson of the last 40 years is that success is never a given.

The average age of the CAC 40 companies is over 100 years. This is an indication of the quality, the level of technological investment⁵² and the resilience of our large corporations. However, only one "young"⁵³ technology company – Dassault Systèmes – has joined the elite ranks of French capitalism. By contrast, the technology sector represents around 30% of the S&P 500's market capitalisation in the United States⁵⁴ due to Google, Apple, Facebook, Amazon and Microsoft. These companies are less than 40 years old.

1.3. Innovation is crucial for France's prosperity

Alongside capital and labour, productivity is a key factor for GDP growth – and thus for the prosperity of a nation and its citizens – provided that effective redistribution mechanisms are in place. History has a great deal to teach us in this respect. Productivity gains are traditionally associated with technological progress. There are two key advantages in developing and financing the most productive companies, as shown by the discussions around France's new digital services tax:

- ◆ Increasing the tax and social security base
- ◆ Keeping technology-generated rents, paid by consumers to the owners of these large digital companies, within the borders of that State

As well as macroeconomic considerations, this has the benefit of strengthening the social fabric by creating jobs and giving a positive vision of the future in a rather pessimistic country. According to the Boston Consulting Group, French start-ups, properly funded and supported, could create a net 400,000 jobs by 2022,⁵⁵ i.e. around a third of the net 250,000 jobs created each year by the private sector in France.⁵⁶ The jobs potential is even greater if we apply figures seen in the United States, where start-ups account for 50% of job creation.⁵⁷

1.4. France has many advantages

France's assets put it in the running to be a leader of the fourth industrial revolution:

⁵² 41 French companies accounted for 3.7% (\$29 billion) of total R&D expenditure by the world's 1,000 largest companies, source: Strategy&, "Global Innovation 1000" (November 2018). Figures for the most recent financial year ending 30 June 2018.

⁵³ Less than 40 years old.

⁵⁴ Source: S&P Dow Jones Indices, as at 31 January 2019. The figure includes the contribution of the GICS "Information Technology" and "Communication Services" sectors.

⁵⁵ Source: Boston Consulting Group and La Boussole, "Devenir une licorne ? Quel bon accompagnement à chaque étape pour les entrepreneurs" ("Becoming a unicorn? Providing entrepreneurs with the right support at each stage" (April 2018).

⁵⁶ Source: INSEE Best-case scenario.

⁵⁷ Source: Kauffman Foundation, "The Economic Impact of High-Growth Firms" (June 2016). See also academic research relating to youth employment cited in "Plus de marché pour plus d'Etat !" ("More market for more government!") by F. Kramarz and P. Tibi, RB-Eyrolles, 2016.

- ◆ High-level fundamental research, with France ranking 7th in the world by number of scientific publications (3.2% of the total between 2014 and 2016)⁵⁸
- ◆ Total R&D expenditure of around \$60 billion, the sixth-highest in the world (3.5% of the total in 2016)⁵⁹
- ◆ Large numbers of talented engineers and scientists, with almost 50,000 engineering degrees and PhDs awarded every year⁶⁰ by world renowned universities and engineering schools (Pierre et Marie Curie, Paris-Saclay, Strasbourg, Grenoble Alpes, Montpellier and Aix-Marseille universities, Ecole Polytechnique, Mines ParisTech, CentraleSupélec, Télécom ParisTech, ESPCI ParisTech etc.). The cost of employing these specialists is up to 50% lower than in Silicon Valley, particularly because of France's research tax credit⁶¹
- ◆ A robust entrepreneurial culture, with 60% of 18-29 year olds wanting to set up their own company⁶² and almost 1,400 start-ups having secured Series A funding in the last five years⁶³
- ◆ A strong industrial tradition and many elite large corporations that have become global or European leaders in their sector, such as Air Liquide, Airbus, BNP Paribas, Bouygues, Capgemini, Carrefour, Danone, Dassault-Systèmes, Engie, Essilor, Legrand, L'Oréal, LVMH, Michelin, Orange, PSA, Publicis, Renault, Safran, Sanofi, Saint-Gobain, Schneider Electric, Sodexo, Total, Valeo, Veolia and VINCI
- ◆ Abundant financial savings, with household savings exceeding €5 trillion⁶⁴
- ◆ Last but not least, membership in the European Union, which allows our firms to take advantage of the Single Market in the world's leading economic region, the free movement of talent, the freedom of establishment within the EU, involvement in major technological and scientific projects, and access to inexpensive funding due to a stable, well-respected currency. France has the capacity to be Europe's premier technology hub

However, France's results in terms of technology start-ups is not a reflection of this strong position. Our opinion is that funding difficulties are a key limiting factor. We believe that those difficulties result from a twofold market failure, which should be addressed using market mechanisms.

⁵⁸ Source: French Ministry of Higher Education, Research and Innovation, "*L'Etat de l'enseignement supérieur et de la recherche en France no. 11*" ("The state of higher education and research in France, no.11") (July 2018).

⁵⁹ Source: UNESCO, "How much does your country invest in R&D?" (2018).

⁶⁰ Source: French Ministry of Higher Education, Research and Innovation.

⁶¹ Source: Le Figaro, "*Le cri d'alarme d'un Français de la Silicon Valley*" ("The warning cry of a Frenchman in Silicon Valley") (February 2014).

⁶² Source: OpinionWay survey for Salon des Entrepreneurs (January 2017).

⁶³ Source: EY, "Venture Capital Barometer" for France. Series A: first fundraising round in which a venture capital fund takes part.

⁶⁴ Source: Banque de France, "*Rapport de l'Observatoire de l'épargne réglementée 2017*" ("Report by the tax-assisted savings observatory 2017"). Figures at end-2017.

2. A twofold market failure, due to a lack of capital and expertise in deploying capital effectively

An insufficiently large domestic commercial market and shortcomings in market infrastructure and regulations are frequently cited as the biggest roadblocks for French technology companies. The former has not prevented Israel or Sweden from achieving notable success, and although the latter is sometimes troublesome⁶⁵, it is not critical at an operational level. We believe that, in terms of initial public offerings, **the key issue is the existence of a broad and deep financial market. Accordingly, we have focused on the essence of a stock market: a venue bringing together supply (issuers) and demand (investors) for shares.**

For technology companies, there is a dual market failure: there are few shares available to buy and low potential demand.

2.1. First market failure: insufficient supply of shares

Despite a number of attractive potential candidates (see section 2.1.1.3.), there are currently few French tech companies with listing potential, i.e. companies that meet the market's key criteria of having a profitable strategy and business model, reasonably predictable cash flows, a diverse set of products and clients, and a management team capable of showing the discipline required by the market. The few companies that have recently decided to list did so at an immature stage. When their results significantly fell short of the forecasts presented to the market, the response was swift and blunt.

We describe these companies as immature at the time of listing because they were unable or unwilling to secure the late-stage funding that would have been more appropriate to their stage of development. It is this late-stage funding, through capital injections ranging between €50 million and several hundred million euros, which allows companies to expand internationally, to erect technological barriers and to prepare for an IPO. This funding is provided almost solely by venture capital funds.

2.1.1. The ongoing lack of late-stage funding for French tech companies

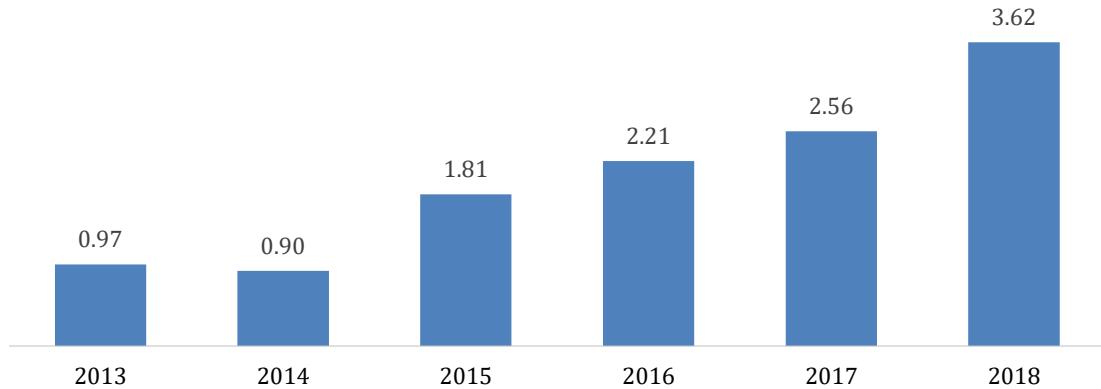
2.1.1.1. Total funding raised by French start-ups has risen by a factor of four in the last five years

According to EY's half-yearly "Venture Capital Barometer", French start-ups raised almost €3.6 billion in 2018. That is a considerable increase over the €1 billion raised in 2014 (Figure 1). In 2018, France accounted for 15% of the total amount raised and 21% of the total number of transactions in Europe, behind the United Kingdom (31% and 22% respectively) and Germany (19% and 19%)⁶⁶.

⁶⁵ Particularly as regards capital increases.

⁶⁶ Source: EY, "Venture Capital Barometer" for France.

Figure 1: Amounts raised by start-ups each year in France (€bn)



Source: EY, "Venture Capital Barometer" for France.

2.1.1.2. Large amounts of seed capital and early-stage funding for start-ups

Funds raised by French start-ups mainly come in the early stages of the funding cycle: from a few million euros at the seed-capital and Series-A stages⁶⁷ to almost €10 million for Series-B funding. These first stages accounted for 90% of the total number of fundraising transactions and 62% of the amount invested in 2018⁶⁸. They are generally used to fund the validation and commercial launch of products.

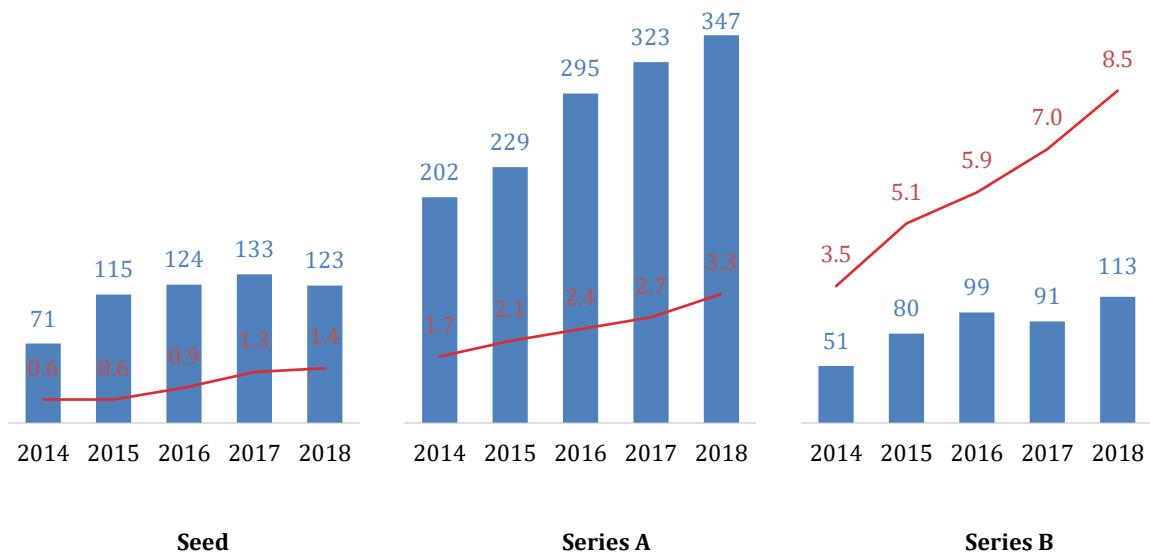
The number of these deals is growing very rapidly (Figure 2), as is the average amount raised. This means that there is a growing number of start-ups emerging. It also means that they are able to raise more money at an earlier stage. As a result, a pool of attractive start-ups is forming within the ecosystem, and they could achieve unicorn status provided that they can access larger amounts of funding at the Series C, Series D and subsequent stages. More than 100 start-ups have raised at least €20 million each since 2015⁶⁹.

⁶⁷ First fundraising round in which a venture capital fund takes part. The Series-B round is the second, and so forth.

⁶⁸ Source: EY, "Venture Capital Barometer" for France.

⁶⁹ Source: Crunchbase.

Figure 2: Number of deals (columns) and average amount raised (€m – rows) by funding round



Source: EY, "Venture Capital Barometer" for France.

This progress is due to the major presence of venture capital funds in the segment, made possible by the government's policy of supporting start-up financing through funds of funds since the early 2000s and further boosted by the launch of the "*Programmes d'investissement d'avenir*" ("Invest for the Future programmes") and the creation of Bpifrance, the French public investment bank.

2.1.1.3. Late-stage funding remains rare

However, there is a market failure in terms of late-stage funding⁷⁰, where companies raise more than €30-40 million⁷¹ to fund industrial production and international expansion and therefore to move from start-up to scale-up status. In 2018, only 7 start-ups raised more than €50 million as opposed to 9 in Germany and 25 in the United Kingdom.⁷² Overall, in the last three years (Table 1), only around 20 start-ups have raised more than €50 million in their latest funding round⁷³. To give an idea of the global competition, 189 US start-ups raised more than \$100 million each in 2018⁷⁴. In addition, the 27 start-ups around the world that reached unicorn status in the first quarter of 2019 raised an average of €260 million in total to achieve that, and €150 million in their latest funding round⁷⁵.

⁷⁰ Also known as the growth capital segment.

⁷¹ Generally corresponding to Series C or D to use the venture capital terminology.

⁷² Source: EY, "Venture Capital Barometer" for France.

⁷³ 8 start-ups have raised more than €50 million since the start of the year, as many as in the whole of 2018. This acceleration is very encouraging. However, these figures do not alter the analysis or the overall situation.

⁷⁴ Source: Crunchbase.

⁷⁵ Source: Crunchbase for fundraising data and CB Insights for the identification of unicorns.

Table 1: List of French start-ups that have raised more than €50 million since the start of 2015

Name	Sector	Date of latest fundraising	Amount of latest fundraising (€m)	Total amount raised (€m)
1. OVH	Cloud	Aug-16	250	250
2. Meero	Platform	Jun-19	203	260
3. BlaBlaCar	Platform	Sep-15	176	291
4. Voodoo	Gaming	May-18	172	172
5. Deezer	Platform	Aug-18	160	455
6. Sigfox	IoT	Nov-16	150	277
7. Doctolib	Platform	Mar-19	150	234
8. Devialet	Hardware	Nov-16	100	140
9. HR Path	Software	Apr-19	100	135
10. ManoMano	Platform	Apr-19	110	183
11. Ynsect	Hardware	Feb-19	110	132
12. Dataiku	Big Data	Dec-18	89	128
13. Wynd	Software	Jan-19	72	110
14. Actility	IoT	Apr-17	70	101
15. Evaneos	Platform	Sep-18	70	92
16. PayFit	FinTech	Jun-19	70	89
17. VadeSecure	Cybersecurity	Jun-19	70	80
18. BioSerenity	Health	Jun-19	65	83
19. Mirakl	Software	Feb-19	62	88
20. Ledger	Cybersecurity	Jan-18	61	68
21. Vestiaire Collective	Platform	Jan-17	58	116
22. Believe Digital	Platform	Jun-15	55	55
23. Ivalua	Software	May-19	54	121
24. Shift Technology	FinTech	Mar-19	53	88
25. ContentSquare	Software	Jan-19	53	107
26. Blade	Cloud	Jun-17	51	65
27. OpenClassrooms	EdTech	May 18	51	59
28. LinkbyNet	Cloud	Aug 16	50	50
29. Recommerce	Hardware	Feb 18	50	57

Source: Press releases, Crunchbase, Dealroom. Figures at mid-July 2019.

2.1.1.4. Only large funds provide late-stage funding

French venture capital funds are smaller than their main foreign rivals. The largest funds manage between €200 million and €400 million.⁷⁶ The largest is currently a Partech Ventures fund: €400 million for Partech International Ventures VII (June 2017). Ardian has a €230 million fund and Idinvest has a €340 million fund. Eurazeo can also take part in large deals because of its existing financial resources, resulting from its traditional private equity business. For French funds, the inability to show investors, in particular foreign investors, a track record of past returns also limits their ability to raise funds to be invested using a late-stage investment strategy.

In the United Kingdom, Atomico raised \$765 million in February 2017, while Index Ventures raised \$1 billion for its fourth growth fund in July 2018. Meanwhile, 18 US venture capital firms

⁷⁶ The largest funds raised in France since 2017, apart from Partech, have been by Idinvest (€340 million for Idinvest Growth Fund II), Cathay Capital (€287 million for Cathay Innovation, announced in June 2017), Alven Capital (€250 million for Alven Capital V announced in January 2017), Iris Capital (€250 million for IrisNext announced in June 2017) and Ardian (€230 million for Ardian Growth II announced in April 2018).

have raised more than \$1 billion for their latest funds. The amounts raised are rising rapidly: the size of the latest funds raised by these 18 firms is on average twice that of their previous funds⁷⁷.

Because of investment diversification rules, French funds are rarely able to contribute more than €30 million to a given funding round. According to France Invest, in 2018 they carried out only two investments of over €30 million and invested between €15 million and €30 million in only 9 companies, for a total amount of €271 million.

2.1.1.5. Adverse consequences for the growth and leadership of French tech companies

This situation is hampering the growth of French start-ups. They can be forced to fund their growth with a series of small funding rounds, which erodes management's focus and also its ambitions, particularly outside of France, as well as creating a risk of being left behind by better funded foreign rivals. **They may also, entirely rationally, decide to sell out prematurely to a rival that is better capitalised and therefore able to capture market share more quickly in sectors in which the leader often enjoys a decisive premium.**

For example, Drivy was acquired in April 2019 by its main rival Getaround, which had received \$300 million of fresh capital, essentially from SoftBank. This fundraising was impossible for the French company. Previous examples include Aldebaran Robotics (acquired by SoftBank), PriceMinister (acquired by Rakuten) and Meetic (acquired by Match.com). More generally, since the start of 2015, around 60 French start-ups have been acquired after Series A or B funding⁷⁸: Molotov by Altice, Luckey Homes by Airbnb, Netatmo by Legrand, PriceMatch by Booking, Zenly by Snap, etc. These transactions allow the ecosystem to build a track record and recycle capital, but also reveal a "glass ceiling" (at a valuation of around €200-300 million) for many companies that may have had greater ambitions.

Only a handful of elite start-ups, usually operating in the B2C segment, have so far attracted interest from foreign funds that provide late-stage funding, such as Accel Partners, Index Ventures and General Atlantic⁷⁹. For others, the market failure means that many start-ups that probably would have had no trouble raising funds in the United States have been left stranded.

2.1.2. The poor track record of tech IPOs in France is a consequence of the ecosystem's inability to provide scale-up funding to many start-ups

2.1.2.1. Immature companies that do not fully understand the workings of the financial market

When a trade sale or venture capital funding is not possible, start-ups are forced to go public to continue their growth and provide liquidity to the funds that have invested in them. An IPO is often regarded as a last resort, especially since these companies often lack the maturity needed to deal with the rigour of the financial markets.

In general, they often quickly experience problems in the market because of a lack of discipline regarding financial reporting and because their business model has not yet stabilised. The IPO route in their situation has three key drawbacks:

- ◆ A very small market cap and free float
- ◆ A lack of conviction among investors, which dump the stock at the first sign of bad news

⁷⁷ As a result of SoftBank and its \$100 billion raise. Funds with between \$2 billion and \$5 billion are leading this race for scale. Source: Crunchbase.

⁷⁸ Source: Crunchbase.

⁷⁹ Such as ManoMano, Open Classrooms and Doctolib.

- ◆ Immense difficulties in keeping promises made during the IPO, and even meeting simple short-term revenue forecasts⁸⁰

2.1.2.2. Companies that do not interest large investors

In France, the tech companies that come to market are therefore small. A company's maturity is not necessarily correlated with its size as measured by market cap. However, the latter remains a good guide to the former, particularly in the tech sector. From this point of view, France is badly placed compared with its rivals. The median market cap of technology companies going public in the last three years⁸¹ has been €57 million in France (12 companies) as opposed to €86 million in the United Kingdom and Germany (31 companies). These figures are well below those seen in the United States. The median market cap of tech companies at the time of their listing on the NASDAQ and NYSE in 2018 was \$608 million for the 214 companies analysed by Crunchbase. The average deal size also shows that France lacks any track record of large tech IPOs⁸². The figure is €64 million in France (12 companies) versus €376 million in Western Europe excluding France⁸³ (80 companies).

These companies do not attract interest from large asset managers (Table 2), who have a minimum amount they can invest⁸⁴ for management cost reasons and because small investments would have no tangible impact on their funds' overall returns. As a result, according to a major investment bank operating in Paris with which we met, large generalist asset managers only account for an average of 15-20% of the IPO order books of small- and mid-cap companies.

⁸⁰ For example, after going public in July 2018, Navya issued a profit warning in early December that year, stating that its revenue for 2018 would be around €17-19 million instead of the €30 million announced at the time of its IPO just a few months before. That announcement had serious consequences: it damaged the company's credibility, caused part of the governance team to be replaced, and knocked 80% off its share price.

⁸¹ Source: Thomson Reuters Eikon, 4 October 2018.

⁸² Like Adyen in the Netherlands, Delivery Hero in Germany and Avast in the United Kingdom.

⁸³ Germany, Belgium, Denmark, Spain, Finland, Italy, Norway, Netherlands, United Kingdom, Sweden and Switzerland.

⁸⁴ Managing a position requires a significant amount of time.

Table 2: League table of asset managers investing in French tech companies

Asset manager	Total (out of 152)	Market capitalisation	
		< €200 million (out of 116)	> €200 million (out of 36)
1. Keren Finance	33	16	17
2. Ostrum Asset Management	32	19	13
3. Norges Bank Investment Management	31	8	23
4. Meeschaert Asset Management	28	21	7
5. Amundi	28	11	17
6. HSBC Global Asset Management	27	15	12
7. UBS	27	18	9
8. Fidelity	26	4	22
9. Sycomore Asset Management	24	12	12
10. Amplegest	21	14	7
11. Dimensional Fund Advisors	21	3	18
12. DNCA Investments	19	7	12
13. Mandarine Gestion	19	6	13
14. HMG Finance	18	14	4
15. Inocap Gestion	17	7	10
16. Amiral Gestion	16	5	11
17. Humanis Gestion d'Actifs	16	10	6
18. Portzamparc Gestion	16	12	4
19. Dorval Asset Management	15	7	8
20. Talence Gestion	14	10	4
21. Tocqueville Finance	15	8	7
22. Oddo BHF Asset Management	15	4	11
23. Uzès Gestion	13	10	3
24. Raymond James Asset Management	12	8	4
25. Erasmus Gestion	11	7	4
26. La Banque Postale Asset Management	11	3	8
27. The Vanguard Group	11	0	11
28. BlackRock	10	0	10
29. Financière Arbevel	10	9	1
30. JPMorgan Asset Management	10	0	10

Source: Thomson Reuters Eikon. Figures at 4 October 2018.

Neither do they attract any interest from research analysts: their trading volumes are too small to generate sufficient brokerage fees or any serious attention from asset managers. The depth of coverage on a stock is closely correlated to the value of its free float⁸⁵.

2.1.2.3. A credibility problem

In addition to this lack of interest from investors and research analysts, long-standing investors in a newly listed company generally sell out after the lock-up period, which weakens the share price. In this situation – falling share price, limited investor base, illiquid market for the shares, almost non-existent research, damaged credibility – it is extraordinarily difficult for a company to carry out further capital increases to continue its growth. At best, such transactions can take place but result in heavy dilution. The company is weakened as a result.

⁸⁵ The coefficient of determination resulting from the simple regression between the number of analysts covering a stock (dependent variable) and the value of its free float (independent variable) – i.e. its market cap multiplied by the percentage of shares that float freely in the market – is 80% for a sample of companies that have went public in the French market in the last three years. 43 companies for which data are available. Source: Thomson Reuters Eikon, 4 October 2018.

The market credibility of IPOs as a whole is tarnished. The track record of newly listed companies in terms of investment returns is a key factor. This is one of the criteria used when investors – particularly foreign ones – consider an investment in a new transaction. A selective approach is therefore vital. We take the view that increasing the number of IPOs should not be a key objective in itself. Instead, we recommend focusing on the quality and size of transactions. Relevant indicators in this respect would be the total market cap and median value of companies floated on the market.

Restoring the market's credibility depends on floating companies that have achieved sufficient scale and maturity. It also requires a more selective approach. We therefore advise carrying out stricter pre-IPO due diligence, particularly regarding revenue forecasts, and publicising the support of one or more anchor or cornerstone investors, which would signal the quality of the candidate company.

These investors⁸⁶ consist of renowned asset managers that undertake, a few weeks before the IPO, to subscribe a substantial proportion of the shares put up for sale. This helps the transaction go smoothly by causing a “me-too” effect, generated by their good reputation among other investors. According to discussions we have had, 75% of IPOs in Sweden⁸⁷ now have at least one cornerstone investor, usually a domestic one, whereas almost none did before 2013. Between 2014 and 2017, there was at least one cornerstone investor in 65% of Swedish IPOs raising more than €36 million⁸⁸. According to Dealogic, in the Hong Kong stock market, cornerstone investors represented 58% of the amount raised in IPOs in 2016, up from 45% in 2015 and only 18% in 2010.

The rules governing cornerstone investors vary between countries. For example, no specific rules apply to them in Sweden, where they simply operate according to market practice. In Hong Kong, rules have been clearly defined by the Hong Kong Stock Exchange⁸⁹. They obtain a guaranteed allocation when the IPO takes place, even before the roadshow presenting the company to other investors. They commit to investing a certain sum, but they subscribe shares at the IPO price. In return, their names and details are published in the IPO prospectus, they cannot have any members on the board of directors and they are generally subject to a lock-up period of at least six months.

We therefore recommend encouraging French investors to play the role of cornerstone investor in IPOs in the French market, and to make this standard practice in France.

⁸⁶ A cornerstone investor has a guaranteed allocation, but that is generally in return for accepting a lock-up period and having their name published in the prospectus. An anchor investor does not have a guaranteed allocation, but does not assume obligations in return.

⁸⁷ Sweden is a good reference, because it hosts a large number of high-quality IPOs: 115 in 2017.

⁸⁸ Source: Engman, Jonathan Lu and Leeven Pehrson, Markus, "Cornerstone Investors on the Swedish IPO Market – Salvation or Damnation?" (2017).

⁸⁹ Source: HKEX, "Guidance letter HKEX-GL85-16" (January 2016, updated in February 2018).

2.2. Second market failure: very weak informed demand for shares in listed technology companies

As a result, the first objective is to vastly increase the number of French tech companies that could potentially go public. However, achieving that objective will not guarantee that they will list in France, as shown by the example of Israel (see section 2.3.), where a flourishing venture capital sector exists alongside a subdued stock market. **A company lists where its investors are based.** Our technological leaders will list in France if there is a critical mass of shareholders and sufficient liquidity in France⁹⁰. That critical mass does not currently exist and this is the second market failure that needs to be addressed.

2.2.1. French institutional investors are underinvested in the tech sector

A good example is the exposure of general life insurance funds to the tech sector, which accounts for only 7% of their listed equity exposure as opposed to the global benchmark of 19%.

The general funds (or non-unit-linked funds) of life insurance and mixed insurance companies had €2.034 trillion of assets under management at end-2017. Using the NACE categories⁹¹, the ACPR (the Banque de France's prudential control and resolution authority) provided us with information about those funds' exposure to listed tech stocks (Table 3):

- ◆ Without analysing the underlying assets of collective investment products, equity investments amounted to €156 billion, 7.7% of their total assets under management in non-unit-linked funds. In the listed equities category, €4.2 billion was invested in the tech sector, i.e. 5.9% of the total
- ◆ On a look-through basis (i.e. taking into account the underlying assets of collective investment products), equity investments totalled €230 billion, i.e. 11.3% of total assets under management in non-unit-linked funds. Of their investments in listed equities, €8.9 billion were in the tech sector, i.e. 6.9% of the listed equities held by life insurance and mixed insurance companies

⁹⁰ The best companies and those that do significant business in the United States will list in the United States anyway. For those companies, the challenge is to get them to have a dual listing, which has to date been regarded as unnecessary by French former unicorns such as Criteo, DBV Technologies, Cellectis and Talend.

⁹¹ J58.2 – Software publishing; J61 – Telecommunications; 62 – Computer programming, consultancy and related activities; J63 – Information service activities; M72.11 – Research and experimental development on biotechnology.

Table 3: Exposure of French insurers' non-unit-linked funds to listed tech companies

	Amount (€bn)	%		Amount (€bn)	%
Investments of non-unit-linked funds (non-look-through)	2,034		Investments of non-unit-linked funds (look-through)	2,034	
Equities	156	7.7%	Equities	230	11.3%
of which listed equities	72		of which listed equities	128	
of which tech sector	4.2	5.9% of listed equities	of which tech sector	8.9	6.9% of listed equities
of which unlisted equities	84		of which unlisted equities	102	

Source: ACPR.

One of the most reliable tenets of financial theory⁹², however, is that diversification improves an investor's risk/return profile. As a result, an equity portfolio's optimal theoretical exposure to the tech sector should be 19%⁹³.

There are three reasons for this underinvestment: the overweighting of euro-denominated assets, the low equity exposure of life insurance funds, and insufficient expertise regarding tech stocks among major French asset managers.

- ◆ It was pointed out to us that French life insurers' liabilities are euro-denominated, and so they should be backed with assets in the same currency⁹⁴. Tech stocks account for a much smaller proportion of market capitalisation in Europe than worldwide: 9% of the MSCI eurozone index as opposed to 21% for the MSCI USA index and 19% for the MSCI World index.⁹⁵ However, even accounting for the currency-related constraint, **increasing the weighting in line with the European benchmark would lead to additional investment of around €3 billion in tech stocks**. Increasing the weighting in line with the global benchmark would lead to additional investment of €15 billion
- ◆ Given the specific features of investments in the tech sector, it should be regarded as a separate asset class. However, the amounts involved are too small for it to be treated differently. It is only a sub-category of the "listed equities" segment, which is already very small compared with the size of non-unit-linked funds. The impact of increasing the tech sector's weighting on the returns of non-unit-linked funds – which have around €2,000 billion under management – would therefore be minimal. As a result, little attention is paid to the sector
- ◆ Finally, almost all insurers have an asset-management subsidiary that manages the vast majority of the money that flows into life insurance products on their behalf. Those specialists have only recently shown any real interest in tech stocks; accordingly, they lack the range of skills required, and specialist teams in particular. This is a crucial point and deserves to be explored in greater depth

⁹² Portfolio theory developed by Nobel Prize-winning economist Harry Markowitz (1952).

⁹³ The tech sector's weighting in the MSCI World Index at 31 December 2018.

⁹⁴ It should be noted that this is not standard practice in asset management, including in the life insurance sector. Instruments to hedge currency risk could provide a solution, although at the cost of a higher risk weighting for capital adequacy purposes, the cost of which must be compared with the benefits of diversification. It could also be argued that tech companies operate in a global market, which may cause currency risk to be reassessed.

⁹⁵ Source: MSCI European Economic and Monetary Union Index, MSCI USA Index and MSCI World Index at 31 December 2018. These indexes cover around 85% of the relevant region's market capitalisation.

2.2.2. No major specialist tech funds managed by French companies

France has world-class asset managers, but none of them rank among the world's top 30 specialists in terms of their expertise in managing listed equity investments in the technology sector.

2.2.2.1. Large French asset managers rank among the world leaders in terms of assets under management

France is continental Europe's largest asset management market, with almost €4 trillion of AuM.⁹⁶ Of the world's top 30 players in this sector, four are French (see Table 4): Amundi, Natixis Investment Managers, AXA Investment Managers and BNP Paribas Asset Management.

⁹⁶ Source: Association Française de Gestion (AFG), the French asset management association.

Table 4: World asset manager league table by total AuM

Asset manager	Country	AuM at 31-Dec-19 (€bn)
1. BlackRock	US	5,251
2. Vanguard Asset Management	US	4,257
3. State Street Global Advisors	US	2,197
4. Fidelity Investments	US	2,097
5. BNY Mellon Investment Management	US	1,498
6. J.P. Morgan Asset Management	US	1,486
7. Capital Group	US	1,467
8. PIMCO	US / Germany	1,452
9. Amundi	France	1,425
10. PGIM	US	1,205
11. Goldman Sachs Asset Management International	US	1,165
12. Legal & General Investment Management	US	1,131
13. Wellington Management International	US	878
14. T. Rowe Price	US	842
15. Nuveen	US	813
16. Natixis Investment Managers	France	808
17. Invesco	US / UK	777
18. Northern Trust Asset Management	US	774
19. AXA Investment Managers	France	730
20. Sumitomo Mitsui Trust Asset Management	Japan	696
21. Insight Investment	UK	692
22. UBS Asset Management	Switzerland	682
23. DWS Group	Germany	662
24. PGIM Fixed Income	US	649
25. Affiliated Managers Group	US	643
26. Legg Mason	US	639
27. Franklin Templeton Investments	US	567
28. Aberdeen Standard Investments	UK	563
29. BNP Paribas Asset Management	France	537
30. MetLife Investment Management	US	514

Source: IPE, "Top 400 asset managers 2019". Figures at 31 December 2018.

2.2.2.2. However, large French asset managers do not manage "global tech" funds, which play a crucial role

2.2.2.2.1. Barring some high-profile exceptions in Europe, the sector is largely dominated by US managers

There are no major French asset managers represented in the top 30 "global tech" funds⁹⁷ – i.e. funds investing in technology companies listed anywhere in the world – ranked by assets under management (Table 5).

However, the asset managers with the strongest positions in the tech sector are of a similar – or smaller – overall size than the French majors:

⁹⁷ The league table only takes into account open-end funds, not mandates or ETFs. Information about mandates is not publicly available. However, when an asset manager has been granted a mandate, it often replicates that mandate via an open-end fund. Lastly, ETFs are passively managed, and so fall outside the scope of this report.

- ◆ Large US asset managers: Fidelity, BlackRock, T. Rowe Price, Janus Henderson, Columbia Threadneedle
- ◆ In Europe:
 - Innovative firms like Pictet
 - Large European funds with an equity strategy covering a broad range of sectors and/or a strong presence in the United States: DWS, Allianz GI, Crédit Suisse, UBS
 - Nordic asset managers: Swedbank, DNB, SEB

Table 5: World “global tech” fund league table by assets under management

Name	Asset manager	Start date	Size (\$m)	Ann. perf. 2y (%)	Tracking error over 3y (%)	Geographical exposure (%)				
						N. America	Dev. Europe	Dev. Asia	Em. Asia	France
1 Ivy Science And Technology C	Ivy	31/07/1997	8,468	22.13	8.81	89.2	0.0	2.4	8.0	0.0
2 Fidelity® Select Software & IT Svcs Port	Fidelity	29/07/1985	6,862	26.81	8.53	96.9	0.8	0.0	0.9	0.8
3 Fidelity® Select Technology	Fidelity	14/07/1981	6,417	28.85	9.71	82.0	1.2	4.8	6.9	0.0
4 Columbia Seligman Comms & Info A	Columbia Threadneedle Investments	23/06/1983	6,087	20.17	10.95	95.6	0.0	0.0	3.5	0.0
5 Pictet - Robotics I dy EUR	Pictet	07/10/2015	5,846	17.51		66.0	14.6	0.8	2.4	0.0
6 T. Rowe Price Science & Tech	T. Rowe Price	30/09/1987	5,634	17.86	8.60	85.5	3.9	7.9	17.6	0.0
7 T. Rowe Price Global Technology	T. Rowe Price	29/09/2000	5,300	16.03	12.21	54.1	3.9	9.1	27.5	0.0
8 Swedbank Robur Technology	Swedbank	01/09/1983	4,294	29.10	10.17	73.3	5.0	5.6	7.2	1.3
9 Fidelity Global Technology A-Dis-EUR	Fidelity	01/09/1999	3,928	17.73	9.13	85.1	8.1	9.9	10.1	0.3
10 Pictet-Digital PIUSD	Pictet	14/11/1997	3,550	15.24	8.19	80.2	1.6	6.2	19.0	0.5
11 Fidelity® Select Semiconductors	Fidelity	29/07/1985	3,350	20.03	12.93	85.9	0.0	2.3	10.7	0.0
12 Janus Henderson Global Technology T	Janus Henderson	31/12/1998	3,140	27.95	8.59	77.5	1.0	6.4	11.6	0.5
13 Janus Henderson Hzn Global Tech A2 USD	Janus Henderson	15/10/1996	3,110	24.20	9.47	84.3	1.4	5.4	6.7	0.0
14 Franklin Technology A(acc)USD	Franklin Templeton	03/04/2000	3,015	24.61	9.32	90.5	1.0	1.6	6.9	0.0
15 Fidelity® Select IT Services	Fidelity	04/02/1998	2,964	28.33	6.25	93.2	2.9	0.0	2.5	1.4
16 JNL/Mellon Capital Infor Tech Sect A	Jackson National	02/07/1999	2,946	27.33	8.59	97.9	0.0	0.2	1.7	0.0
17 Polar Capital Global Tech Inc	Polar Capital	19/10/2001	2,903	28.99	10.18	79.5	2.8	5.8	6.1	1.6
18 CS (Lux) Global Robotics Equity DB USD	Credit Suisse	30/06/2016	2,826	27.70		56.8	19.8	0.0	4.4	1.6
19 DNB Teknologi	DNB	06/08/2001	2,424	23.76	8.95	63.8	14.6	0.4	8.7	4.8
20 Swedbank Robur Ny Teknik A	Swedbank	11/11/1996	2,394	28.41	13.65	8.5	79.2	0.0	0.7	0.0
21 Fidelity Advisor® Technology I	Fidelity	03/09/1996	2,332	29.27	9.76	82.1	1.1	5.0	6.8	0.0
22 AllianzGI Technology Institutional	Allianz Global Investors	27/12/1995	1,705	33.09	10.85	97.8	0.0	2.0	0.1	0.0
23 BGF World Technology A2	BlackRock	03/03/1995	1,472	32.45	10.08	70.0	7.7	3.7	9.7	2.4
24 KBC Eq Fd Strat Telec&Tech Cl Dis	KBC	05/01/2000	1,456	18.65	8.27	61.1	20.7	7.0	2.9	4.2
25 Columbia Global Technology Growth Inst	Columbia Threadneedle Investments	09/11/2000	1,456	28.70	8.69	85.3	1.8	4.8	5.4	0.2
26 T. Rowe Price Global Tech Eq I USD	T. Rowe Price	15/06/2015	1,438	17.04	12.11	54.8	4.1	9.4	26.1	0.0
27 USAA Science & Technology	USAA	01/08/1997	1,430	19.48	7.30	81.6	0.7	4.9	9.1	0.0
28 VALIC Company I Science & Technology	VALIC	29/04/1994	1,414	24.08	8.55	81.2	1.8	5.7	8.6	0.1
29 BlackRock Technology Opportunities Instl	BlackRock	15/05/2000	1,336	31.28	10.14	69.2	8.4	3.6	8.9	2.4
30 Allianz Global Artfc Intlc W EUR	Allianz Global Investors	31/03/2017	1,289			90.8	3.1	0.8	3.9	1.9

Source: Morningstar, 7 October 2018. Only open-end funds, excluding mandates and ETFs.

This does not mean that major French asset managers are totally absent from the tech sector (Table 2). They mainly adopt a regional, not sector-based, approach to asset allocation, and their investment strategy is often devised in relation to a benchmark (geographical index). However, their absence from the global tech league table shows that they generally lack specialist teams, unlike their foreign rivals, which are able to gain a deep understanding of the specific features of tech firms: global competition, network effects, highly specific entry barriers, the fact that it may take a long time for companies to achieve their normal level of profitability, sometimes radical changes in strategy, and the ability to form a dialogue with company managers in the sector. These features mean that generalist teams are less inclined to risk investing in the tech sector.

The absence of French asset managers from the top 30 can be attributed to insurers – which are the key source of investment mandates for French asset managers – being under-exposed to the tech sector⁹⁸.

⁹⁸ The same applies to public-sector investors.

2.2.2.2.2. The role of global tech funds is nevertheless crucial for tech firms' funding ecosystem

Global tech funds play a very important role in building an effective funding ecosystem within a financial centre, for four reasons:

- ◆ They offer an attractive range of services, they put together and train teams of high-quality asset managers and they help to nurture the ecosystem. They are one of the reasons why Sweden has been so successful in this area. Their absence in Israel explains why that country has seen so few local IPOs, despite its high-quality venture capital system
- ◆ They are natural consumers of specialist technology research and therefore pay research providers, which accordingly devote the necessary resources to covering the relevant stocks
- ◆ They are the key contact people for company managers wanting to carry out an IPO. Without credible contacts, from the point of view of a company's managers and shareholders, an IPO in the company's home country is out of the question
- ◆ They are major players in IPOs, both in terms of the amount they invest and the signals they send as highly informed investors. More specifically, they often play the role of cornerstone investor in an IPO (see 2.1.2.3.).

2.2.2.3. Major French asset managers are absent from pre-IPO funding rounds, which are also critical for an IPO's success

2.2.2.3.1. Pre-IPO investments give investors the opportunity to capture part of a company's value before flotation, and to ensure the success of the future IPO

Pre-empting value that is increasingly captured by VCs...

Pre-IPO investments are made during start-ups' final fundraising rounds (Series E and F) prior to their IPO. Participants are either dedicated funds – i.e. distinct legal entities managed by an asset management company whose strategy is to invest solely in pre-IPO rounds as with Wellington's pre-IPO fund – or funds with a broader investment strategy such as global tech funds, an example being that of Capital Group.

The time between a pre-IPO investment and an IPO is generally between six months and three years. Funds invest when an IPO is clearly the route that the company has selected, and when they anticipate major interest in the company. These investments are very common in the United States but more sporadic in Europe. For example, Fidelity – one of the world's largest asset managers in terms of assets under management – was a pre-IPO investor in Facebook, Snap, Spotify and Uber, which are now listed, and holds a stake in Airbnb, which is set for an IPO this year.

...because of an increasingly long gestation period

These strategies are attractive for major listed-equity asset managers because venture capital funds are increasingly pre-empting the future value of the firms they are funding. For example, Facebook floated with a valuation of \$100 billion⁹⁹. Successful companies are going public at an increasingly late stage: the average age of a US company supported by venture capital funds at the time of listing rose from 4.5 years in 1990-2001 to 6.5 years in 2002-2017¹⁰⁰. They are increasingly mature when they carry out their IPO. As a result, funds investing at the pre-IPO stage are seeking to capture value that was previously available in the market. In a low-interest-rate environment, asset managers are also encouraged to take more risks in the hope of capturing the best returns from unlisted assets.

⁹⁹ Compared with Microsoft and Amazon, which both floated at valuations of less than \$1 billion.

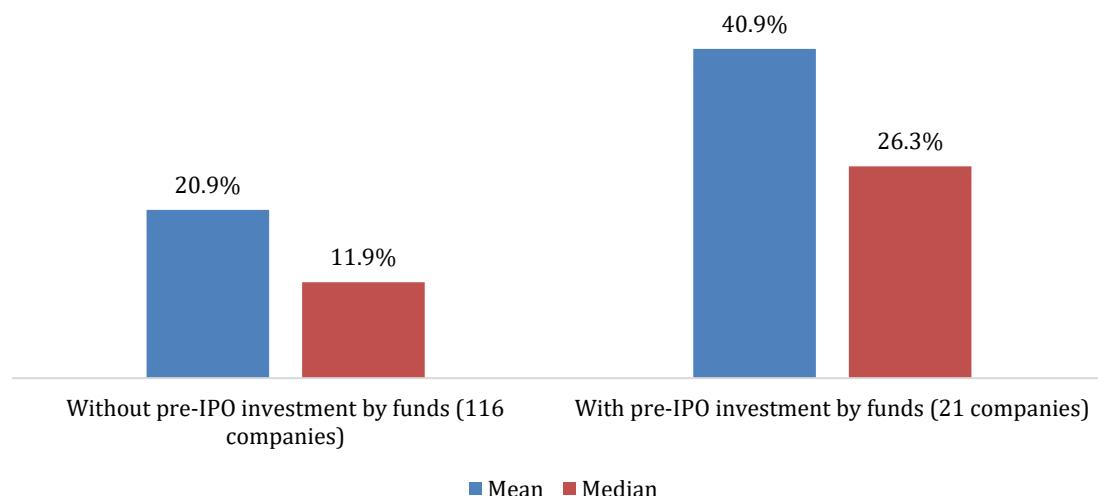
¹⁰⁰ Source: National Venture Capital Association.

Preparation for the governance required by public markets

Investors can only realise a capital gain if the stock performs well after flotation. As a result, funds investing at the pre-IPO stage also have the role of helping company managers with the IPO process in order to maximise the company's value after going public. This is why pre-IPO investments are mainly made by asset managers, which are experts in investing in the markets, and not by private equity funds. Given that companies are now IPO-ed at a more mature stage, pre-IPO investments may also be seen as a new link in a start-up funding chain, coming after late-stage investments.

Pre-IPO investments are associated with higher returns. A study by Atlas Venture published in November 2014 showed that, of 94 IPOs by companies in the healthcare sector in 2013 and 2014, the 24 companies that received pre-IPO funding had a median valuation multiple that was 128% higher¹⁰¹ at the time of the IPO than companies that did not receive such funding. Post-IPO, companies whose shareholder bases include asset managers that invested at the pre-IPO stage also outperform (Figure 3).

Figure 3: Returns after 1 year from US tech companies that have floated since the start of 2015, with and without the presence of funds investing in them at the pre-IPO stage



Source: Wellington Management, "Tapping into a new opportunity: the late-stage pre-IPO market" (September 2018). Figures at 31 March 2018.

There are four reasons for these higher returns:

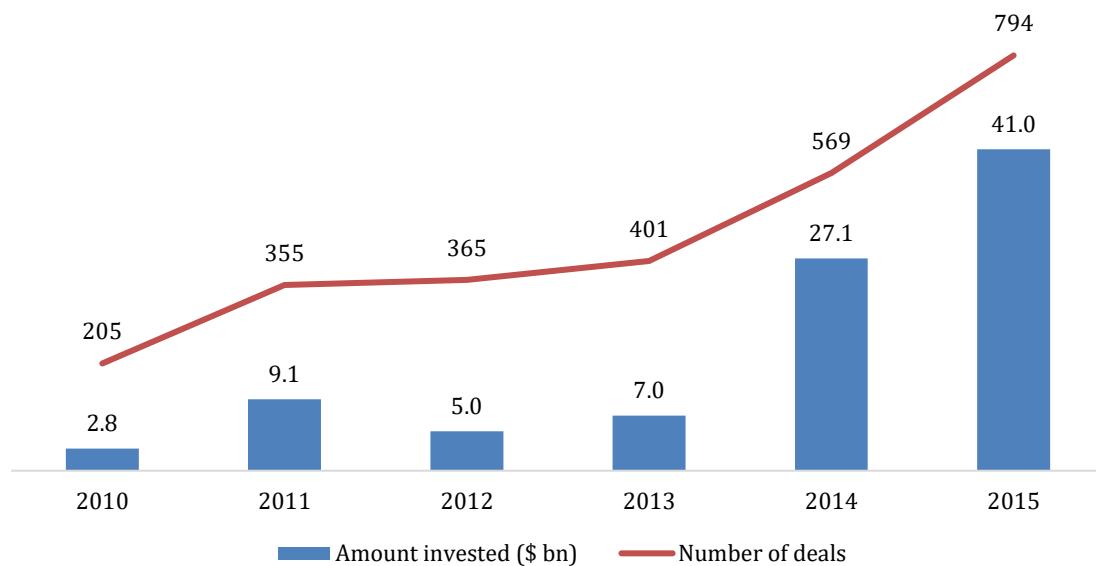
- ◆ A selection effect, since only the best companies attract funds at the pre-IPO stage
- ◆ Asset managers investing at the pre-IPO stage generally buy some of the shares to be offered in the IPO and therefore play the role of cornerstone investor
- ◆ The presence of funds at the pre-IPO stage sends a signal that the company is a credible investment
- ◆ Funds investing at the pre-IPO stage spread the word about the company among their investor networks and the other divisions of their groups

¹⁰¹ 80% after adjusting for capital raised at the pre-IPO stage.

2.2.2.3.2. The pre-IPO market is dominated by US asset managers, while their French peers are absent

The rise of pre-IPO investments by asset managers dates back to the early 2010s. Since then, their pre-IPO investments have grown exponentially (Figure 4).

Figure 4: Amounts invested by asset managers in tech companies at the pre-IPO stage and number of transactions in which they have been involved worldwide



Source: CB Insights.

According to CB Insights, the five asset managers that are most active in the pre-IPO segment worldwide are Hartford Funds, Fidelity Investments, Blackrock, Wellington Management and T. Rowe Price, four of which rank among the world's largest asset managers. More broadly, of the world's top 20 asset managers in terms of assets under management, 9 invest at the pre-IPO stage (Table 6). They do not include any French asset managers.

Table 6: Asset managers ranking among the world top 20 by AuM that invest at the pre-IPO stage

Asset manager	Country	AuM at 31-Dec-18 (€bn)	Pre-IPO investments
1. BlackRock	US	5,251	✓
2. Vanguard Asset Management	US	4,257	✓
3. State Street Global Advisors	US	2,197	✗
4. Fidelity Investments	US	2,097	✓
5. BNY Mellon Investment Management	US	1,498	✓
6. J.P. Morgan Asset Management	US	1,486	✓
7. Capital Group	US	1,467	✓
8. PIMCO	US / Germany	1,452	✗
9. Amundi	France	1,425	✗
10. PGIM	US	1,205	✗
11. Goldman Sachs AM International	US	1,165	✓
12. Legal & General Investment Management	UK	1,131	✗
13. Wellington Management International	US	878	✓
14. T. Rowe Price	US	842	✓
15. Nuveen	US	813	✗
16. Natixis Investment Managers	France	808	✗
17. Invesco	US / UK	777	✗
18. Northern Trust Asset Management	US	774	✗
19. AXA Investment Managers	France	730	✗
20. Sumitomo Mitsui Trust Asset Management	Japan	696	✗

Source: Company data, IPE, Forbes, CB Insights.

We are not aware of any major French pre-IPO funds in the real sense of the term. In spring 2018, Sofinnova raised a €275 million “crossover” fund (such funds are often synonymous with pre-IPO investments, because they represent a “crossover” between private and listed investments). The fund will have to raise more money to support unicorn IPOs. Unlike the situation in the United States and Sweden, the fund is managed by a company specialising in unlisted investments moving towards later-stage investments, rather than a major asset manager moving towards earlier-stage investments. This means that the company’s influence in the listed sphere is limited. However, Sofinnova’s initiative is a useful one. It creates a precedent and will fund some ambitious companies. We advise major asset managers operating in France to create more funds of this type.

2.2.3. A lack of informed demand in France means that our best start-ups are choosing to list solely in the United States

In any event, the best start-ups have a strong incentive to float in the United States: the number and diversity of US stock market investors, advice from their existing shareholders – particularly the late-stage investors that consist mainly of US venture capital funds – and the scale of their activities in the United States. A dual listing is possible in theory, but the absence of specialist French investors in the tech sector provides a good reason to rule out a Paris listing completely. As a result, the natural choice is to list solely in the United States, particularly on the NASDAQ, where there are sophisticated asset managers and research analysts capable of understanding a company’s business and valuing it accordingly.

Since Dassault Systèmes IPO in 1996, no technology company with a valuation of over €1 billion has entered the French market. All such companies have chosen to list¹⁰² in the United States, following the example of Business Objects in 1994: Criteo (2013), DBV Technologies (2014), Cellectis (2015) and Talend (2016). French asset managers own very few of these companies' shares¹⁰³: less than 1% for DBV Technologies and Cellectis, around 2% for Criteo and around 8% for Talend.

Although France has a reasonable pool of specialist investors, it is hard to imagine – at least in the near future – a French tech company partly owned by US venture capital funds and with a substantial presence in the US market deciding to list solely in France. The NASDAQ will remain a very attractive stock exchange because of the diversity of its investors and the amounts they invest in the tech sector. For these companies, the aim is to get them to have a dual listing in Paris and on the NASDAQ, and accordingly to make this as easy possible by reducing regulatory friction, particularly regarding financial reporting requirements.

We therefore recommend facilitating dual Paris/NASDAQ listings by minimising regulatory friction. However, dual listing should not be the only solution. A NASDAQ listing is still reserved for the select few. It is hard for a tech company with no operations in the United States and valued at less than €2-3 billion to feature on the radar of US investors and research analysts. It therefore remains crucial to offer such a company an attractive domestic stock market, in terms of its own needs, in France. This is one of the lessons to be drawn from the Israeli paradox.

2.3. Israel's example shows that an effective ecosystem for funding start-ups does not automatically develop into a healthy stock market ecosystem

It illustrates that market failures on the supply and demand sides are **independent**, and so each should be addressed in depth.

2.3.1. The “start-up nation”: an industrial success story supported by venture capital

The quality of the Israeli start-up ecosystem is now recognised around the world. Israel calls itself a “start-up nation” and is often cited as an example to be emulated¹⁰⁴. Here are some key figures¹⁰⁵ illustrating the success, initially spurred on by public policy¹⁰⁶, achieved by a country of only 9 million people:

- ◆ \$6.4 billion (around €5.6 billion) raised by start-ups in 2018 (up 120% vs. 2013) in 623 deals as opposed to €3.6 billion and 645 deals in France
- ◆ 100 fundraising rounds of over \$20 million in 2018 and an aggregate of \$4.1 billion (around €3.6 billion) versus 39 and €1.7 billion in France. 5 fundraising rounds of over \$100 million in 2018 (3 in France)
- ◆ 4 unicorns: Infinidat, ironSource, Gett and OrCam Technologies
- ◆ 133 trade sales for a total amount of \$23.7 billion in 2017, 103 and €12.6 billion in 2018

¹⁰² DBV Technologies and Cellectis are also listed in Paris. However, they chose a dual listing from the time they carried out their first substantial capital increase: €104 million for DBV Technologies in 2014 after floating on Euronext in 2012; €194 million for Cellectis in 2015 after floating on Euronext in 2007.

¹⁰³ Source: Thomson Reuters as of 24 April 2019.

¹⁰⁴ Phrase popularised by Dan Senor and Saul Singer in their book "Start-up Nation: The Story of Israel's Economic Miracle", Hachette, 2009.

¹⁰⁵ Source: IVC and ZAG-S&W, "High-Tech Capital Raising Report"; EY, "Venture Capital Barometer" for France; CB Insights; IVC and Meitar, "High-Tech Exit Report"; NASDAQ.

¹⁰⁶ In 1993, as part of its Yozma plan, Israel invited leading foreign funds to set up in Israel by contributing some capital to them and offering them a disproportionate share of the resulting returns. The plan has been fundamental to Israel's success in this area.

- ◆ 95 Israeli companies listed on the NASDAQ (13 French companies¹⁰⁷). Israel is the second-most represented foreign country after China

2.3.2. However, the technology culture has not spread automatically to domestic institutional investors

2.3.2.1. Venture capital mainly financed by foreign investors

When we visited Israel, we saw that the local venture capital ecosystem received little or no funding from domestic institutional investors. Given that the tech sector has become a key part of the Israeli economy (8% of the labour force, 9% of GDP and 40% of exports)¹⁰⁸, the lack of local funding sources may appear surprising, especially given that the Israeli economy has a large amount of financial savings, particularly as a result of funded pension plans. At end-November 2018, institutional investors managed €465 billion of assets, including around 40% on behalf of pension funds¹⁰⁹.

The venture capital firms we met told us that almost 90% of their money comes from foreign institutional investors¹¹⁰. At end-November 2018, only 9.1% of the assets managed by Israeli institutional investors (pension funds, insurers, mutual funds etc.) were invested in domestic listed equities and 0.2% in unlisted equities, with similar figures for all investors¹¹¹. Above all, those with whom we spoke mentioned the lack of expertise among institutional investors when it comes to technology investments. Part of this anomaly could be attributed to restrictions on management fees paid to external asset managers.

2.3.2.2. The Tel Aviv stock exchange is overlooked by tech companies

Once start-ups have become sufficiently mature, they mainly choose to list on the NADSAQ: 95 Israeli companies have done so. Even before they reach that stage, many start-ups are sold to large groups, mainly in the United States. According to Israeli officials, this is less than ideal in terms of creating wealth in Israel. Israel has almost 300 R&D centres run by foreign multinationals¹¹² that have set up operations from scratch or acquired local companies. This shows the vitality of the ecosystem, but these foreign-owned centres also draw on the finite pool of Israeli engineers, and some of the people we spoke to believe that this hampers the development of Israeli firms.

The real situation is obscured by dual listings

One solution adopted by the Israeli government is to encourage dual listings. The idea is that companies listed on certain foreign markets¹¹³, the NADSAQ included, should also be allowed, almost systematically, to list on the Tel Aviv Stock Exchange (TASE) as well. There are no further

¹⁰⁷ Avadel Pharmaceuticals, Celllectis, Criteo, DBV Technologies, EDAP TMS, Erytech Pharma, Genfit, Orange, Sanofi, Schlumberger, Sequans Communications, Talend and Total. Source: NASDAQ.

¹⁰⁸ Source: Israeli Ministry of Finance.

¹⁰⁹ Source: Bank of Israel, "Asset portfolio of institutional investors".

¹¹⁰ A figure picked up in the media, e.g. CNBC, "Israel is getting serious about opening up the high-tech market to domestic investors" (11 July 2017).

¹¹¹ Source: Bank of Israel, "Asset portfolio of institutional investors".

¹¹² Source: Israel Innovation Authority, "Annual Report 2018".

¹¹³ Hong Kong Stock Exchange, London Stock Exchange, NASDAQ, New York Stock Exchange, Singapore Exchange and Toronto Stock Exchange.

conditions to secure this dual listing, including as regards financial communication. The requirements of foreign markets are recognised as "equivalent" by the Israeli market.

As a result, of the 452 companies listed on TASE, 61 are also listed on the NASDAQ, almost half of the TASE's tech sector. They account for 40% of TASE's market capitalisation and 35% of its trading volume. They are included in local indexes. Their size prompts institutional investors to take an interest in them and therefore to develop related skills. **The initiative is a useful one, but it will have no practical effect unless Israeli investors increase their exposure to tech stocks.**

3. A strategic recommendation: transform investments in the tech sector through more late-stage and global tech funds managing a total of €20 billion

3.1. Develop an ideological and cultural narrative in which there is a burning need to invest in the tech sector in order to win the battle of ideas

Under-investment in the tech sector is the result of certain habits encouraged by prudential standards that ignore the strategic function of risky asset classes over the long term. It is impossible to lay the foundations for a nation's industrial future through exclusively capital-guaranteed financial products¹¹⁴. It is therefore important to continually remind the French public – who are inclined to think that history has come to an end and that the hierarchy of living standards between countries is set in stone – about the lessons of political history and economic theory (see Section 1).

We therefore recommend expressing and acting on a strong political will, portraying the development and funding of French tech companies as a “burning need”. This is a logical extension of the desire to make France a “start-up nation”. French Tech needs to be promoted as a major investment theme, like socially responsible investment (SRI) and solidarity-based investment. This is a vital part of the process, so that participants in the financial ecosystem will rally to this grand cause.

It is also important to specify that investing in the tech sector is not a charitable act in support of a public policy. **We want to repair a market failure using market mechanisms.** Although past performance (see Table 5) does not of course guarantee future performance, it shows that tech investments can deliver attractive financial returns for investors. This also holds over the long term: imagine the return delivered by an equity portfolio in 1950 that excluded the automotive, healthcare and aerospace sectors!

3.2. One strategic requirement and one ambition to increase the number and quality of IPOs: ten venture capital funds each managing more than €1 billion of assets

3.2.1. Attract high-potential firms to the French market

To ensure that the market is presented with attractive tech companies, it is vital to foster a genuine pool of French late-stage funds capable of funding large deals. These funds will support high-potential French start-ups over a longer period, until they float on the stock market.

They must be able to take part in fundraising rounds of over €100 million, which are the norm for unicorns ahead of their IPOs (see 2.1.1.3.). Those fundraising rounds are generally associated with enterprise values of between €500 million and €1 billion, which is the minimum size required to attract investors in the market. **To achieve that, funds must have at least €1 billion under management. The aim is for France to have ten such funds in order to be able to finance the pipeline of high-quality firms currently raising Series A and B funding** (see Figure 2).

¹¹⁴ 62% of French household wealth is held in capital-guaranteed products (non-unit-linked life insurance plans and bank deposits, including tax-assisted accounts such as the Livret A and Plan d'épargne logement or PEL). Source: Banque de France, "Rapport de l'Observatoire de l'épargne réglementée 2017" ("Report by the tax-assisted savings observatory 2017"). Figures at end-2017.

3.2.2. Get French investors to support late-stage funds

For a long time, having late-stage funds based in France seemed like an odd concept. A lack of local teams meant that France had to resign itself to seeing its best start-ups being funded largely by US/UK funds. This time has come to an end. France now has solid teams. The government also wants to invite the best foreign funds to set up in France. The real key is to have locally based teams, in order to take advantage of the cross-fertilisation seen in the main technology hubs.

To achieve our targets, major resources are needed:

- ◆ As regards the private sector, where most of the available capital is located, encourage French institutional investors, and insurance companies in particular, to invest in this asset class, which differs from early-stage investments and seed capital. They could invest either directly in the late-stage funds of their choice, or in dedicated funds of funds. In any case, it would be useful for Bpifrance or another entity to raise French investors' awareness of this segment, particularly through training initiatives. An "LP accelerator" (for limited partners) could be launched, based on the "GP accelerator" (for general partners) model used for private equity firms
- ◆ Maintain government support, via Bpifrance, to encourage the launch of late-stage funds by French venture capital teams and take part in the raising of these funds through funds of funds while also leveraging private investment. Under the third "Invest for the Future programme" (PIA3), Bpifrance's fund of funds dedicated to late stage ("Fonds de fonds multicap croissance" or FFMC2) raised a further €400 million in 2018. This amount could be increased by an additional €200 million using the remaining "major challenges" funding available under PIA3
- ◆ More flexible conditions are needed for investing in France and in the multi-investor funds of France's pension reserve fund (FRR) and civil service supplementary pension fund (ERAFP), so that they can invest in late-stage funds instead of granting mandates involving highly specific conditions, which are of limited interest to venture capital firms. Late-stage funds are by their nature multi-investor funds, as are all private equity funds. Mandates are not common market practice in this asset class. In addition, they inevitably cover a wider area than France given the pool of target companies

3.2.3. Deploy economic diplomacy

In 2018, almost half of the capital raised by all French private equity funds came from foreign institutional investors (sovereign funds, pension funds etc.), i.e. around €9 billion in all. That proportion is rising rapidly, equalling 48% in 2018 vs. 39% on average between 2008 and 2017¹¹⁵. However, foreign investors are focusing their investments on the buyout segment. They also need to be encouraged to invest in venture capital.

To achieve this, specific efforts should be made to encourage them to take part in the raising of French venture capital funds. Several initiatives of varying scope could be adopted:

- ◆ Make this objective an integral part of foreign trips made by members of the French government, similar to the signature of industrial contracts
- ◆ Organise occasional events in France and abroad similar to the Scale-up Tour organised in December 2018, as well as foreign trips
- ◆ Develop more widely-used promotional tools to raise awareness about the progress achieved by the French start-up ecosystem and its constituents

This remit to increase France's appeal could be more officially entrusted to Bpifrance, given its knowledge of the French venture capital market, although it already has initiatives in this area. Bpifrance could also use CDC IC, which has been part of Bpifrance since January 2019, as a

¹¹⁵ Source: France Invest, "*Activité des acteurs français du capital-investissement en 2018*" ("Activity among French venture capital firms in 2018") (March 2019).

platform for getting foreign sovereign funds to invest more frequently in this area, as has already been done with Mubadala¹¹⁶.

3.3. Considerably increase demand for shares in tech companies by launching global tech funds managed in France and with combined AuM of €10 billion

The financial markets are primarily fora for supply and demand for securities to meet. Let us assume that the supply of shares in tech companies will be sufficient thanks to past efforts and to our recommendations to increase late-stage funding for start-ups. All that remains is to increase French demand for shares to ensure that companies list in Paris. French shareholders are a prerequisite for deciding to list on the French market. **The Paris stock exchange could become the long-awaited “European NASDAQ” – often touted as a solution to Europe’s technology problem. European firms could choose to list in France, attracted by the existence of shareholders who can understand and appropriately value their business.** The creation of a stock exchange does not precede the existence of a market. It is rather an immediate consequence of a market’s existence, especially in the deregulated post-MiFID context¹¹⁷.

We have established that French institutional investors, despite having large amounts of assets under management, are greatly underexposed to the tech sector. Major French asset managers do not manage funds that specialise in this sector; such funds are highly discriminating, because they have a critical mass of skilled specialists. As a result, France does not currently offer a sufficiently large shareholder base for tech companies that have decided to list in order to expand.

Accordingly, our main recommendation is to encourage the emergence of global tech funds managed in France, with aggregate AuM of €10 billion.

3.3.1. Encourage the emergence of global tech funds managed in France

3.3.1.1. Funds investing in tech companies around the world, either listed or at the pre-IPO funding stage

We use the term “global” because the funds will necessarily invest in listed technology companies all around the world. In the tech sector, the playing field is global. A fund cannot reasonably value a French tech company without being exposed to its American, Chinese, Japanese, Israeli or South Korean competitors in fields such as artificial intelligence, robotics, self-driving vehicles and batteries, space and biotechnology. It is the same than for unlisted investments, in which investors have compared Deezer with Spotify, Dailymotion with YouTube, and OVH with AWS, Amazon’s cloud service. In addition, it would be a bad idea for investors to restrict themselves to France given the size of listed French tech companies (see 2.1.2.2.). A bubble would inflate the sector’s value unjustifiably.

Given France’s current offering in terms of tech stocks, French global tech funds will initially be more exposed to foreign companies. However, these international investments will enable the asset managers, based in France, to develop their skills. This is a prerequisite for them to be able to make informed investments in French companies likely to list in the next few years (see Table 1). The funds will eventually shift the balance of their portfolios to give French stocks a

¹¹⁶ The world's top 10 sovereign funds already manage around \$5,600 billion. Source: Sovereign Wealth Fund Institute (SWFI).

¹¹⁷ The “market undertakings” sector has been opened up to competition. The existence of a market will attract infrastructure.

higher weighting that ensures effective support for our economy, still favoured by the "home bias"¹¹⁸.

3.3.1.2. Limit benchmark-tracking in order to foster skills

These funds will not be designed to replicate any tech sector benchmark portfolios, which would have large exposure to shares in the digital giants¹¹⁹, since that would be unlikely to produce the specialist skills our ecosystem requires. As a result, investments in them will be capped. Funds could also decide to limit their investments in companies with a market cap of less than €10 billion at the time of investment.

3.3.1.3. Fund size: at least €1 billion in order to exert influence and attract the best managers

This strategic recommendation has two main aims, i.e. to attract money but also skills, i.e. the portfolio managers. As Figure 5 shows, to rank among the world's top 30 global tech funds, assets under management of at least €1 billion are required. This is the figure that allows a fund to exert influence over the ecosystem, and, in particular, to play the role of cornerstone investor in IPOs of at least several hundred million euros (which France should be targeting), or simply to be allocated shares in deals, particularly those taking place outside of France.

It is also the figure that generates a level of fees (generally 0.5-0.8% of AuM per year) allowing the asset manager to recruit a team of 5-10 specialist managers dedicated to the fund¹²⁰. Overall, **if France wants a solid base of shareholders in tech companies, both at the national and international, it needs 5-10 global tech funds, i.e. €10 billion invested and 50-100 managers recruited**. This is a lot relative to the €9 billion currently invested in the tech sector by life insurance funds through more diversified portfolios (see Table 3). However, it is very little compared to the €2 trillion invested in these funds and the €4 trillion managed by French asset managers.

3.3.2. Get behind key transformative initiatives

3.3.2.1. Make the most of existing initiatives in a changing ecosystem

The first recommendation, and in theory the most obvious one, is to make the most of initiatives already adopted by certain private-sector entities. We were therefore pleased to see Natixis Investment Managers recruiting three theme fund managers from Pictet in November 2018, including the co-manager of the Pictet Digital fund, which ranks among the world's top 10 global tech funds (see Table 5). Natixis IM will be launching theme funds, including some focusing on the technological sector. The funds will initially be backed by the Natixis group's insurance and asset management companies, and are then likely to be distributed to retail investors across Natixis IM's global network. This strategic move is likely to inspire other French asset managers.

In December 2016, Amundi's subsidiary CPR Asset Management, which specialises in theme investments, launched a Global Disruptive Opportunities fund. It invests in four disruptive areas, with technology accounting for 25% of the fund's assets. It is also distributed among retail investors. It now has €1.3 billion under management, mainly because of inflows from private banking clients in Italy, Germany and the Netherlands.

¹¹⁸ The "equity home bias puzzle" refers to the fact that investors tend to overweight companies based in their home country within an international portfolio.

¹¹⁹ Google, Apple, Facebook, Amazon, and Microsoft.

¹²⁰ Source: conversations with major French and foreign asset managers.

These initiatives could receive political support, possibly taking the form of an event organised by the Ministry for the Economy and Finance on the topic of investment in the tech sector. This would also be an opportunity to launch a broader initiative called “French Tech Investment”, with a dedicated communication strategy and a label for retail open-end funds (see 3.3.2.4.3.).

As part of the same ideological approach of supporting the emergence of technology leaders, efforts should be made to highlight French entrepreneurial achievements, particularly companies likely to list in the near future. The government’s imminent launch of the “Next40” index – a CAC40 for start-ups – is fully in line with this approach.

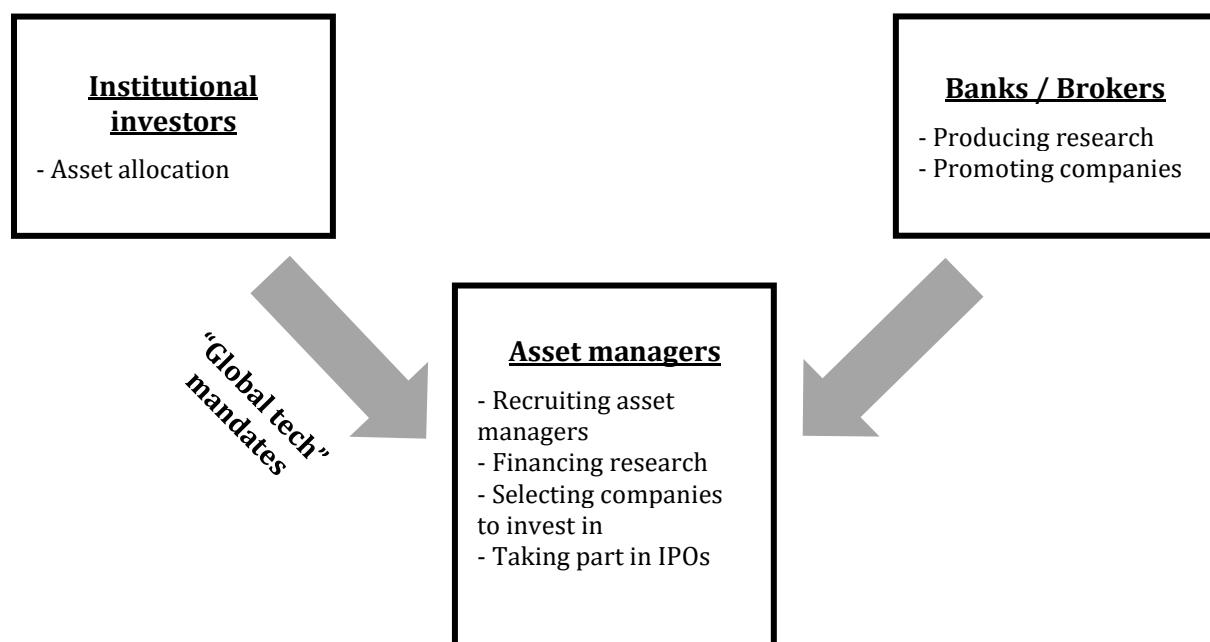
3.3.2.2. Organise requests for proposals for institutional global tech funds

Our €10 billion investment target could be achieved in two ways: through institutional mandates and through products distributed to retail investors.

Initially, we recommend that the government co-ordinate requests for proposals aimed at asset managers specialising in technology. A competent operator will encourage and support French institutional investors wanting to invest in French funds. **Of course, these investors are quite prepared to grant mandates to asset managers of their choice if that is their strategy.**

In any event, the aim is for global tech mandates to be granted to asset management teams substantially based in France. Those institutional mandates, which generally last for five years, will allow a comprehensive ecosystem for investments in listed tech companies to be created in France. Because they will have a predictable level of fee income over several years, the asset managers will be able to recruit managers specialising in the tech sector and therefore develop skills in France, which will be needed subsequently to take part in IPOs by French companies.

The fee income will also enable them to fund research by France-based brokers and banks in order to follow these companies (see diagram below). This ecosystem will not only allow French technology companies to secure proper funding but will also make Paris much more able to attract other European companies to list on the French market.



Requests for proposals could include the following aspects:

- ◆ Investment strategy: choice of technology themes, part of pre-IPO investments in unlisted companies
- ◆ Selection criteria: team partly based in France, managers' track records
- ◆ Team structure: dedicated asset management company, subsidiary or not of a major asset manager, team directly recruited by an asset manager

3.3.2.3. Investors from both the private and public sectors

The term “institutional investors” refers in particular to life insurance companies, mutual insurers and pension funds. The government must also set an example by mobilising public-sector assets: from the savings funds of the Caisse des Dépôts et Consignations (CDC), the retirement reserve fund (FRR), the civil service supplementary pension fund (ERAFP) and EDF’s nuclear decommissioning fund. In addition, as regards investments in listed technology companies, following on from venture capital investments, the government could use the “Invest for the Future Programmes” (PIA) to invest in global tech funds, in the same way as it currently invests in funds of funds or directly in venture capital funds managed by Bpifrance.

In 2018, under the third PIA, the government invested €1 billion in funds of funds (one dedicated to late-stage funds and another one dedicated to seed/early-stage funds) to support venture capital in France, and particularly to encourage the development of late-stage funds. Similar support could be provided to global tech funds with the remaining “major challenges” equity funding available under PIA3; such investment is justified by the existence of a market failure, in line with the approach taken by the General Secretariat for Investment (SGPI), which is in charge of the PIAs.

3.3.2.4. Offer retail funds, inspired by the success of solidarity-based and SRI-labelled investment funds

3.3.2.4.1. Leverage institutional mandates

Institutional mandates give asset managers financial security, which enables them to recruit staff. Using those resources and their investment track records, asset managers will then be able to increase “global tech” assets under management by launching open-end funds aimed at retail investors and managed by the same teams.

Retail investors show real interest in technology stocks. According to an Odoxa-Linxea survey for Les Echos on “French people’s relationship with the stock market and savings products” published in March 2019, for French people prepared to invest or invest more in the stock market, “growth sectors such as new technologies and biotech” hold the most appeal, with 47% of people showing interest in them.

3.3.2.4.2. Take inspiration from the success of solidarity-based and SRI-labelled investment funds, particularly in employee savings plans

To maximise inflows into these investments, we recommend drawing inspiration from SRI¹²¹-labelled and solidarity-based investment funds.

¹²¹ Socially responsible investing.

At 31 December 2017¹²², almost a million savers had made more than 2.4 million investments totalling €11.6 billion into solidarity-based savings products. Of that amount, 64% was invested through solidarity-based employee investment funds (FCPESs) offered via vehicles such as single- or multi-company savings plans and collective pension savings plans. In addition, 31% came from banks (savings accounts, life insurance etc.), while 5% came from savings collected directly by solidarity-based companies (mainly unlisted).

Overall, collective investment undertakings account for 74% of solidarity-based savings. Inflows into solidarity-based savings include savings products that have been accredited by Finansol (170 products at end-2017), a label that was created in 1997 and which requires at least 5% of money inflows to be invested in solidarity-based activities. They also include assets under management in FCPESs, which are required by regulations to invest 5-10% of their portfolios in solidarity-based companies that have received ESUS accreditation from the government.

In the last five years, inflows into solidarity-based savings products have been running at between €1.5 billion and €2 billion per year. This high level of inflows via employee savings plans is due in particular to the statutory obligation for companies offering a retirement savings plan or a company savings plan to propose an FCPES.

As regards SRI-labelled funds, there are 184 such funds managed by 41 asset management companies, and they have €49 billion of assets under management¹²³. The SRI label was introduced in 2016 by the Ministry for the Economy and Finance to make more visible socially responsible investment products offered to retail investors (employee savings plans, life insurance etc.). It is awarded by independent third-party organisations accredited by the French Accreditation Committee (COFRAC). These investments in listed equities or debt instruments aim to reconcile economic performance with social and environmental impact by financing companies that contribute to sustainable development in all sectors of activity.

France's Business Growth and Transformation Action Plan (PACTE) Act has made even more visible solidarity-based and SRI funds by introducing an obligation for all new life insurance policies to refer to at least one SRI or ecological transition¹²⁴ or solidarity-based (same criteria as for FCPES funds) investment fund in which a life insurance policy can invest by 2020; after that, one SRI investment plus one ecological transition or solidarity-based investment fund by 2022.

3.3.2.4.3. “French Tech Investment” label

Accordingly, for technology funds, the three channels being considered for distribution to retail investors are direct distribution, distribution via unit-linked life insurance products with units that replicate the strategy of institutional mandates, and employee savings plans (company savings plans, collective retirement savings plans) via FCPE employee savings mutual funds. For the latter to reach a wider audience, they must offer ex-ante diversification and cannot invest exclusively in the tech sector. “French Tech Investment” funds may be offered, with a label based on the model of SRI label granted by the government or that granted by Finansol for solidarity-based funds, with between 10% (the tech sector’s proportion of the euro area’s total market cap)¹²⁵ and 20% (the tech sector’s proportion of the world’s total market cap¹²⁶) invested in listed tech companies.

¹²² Source (all figures in the paragraph): Finansol, “Zoom sur la finance solidaire 2018” (“Focus on solidarity-based finance 2018”).

¹²³ At end-January 2018.

¹²⁴Funds bearing the TEEC (energy and ecological transition for the climate) label.

¹²⁵ Source: MSCI European Economic and Monetary Union Index at 31 December 2018 (9% to be exact).

¹²⁶ Source: MSCI World Index at 31 December 2018 (19% to be exact).

Given inflows into solidarity-based funds, we estimate that around €8 billion¹²⁷ will flow into “French Tech Investment” funds over the medium term (five to six years), which means around €1.2 billion invested in listed tech companies. These investments will be handled by the teams of “global tech” institutional funds. At the same time, asset managers could distribute funds that exactly replicate institutional mandates in the form of unit-linked life insurance products or directly-held funds, via private banks and asset management advisory firms, in France and abroad. This channel could attract inflows of several hundred million euros¹²⁸

Overall, it is realistic to expect medium-term inflows of around €2 billion from retail investors into vehicles investing in listed technology companies.

¹²⁷ Assumption based on predicted annual inflows that are slightly lower than those attracted by solidarity-based savings products in the last few years (between €1.5 billion and €2 billion per year).

¹²⁸ The “Global Disruptive Opportunities” fund managed by CPR Asset Management has attracted more than €1 billion through this channel since the end of 2016 (see 3.3.2.1.).

Appendix: List of the persons met by the authors

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Jean-Baptiste Danet, Chairman – CroissancePlus
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