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Venture capital investing in Fintech start-ups

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1 Introduction

Venture capital plays a crucial role in the field of technological innovation, providing young companies economic support, consultancy, and non-monetary resources. The relationship of venture capital funds with start-ups goes far beyond the simple investment: they actively monitor the evolution of the company providing advices to minimize the high information asymmetry which characterizes this industry.

In recent years, venture capital played a key role in the success and establishment of an innovative type of company: Fintech. Fintech encompasses any emerging technology which offers faster and more efficient means of delivering financial services than the traditional methods available.

Fintech venture capital investments have seen a notable upsurge in the aftermath of the financial crisis allowing this particular type of entrepreneurship to emerge and renovate the traditional financial industry.

The objective of this thesis is to provide an overview of Fintech venture capital activity, analyzing where investments are taking place around the world and what are the most relevant features shaping Fintech formation. Investments, firms and investors in the analysis have been extracted from Crunchbase, which is the data source used for the study.

This thesis will be structured as follows. First of all, the reader will be introduced to the theoretical concepts characterizing venture capital and Fintech (**Chapter 2**); it will be presented the structure of a VC fund, the types of VC, their life cycle and the main methods used to mitigate information asymmetry. Then, a brief history of Fintech will be exposed, together with the main categories and technologies which characterize it.

A review of the literature on Fintech venture capital will be presented in **Chapter 3**; in particular, after analyzing particular business models or categories of venture capital and Fintech, the state of the art of the literature referring to the industry of Fintech venture capital as a whole will be outlined.

The data source used to elaborate statistics and the methodology followed in order to extract a sample useful for the analysis will be presented in **Chapter 4**.

Results and discussion of the analysis performed will follow in **Chapter 5**. After highlighting the general investment activity in the market, a deeper analysis of the most relevant countries and continents and a comparison between Fintech and non-Fintech investments will follow.

2 Theoretical background

This chapter will provide a theoretical overview of venture capital and Fintech. It will present definition, types and most relevant features concerning the nature of VC. Then, it will dig into the history of Fintech, its different applications and underlying technologies.

2.1 Venture capital

2.1.1 What is venture capital

Start-ups' founders often have constraints with respect to the economic resources needed for financing their projects; financial and capital support are needed to support activities such as: research, product prototyping, manufacturing, patent and legal expenses, salaries and marketing expenses. At each stage of a company's development, different levels of investment are required and they are always increasing over time.

As a matter of fact, access to financing is one of the biggest obstacles for entrepreneurship. Start-ups always face what is called a *funding gap*. A funding gap is the amount of money needed to fund the ongoing operations or future development of a business or project that is not currently funded with cash, equity, or debt. Funding gaps can be covered by investments from venture capital funds or angel investors, equity sales, or through debt offerings and bank loans. Venture capital exists, as a more accessible source of financing, in order to support the growth of the innovative company, for all those entrepreneurs who agree to sell part of their property rights.

Venture capital is a form of private equity financing that is provided by venture capital firms or funds to start-ups or emerging companies which are expected to have high growth potential or which have demonstrated high growth (in terms of number of employees, annual revenue, or both). Venture capital firms or funds invest in these early-stage companies in exchange for equity, or an ownership stake. Venture capitalists finance risky companies hoping that some of the firms they support will become successful. Normally, because these start-ups face high uncertainty, venture capital investments have high rates of failure.

2.1.2 Venture capital and private equity

It's important to underline that the terms venture capital (VC) and private equity (PE) are often mistakenly used as they are referring to the same concept, but while their strategies are similar,

they each possess several distinct characteristics. VC falls under the broad umbrella of PE. More specifically, venture capital puts itself at the earliest stages of PE investment, typically when companies have little or no revenue. That's why the financing rounds of venture capitalists typically involve multiple investors and small portions of equity. Given that the company should be theoretically growing, each round tends to involve more money than the last.

On the other hand, private equity financing is more inclined to involve a single firm and the acquisition of a majority, if not all, of the company's equity. However, there can also be minority private equity investments, referred to as growth or expansion deals.

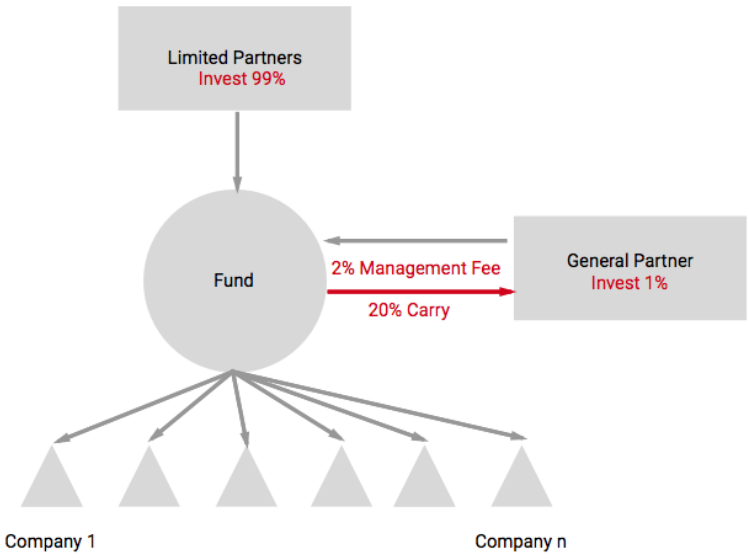
Nowadays, due to the nature of companies in the VC ecosystem, these deals tend to have even a higher risk profile and reward potential than traditional private equity investments.

2.1.3 Structure of a venture capital fund

Venture funds have two principal parties: general partners (GPs) and limited partners (LPs).

LPs are the fund's financial providers. These are the people who provide the capital to be invested. LPs can range from university endowments to pension funds to wealthy individuals.

Figure 2.1 Structure of a VC fund.



Source: riskom.it

Instead, GPs are the fund's day-to-day managers. These are the people who make start-up investments. They can be thought of as the middlemen that connect LPs' capital to the founders who need funding for their start-ups. On top of allocating capital, good GPs usually try to provide value to founders in the form of advice or introductions or services.

Regarding the economics of the fund, like many hedge funds, a typical venture capital fund has a *2 and 20* fee structure. This means that 2% of the fund is charged as a management fee each

year, and the fund's GPs and employees split 20% of the profits they generate. The profit-sharing portion is usually referred to as *carried interest*.

2.1.4 Types of venture capital funding

Concerning the nature of VC, it might be of different type. According to (Bertoni *et al*. 2015), the differences in ownership and governance are what make different the VC investors, and these differences influence their objectives and their investment strategies (Da Rin *et al*. 2013). This means that different configurations of ownership and governance are associated to different types of VC investors. The independent VC investor (IVC) is the most known VC type, which is an investor acting as general partner in a limited partnership in which the fund providers serve as limited partners (Sahlman 1990). This fund basically uses other investors' funds to invest. Non-independent, or captive, VC investors are structured as investment vehicles or as business units of a parent company. The parent company might be a non-financial company in the case of a corporate VC (CVC) investor, a financial intermediary in the case of a bank-affiliated VC (BVC) investor, a governmental agency or body in the case of a governmental VC (GVC) investor. The parent company provides capital and has influence on the selection and management of investments (Gompers 2002; Leleux and Surlemont 2003; Hellmann *et al*. 2008; Dimov and Gedajlovic 2010; Dushnitsky 2012).

2.1.5 Venture capital fund life cycle

Venture capital investments are made through a fund that is created and managed by a VC investment firm, namely, by the general partners of the fund. Each fund typically has a lifespan of 8 to 12 years in which to enter into and exit from all of its investments. Before starting to invest, GPs will set a fundraising target and outline a specific strategy for the fund, such as preferred industries, regions and financing sizes.

The stages of a VC fund's life cycle include the fundraising, investment, management and exit stages. Each stage is characterized by various actions to be undertaken, in particular:

- *Fundraising*, a stage that may require a month to several years. The general partners raise money by issuing an offering memorandum to the fund's limited partners, which typically attempts to convince the limited partners that the general partners have a unique expertise or insight into a specific market segment. The fund closes once the VCs have raised the required money and, when GPs identify suitable investment

opportunities, they use the required capital provided by the LPs in proportion to their original commitment.

- *Investment*. After the capital has been procured, it is responsibility of the general partners to make prudent investments. To find deals is a difficult process that requires a dedicated team to search for investing opportunities, conduct research and due diligence and carry out other essential tasks prior to the investment.

- *Management*. General partners of venture capital funds do not usually own a majority stake in their portfolio companies. However, both the VC-backed company and GPs have legal and nonlegal responsibilities to comply with in order to keep the two entities together in a mutually beneficial relationship. In exchange for an equity stake in the company, VC firms are granted seats on the business' board of directors, often receive preferential terms for when the company is sold and may also hold other rights, such as voting rights and the ability to receive dividend payouts. The important thing is that the GP, in an effort to ensure its portfolio company succeeds, will provide advice, connections and other management help for the start-up. They also use their position on the board to influence the company's direction and vote in ways they believe will be beneficial for the start-up's long-term success.

- *Exit*, because all of the work outlined in the previous stages is building toward one goal for the VC fund: the exit, also known as a liquidity event. Venture capital firms typically have two choices at the moment of the exit, each with their distinct advantages and drawbacks. The most common exit method is the corporate acquisition, or buyout, in which another company purchases the start-up for strategic purposes. The second-most popular exit option—and often the most high-profile—is the initial public offering (IPO), which moves the company from the private to the public sphere. Venture capital firms that choose the IPO route typically sell a portion of their shares after the initial lock-up period ends and fully exit their position within a year or two. GPs may also transfer their publicly traded shares to their limited partners.

2.1.6 Asymmetric information

The nature of venture capital funds puts them in the position of being financial intermediaries focused on funding projects in emerging high-technology fields. Nascent technologies, business models and most importantly intangibility of assets are the main features characterizing such VC funded projects. The result turns out to be an extreme level of information asymmetry, which means that funding these projects requests specialized risk assessment skills. As a matter of fact, venture capitalists are known to have very strong skills in selecting and monitoring ventures with an extreme level of information asymmetry (Chan, 1983; Sahlman, 1990; Macintosh, 1994; Amit, Glosten and Muller, 1990, 1993, 1998).

Information asymmetry occurs in two distinct manners or kinds of risk: adverse selection and moral hazard. Adverse selection risks are those resulting from hidden information (i.e., entrepreneurs possess certain information not known to the venture capitalists). Moral hazard risks are the ones emanating from hidden actions (i.e. entrepreneurs can take certain actions not observable by the venture capitalists). As niche financial intermediaries, VC firms are known to be equipped with strategies to tackle both of these. While adverse selection is tackled by intensive proposal screening and due diligence, syndication of deals (co-investing with other VC firms) and specialization (by domain, funding size, stage of funding); moral hazard is overcome by staging of investments, legal contracting and extensive monitoring of the investee firms (Gupta and Sapienza, 1992; Rosenstein, Bruno, Bygrave and Taylor, 1993; Barry, 1994; Lerner, 1994; Fried and Hisrich, 1994; Gompers and Lerner, 2004; and Pruthi, Wright and Lockett, 2003). In general, presence of information asymmetry warrants an extensive usage of signaling mechanisms to overcome the risks (Joshi and Subrahmanya, 2015).

The asymmetric information associated with start-up companies makes project governance extremely important. During the screening process, venture capitalists review business plans of young companies and design contracts with entrepreneurs that minimize potential agency costs. Two of the most common control mechanisms adopted by venture capital funds are: the staging of capital infusions and the syndication of investment (Gompers, 1995).

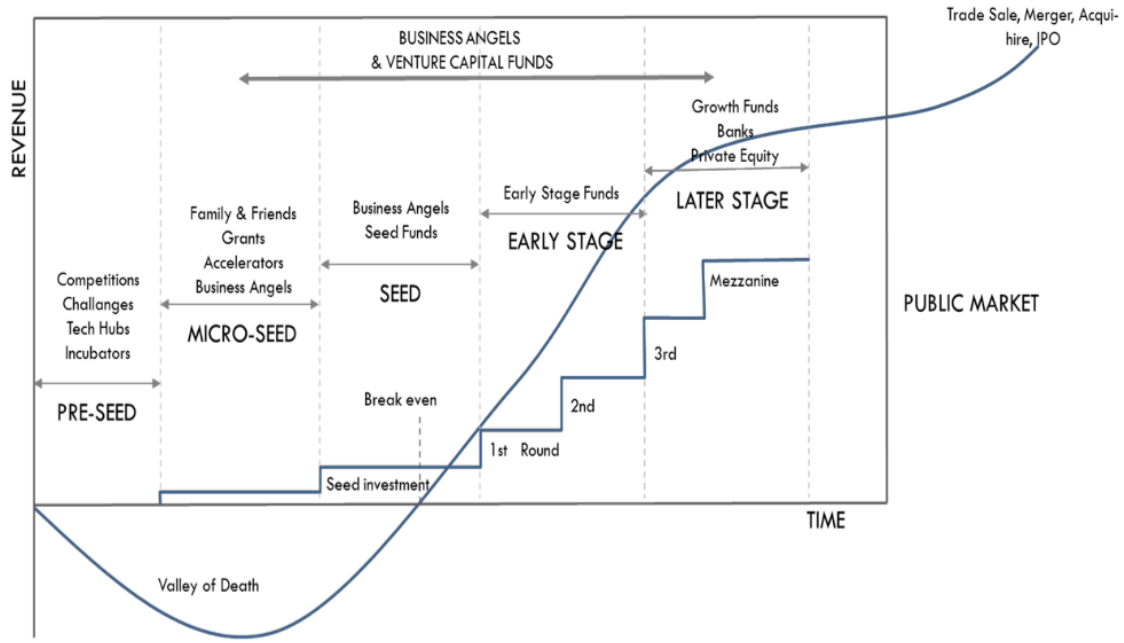
2.1.7 Staging of investments

The staging of investments consists in distributing the infusions of capital to the backed company in steps, over time. Depending on the phase and on the needs of the business project to be financed, the amount of capital and the related risk will vary. Thus, there is a specific

structure associated with each capital infusion consisting in a particular phase of development of the start-up.

A brief description of the classic funding phases in which VC funds act will follow, taken from (Yetisen *et al*., 2015) and (Investopedia, 2010), together with **Figure 2.2** which represents the general start-up lifecycle as well as the stages of its financing process:

Figure 2.2 Startup lifecycle and stages of financing



Source: Claris Ventures (2019)

- *Seed*, normally the first stage of the funding process which entails the highest risk; small amounts of money are required in order to finance the product prototyping phases, develop the business plan and expand the entrepreneurial team;

- *Early stage*
    - *Series A*: in this stage the first revenues of the small company appear; once the research phase is over, this phase will support the development and optimization of the product and the entrance in the market of the start-up;
    - *Series B*, this phase is similar to series A; it begins to involve specialized venture capitalists in the following stages.

- *Later stage*
    - *Series C* and subsequent: these rounds entail improvement phases of a business already started and aimed at scaling the company, for start-ups that have demonstrated a solid marketable product; the risk in these phases is relatively low, such as to involve investors like hedge funds and investment banks.

- *Bridge*, this round is a financing step which represents the bridge between the expansion of the company and its exit.

Hence, staging allows venture capitalists to distribute investments rather than concentrating all the funding in a single round, which would entail a much higher risk. Of course, not all business projects follow this investment path but the total amount of investments, as well as the number of funding rounds, are typically greater for successful start-ups.

2.1.8 Syndication

In the world of venture capital funds, it usually happens that more than one investor take over in the funding of a target company (Lerner, 1994; Brander *et al*., 2002). Several subjects join forces in an investment, to jointly contribute not only to the amount paid, but also in the provision of tangible and intangible resources, such as experience and consultancy, that the target company may need for its development (De Clercq & Dimov, 2004). All investors share the due diligence costs for the valuation of the company, structure the transaction and establish the shareholding fees; thanks to this investment method, venture capitalists can also have the opportunity to compare their knowledge with those of other investors, so as to have a form of verification on their choices (Cherif & Elouaer, 2005).

By sharing the investment, the costs of adverse selection are mitigated, as skills are also added in the investment screening phase (Lockett & Wright, 1999; Lockett & Wright, 2001). It happens that information asymmetry do also arise among the members of the investment, resulting in over or underestimation of the company. However, it is well documented in the literature how the positive aspects of syndication prevail: the network of investors facilitates the flow of information and facilitates monitoring operations, alleviating the problems of information asymmetry towards the target company (Bergemann & Hege, 1998; Lockett & Wright, 1999; Manigart *et al*., 2000).

2.2 Fintech

2.2.1 A brief introduction

The term *Fintech* is a contraction of *financial technology* and it was most probably first mentioned, as (Puschmann, 2017) argues, in the early 1990s by Citicorp's chairman John Reed in the context of a newly founded ''Smart Card Forum'' consortium: ''Speaking a language of cooperation between companies and across industries, (...) Citicorp has shed its historical insistence on calling its own technological tune. The harmony emanating from the Smart Card Forum has attracted about 30 dues-payers, including leaders from financial services and high technology. Another 30 have shown an interest in joining. Along with another Citicorp-initiated banking research project called Fintech, it tends to disarm any remaining criticism about Citicorp's being arrogantly out of touch with market preferences'' (Kutler 1993).

(Leong and Sung, 2018) define Fintech as follow: "a cross-disciplinary subject that combines Finance, Technology Management and Innovation Management" and also: "any innovative ideas that improve financial service processes by proposing technology solutions according to different business situations, while the ideas could also lead to new business models or even new businesses".

Fintech encompasses any emerging technology that offers faster and more efficient means of delivering financial services than the traditional methods available.

Generally, financial technology is referred to all those companies that make use of the Internet, cloud services, and software technology to convey financial services to consumers on mobile devices. Connecting consumers' finances with technology is what many Fintech products are designed to do in an effort to facilitate ease of use in whatever financial operations the consumers might be interested in.

At the end of 2008, when the financial giant Lehman Brothers filed for bankruptcy, the financial world was really shaken. What happened next would completely change the face of the banking industry, ultimately leading to the explosion of Fintech.

The consequences of that event were huge: people were losing their job, families were losing their home and everyone was losing trust in the institutions that were meant to offer people financial support. On the 22nd of February, 2016, an article on Bloomberg said: "...without the financial crisis and the popular anger it spawned against the whole banking system, there would be no Fintech". There was the need to reimagine traditional financial products and offer them through new and disruptive technologies.

Traditional banks had for decades little to no competition, that's why they had the possibility to monopolize financial services. Charging abnormally high commissions, inflating foreign exchange spreads were just some of the actions they performed to obtain the most from their customers. Consumers had little choice when it came to financial service providers and so they had to play by the banks' rules, simply because there were no other viable options.

But there was a shift in consumer mentality, due to the reasons outlined before, which created a demand that offered new players an opportunity to join the market and offer more competitive services. An ancient industry started to slowly change and evolve, because after the financial crisis, many highly skilled people working in the financial sector decided to take on an entrepreneurial route in order to reimagine the industry.

There is another factor that helped promote the emergence of Fintech, and it was the banks' inability to focus on developing better technologies. Instead, they shifted their attention towards reviewing their financial models and banking operations to prevent future meltdowns from happening, which was a natural reaction to a global crisis.

Financial technology start-ups, on the other hand, entered the market with a technology-based approach, starting to imagine financial services based on the evolution of technology and the internet, which allowed them to provide faster and more competitive services.

Once the potential of Fintech was clear, venture capital funds started to invest money into these potentially disrupting businesses.

2.2.2 Categories of Fintech

Financial technology has many applications with which it is transforming financial services and changing the way consumers interact with the products. The following is a list of the most relevant categories in which Fintech is being applied, in line with the categorization outlined by (Haddad & Hornuf, 2019) (see also **Table 4.3** for a summary of each category):

1. *Asset and wealth management*, a category that encompasses all those start-ups providing services such as robo-advising, personal finance and consumer banking. Robo-advising makes possible the creation of diversified investment portfolios for consumers without the need for an investment professional or advisor. It is a technology built for beginner investors to help with professional investment management. Personal finance focuses on the improvement of wealth management and retail investment services through the use of technology to augment and deliver the operations in a more efficient

and automated manner. Consumer banking entails the willingness of many banking institutions to embrace the use of digital technology to provide their services in a more streamlined and effective manner. Better user experience, reduced costs, and friction in operations are a few of the benefits offered over the traditional means of banking.

2. *Exchange services*, where all the start-ups providing financial or stock exchange services, such as securities, derivatives, and other financial instrument trading, are included.

3. *Financing*, encompassing start-ups providing services such as lending and crowdfunding. In general, it refers to those companies providing equity through information technology. Providing lending solutions means offering to consumers provision of capital through more accurate and streamlined processes. Smart systems, using artificial intelligence and machine learning algorithms, are used to process and verify identity credentials to ensure error-free results. Forecasting income prospects, assessment of the borrower's track record, appraisal of collateral value, and predictions of changes are facilitated by the inclusion of technology in lending processes. Crowdfunding instead, is a method of raising funds or capital on the web, in exchange for shares or specific rewards. Through the use of technology, a wider audience of investors can be tapped into by crowdfunding.

4. *Insurance*, which refers to those companies providing insurance services through technology. Insurance solutions of great value are introduced in the industry with the adoption of digitized financial ecosystems to improve the customer experience. Smartphone apps, drones, internet of things (IoT), artificial intelligence (AI), machine learning, and other tools are being integrated by insurers to provide more impact through their services to consumers and other bodies that need them.

   Insurtech is steadily changing the way insurance products are being perceived by customers, with many benefits being offered like online marketplaces, more convenient and personalized approaches, customized profiting, and many more.

5. *Loyalty program*, which encompasses start-ups that provide loyalty program services to customers. They are considered as a category of Fintech because they often use big data analytics and are closely linked to payment transactions. The category loyalty program

involves, for example, start-ups providing rewards for brand loyalty or giving customers advanced access to new products, special sales coupons, or free merchandise.

6. *Other*, which refers to some Fintech start-ups that offer investor education and training, innovative background services (e.g., near-field communication systems, authorization services), white-label solutions for various business models, or other technical advancements classified under other business activities of Fintech start-ups.

7. *Payment*, which entails business models that provide new and innovative payment solutions, such as mobile payment systems, e-wallets, or crypto currencies.
   Fintech is changing the payments industry with the development and integration of digitized processing applications and diverse processing networks. Wearable technology and smart devices are being developed for consumers to facilitate better digital connectivity and consumer identity protection.
   Mobile wallets and other integrated payment solutions are being used widely by business models and individuals to facilitate and conduct payment operations through the use of technology. This is a major area of Fintech, as every transaction being made by any consumer involves the payment process. Consumers worldwide are making use of digitized wallets like Apple Pay, Google Wallet, Square Cash, and Zelle. These platforms are easy-to-use, secure, and improve the overall consumer experience.
   Another important category that refers to payments is the one of cryptocurrencies, which is based on the blockchain technology. Some of the most known cryptos are Bitcoin, Ethereum, Chain and Wirex. Blockchain provides a transparent, secure, immutable and reliable ledger to document contracts, transactions, and records.

8. *Regulatory technology*, or Regtech, was introduced in 2015 by the Financial Conduct Authority, who described it as "a subset of Fintech that focuses on technologies that may facilitate the delivery of regulatory requirements more efficiently and effectively than existing capabilities". Regtech encompasses the use of innovative technology to aid better compliance and delivery of easy-to-integrate, secure, and cost-effective regulations. Basically, regulatory technologies are used to standardize and facilitate transparent regulatory processes that automate the whole compliance system.

9. *Risk management*, a category which contains start-ups that provide services aimed to help companies better assess the financial reliability of their counterparties or better manage their own risk.

2.2.3 Technologies

Fintech companies bring technological innovation to financial services and compete directly with banks. Technologies involved in the Fintech environment are many. The followings are the most relevant technologies and their applications used by Fintech start-ups with the aim of disrupting the financial services industry:

- *Mobile Banking*, a technology which gives the opportunity to connect end users to a variety of financial services and enables financial transactions anytime, anywhere. It removes the location dependencies of traditional banking systems and reduces operational costs of retail banking. Moreover, it provides mobile interfaces for clients and simple and secure cashless/cardless mobile payments.

- *Biometrics*, which is a technology that uses physically unique features such as fingerprints, voice, face, retina and other form of recognition to enhance security and identity verification. It allows to better identify individuals to increase security and prevent data breach, as well as reducing damages caused by fraud and phishing.
  With more smart devices equipped with better sensors, banks are able to safeguard their users, prevent cyber-crimes, and identity theft better than ever.

- *Open Banking APIs*, in full open banking application program interfaces, through which banks can give not only users but also partners more transparency and access to banking data, and encourage the creation of new value chains and services.

- *Artificial Intelligence*, or AI, a technology that relying on historical data, helps banks to analyze their big data to improve existing solutions and make better decisions. It brings advancements in chatbots, robo-advisors and other automated advisory solutions to clients. Artificial intelligence streamlines processes and takes over repetitive low value financial operation through chatbots and virtual assistance. Thus, it enhances a

company's ability of going through large amounts of unstructured texts and data to find hidden insights.

- *Blockchain*, which relies on a distributed smart contract system to create a transparent, secure, immutable and reliable ledger to document contracts, transactions and records. Cryptocurrencies based on blockchain technology provide faster, safer and independent digital transactions.

- *Big Data*, which through new data sources such as mobile banking or internet of things provide an additional layer of data gathering. Big data analytics are necessary to rapidly and effectively combine these datasets for better insights.
  Combined with artificial intelligence, big data analytics utilize large amounts of old and new data to discover hidden patterns for better risk management and fraud detection. New insights from big data improve the understanding of customer behaviors and help banks to create better and more customized products and services.

2.2.4 The near future

In order to imagine the possible future of financial services, it is important to relate Fintech with the traditional banking sector. To do so, the work of (Philippon, 2016) highlights some of the possible evolutions of the industry. In particular, he argues that the key advantage of incumbents (i.e. the banks) is their customer base, their ability to forecast the evolution of the industry, and their knowledge of existing regulations. The key advantage of start-ups is, instead, that they are not held back by existing systems and are willing to make risky choices. In banking, for instance, successive mergers have left many large banks with layers of legacy technologies that are at best partly integrated, as discussed in (Kumar, 2016). Fintech start-ups, on the other hand, have the chance to build the right systems from the start. Moreover, they share a culture of efficient operational design that many incumbents do not have.
A feature that is more specific to the finance industry is the degree to which incumbents rely on leverage. Leverage is embedded in many financial contracts and subsidized by several current regulations. This gives the illusion that leverage is everywhere needed to operate an efficient financial system. Conceptually, one can think of leverage today as partly a feature and partly a bug. It is a feature, for instance, when it is needed to provide incentives, as in (Diamond and Rajan, 2001). It is a bug when it comes from bad design or regulatory arbitrage (as in fixed

face value money market funds), or when it corresponds to an old feature that could be replaced by better technology (as in some payment systems). The issue, of course, is that it is difficult to distinguish the leverage-bug from the leverage-feature. Fintech start-ups can therefore help for two reasons. First, they will show how far technology can go in providing low-leverage solutions. Second, they are themselves funded with much more equity than existing firms (Philippon, 2016).

3 Literature review

The following chapter will present the state of the art of the research on Fintech and venture capital. After an overview of the most relevant findings in both fields, a review about the latest findings in the research of Fintech venture capital will follow. A summary about the papers analyzed in order to write this review can be found in the **Appendix**.

3.1 An overview of the extant literature

Financial Technology start-ups, in short Fintechs, work on the design and the delivery of financial products through technology (Leong *et al*. 2017). As already highlighted once we introduced this particular type of entrepreneurship, the term Fintech is from the early 1990s when a Citigroup project created the abbreviation for *Financial Services Technology Consortium* (Arner, Barberis, and Buckley 2015).

According to (Cumming and Schwienbacher, 2018) the amount of hype about Fintech, and VC Fintech in particular, of the recent years could remind the one of the dot com bubble from 1998-2000. The worldwide investment volume in Fintech start-ups increased a lot in the last years and the financial crisis played a crucial role to help this happen (Arner, Barberis and Buckley, 2015; Kelly, 2014). First, given that incumbents faced stronger regulation and scrutiny by regulators after the financial crisis, those Fintech ventures that develop products and services outside the scope of regulators have been preferred to incumbents. For instance, in crowdfunding platforms, due to their structure, many of the services that are subject to strong regulation are outsourced or not offered to the customers at all. For this reason, many platforms can operate under much lighter regulation (Hornuf and Schwienbacher, 2017). Second, the financial crisis made many skilled employees of financial institutions to be fired or to leave their job. These people started seeking for new opportunities by undertaking entrepreneurial activities, resulting in increased supply of investing opportunities by venture capital funds and increased demand for VC by Fintech start-ups.

Data confirm the fact that after the financial crisis Fintech gained momentum. From 2008 to 2018, global searches on Google for the term *Fintech* have grown 25 times according to Google Trends. In 2017, Fintech investment reached $27.4 billion whereas in 2008 it was only a $1 billion business (CB Insights 2018) (Giaquinto and Bortoluzzo, 2020).

According to PWC (2016), over 80% of the activities carried out in banks and other financial institutions are put at risk by Fintech start-ups and Goldman Sachs (2015) have estimated that the Fintech sector is worth $4.7 trillion. The reasons to support this numbers are many. Fintech start-ups cover pretty much the entire scope of services provided by the traditional financial industry (Arner, Barberis, and Buckley 2015). From lending to payments, insurance, wealth management and so on, Fintech companies usually come out with a disruptive business model which is intended to cut costs, in order to succeed. According to (Lee and Shin, 2018), the advent of Fintechs may force the whole financial sector to improve the quality of its services. Also, in terms of inefficiencies, the Fintech revolution may fill the gap in available financial services, to both retail and business customers. In emerging countries and economies these inefficiencies are particularly high because the population has difficult access to financial products and small businesses face high credit constraints. As a matter of fact, the Global Findex database of the World Bank Group, the world's most comprehensive data set on how adults save, borrow, make payments, and manage risk, shows that in developed economies 94% of adults have an account, while in emerging economies only 63% do so (Giaquinto and Bortoluzzo, 2020).

According to (Leong *et al*, 2017), by reducing the cost of payments or by allowing more people to save and invest in their health and education, financial services can help drive development. For instance, Fintechs increased the offer of small loans because technology reduces transaction costs (Giaquinto and Bortoluzzo, 2020).

In the financial services industry, a profound process of digitization is underway and (Puschmann, 2017) gave a clear view of the situation in his study about Fintech. One major reason he found is that financial products are almost exclusively based on information. For instance, payment transactions or credit contracts do not include any physical element. On the contrary, purchasing a car will always involve something material, obviously. Another reason is about processes. In the financial industry they are almost entirely implemented without any physical interaction such as for example online payment or stock trading – exemptions are some physical forms of interaction such as client advisory. Due to the recent developments in information technology (IT), the process of digitization is not only going towards process automation, but to a fundamental transformation of the value chain, with new business models (e.g., robo-advisors) and new actors entering the market (e.g., Apple). Thus, the term Fintech reflects the development of an IT-induced transformation. The drivers of this transformation might be the followings (Alt and Puschmann, 2012, 2016):

- *Information technology*, because recent developments in IT such as big data, internet of things, cloud computing and artificial intelligence enable financial services companies to not only automate their existing business processes, but to offer the possibility to provide entirely new products, services, processes and business models for the financial services industry. Examples are crowdfunding or peer-to-peer insurance platforms which have developed as complementary models to the ones of banks and insurance companies.

- *Consumers' behavior*, because in the last years the use of electronic interaction channels by customers has grown a lot thus forcing many financial service providers to resize their branch and agent networks and reorganize their channel management towards hybrid client interaction and more customer *self-services* (Nüesch *et al*. 2015). For instance, in Germany the number of banks has been reduced from about 50,000 in 1990s to almost 34,000 in 2015 (Deutsche Bundesbank 2016) and the number of branch visits sank from 3 to 1 within 15 years (Pickens *et al*. 2009).

- *New ecosystems*, because traditional banks and insurance companies have started to outsource a lot over the last decades, leading to more specialization. This trend towards resizing internal operations started in the companies' back offices and has recently gained momentum in their front offices too, leading to entirely new ecosystems including incumbents and Fintech start-ups but also to the inclusion of companies from outside the financial services industry. An example is the cooperation of Fidor Bank and O2 Telefonica.

- *Regulation*, because even if after the crisis in 2008 regulation became more stringent in almost all areas of financial services, many countries have launched initiatives to lower entry levels for Fintech start-ups in recent years. The most known examples are London and Singapore which introduced a so called *Fintech hub* for experimenting with new products and services and business models, foster market development with specialized organization units (e.g., Innovate Finance in the UK), and provide financial support (e.g., Monetary Authority of Singapore).

(Hornuf *et al*. 2018) have studied what drives banks to form alliances with Fintech start-ups in Germany, UK, France and Canada, finding that banks are significantly more likely to form alliances when they have employed a Chief Digital Officer and so they have a defined digital strategy to follow. Moreover, they highlighted the fact that markets react better if digital banks, instead of traditional ones, announce an alliance with a Fintech company.

According to (Brandl and Hornuf, 2020), while in science and technology-driven industries such as biotechnology, the birth of intellectual centers such as universities are more likely (Powell *et al*., 2012), the lack of such innovation centers in the financial industry indicates an innovation field more strongly driven by factors such as the adaptation to the specific needs of customers.

As highlighted by (Haddad and Hornuf, 2019), prior research on Fintech is mostly focused on specific Fintech sectors. For instance, about equity crowdfunding and reward-based crowdfunding, it has been investigated the dynamic of success and failure among crowdfunded start-ups (Mollick, 2014), the determinants of funding success (Ahlers *et al*., 2015; Hornuf and Schwienbacher, 2017a, 2017b; Vulkan *et al*. 2016), and the regulation of equity crowdfunding (Hornuf and Schwienbacher, 2017c). In the area of crowdlending, it has been analyzed the geography of investor behaviour (Lin and Viswanathan 2015), the investors' preferences when making an investment decision (Burtch *et al*. 2015), and the probability of loan defaults (Serrano-Cinca *et al*. 2015; Iyer *et al*. 2016).

It has been also investigated the risk and regulatory issues related to cryptocurrencies such as Bitcoin and Ethereum (Böhme *et al*. 2015; Gandal and Halaburda 2016) and the blockchain (Yermack 2017). Moreover, researches have been conducted about social trading platforms (Doering *et al*. 2015), mobile payments and e-wallet services (Mjølsnes and Rong 2003; Mallat *et al*. 2004; Mallat 2007) and robo-advisors (Fein 2015).

Regarding previous studies about venture capital, according to (Cumming and Schwienbacher 2018), booms and busts in VC investment have been documented by (Gompers and Lerner, 1999), (Cumming *et al*., 2005) and (Buzzacchi, Scellato and Ughetto, 2015), among others. (Bertoni *et al*. 2015) documented region-specific patterns of venture capital activity, whereas international analyses of VC investment patterns linked to differences in institutional settings have been examined, among others, by (Bertoni and Groh, 2014), (Bonini, Alkan and Salvi, 2012), (Dai and Nahata, 2016).

(Giaquinto and Bortoluzzo 2020) explain that previous research of (Cherif and Gazdar 2011; Félix, Pires, and Gulamhussen 2013; Gompers and Lerner 1998; Nofsinger and Wang 2011;

Precup 2015) has shown that GDP growth, economic freedom, financial development, and R&D expenditure are statistically significant for start-up funding.

(Bernstein *et al*., 2016) investigate the determinants of early-stage investments on AngelList. They find that the average investor reacts to information about the founding team, but not start-up traction or existing lead investors.

Previous work has not examined venture capital investment cycles on Fintech, except for the work made by (Haddad and Hornuf, 2019), who examine economic and technological determinants of Fintech start-ups, and the work made by (Cumming and Schwienbacher, 2016), who examine venture capitalist investments in Fintech start-ups around the world. They attribute venture capital deals in the Fintech sector to the differential enforcement of financial institution rules among start-ups versus large established financial institutions after the financial crisis. Moreover, (Giaquinto and Bortoluzzo 2020) studied the influence on the Fintech sector of angel investors, seed-stage investors and founders. They show that there is a positive relationship between having received an angel and a seed round with follow-on financing, and a negative relationship between having a single founder. Also, they show that these impacts are weaker in emerging markets.

3.2 Fintech venture capital

The literature analyzed so far relates to specific studies about Fintech or venture capital. We will now take a closer look at those studies which have tried to give a general view about financial technology firms related to venture capital funds. In particular, referring to the Fintech industry as a whole, not to particular categories or business models. Hence, it will follow a review in chronological order about the latest findings concerning the Fintech venture capital field.

3.2.1 Determinants of VC investments in Fintech start-ups

When a country is characterized by more favorable regulation, firms in the market may gain an advantage in terms of reducing costs and investing in innovations which could be way more difficult in other countries with more stringent regulation (Blind, 2012; Wang and Wang, 2012; Braun *et al*., 2013; Bozkaya and Kerr, 2014; Levine, Lin and Shen, 2015; Dharmapala and Khanna, 2016; Hornuf and Schwienbacher, 2017). This means that differential enforcement of law may drive the business pattern of start-up activity, letting them develop their business more freely and thus spurring investments.

As already outlined, the financial crisis has had a great impact on economies and markets, changing also investment behavior made by venture capital funds specifically on Fintech start-ups. As a matter of fact, (Cumming and Schwienbacher, 2018) show that Fintech venture capital round investment sizes went up by a large amount among smaller VC funds. On the contrary, larger venture capital funds did not increase that much their round investment size. Also, Fintech VC round investment amounts were very large in countries without a major financial center, whereas they were unchanged in countries with a major financial center. The average round syndicate size also went up. It increased more for small VC funds than large VC funds, substantially for countries without a big financial center and unchanged for countries with a big financial center. Finally, Fintech venture capital deals resulted to be less likely write-offs if they happened after the financial crisis, except for investments made in ventures which were in countries without a major financial center. In these cases, data showed a substantial increase in the probability of having write-offs for Fintechs after the financial crisis.

The reason that motivates these findings is that being away from a major financial center results in a dearth of enforcement of banking rules, thus encouraging innovation and exploitation of risky opportunities. Regions with major financial centers present economies of scale in prudential supervision (Cassard, 1994). There are also costs caused by being away from a major financial center. The most important one is that a firm is much less well connected with the main industry players which provide both human and financial resources.

In sum, (Cumming and Schwienbacher, 2018) focused on Fintech VC investments after the recent financial crisis. It is interesting that even if, in general, Fintech start-ups have been able to raise significant amounts of capital over the last 10 years, they show that this change is more pronounced for smaller, private independent limited partnerships VCs and in countries without a major financial center. However, these ventures are the ones with more probability to fail, showing that in some regions of the world venture capital investments are inefficient. Another interesting finding is that, even if syndicate sizes for Fintech VCs have become larger after the financial crisis (implying generally more successful deals), data shows that Fintech start-ups are more likely to be liquidated after the crisis rather than be acquired. This shows exuberance in Fintech VC investments (Cumming and Schwienbacher, 2018).

3.2.2 Determinants of emergence of the Fintech market

In 2019, Haddad and Hornuf investigated what are the economic and technological determinants inducing entrepreneurs to establish Fintech ventures. Together with the work of

Cumming and Schwienbacher in 2018, they were the first to watch at the field of Fintech venture capital in its entirety. As their work inspired the development of this thesis, it is interesting to retrace the way they developed their writings and the results they found.

In order to analyze what drives the probability of Fintech start-up formation, the approach adopted was to see Fintech innovation, and hence the start-ups born, as the matching of supply and demand in the economy. The supply of Fintech start-ups, as explained by (Choi and Phan 2006), is reflected in entrepreneurs who want to undertake self-employment. For Fintech start-ups in particular, such a supply might be driven by those investment bankers or any kind of employee in the finance field who lost its job after the crisis and that was in search for a new place which could put in light its finance skills in a promising new financial sector. With regards to the demand of Fintech start-ups, instead, it might be the number of entrepreneurial positions that can be replenished by Fintech innovations in the economy (Thornton 1999; Choi and Phan 2006). If, for instance, the services or business models provided by the traditional financial industry and banks are almost obsolete, the result will be a larger demand for innovative Fintech start-ups.

First of all, they guess that the more an economy or a traditional capital market is developed, the higher will be the demand for new start-ups, Fintechs in this case, to be funded. Just like any type of venture, Fintech start-ups need to be funded in order to grow and develop their business. When capital markets, both traditional and of ventures, are large and developed, entrepreneurs have higher possibility to access to the capital needed to fund their business. Even if small business financing does not happen normally in regular capital markets, Fintech ventures might receive money from accelerators or incubators, which are established thanks to the traditional financial sector. Also, when an economy is well-developed it means that people have money, increasing the probability that individuals need services such as asset management or financial education tools. Moreover, (Black and Gilson 1999) pointed out that active stock markets are positively related with the presence of venture capital, meaning that they help entrepreneurship to prosper. This happens because venture capitalists can exit successful portfolio companies through IPOs. Thus, active stock markets could have a positive effect on Fintech start-up formations. More generally, a well-developed capital market can enhance demand for entrepreneurship simply because a bigger financial market gives more possibility to change existing business models through innovative services. In the case of a small financial market, it is harder to change paradigms with the introduction of innovative business models. Thus, for a well-developed but technically obsolescent financial sector, there are more entrepreneurial positions that can be filled by Fintech innovators.

Another driver on the demand side of Fintech start-up formation is reflected by how the latest or most innovative technology is available in the economy. With the latest technology available in the market Fintech start-ups are helped to build their business models based on this technology. As highlighted by (Dosi 1982; Arend 1999; Stam and Garnsey 2007), technological advancements are among the most important drivers of entrepreneurship because they create opportunities which can be further developed by entrepreneurial ventures. For Fintech companies, these technological changes enable the creation of new business models aimed to disrupt the traditional financial industry. In the past, these changes have already occurred with the move from banking branches to ATM machines and from ATM to mobile banking (Singh and Komal 2009; Puschmann 2017). It is important to underline that nowadays geographic boundaries are increasingly teared down, meaning that having access to the supporting infrastructure such as broadband networks or cloud servers can be of big importance for the birth of Fintech start-ups in a country. At the same time, the increasing percentage of smartphone usage is giving the possibility to much more people to have digital services at hand, which before could not happen. Consumers who previously could not be reached are now experiencing these services, thus increasing the value delivered.

As highlighted by (GSMA 2015; PricewaterhouseCoopers 2016), nowadays mobile money penetration outstrips bank accounts in several emerging countries.

Other technologies such as near-field communication, bluetooth low energy and QR codes are today being used for retail point of sale and mobile wallet transactions (Ernst and Young 2014). Hence, Fintech start-ups are heavily relying on ultimate technologies in order to improve the flow of information, to create faster and smarter payment services and to offer easy and user-friendly operations to their clients. More generally, Fintechs rely on advanced technologies in order to cut costs of traditional banking transactions.

In other words, the better the supporting infrastructure, the higher is the supply of Fintech start-ups, as individuals who are seeking entrepreneurial activity based on these technologies have more opportunities to succeed.

A third driver of Fintech demand is related to the presence of the traditional financial institutions. As already said before, the boom in Fintech formation can be partly attributed to the global financial crisis of 2008 (Koetter and Blaseg 2015). (He *et al*. 2017) pointed out that the market valuation of public Fintech start-ups has increased four times since the crisis, a result that outperforms many other sectors.

There are many reasons why the crisis may have spurred the demand for Fintech start-ups. After the crisis, the trust towards the traditional financial sector (i.e. the banks) has felt down. Fintech start-ups might have benefited from this situation.

The studies of (Schindele and Szczesny 2016; Lopez de Silanes *et al*. 2015) highlight that after the financial crisis the cost of debt of many small firms has increased, and sometimes banks stopped giving money to businesses. For instance, the objective of Fintechs covering the areas of crowdfunding is to fill this gap. As a matter of fact, the findings of (Koetter and Blaseg 2015) underline that when banks appear to be stressed, start-ups and companies are more likely to ask for equity crowdfunding as a source of external finance. Thus, we can think that the demand for Fintech start-ups may be higher in those places which have heavily suffered from the global financial crisis and where the financial sector is less sound.

Finally, on the supply side, it has been put in relation the labor market and the business regulation to Fintech start-up formations. In order for an economy to push people to undertake self-employment, it must adopt a supportive regulatory regime. Entrepreneurship is promoted when the extent to which the credit is supplied to the private sector is higher and there aren't controls on interest rates interfering with the credit market. Another important point is that, in order for a start-up to hire talented individuals, a country should let the market forces to establish wages and conditions enabling the firm to easily hire and fire employees. In the presence of large bureaucratic costs and a lot of administrative requirements the entrepreneurial activity might be inhibited.

One important characteristic of countries with high percentage of self-employment are their bankruptcy laws. The evidence suggests that more favorable bankruptcy laws have a positive impact on entrepreneurial activity and self-employment (Armour and Cumming 2008). As a matter of fact, it can be conjectured that the quality of credit and labor market as well as business regulation should have significant impact on Fintech start-up formations.

There is also empirical evidence from the (International Labour Organization 1990) which shows that a population which is growing contains a higher number of entrepreneurs in their workforce with respect to a population which does not experience growth.

In other words, one can think that the more flexible and large the labor market, the higher the potential number of entrepreneurs who are ready to undertake self-employment.

Summing up, (Haddad & Hornuf, 2019) provided evidence that Fintech start-up formation takes place in well developed economies and that it occurs more frequently in countries where the supporting infrastructure is readily available. Moreover, in line with the findings of (Cumming and Schwienbacher, 2018), they found evidence that Fintech start-up formation is more

widespread when there is the presence of a fragile financial sector and when there is a larger labor market. They showed that until 2015, USA had the largest Fintech market, followed by the UK, India, Canada, and China at a considerable distance. Categorizing Fintechs in subcategories, they showed that financing is the most important segment of the emerging Fintech market, followed by payment and asset management.

3.2.3 The role played by location in Fintech start-up formation

The work of (Laidroo and Avarmaa, 2019) aimed to determine what are the location-specific factors associated with the formation of Fintech start-ups. They showed that those countries with stronger ICT services clusters give rise to high Fintech formation intensity but, contrary to the expectations, the intensity results to be greater in smaller countries with smaller domestic markets. Factors like fixed-line availability, overall ICT readiness, education enrolment and university-industry cooperation are positively related to Fintech formation. The same is shown for indicators that reflect macroeconomics situations or indicators of financial development. For instance, countries that faced a crisis or that have a more developed financial ecosystem tend to present greater Fintech formation intensity. In fact, in terms of number of Fintechs started, North America has the leading position due to the large number of Fintechs in US and Canada (in line with the findings of Haddad & Hornuf). It is followed by Western Europe and Oceania. The fact that the median Fintech formation intensity in North America exceeds that of Central and South America more than 10 times and the median in Western Europe that of Central and Eastern Europe over 5 times, does refer to a potentially positive association with financial development levels of the countries. Moreover, stronger legal rights are associated with greater Fintech formation.

To underline again the role of the financial crisis, (Laidroo and Avarmaa, 2019) pointed out that countries which have experienced a crisis during the chosen period (2007-2017), showed 55 to 86% greater Fintech start-up formation.

3.2.4 Determinants for receiving funding

The work from (Giaquinto and Bortoluzzo, 2020) highlights the importance of the entrepreneurial path followed by Fintech start-ups. More specifically, what are the determinants causing an increase of probability of receiving funding from venture capital or private equity funds, which will surely impact the success of the firm. Given that around 70% of rejections by PE/VC in funding occur at the first step (Riding, Madill, and Haines 2007), understanding what are the determinants of venture capital and private equity funding is important both for

policymakers who design public incentives and for entrepreneurs who are looking for capital. GDP growth, economic freedom, financial development, and R&D expenditure are statistically significant for start-up funding (Cherif and Gazdar 2011; Félix, Pires, and Gulamhussen 2013; Gompers and Lerner 1998; Nofsinger and Wang 2011; Precup 2015) whereas, surprisingly, corporate tax is not statistically significant (Giaquinto and Bortoluzzo, 2020). They show that the impact of having received an angel funding is positive, but not statistically significant. This is due to the difficulties in identifying the business angel population (Croce, Guerini, and Ughetto 2018). Moreover, the impact of having received seed funding has a positive influence in the subsequent Fintech PE/VC funding. Fintechs that received an angel, or a seed round present a higher percentage of PE/VC funding, namely 39% and 43%, while companies with a single founder showed a lower percentage of 29%. Regarding the phase of development of the country, angel investors have more impact on an emerging market whereas the seed-stage investors and the single founders have less impact on an emerging market. But, even if Fintechs are growing fast in emerging markets, the market remains highly concentrated as USA and UK still account for 55% of Fintechs companies and 58% of Fintechs PE/VC rounds.

Also, in line with (Haddad & Hornuf, 2019) they underlined that the most widespread Fintech categories are financing and payment.

Regarding country-specific variables, Fintechs which received private equity or venture capital financing are typically from countries where GDP growth is higher than normal. Also, financial development is higher among those firms that received PE/VC financing, as well as R&D expenses (Giaquinto and Bortoluzzo, 2020).

3.2.5 The role of clusters in the Fintech industry

It is interesting what (Gazel and Schwienbacher, 2020) pointed out in their work based on 1000 Fintech ventures located in France. Their study aimed to highlight what is the role of clusters in entrepreneurial ventures. In particular, given that digitalization has alleviated many constraints in terms of geographical proximity, they asked themselves if the importance of location changed as a result. To do so, they examined the financial industry, which is an industry heavily affected from digitalization. They found out that location is still very important and that start-ups are more likely to survive when they are located in large clusters of other similar start-ups. Moreover, the importance of incubators and accelerators results fundamental for supporting entrepreneurial start-ups, sustaining policy initiatives aimed to the creations of this type of ecosystem.

About exits of Fintech companies, they highlight that being located in a larger cluster reduces the risk of failure but increases the probability of being acquired. Failure rates are increased if the competition in a given segment of Fintech is increased. If a Fintech start-up has been developed with the help of an incubator, it is showed by (Gazel and Schwienbacher, 2020) that its risk of failure decreases significantly.

Once highlighted major evidences that have emerged so far regarding the investment behavior of venture capital funds with respect to financial technology companies, we now move on to introduce the work carried out in order to give an overview about Fintech venture capital activity in recent years.

4 Data and methodology

This chapter will present the data source used to elaborate statistics and the methodology followed in order to extract a useful sample for the analysis.

4.1 The initial sample

The data source used for searching information about venture capital investing in Fintech start-ups is the Crunchbase database. The database was founded in 2007 and has increased its coverage during the following years (Dalle, den Besten, and Menon 2017). It contains detailed information on fintech startup formations and their financing as it is filled by more than 200,000 company contributors, 2000 venture partners, and millions of web data points (Bernstein *et al*. 2016; Cumming *et al*. 2016). It has basically three groups of information: company, people, and funding rounds. Select contributors can add information to the Crunchbase platform which is then reviewed by the data set team before going online (Croce, Guerini, and Ughetto 2018). For this reason, the level of accuracy of the data and completeness vary, and some specific dimensions have limited information (Roeder *et al*. 2018). To explain better how it is assembled, the Crunchbase data items are listed in **Table 4.1** (Hsieh and Li, 2017).

Many research papers integrated CrunchBase data with other sources (Dalle, den Besten, and Menon 2017). The database offers free academic research access and I had the possibility to work with it thanks to Politecnico di Torino. This is the reason why it attracts attention not only from the PE/VC industry but also from scholars.

4.2 Relevant sample identification process

In CrunchBase, companies are identified with categories referring to sectors of the industry in which they act. To build the sample, it was first filtered in Microsoft Excel for the category "Fintech", but the number resulted quite small with respect to the numbers outlined in the literature. The motivation was that many Fintech start-ups did not fall under the category "Fintech".

In order to identify all Fintech start-ups in the database it was necessary to carry out a more specific filtering work. First of all, using an advanced filter all the potential Fintech companies in the database were identified. To do this, after analyzing all the categories to which the various

companies belonged, the keywords referring to possible Fintech start-ups were identified. These keywords are shown in **Table 4.2**.

Table 4.1 Crunchbase data sections and items.

Data Section	Data items
Company profile	Company name
	Company location
	Industry category
	Tag keyword
	Founded date
	Operating status
	Competitor
Funding rounds	Number of funding rounds
	Total funding amount
	Funding date – Funding amount
	Funding investors
Investors	Number of lead investors
	Number of investors
Investor profiles	Investor name
	Investor categories
	Investor founded date
	Investor type

Source: Hsien & Li 2017

The first filter identified 12760 potential Fintech companies. At that point, some companies could not have been Fintech but just companies belonging to financial services in general. For instance, a company providing asset management does not have to be necessarily a Fintech. For this reason, a specific analysis was conducted in order to eliminate those companies that had fallen under the broad umbrella of financial services but were not Fintech start-ups.

In order to be sure to identify only Fintech companies, every word that might refer to financial services in general was associated with a word that referred to Fintech start-ups. In column (3) of **Table 4.3** are showed all the keyword's associations used to identify every Fintech category.

Table 4.2 Keywords identifying Fintech start-ups

Type of company	Keywords
Fintech	fintech, finance, financial services, wealth management, asset management, personal finance, financial exchanges, stock exchanges, crowdfunding, crowdlending, lending, micro credit, micro lending, insurtech, risk management, angel investment, coupons, gift card, loyalty programs, Ethereum, NFC, bitcoin, cryptocurrency, payments, mobile payments, banking, funding platform, cyber security, credit

Table 4.3 Definition and keywords of Fintech categories

Category of Fintech	Definition	Keywords
Asset and wealth management	If they offer services such as robo-advice, social trading, wealth management, personal financial management apps, or software.	Asset management or wealth management or advice or consulting or personal finance or robotics together with finance or fintech or financial services
Exchange services	If they provide financial or stock exchange services, such as securities, derivatives, and other financial instrument trading.	Financial exchanges or stock exchanges
Financing	If they provide, for example, crowdfunding, crowdlending,	Banking or angel investment or

Category of Fintech	Definition	Keywords
	microcredit, and factoring solutions.	crowdfunding or crowdlending or micro lending or lending or consumer lending or credit
Insurance	The category insurance entails, for example, startups that broker peer-to-peer insurance, spot insurance, usage-driven insurance, insurance contract management, and brokerage services as well as claims and risk management services.	Insurance together with finance or fintech or financial services Insurtech
Loyalty program	Startups that provide loyalty program services to customers. They are considered because they often use big data analytics and are closely linked to payment transactions. The category loyalty program involves, for example, startups providing rewards for brand loyalty or giving customers advanced access to new products, special sales coupons, or free merchandise.	Loyalty program or coupon or gift card
Others	Some fintech startups offer investor education and training,	NFC or training or education together with

Category of Fintech	Definition	Keywords
	innovative background services (e.g., near-field communication systems, authorization services), white-label solutions for various business models, or other technical advancements classified under other business activities of fintech startups.	finance or fintech or financial services
Payment	The category payment entails business models that provide new and innovative payment solutions, such as mobile payment systems, e-wallets, or crypto currencies.	Payments or mobile payments or cryptocurrency or bitcoin or ethereum Credit cards together with finance or fintech or financial services
Regulatory technology	If they offer services based on technology in the context of regulatory monitoring, reporting, and compliance benefiting the finance industry.	Cyber security Compliance or Legal or LegalTech together with finance or fintech or financial services
Risk management	The category risk management contains startups that provide services that help companies better assess the financial reliability of their counterparties or better manage their own risk.	Risk management together with finance or fintech or financial services

Category of Fintech	Definition	Keywords
General fintech services	The category general fintech services contains all those startups that reflect more than one category, for example a startup which provides both payment and financing at the same time	All the remaining cases

As already pointed out in the previous chapters, in order to categorize Fintech in different types of start-ups, the categorization made by (Haddad and Hornuf, 2019) has been followed. Due to the fact that after filtering many companies resulted to belong to different categories, it has been decided to add the category "General fintech services", which is intended to contain all those Fintech start-ups which provide more than a specific Fintech service (see **Table 4.3** column (2) for a summary of every Fintech category).

After having specified the various associations of keywords, 12086 Fintech companies were identified, leading to a loss of almost 700 companies from the first filter applied.

In light of what has been said in the previous paragraphs, in order to consider companies that certainly responded to the Fintech category it was decided to restrict the circle of companies identified to a specific period. The motivations to this are basically two. As specified by (Roeder *et al*. 2018), the level of accuracy of the data and completeness in the database might vary, and some specific dimensions might have limited information. A small number of Fintech companies identified resulted to be founded in the 80s, which is not real and might be due to wrong assignation of category in the database. Another reason is that in order to carry out a research in line with the nascent literature on Fintech VC, the relevant years of Fintech evolution are those of the new millennium. Hence, it was decided to consider only those Fintechs born between 2005 and 2019. As a final result, 9484 Fintech companies were identified for the relevant sample period, from 118 different countries (see **Table 4.4** for a list of countries in the dataset, together with their ranking in terms of number of Fintech started).

Table 4.4 List of countries in the dataset (ranking according to number of Fintech start-ups)

Ranking	Country	Nbr. Fintechs started	Ranking	Country	Nbr. Fintechs started	Ranking	Country	Nbr. Fintechs started
1	USA	3867	41	Egypt	23	81	Senegal	4
2	UK	1228	42	New Zealand	23	82	Tanzania	4
3	China	511	43	Thailand	22	83	Côte d'Ivoire	3
4	India	492	44	Vietnam	22	84	Costa Rica	3
5	Germany	289	45	Czech Republic	20	85	Georgia	3
6	Canada	270	46	Portugal	19	86	Cambogia	3
7	France	244	47	Hungary	18	87	Liechtenstein	3
8	Singapore	234	48	Luxembourg	17	88	Sri Lanka	3
9	Israel	207	49	Ghana	16	89	Slovakia	3
10	Australia	204	50	Ukraine	14	90	Seychelles	3
11	Spain	163	51	Lithuania	12	91	Bahrain	2
12	Brazil	156	52	Latvia	12	92	Belarus	2
13	Switzerland	133	53	Peru	12	93	Belize	2
14	Netherlands	127	54	Romania	12	94	Botswana	2
15	Sweden	114	55	Taiwan	12	95	Cameroon	2
16	Ireland	107	56	Bulgaria	11	96	Guernsey	2
17	Mexico	104	57	Lebanon	11	97	Iran	2
18	Russia	102	58	Bangladesh	9	98	Kuwait	2
19	Hong Kong	79	59	Cayman Islands	9	99	Mongolia	2
20	Italy	75	60	Malta	9	100	Palestine	2
21	Japan	74	61	Pakistan	9	101	Rwanda	2
22	South Africa	73	62	Uganda	9	102	Azerbaijan	1
23	Denmark	61	63	Cyprus	8	103	Bahamas	1
24	Indonesia	58	64	Iceland	8	104	Burkina Faso	1
25	Korea, Rep.	55	65	Myanmar	8	105	Barbados	1
26	Nigeria	53	66	Gibraltar	7	106	Algeria	1
27	Poland	52	67	Mauritius	6	107	Haiti	1
28	Chile	49	68	Saudi Arabia	6	108	Jamaica	1
29	Finalnd	47	69	Slovenia	6	109	Kazakistan	1
30	United Arab Emirates	45	70	Jordan	5	110	Saint Kitts and Nevis	1
31	Argentina	41	71	Panama	5	111	Moldova	1
32	Belgium	37	72	Uruguay	5	112	Madagascar	1
33	Norway	37	73	Zambia	5	113	North Macedonia	1
34	Turkey	36	74	Zimbabwe	5	114	Namibia	1
35	Philippines	34	75	Bermuda	4	115	Puerto Rico	1
36	Austria	33	76	Ecuador	4	116	Sierra Leone	1
37	Kenya	33	77	Greece	4	117	Togo	1
38	Colombia	31	78	Croatia	4	118	Venezuela	1
39	Malaysia	29	79	Isle of Man	4			
40	Estonia	26	80	Morocco	4			

5 Results and discussion

The following chapter will present summary statistics and considerations about the way Fintech venture capital have developed in recent years. Moreover, the countries and continents where the majority of investments took place will be further analyzed. Then, a comparison between Fintech and non-Fintech start-ups investments will be presented.
In order to analyze the data of the sample, it has been used the Stata software, which allowed to make statistics and aggregate the variables used to describe the characteristics of the sample.

5.1 Development of the market

Table 5.1 presents statistics about the number of Fintechs founded and the amounts that these companies have raised through venture capital investments by year. It considers the full sample, so every country in which at least one Fintech start-up was born, and the period from 2005 to 2019. Column (1) presents statistics about the number of Fintech formation in a given year. As highlighted by the table, there is a constant growth of Fintech start-up formation from 2005 to 2015. In 2016, there was for the first time a decrease in Fintech formation compared to the previous years. In column (2) it is showed the total amount raised by Fintech start-ups each year. The amount raised fluctuated from 2005 to 2009, then it increased every year until 2014. From 2015, it steadily declined. 2014 was by far the greatest year in terms of amount raised, with a total of 46.4 billion USD raised from nascent Fintech start-ups around the world.
From column (3) to column (12) the table shows the number of Fintech start-ups started providing every specific service, according to the categorization outlined before. Except for the category of general fintech services, it is clear that the largest categories in terms of number of Fintechs started are in order, payment, financing and regulatory technology, meaning that the demand for innovation in these fields was strong.

Table 5.1 Total sample - Development of the Fintech market by year

Year	Total Sample											
	Categories											
	1	2	3	4	5	6	7	8	9	10	11	12
	Nbr. fintechs started	Amount raised (M$)	Asset and wealth mngmt	Exchange services	Financing	General fintech services	Insurance	Loyalty program	Other	Payment	Reg tech	Risk mngmt
2005	168	7348	13	6	25	55	6	5	2	28	16	12
2006	182	7273	12	8	22	67	6	9	3	25	20	10
2007	247	15000	15	4	34	94	8	17	3	30	30	12
2008	259	9619	12	10	38	97	7	23	3	35	22	12
2009	342	21330	14	6	52	127	5	25	6	52	43	12
2010	479	15780	21	10	64	153	13	74	11	83	40	10
2011	629	24210	21	8	92	209	17	69	17	130	47	19
2012	821	25720	38	18	144	266	25	63	21	151	77	18
2013	925	31520	40	7	170	299	37	42	9	195	107	19
2014	1179	46450	53	16	209	376	40	35	14	256	152	28
2015	1244	25870	74	19	225	409	76	32	13	196	173	27
2016	1186	15800	69	9	184	433	115	16	10	193	139	18
2017	1063	8892	46	13	137	358	95	13	10	250	126	15
2018	655	5353	26	9	79	239	24	9	7	197	61	4
2019	105	677	2	2	11	45	5	2	4	21	13	0
Total	9484	260842	456	145	1486	3227	479	434	133	1842	1066	216

Figure 5.1 provides a more comprehensive view about the percentages with which every Fintech category constitutes the sample. The figure is referred again to the total sample and as it shows, 34% of the pie is constituted by the general Fintech services category, which refers to those start-ups providing more than one specific service in the field of financial technology, resulting therefore the larger category as it may include a slice of pie from all categories in the sample. It has been decided to include this category in the research in order to give a complete view of the numbers concerning investments in Fintechs but from now on, only the single-service categories will be considered in the discussion.

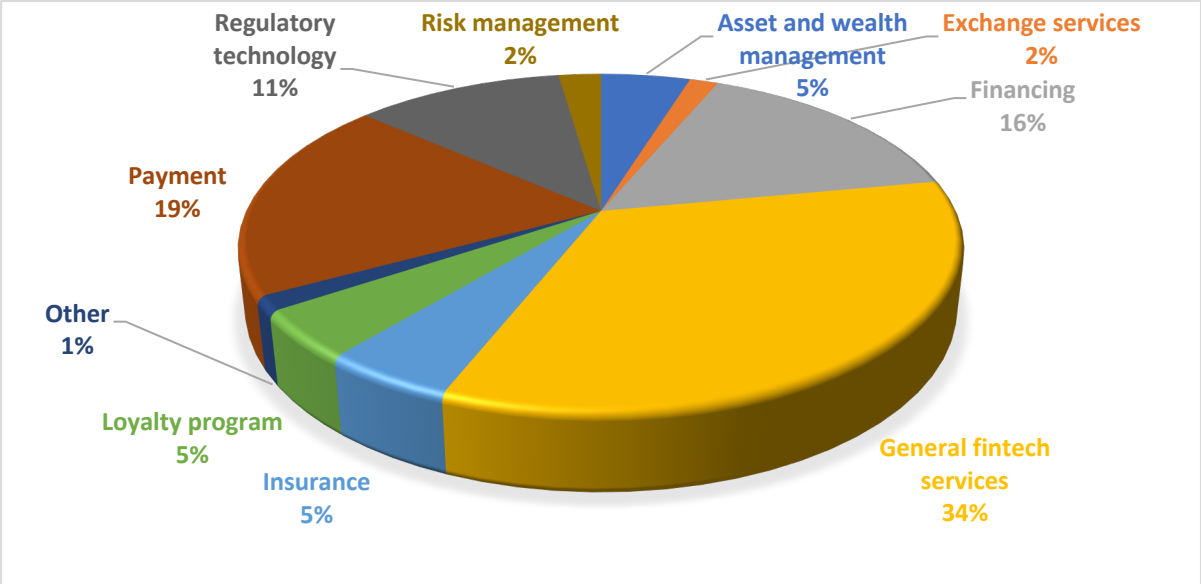
The first-largest single group is constituted by Fintechs providing payment services, accounting for 19% of the sample. The growth of mobile, e-commerce, and connected devices, along with the decline of purchases made in-person have helped Fintechs in the field of payment services to grow more than any other category. Then, the category financing services counts 1486

companies born since 2005, accounting for 16% of the sample. This number might be due to the traditional funding gap faced by small firms around the world (Schindele and Szczesny 2016) and to the increasing funding constraints after the recent financial crisis (Campello et al. 2010; European Central Bank 2013; European Banking Authority 2015).

Regulatory technology start-ups increased a lot in recent years, resulting in a total of 1066 start-ups born since 2005, 11% of the total sample. Start-ups providing loyalty programs, insurance and asset and wealth management account each for 5% of the sample, whereas the less popular Fintech categories are those dealing with exchange services and risk management, accounting each for 2% of the sample.

These findings are not surprising as Fintech start-ups about payment and financing services are the pioneers of the industry, as well as the most widespread and well-known to the people.

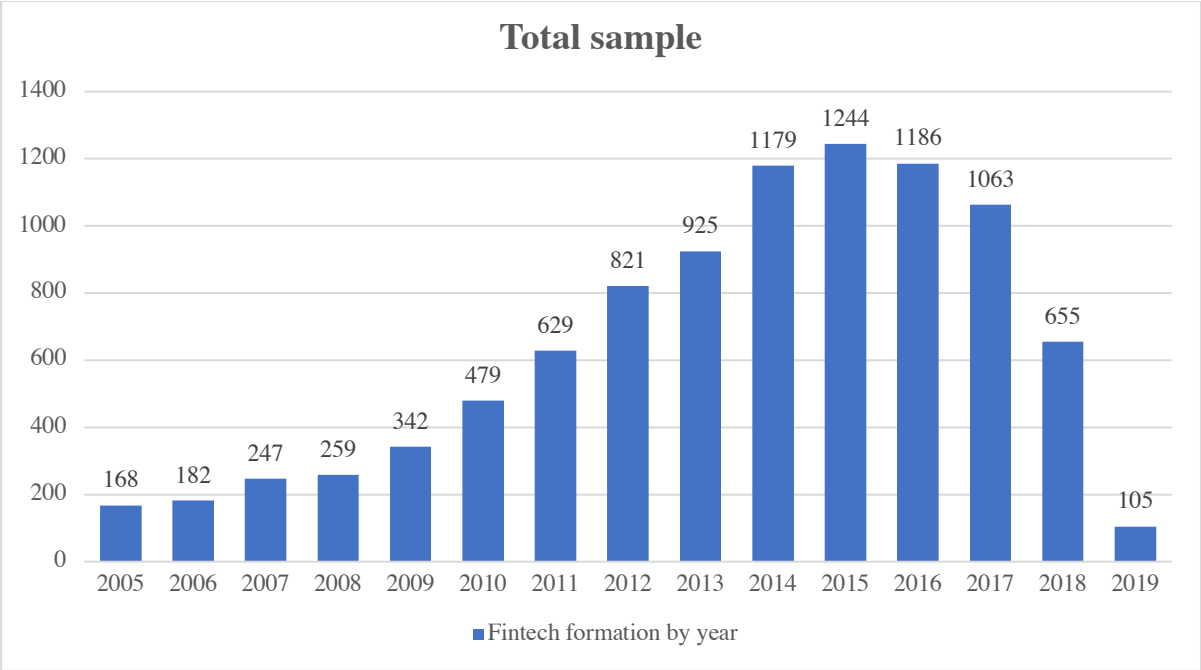
Figure 5.1 Differentiation of Fintech by category



In **Figure 5.2** it is depicted a clearer view of the number of Fintech formations by year. As the figure shows, there is a strong upsurge of Fintech start-ups especially from 2008. As a matter of fact, the number of Fintech start-ups founded in 2011 was more than twice as large as in 2008. The reason refers to the financial crisis. In fact, after 2008 the Fintech market has seen a notable increase of investments by venture capital funds. After this first wave of Fintech formation in the aftermath of the financial crisis, a second wave might be identified from 2014. In fact, this was likely driven by new technologies that matured and permitted the development of new financial services and products (Gazel and Schwienbacher, 2020). Starting from 2016, Fintech formation started to decrease globally. Even if it is early to conclude that this trend is

persistent (in particular because data from 2019 might not be complete), the sample analysis allows for this suggestion.

Figure 5.2 Total sample – Fintech formation by year



In order to investigate different dynamics and intensity about Fintech formation around the world, descriptive statistics of the most relevant continents and countries have been reported with the aim of observing how VC funds reacted to the global financial crisis and if the Fintech formation intensity changed.

Figure 5.3 Total sample – Intensity of Fintech formation

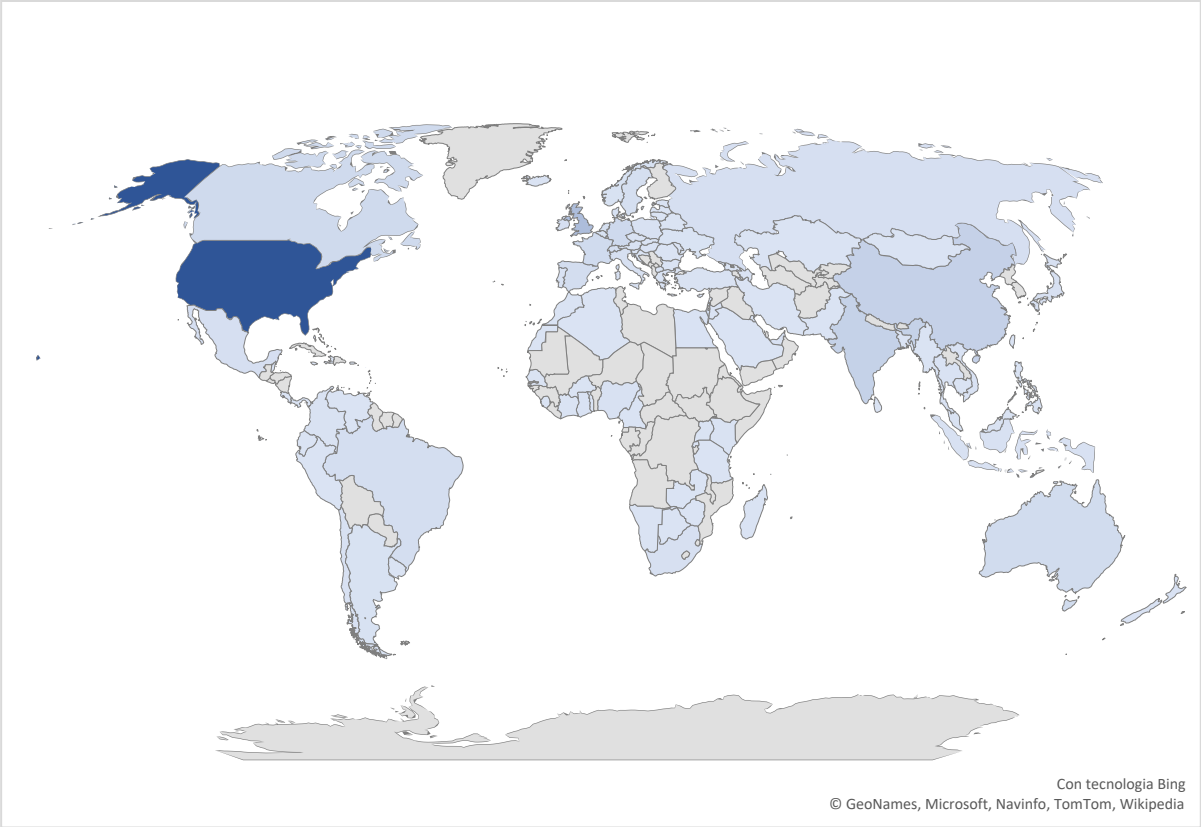
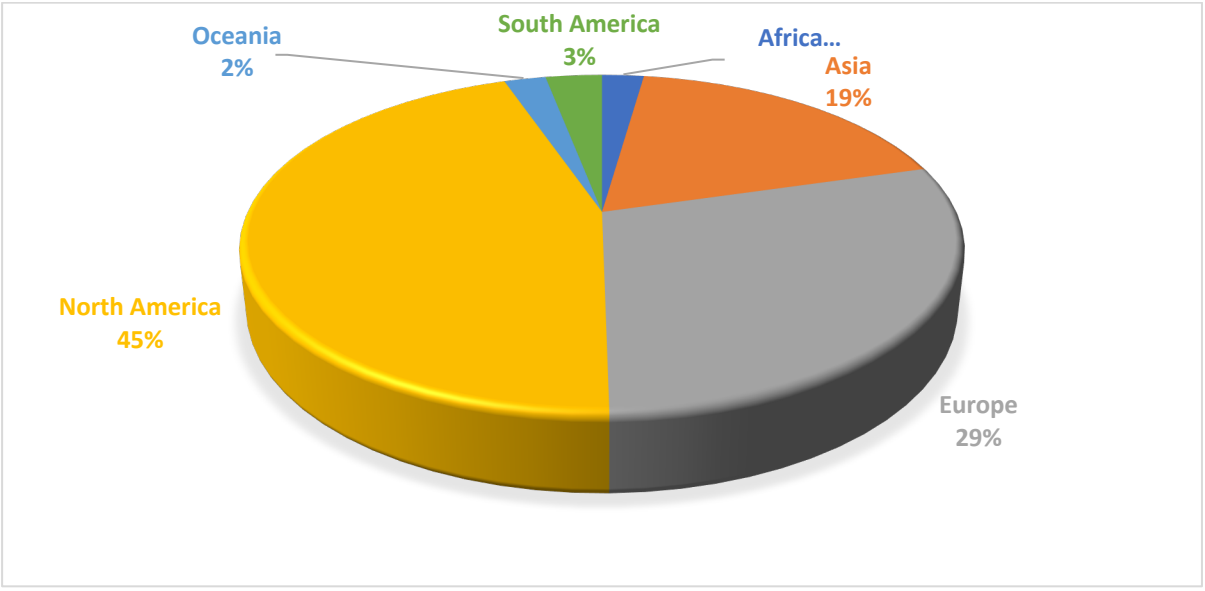


Figure 5.3 gives a picture of Fintech formation intensity in every country around the world. Without any doubt the country showing greater formation's intensity are the United States, followed by UK and China. Africa and South America are the continents showing less formation intensity. This is due to the fact that in less developed economies Fintechs find it more difficult to emerge and be funded. Accounting for almost half of the sample (45%), North America is the continent with the greatest number of Fintech start-ups in the world. The other half of the pie is almost totally split between Europe and Asia (respectively, accounting for 29% and 19% of all Fintechs). Africa, South America and Oceania account respectively for 2%, 3% and 2% of the total sample (**Figure 5.4**).

The fact that Fintech establishment intensity in Northern America widely exceeds that of Central and South America, and Fintech establishment intensity in Western Europe does the same with respect to Central and Eastern Europe, does probably refer to financial development levels. Regions which present higher financial freedom and financial development tend to show greater Fintech formation intensity (Laidroo and Avarmaa, 2019).

Figure 5.4 Differentiation of Fintech started by continent



5.2 US, Europe and Asia

The following tables present descriptive statistics of the most relevant countries and continents. As the USA has the overall largest market share in the sample, with San Francisco and New York being the capitals of Fintech activity, **Table 5.2** presents statistics about the development of the US Fintech market only for each year, from 2005 to 2019. In column (1) it is showed the number of Fintech start-ups launched in the USA, representing almost 40% of the entire sample. Column (2) depicts the amounts raised each year whereas columns (3)-(12) the number of Fintechs started for each category of Fintech. Fintech start-ups performing payment services (17%) are again the largest category, followed this time by regulatory technology (14%) before financing (13%). Then loyalty program (5%), asset and wealth management (4%), insurance (4%), risk management (3%), exchange services (1%) and other business activities (1%).

Table 5.3 provides statistics for the Europe sample by year. Columns (1)-(12) are described as before but calculated for the countries belonging to the Europe continent. Also in Europe, Fintechs providing payment services are the largest category (20%), followed by financing (17%), regulatory technology (10%), insurance (6%), asset and wealth management (5%), loyalty programs (4%), risk management (2%), exchange services (1,5%) and other business activities (1%).

Table 5.2 US sample - Development of the Fintech market by year

Year	US Sample											
	Categories											
	1	2	3	4	5	6	7	8	9	10	11	12
	Nbr. fintechs started	Amount raised (M$)	Asset and wealth mngmt	Exchange services	Financing	General fintech services	Insurance	Loyalty program	Other	Payment	Reg tech	Risk mngmt
2005	85	3272	9	4	14	29	2	4	1	9	8	5
2006	103	3969	7	5	7	37	3	8	1	14	13	8
2007	128	6394	3	1	12	55	3	7	1	16	22	8
2008	135	5819	8	2	22	51	1	12	1	15	14	9
2009	181	8205	10	3	24	74	2	14	2	24	25	3
2010	250	7018	7	5	21	90	5	41	7	46	22	6
2011	305	14270	11	4	33	119	8	35	8	51	25	11
2012	359	14070	19	8	51	122	11	30	10	52	46	10
2013	356	12000	19	3	66	117	13	17	3	58	53	7
2014	471	10930	12	6	73	151	20	18	5	91	83	12
2015	441	8261	28	5	59	144	26	8	7	54	97	13
2016	398	7818	22	3	53	140	31	7	6	63	62	11
2017	387	3783	16	7	42	118	29	7	4	104	53	7
2018	231	3045	10	4	24	83	10	1	2	67	28	2
2019	37	358	0	1	4	15	2	0	3	5	7	0
Total	3867	109212	181	61	505	1345	166	209	61	669	558	112

Table 5.3 Europe sample - Development of the Fintech market by year

Year	Europe Sample											
	Categories											
	1	2	3	4	5	6	7	8	9	10	11	12
	Nbr. fintechs started	Amount raised (M$)	Asset and wealth mngmt	Exchange services	Financing	General fintech services	Insurance	Loyalty program	Other	Payment	Reg tech	Risk mngmt
2005	49	2237	3	0	5	20	1	1	1	8	5	5
2006	36	725	1	1	7	11	1	0	2	7	5	1
2007	63	6715	4	2	10	23	3	5	0	8	5	3
2008	61	1539	0	4	7	26	3	4	0	9	6	2
2009	93	2081	1	1	18	35	2	5	2	13	10	6
2010	122	3278	12	3	25	35	4	17	0	15	10	1
2011	171	4000	6	3	32	50	3	16	3	40	12	6
2012	229	3654	4	5	57	64	9	17	6	44	17	6
2013	296	4667	6	2	53	90	13	16	2	75	30	9
2014	355	5494	24	7	68	108	10	10	2	77	40	9
2015	374	4378	20	6	71	125	23	8	1	67	45	8
2016	360	2925	22	4	54	113	48	4	3	64	42	6
2017	321	1496	19	1	39	116	31	3	3	64	41	4
2018	200	963	8	2	28	85	9	6	1	45	15	1
2019	23	76	0	0	3	8	3	2	1	5	1	0
Total	2753	44228	130	41	477	909	163	114	27	541	284	67

Table 5.4 reports data about the Asia sample only, as it represents the third largest market share in our sample. The first number which is quite surprising refers to the amount raised. In fact,

Fintech start-ups started in Asia in our sample raised a total of 91.3 billion USD from 2005 to 2019, which is twice the amount raised by European Fintech start-ups. With almost less than one thousand start-ups born with respect to Europe, this means that in Asia, Fintech companies are able to raise much more money on average.

The category of Fintech with the highest number of nascent start-ups is again the one of payment services (21%), followed by financing (18%), regulatory technology (9%), asset and wealth management (5,5%), insurance (5%), exchange services (1,5%), risk management (1%), loyalty programs (1%) and other business activities (1%).

Table 5.4 Asia sample - Development of the Fintech market by year

Year	Asia Sample											
								Categories				
	1	2	3	4	5	6	7	8	9	10	11	12
	Nbr. fintechs started	Amount raised (M$)	Asset and wealth mngmt	Exchange services	Financing	General fintech services	Insurance	Loyalty program	Other	Payment	Reg tech	Risk mngmt
2005	19	1157	1	1	5	2	2	0	0	6	2	0
2006	24	1636	3	0	3	14	2	0	0	1	0	0
2007	35	651	6	1	7	12	1	1	1	3	1	1
2008	32	1612	2	2	4	11	2	1	1	5	2	1
2009	39	10690	2	1	6	9	1	1	1	8	8	1
2010	56	5185	0	1	12	15	2	2	2	15	3	1
2011	85	4984	2	0	16	24	3	2	2	21	8	1
2012	121	5549	10	5	21	35	3	1	1	30	10	1
2013	162	11380	11	1	33	50	5	2	2	33	19	2
2014	220	28980	8	2	48	70	6	3	3	50	21	6
2015	272	12040	16	6	56	96	18	3	3	42	22	3
2016	271	4114	20	2	44	113	23	1	1	38	28	0
2017	216	2282	4	5	35	74	17	2	2	55	18	4
2018	140	996	6	1	15	52	2	2	2	50	11	0
2019	28	95	2	0	3	11	0	0	0	8	4	0
Total	1720	91351	93	28	308	588	87	21	21	365	157	21

In order to present a clear image about Fintech start-up formation for every year in the most relevant continents, **Figure 5.5**, **Figure 5.6** and **Figure 5.7** are showed. The first thing that can be noticed is that the three curves are similar. After the financial crisis, the number of VC investments in Fintechs allowed the constant growth of the market. In USA the number of Fintech formations started to decline in 2015, whereas in Asia and Europe it continued to rise until 2015, then steadily declined. Given that USA, Europe and Asia constitute together almost 90% of our sample, it is not surprising that the graph of Fintech formations for the total sample highlighted in **Figure 5.2** follows the same trend.

Figure 5.5 US sample – Fintech formation by year

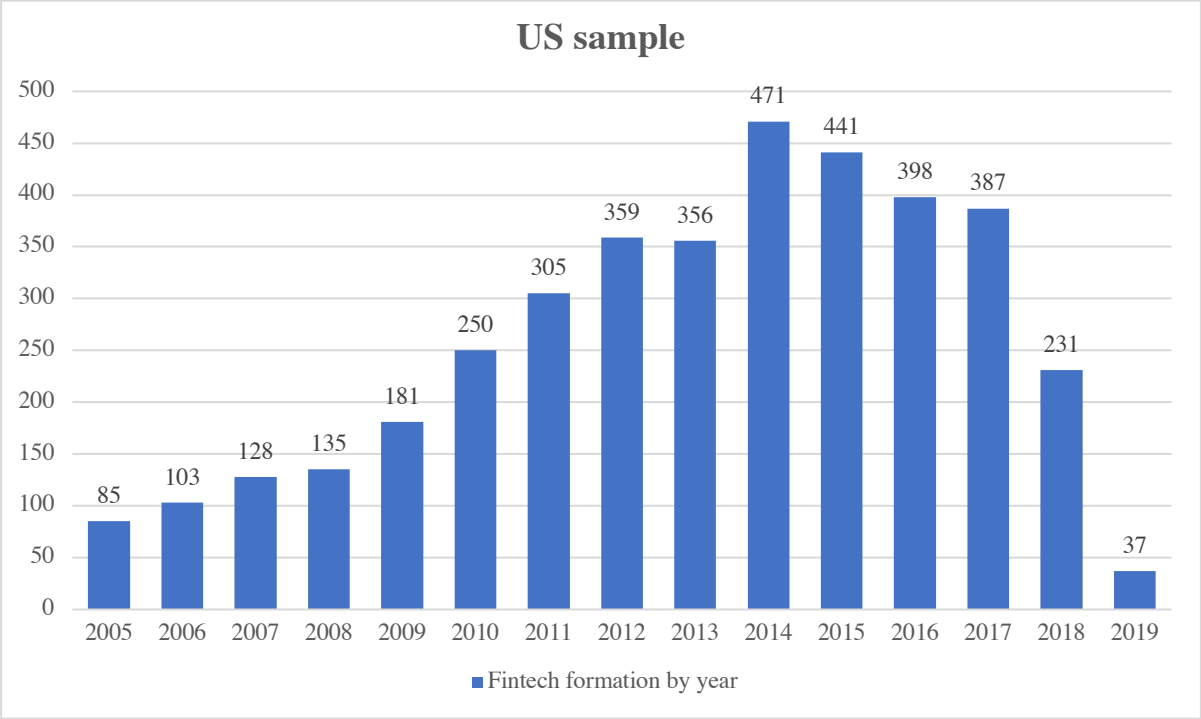


Figure 5.6 Europe sample - Fintech formation by year

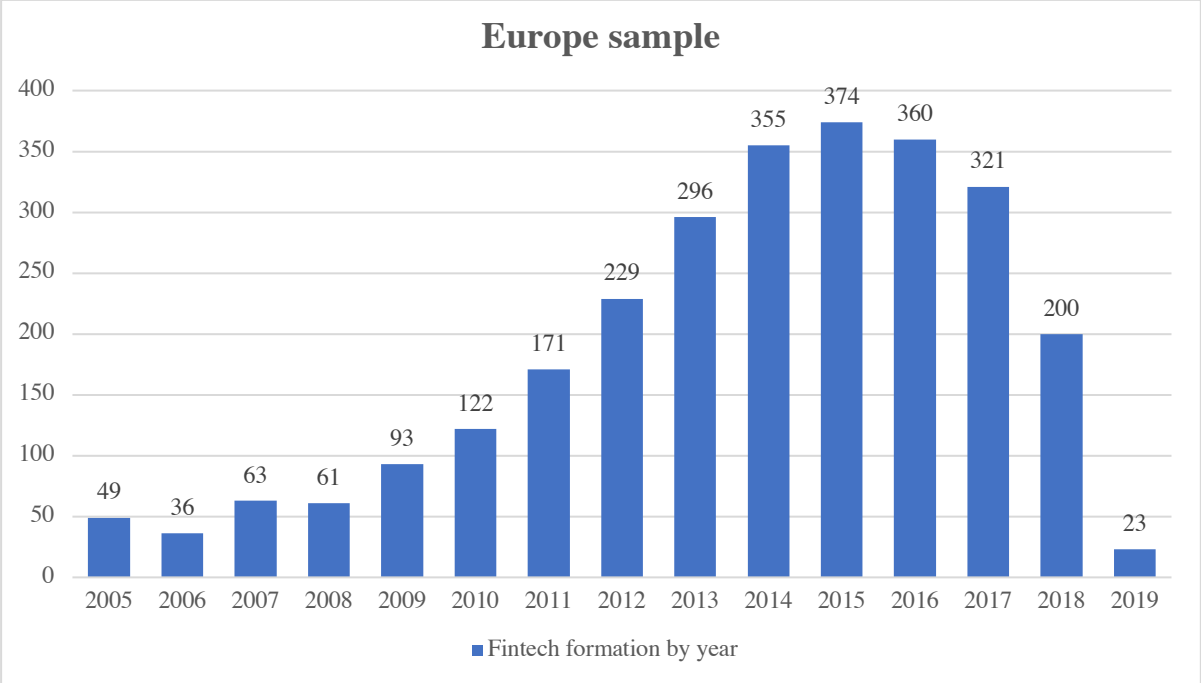
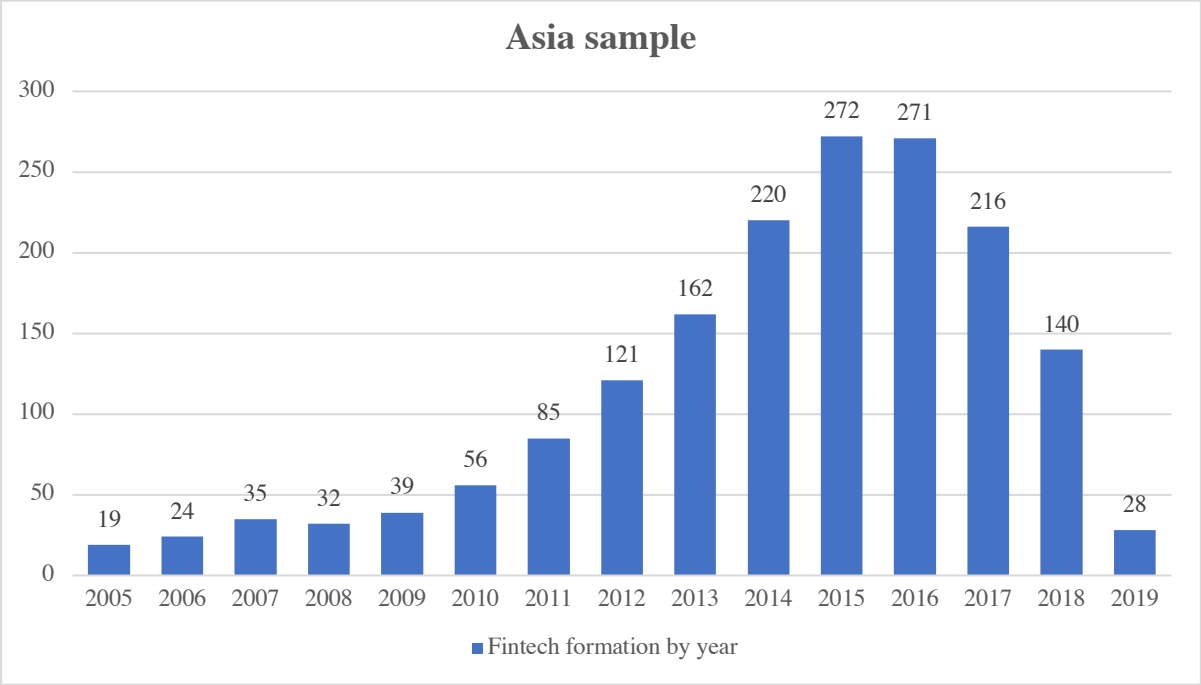


Figure 5.7 Asia sample - Fintech formation by year



As already highlighted in the previous chapters, the growth in the number of Fintech formations is largely due to the recent financial crisis. Fintech ventures, while incumbents had to face stronger regulation and scrutiny by regulators, had the possibility to grow in a field which was outside the scope of regulators. Moreover, many employees that worked for financial institutions prior to the crisis had to leave their job and seek for new opportunities in the financial industry. Many of them might have undertaken entrepreneurial opportunities in the field of financial technology.

Why after 2015 the number of Fintech formations started to decrease? The answer might be due both to the nature of Fintechs and of VC funds. As highlighted by a managing director of Accenture in a recent interview, despite the strong demand for Fintech globally, it is very likely that as start-ups become more mature, investments will move to fast-growing economies (like India for instance), where the pool of consumers is very large and still unaddressed. It is in those markets where innovation might disrupt the industry. Also, venture capital investments are cyclical, hence it is not surprising if they may decline after a period of record volumes or very intense activity. Moreover, experts also say that there is a risk that banks might copy the products of Fintech start-ups. This may devaluate the achievements of Fintech start-ups causing a drop in the number of formations as well.

5.2.1 Focus: the 10 most relevant European countries

Table 5.5 presents statistics by country for the 10 most relevant European countries in our sample during the period from 2005 to 2019. Column (1) presents the number of Fintechs started for each country, column (2) the amount raised by each country whereas columns (3)-(12) report the number of Fintechs started for each category of Fintech in a given country.

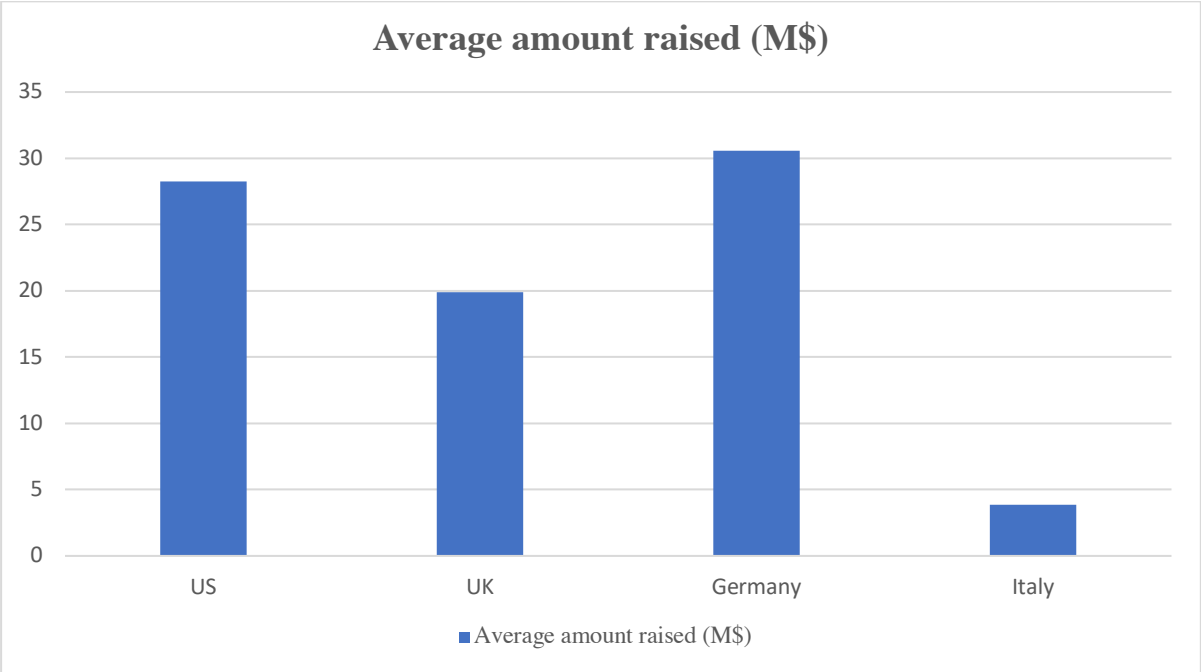
UK is at the top of the list both in terms of amount raised and number of Fintechs started, followed by Germany, France and Spain. Italy results to be the ninth country in Europe in terms of number of Fintechs started with 75 start-ups and a total amount raised of 291 million USD. The number of Fintech started in UK and the total amount raised constitute nearly half of our sample (48% and 55%, respectively). A recent study conducted by Deloitte (2017) has ranked the United Kingdom as the best place to grow as a Fintech start-up and the third around the world, after China and the USA. The reasons lie in the fact that UK has the most supportive regulatory regime and effective tax incentives. Being London a global financial center, the country attracts entrepreneurs willing to found Fintech start-ups (Haddad and Hornuf, 2019). Moreover, UK has one of the highest consumer Fintech adoption rates, as 71% of UK consumers already use Fintech services (global average is at 64%). Hence, with the world's largest cluster of financial and professional services providing a large pool of clients and partners and a very well-connected consumer market, it offers an incredible opportunity for growth.

Table 5.5 Top 10 Europe - Development of the Fintech market by country

Year	Top 10 Europe											
	Categories											
	1	2	3	4	5	6	7	8	9	10	11	12
	Nbr. fintechs started	Amount raised (M$)	Asset and wealth mngmt	Exchange services	Financing	General fintech services	Insurance	Loyalty program	Other	Payment	Reg tech	Risk mngmt
UK	1228	24410	67	24	198	443	77	33	12	205	130	39
Germany	289	8834	17	3	51	90	34	10	1	53	26	4
France	244	2095	11	1	45	74	16	9	2	52	29	5
Spain	163	493	8	4	48	41	9	9	0	25	17	2
Switzerland	133	1188	7	0	17	47	3	3	1	35	16	4
Netherlands	127	1129	9	5	26	36	4	7	0	27	8	5
Sweden	114	2633	3	2	30	37	4	3	1	25	7	2
Ireland	107	3067	2	2	12	38	3	4	1	20	16	9
Italy	75	291	3	0	17	24	5	6	0	14	5	1
Denmark	61	280	3	0	8	29	3	1	1	11	4	1
Total	2541	44420	130	41	452	859	158	85	19	467	258	72

Regarding average amounts raised by Fintech start-ups, **Figure 5.8** provides information about US, UK, Germany and Italy. In Germany, Fintech start-ups raised on average more than any other country (30.5 million USD). USA Fintech start-ups raised on average 28 million USD while UK Fintech start-ups 20 million USD. Italy, with 3.8 million USD raised on average, is very far from the big players in the industry.

Figure 5.8 US, UK, Germany, Italy - Average amount raised by country



5.3 Investments, financing rounds and investors

With the objective of analyzing more deeply venture capital investment activity, **Table 5.6** provides an overview about rounds and investments during the recent years. In particular, the table shows the number of Fintechs started by year in column (1), financing rounds Fintech start-ups have obtained in that year (2), number of investments in Fintech companies (3), amount raised (4) and number of investors (5). It is referred to the total sample and with financing round it is intended the round of funding in which start-ups go through to raise capital from venture capital funds. Each round of financing means the business accepts at least one investment from at least one investor within a specific time period.

The number of financing rounds that Fintech start-ups received during each year followed the curve of Fintech formations (see **Figure 5.9**). So, after a growth from 2005 to 2014, they steadily declined. The total amount raised by new start-ups declined as well, whereas the number of investments continued to grow until 2018, when it reached the astonishing number

of 8680 investments in a year. Column (2) together with column (4) tell us that the average volume per funding round has dropped in recent years. Moreover, the average volume per investment, which reached almost 10 million USD at its peak in 2014, dramatically dropped. Hence, while the pace of new Fintech formation may have slowed, venture capital investment activity remains robust but with a decrease in amount invested. These data suggest that VCs should be concerned about excessive pushes into hot industries, probably fueled in part by media. In fact, the graph suggests that in the last years too much money is chasing too few quality deals, causing a commensurate reduction in the average quality of such deals (Cumming and Swchienbacher, 2018)

Table 5.6 Total sample - Development of investments and rounds by year

Year	Total Sample				
	1	2	3	4	5
	Nbr. fintechs started	Nbr. Financing rounds	Nbr. investments	Amount raised (millions $)	Nbr. investors
2005	168	366	398	7348	80
2006	182	396	545	7273	65
2007	247	551	635	15000	151
2008	259	525	624	9619	137
2009	342	775	713	21330	189
2010	479	1099	1018	15780	267
2011	629	1521	1598	24210	457
2012	821	1946	2353	25720	610
2013	925	2060	3332	31520	527
2014	1179	2562	4681	46450	707
2015	1244	2576	6068	25870	756
2016	1186	2093	6461	15800	590
2017	1063	1670	7697	8892	484
2018	655	872	8680	5353	290
2019	105	127	6847	677	38
Total	9484	19139	51650	260842	5348

With regard to the distribution of investors, **Figure 5.10** provides an overview about the distribution of VC funds around the continents. In particular, it shows the number of different VC investors that have invested in Fintech start-ups since 2005. Obviously, the fact that in North America, Europe and Asia we notice a high Fintech formation intensity is due to the large presence of VC funds (or investors), which enable the fast growth of the market. In fact, the highest number of VC investors in our sample comes from North America (50%). Europe and Asia contribute with 1455 (26%) and 1023 (18%) investors respectively, then Oceania (3%),

South America (2%) and Africa (1%). Notice that it is possible that some data of the database lack information about the origin of investors.

Figure 5.9 Total sample – N of Fintech formation, investments and rounds by year

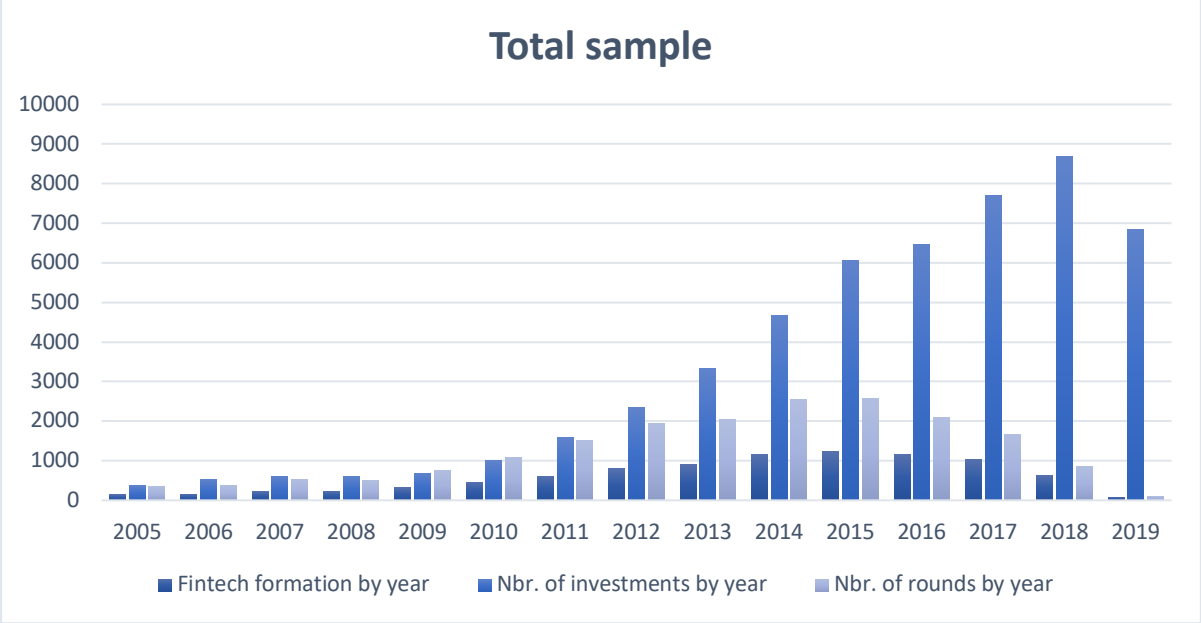
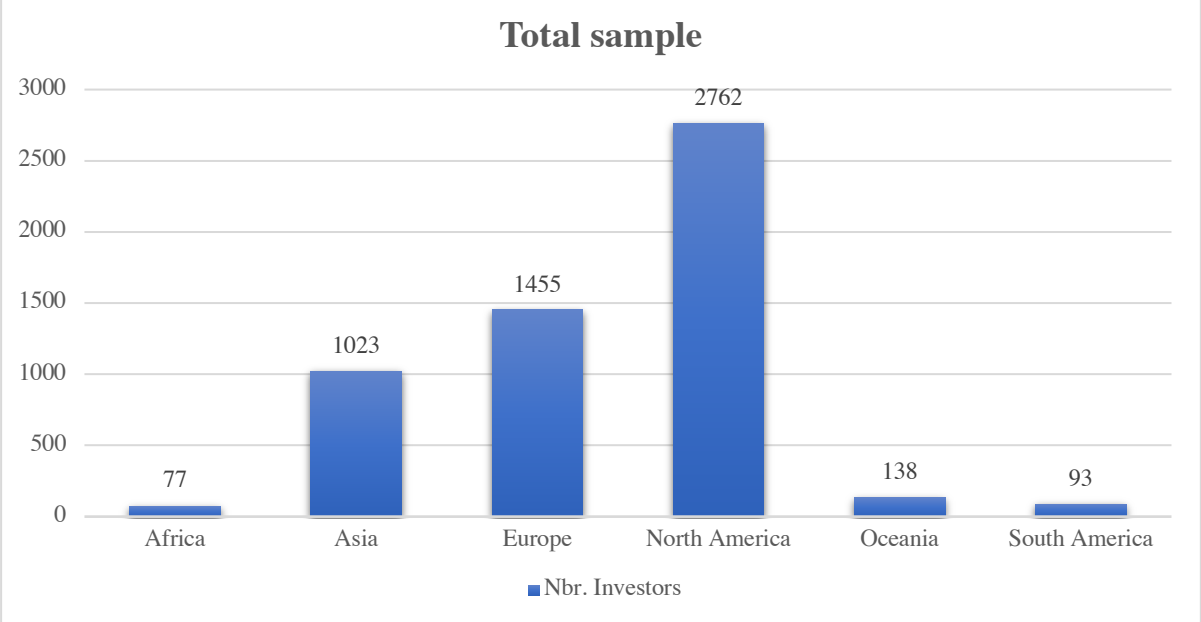


Figure 5.10 Distribution of investors by continent



5.4 Fintech vs non-Fintech investments

In order to give a more comprehensive view regarding the evolution of the Fintech venture capital industry, **Table 5.7** presents summary statistics that relate data of Fintech and non-

Fintech start-ups funded by all VC investors in the sample. In particular, column (1) and (5) show number of Fintech and non-Fintech start-ups started by year, columns (2) and (6) the number of financing rounds start-ups have obtained in that year, columns (3) and (7) number of investments and columns (4) and (8) the total amounts raised in million USD by each year. Since 2005, the number of Fintechs started constitutes more than 10% of the total start-ups born in our sample (9484 Fintech out of 82435 total start-ups). Moreover, if we look at the number of financing rounds, we can state that for Fintech companies they continued to grow steadily until 2015, whereas for non-Fintech start-ups they remained almost constant from 2012 to 2015, then declined. Similarly, the number of total investments of Fintechs continued to grow steadily until 2018, while non-Fintechs investments grew softly from 2015 to 2018, then steadily declined (see **Figure 5.13** to **Figure 5.18** for a more accurate picture).

Table 5.7 Total sample - Comparison Fintech vs non-Fintech

Year	Total Sample							
	Fintech				Non-Fintech			
	1	2	3	4	5	6	7	8
	Nbr fintechs started	Nbr. Financing rounds	Nbr. investments	Amount raised (millions $)	Nbr. others started	Nbr. Financing rounds	Nbr. investments	Amount raised (millions $)
2005	168	366	398	7348	2183	4461	6541	64800
2006	182	396	545	7273	2594	5184	7591	76910
2007	247	551	635	15000	2849	5866	10239	99420
2008	259	525	624	9619	2945	5843	9854	77540
2009	342	775	713	21330	3554	6899	8333	103100
2010	479	1099	1018	15780	4424	8593	11343	143900
2011	629	1521	1598	24210	5773	11262	15503	108700
2012	821	1946	2353	25720	7313	14337	20084	168400
2013	925	2060	3332	31520	7966	14877	26522	115800
2014	1179	2562	4681	46450	8379	15652	33763	122800
2015	1244	2576	6068	25870	8664	15220	40360	105900
2016	1186	2093	6461	15800	7105	11310	40537	73280
2017	1063	1670	7697	8892	5401	7833	42574	58360
2018	655	872	8680	5353	3059	3904	45745	23880
2019	105	127	6847	677	742	851	36440	4142
Total	9484	19139	51650	260842	72951	132092	355429	1346932

Figure 5.11 provides average amounts raised, comparing Fintechs and non-Fintechs. Average amounts raised by Fintechs have been larger every year since 2005 to 2016 and in 2009 the value was more than twice as large as the amount raised by non-Fintech start-ups. This might be an index suggesting how after the financial crisis VC funds invested and believed in the explosion of the Fintech environment. Moreover, regarding the average round investment size raised by Fintech and non-Fintech companies, **Figure 5.12** provides a comparison. Except for

2010 and 2017, the average round investment size has always been greater for Fintech start-ups.

Figure 5.11 Average amount raised by year

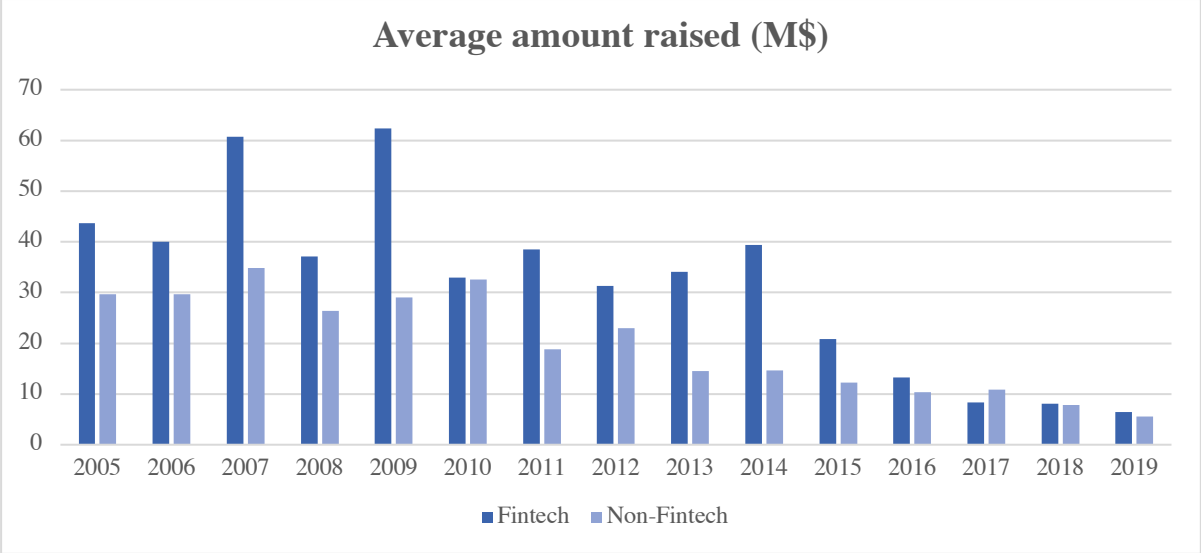


Figure 5.12 Average round investment size by year

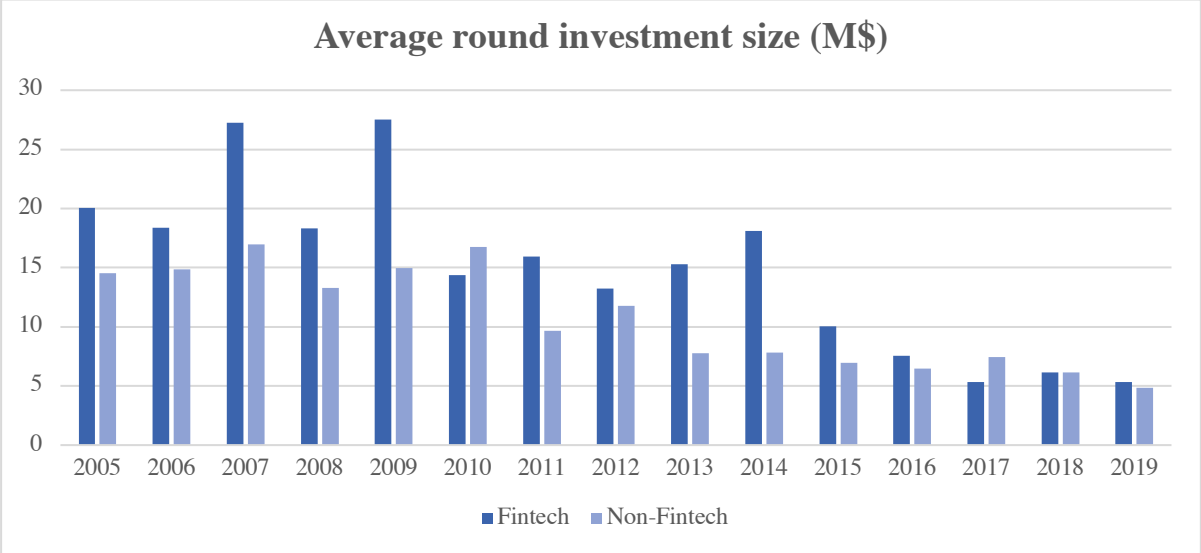


Figure 5.13 Number of investments in Fintech start-ups

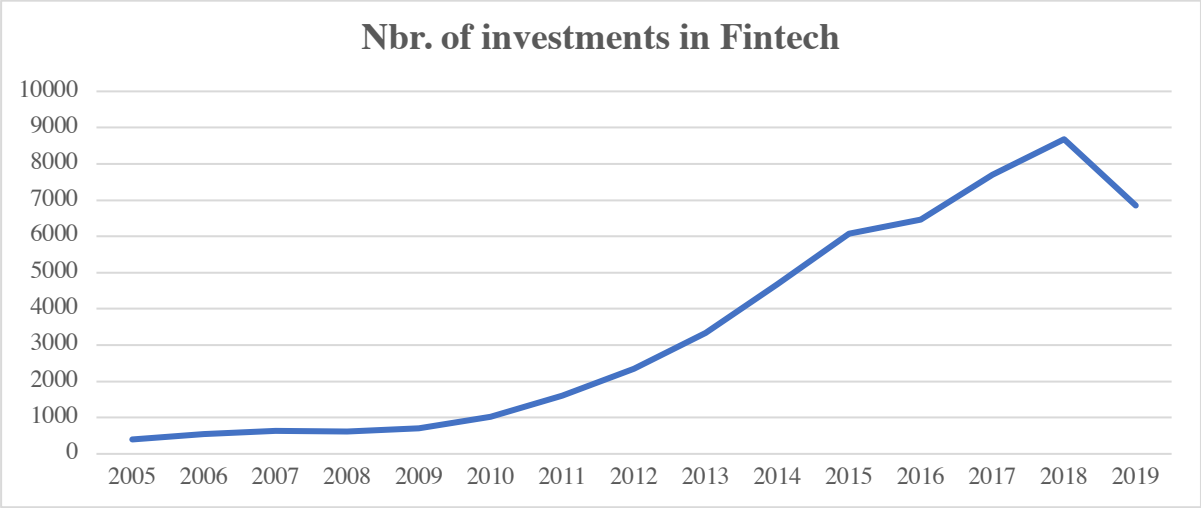


Figure 5.14 Number of investments in non-Fintech start-ups

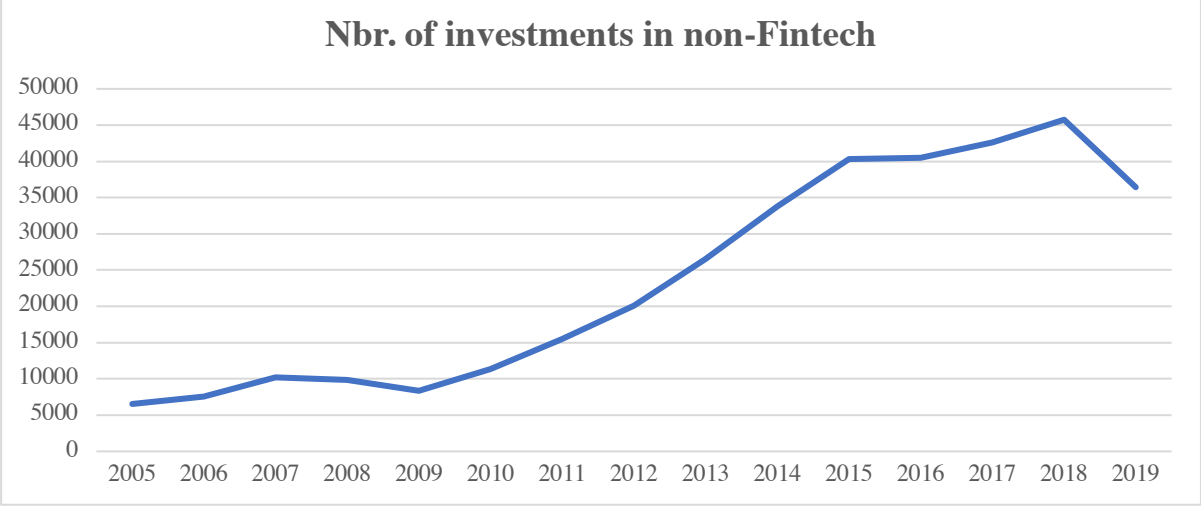


Figure 5.15 Number of rounds in Fintech start-ups

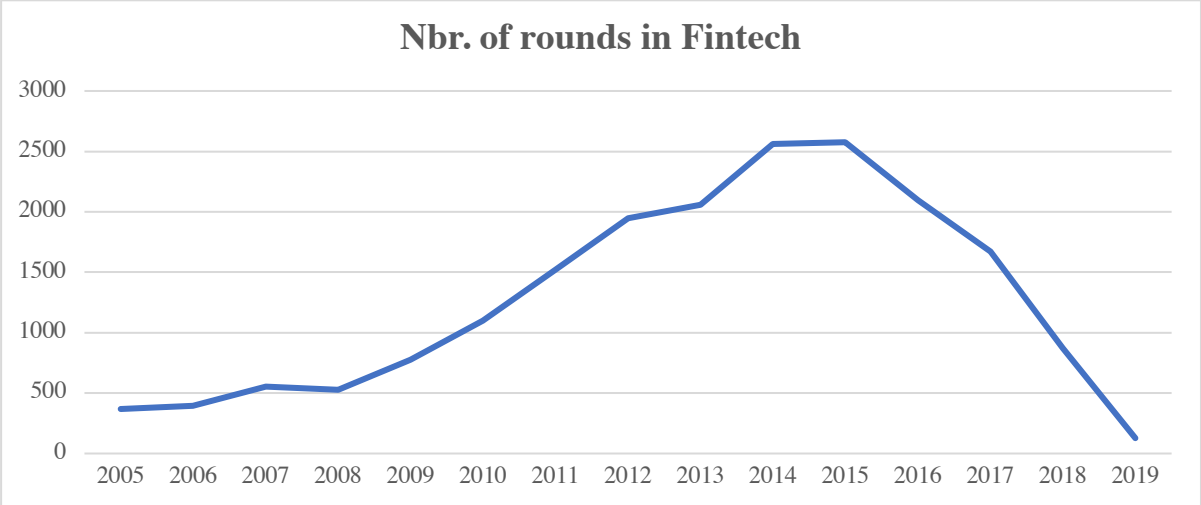


Figure 5.16 Number of rounds in non-Fintech start-ups

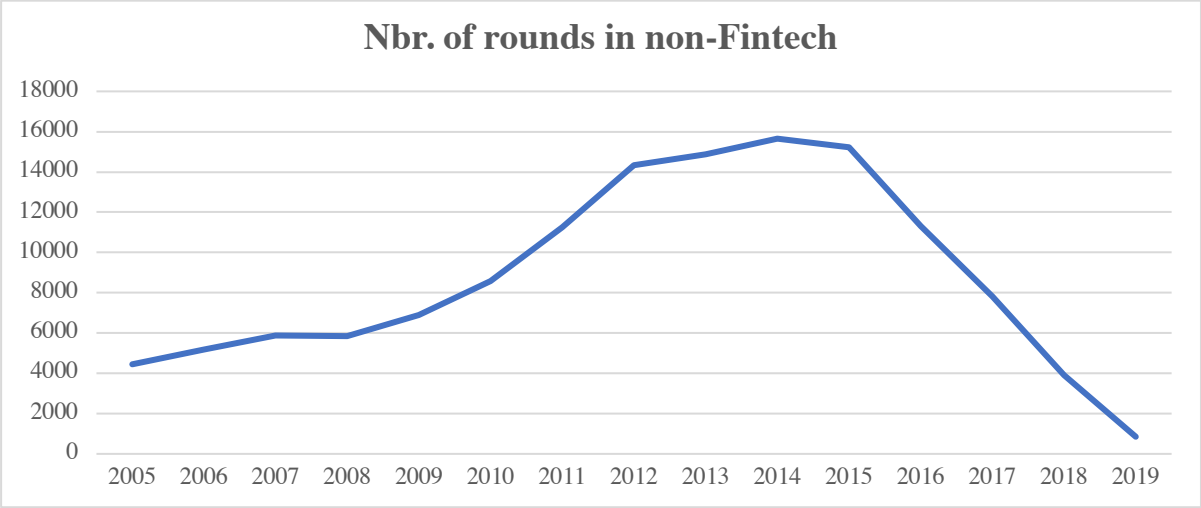


Figure 5.17 Number of Fintech started

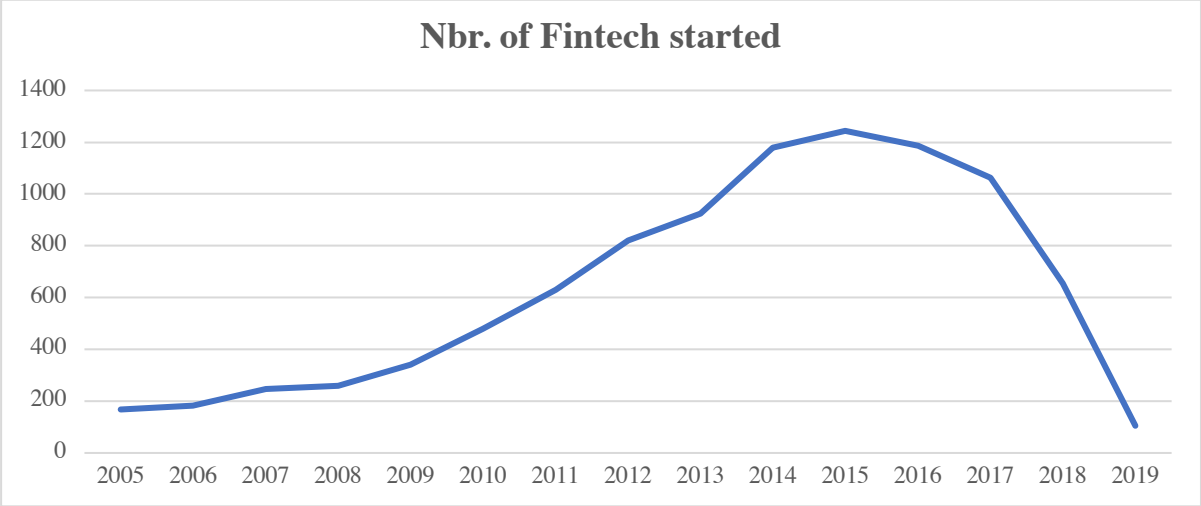
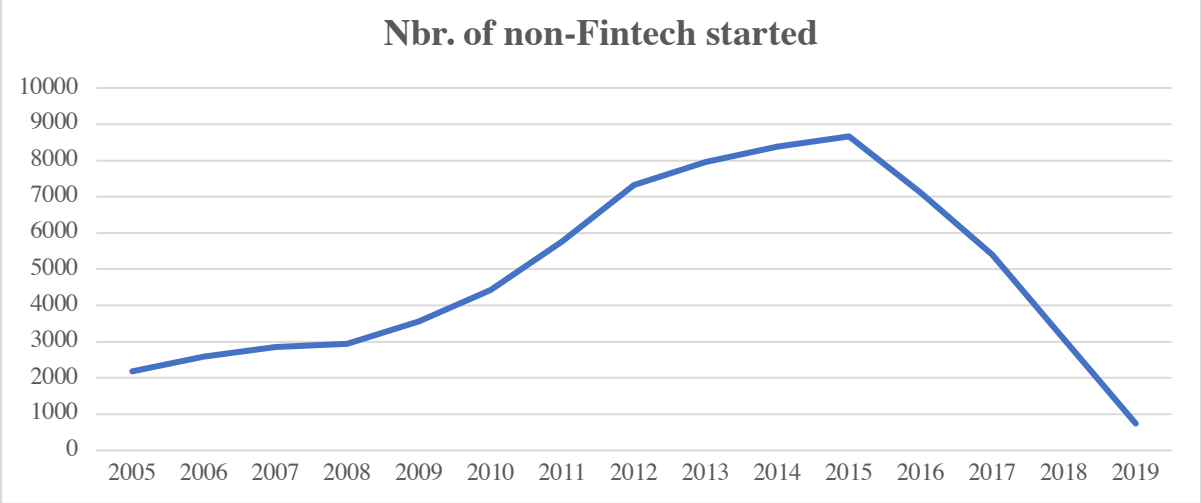


Figure 5.18 Number of non-Fintech started



6 Conclusion

The purpose of this thesis was to give an overview about venture capital investments in Fintech start-ups in recent years. In order to do so, it has been used Crunchbase as the data source for the study, from which number of Fintechs, investments, rounds and investors have been extracted in order to present relevant statistics. It has been found that the USA have the largest Fintech market, followed by the UK, China and India at a considerable distance. The distribution of Fintechs around the world sees North America with the leading position in terms of number of Fintech started, followed by Europe, Asia, South America, Oceania and Africa.

Fintech start-ups have been categorized in the following categories, in line with the work of Haddad and Hornuf: *asset and wealth management, exchange services, financing, general Fintech services, insurance, loyalty program, other, payment, regulatory technology and risk management*. Payment and financing resulted to be, by far, the most important categories in the Fintech market, followed by regulatory technology, insurance, loyalty program, asset and wealth management, exchange services and risk management.

After 2008, when the financial world was really shaken by the crisis, the first notable upsurge of Fintech formations was identified. Then, there was a second wave from 2014 whereas since 2016 the number of Fintech formations and financing rounds steadily declined. This trend was confirmed for all the most relevant countries and continents.

In Europe, the UK accounted for almost half of the sample, with more than four times the number of Fintech started in Germany, which occupies the second position before France. Italy is the ninth country in terms of number of Fintech started, with only 291 million USD raised.

Countries where economy is well-developed, market regulations are flexible and the supporting infrastructure is readily available witness more Fintech start-up formation, suggesting policymakers the way to promote this new sector. At the same time, incumbent financial organization must pay attention to the pace of innovation which characterizes Fintech start-ups, because by being larger and more immobile they cannot easily relocate in Fintech hubs and attract talented individuals. Similarly, Fintech entrepreneurs must avoid incumbents from easily copying their business models, because by having deep pockets and a large pool of customers banks can easily start large-scale projects and attract a critical mass of clients faster.

Regarding VC investors, the market has seen in the last two years a big amount of investments but not big returns or profits, meaning that excessive pushes into hot industries are happening.

Hence, even if customers in developed countries might have higher income and so more likely to use financial technology, Fintechs might solve more important problems of inclusion and intermediation in developing countries. As a result, the next hot markets for financial technology might be Africa or South America.

Like other, this research has its limitations. For instance, syndicate size of investments was not taken into consideration and different exit outcomes of the start-ups have not been analyzed. In any case, this work should be seen as a contribution to the research about venture capital investments, specifically in the Fintech industry.

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Appendix

Authors	Article	Research Question	Data	Research method	Findings
Haddad, C. Hornuf, L.	The emergence of the global fintech market: economic and technological determinants. 2019. Small Business Economics, 53, 81-105	What are the economic and technological determinants inducing entrepreneurs to establish ventures with the purpose of reinventing financial technology (fintech)?	CrunchBase database containing information about founders and funding rounds of over 200,000 companies.	Random effects negative binomial model. Dependent variables: number of fintech startups funded, number of fintech startups funded for each one of the following categories: -asset management -financing -insurance -loyalty program -others -payment	Fintech startup formations occur more frequently in well developed economies and in countries where the supporting infrastructure is readily available. Furthermore, it takes place more often in countries with a more fragile financial sector and with a larger labor market.
Cumming, D.J. Schwienbacher, A.	Fintech venture capital. 2018. Corporate governance: an international review, 26,5, 374-389	Where are fintech venture capital investments taking place around the world? What is the role of institutional factors on the	Venture capital investments extracted from VentureXpert from 1990 to 2015.	OLS regression on the determinants of investment amounts Dependent variable: round amount Poisson regression on the	Fintech venture capital investments are relatively more common in countries with weaker regulatory enforcement and without a major financial center after the financial crisis.

Authors	Article	Research Question	Data	Research method	Findings
		international allocation of fintech venture capital?		determinants of syndicate size. Dependent variable: n of investors involved in the financing of a given round	The fintech boom is more pronounced for smaller private limited partnership venture capitalists that have less experience with prior venture capital booms and busts. These deals are substantially more likely to be liquidated, especially when located in countries without a major financial center.
Laidroo, L. Avarmaa, M.	The role of location in FinTech formation. 2019. Entrepreneurship & Regional development	What are the location-specific factors associated with FinTech establishment intensity?	CrunchBase database containing information about founders and funding rounds of over 200,000 companies.	Porter's diamond dimensions. One-dimensional OLS regressions. Four-dimensional OLS regressions. Dependent variable: total number of FinTechs of the given type established	Greater FinTech establishment intensity is showed in smaller countries, countries with stronger information and communications technology (ICT) services clusters, and countries that have experienced a crisis during the recent decade. Greater FinTech establishment intensity is also observed in countries with greater tertiary education enrolment rates, stronger university-industry cooperation, greater fixed line availability,

Authors	Article	Research Question	Data	Research method	Findings
					and overall ICT readiness.
Gazel, M. Schwienbacher, A.	Entrepreneurial fintech clusters. 2020. Small Business Economics	What are the formation features and dynamics of entrepreneurial clusters in the emerging fintech industry?	Data collected by hand on entrepreneurial fintech startups started in France.	Longitudinal (panel data) negative binomial regressions, where each observation gives the number of new fintechs in a given year and city.	Most fintechs are geographically clustered and the location of new fintech startups is affected, among other things, by the size of clusters and the presence of incubators. Larger clusters attract more fintech startups, and incubators are shown to be an effective mechanism to attract new fintech startups.
Giaquinto, L. H. Bortoluzzo, A. B.	Angel investors, seed-stage investors and founders influence on FinTech funding: an emerging market context. 2020. Macroeconomics and finance in	What are the differences between FinTechs that received private equity and venture capital funds and those that did not?	CrunchBase database containing information about founders and funding rounds of over 200,000 companies.	Logit model. Dependent variable: 1 if the company received external funding, 0 otherwise	There is a positive relationship between having received an angel and a seed round with follow- on financing, and a negative relationship with having a single founder. The impact of the seed financing and the single founder is weaker in an emerging

Authors	Article	Research Question	Data	Research method	Findings
	emerging market economies				market. Companies in financing and payments categories are more likely to receive funding.
Lee, D. K. C. Teo, E. G. S.	Emergence of FinTech and the LASIC principles. 2015. The journal of financial perspectives: FinTech	What are the key factors and principles linked to the success of Fintech companies?	N/A	N/A	Some of the most important factors linked to the success of fintech business models are: low margin, asset light, scalable, innovative and compliance easy.
Philippon, T.	The fintech opportunity. 2016. NBER working paper series	What is the potential impact of FinTech on the financial industry?	N/A	N/A	It is documented that financial services remain surprisingly expensive, which explains the emergence of new entrants. It is then argued that the current regulatory approach is subject to significant political economy and coordination costs, and therefore unlikely to deliver much structural change. FinTech can bring deep changes but is likely to create significant regulatory challenges.

Authors	Article	Research Question	Data	Research method	Findings
Gomber, P. Koch, J-A. Siering, M.	Digital Finance and FinTech: current research and future research directions. 2017. Journal of business economics, 87,537–580	What is the current state of research in Digital Finance and the potential future research directions?	Databases of academic literature such as Ebscohost, Springer, Sciencedirect, or Google Scholar.	Literature review conducted as a multi-stage process.	Clear overview of the status of the research on Digital Finance. The number of articles published in journals and conference proceedings increased noticeably over the last years. Nearly half of the articles address Digital Financing and nearly all of the articles in this group focus on crowdfunding.
Guild, J.	Fintech and the future of finance. 2017. Asian Journal of Public Affairs, 10(1): e4.	What is the impact of technological innovation on the financial sector?	N/A	N/A	Two cases of fintech in Kenya and China. Intervening too forcefully to shape the fintech market through policy-making and regulatory intervention can produce unwanted effects, with no guarantee that the policy goal of expanded access to finance will be achieved.
Lee, I. Shin, Y. J.	Fintech: Ecosystem, business models, investment decisions, and challenges. 2018. Business	What are the business models, investment decisions and challenges of fintech?	N/A	N/A	Business models: payment, wealth management, crowdfunding, lending, capital market, insurance services Challenges: investment

Authors	Article	Research Question	Data	Research method	Findings
	Horizons, 61, 35-46				management, customer management, regulation, technology integration, security and privacy, risk management.
Puschmann, T	Fintech. 2017. Business and information system engineering, 59(1):69–76	What is fintech and what are its characteristics?	N/A	N/A	There are many drivers of the evolution of fintech: IT, consumer behaviour, ecosystems, regulation. There are many approaches and perspectives to fintech literature: isolated vs comprehensive, aligned vs enabler, cost saving vs investment, regulation vs impact. There are many dimensions of fintech: innovation degree, innovation object, innovation scope.

Authors	Article	Research Question	Data	Research method	Findings
Hornuf, L. Klus, M. F. Lohwasser, T. S. Schwienbacher, A	How do banks interact with Fintech startups? 2020. CESifo working papers	Which banks collaborate with fintechs? How intensely they do so? Which form of alliance they prefer?	Hand collected data of the 100 largest banks of Canada, France, Germany and UK.	Probit panel regression. Dependent variables: -alliance= 1 if bank engaged in at least one alliance with a fintech, 0 otherwise. -investment= 1 if a bank acquired at least a minority stake in a fintech and equal to 0 if the alliance is characterized by a product-related collaboration. Negative binomial panel regression. Dependent variable: number of new alliances.	Banks are significantly more likely to form alliances with fintechs when they pursue a well-defined digital strategy and/or employ a chief digital officer. Moreover, banks invest more frequently in small fintechs but often build product-related collaborations with larger fintechs.

Authors	Article	Research Question	Data	Research method	Findings
Chen, M. A. Wu, Q. Yang, B.	How valuable is fintech innovation? 2019. The Review of Financial Studies, v 32 n 5 2019	Which specific types of new FinTech will be most valuable to their innovators? Will FinTech discoveries help incumbent financial institutions reduce costs and better engage customers?	Bulk Data Storage System (BDSS) provided by the U.S. Patent and Trademark Office (USPTO) containing data about patent filings.	Machine learning to identify and classify innovations by the underlying technologies. Poisson regressions. Multivariate regression. Panel regression.	Most FinTech innovations yield substantial value to innovators, with blockchain being particularly valuable. For the overall financial sector, internet of things (IoT), robo-advising, and blockchain are the most valuable innovation types. Innovations affect financial industries more negatively when they involve disruptive technologies from nonfinancial startups, but market leaders that invest heavily in their own innovation can avoid much of the negative value effect.
Cojoianu, T. F. Clark, G. L. Hoepner, A. G. F Pazitzka, V. Wojcik, D.	Fin vs. tech: are trust and knowledge creation key ingredients in fintech start-up emergence and financing? 2020. Small business economics	How is the emergence of fintech start-ups and their financing shaped by regional knowledge creation and lack of trust in financial services incumbents?	Crunchbase and CB Insights commercial databases.	Negative binomial log-level regression. Dependent variable: Number of New Fintech Start-Ups by Region. Generalized linear log-log regression.	Knowledge generated in the IT sector is much more salient for fostering new fintech start-ups than knowledge generated in the financial services sector. The importance of new knowledge created in the financial services sector (IT sector) increases (decreases) as fintech

Authors	Article	Research Question	Data	Research method	Findings
				Dependent variable: -ln (Regional Fintech Start-Up Investment)	start-ups grow and seek financing. When the level of trust in financial services incumbents falls within a region, this is followed by an increase in the financing provided to fintech start-ups. Regions with historically low average levels of trust in financial services incumbents attract less fintech investment overall.
Sangwan, V. Harshita Prakash, P. Singh, S.	Financial technology: a review of extant literature. 2019. Emerald insight	What is the extant literature about fintech?	Social science research network [SSRN]-29 papers, Scopus-81 papers, other sources-20 papers	A systematic review of literature consisting of 130 studies on Fintech	The impact of FinTech on various stakeholders can be understood using three dimensions: consumers, market players and regulatory front.
Brandl, B. Hornuf, L.	Where Did FinTechs Come From, and Where Do They Go? The Transformation of the Financial Industry in Germany After Digitalization.	How was the transformation of the financial industry in Germany?	436 fintech companies operating in the German market identified by Dorfleitne	N/A	Entrepreneurial dynamics in the FinTech sector are not so much driven by technology as by the educational and business background of the founders. In contrast with other emerging industries

Authors	Article	Research Question	Data	Research method	Findings
	2020. Front. Artif. Intell. 3:8.		*et al*. (2017)		such as biotechnology, a network analysis shows that FinTechs have mostly engaged in strategic partnerships and only a few banks have acquired or obtained a financial interest in a FinTech.
Cumming, D. Fleming, G. Schwienbacher, A	Liquidity Risk and Venture Capital Finance. 2005. Finacial Management, W2005, 77-105	Do venture capitalists adjust their investment decisions according to liquidity conditions on IPO exit markets?	Investment data from VentureXpert database.	Logit regressions.	There is a strong negative relationship between the liquidity of exit markets and the likelihood of investing in new early-stage projects. The liquidity of exit markets significantly affects both the decision to invest in new projects and the size of the investment syndicate.
Schwienbacher, A	Venture capital investment practices in Europe and the United States. 2008. Financial Markets Portfolio Management, 22: 195–217	What are the investment practices and contract behavior of venture capitalists in relation to their portfolio companies?	Surveys conducted in 6 European countries (Belgium, France, Germany, Netherlands, Sweden, UK) and in the US. 171 questionnai	OLS regression	European venture capitalists engage in less monitoring and thus adopt a more hands-off approach to their portfolio companies as compared to US venture capitalists.

Authors	Article	Research Question	Data	Research method	Findings
			res is the total sample.		
Félix, E. G. S. Pires, C. P. Gulamhussen, M. A.	The Determinants of Venture Capital in Europe — Evidence Across Countries. 2013. Journal of Financial Services Research, 44:259–279	Is the size of the M&A's market important in describing venture capital?	Data on 23 European countries.	OLS regression. Dependent variables: - FundRais -TotalInvVC -HighTechInv -EarStgInv.	The size of the M&A market and the market-to-book ratio have a positive impact on venture capital activity whereas the unemployment rate influences the venture capital market negatively.
Bertoni, F. Colombo, M. G. Quas, A.	The patterns of venture capital investment in Europe. 2015. Small business economics, 45: 543-560	What are the investment patterns of venture capital funds in Europe?	Data from VICO database including companies that received their first round of VC investment between 1994 and 2004 and were less than 10 years old at that time.	Transformed Balassa index (TBI).	VC investor types in Europe differ substantially in their investment patterns when compared to one another and, in terms of investment patterns, governmental VC investors appear to be the most distinct type of VC investor. The investment patterns of different VC investors are stable over time and similar across different European countries.

Authors	Article	Research Question	Data	Research method	Findings
					The investment patterns of the different VC investor types in Europe are significantly different from those observed in the USA.
Buzzacchi, L. Scellato, G. Ughetto, E.	Investment stage drifts and venture capital managerial incentives. 2015. Journal of Corporate Finance, 33, 118–128	What are the managerial incentive schemes explaining investments stage drifts?	Dataset of 149 publicly sponsored VC funds that received financial support from the European Investment Fund (EIF) and that invested in 1925 European companies between 1998 and 2007.	Multinomial logit models.	A higher hurdle rate produces a compensation incentive that discourages VC managers from lowering funds' risk. More reputable fund managers are less likely to increase risk by downward stage drifting and more likely to play it safe by following upward stage drifting strategies. Managers of funds with a poor past performance appear to be less keen to perform stage drifts towards less risky stages, relative to well-performing fund managers

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