

A PORTUGUESE VENTURE CAPITAL FUND IN THE
CONTEXT OF TROIKA: ANALYSIS OF ITS RETURNS AND
IMPACT ON INVESTEE FIRMS

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ABSTRACT

Banif, Banco Português de Investimento and Banco Comercial Português received capital from Troika due to the 2008 crisis. In return, they had to invest in venture capital and Revitalizar was the fund chosen, promoted by the Portuguese Ministry of the Economy, with the goal of protecting Small and Medium enterprises from the effects of the crisis. This created a situation where it is questioned if banks, having an obligation to invest, and venture capital firms, having the capital guaranteed by their side, actually cared about investment decisions. This situation together with the restricted investment policy by the State contributed to question the fund's performance. Thus, I studied the impact of Revitalizar on the performance of its portfolio of firms measured by equity growth, estimating a regression through the random effects model, and also analysed the fund return for investors, compared with Pathena, a comparable fund that did not have its hands tied by State-defined policies. The results have shown that receiving Revitalizar investment has no impact on companies' performance but, at the end of 2018, the fund has registered lower net IRR and TVPI, which demonstrates its lower capability of successful exits so far. This situation is not in accordance with previous literature that affirms IVC-GVC syndicates perform better; this may be a reflection of the specific context Revitalizar was created or the general fragility of these syndicates in Portugal, a question that can be further studied by researchers.

Journal of Economic Literature (JEL) classification: G24, G01

Keywords: Venture Capital, Firm Performance, Venture Capital Fund Returns, 2008

Financial Crisis

RESUMO

O Banif, o Banco Português de Investimento e o Banco Comercial Português receberam capital da Troika devido à crise de 2008. Em contrapartida, investiram em capital de risco e o Revitalizar foi o fundo escolhido, promovido pelo ministério da economia portuguesa com o objetivo de recuperar as pequenas e médias empresas da crise. Isto criou uma situação em que se questiona se os bancos, tendo a obrigação de investir, e as empresas de capital de risco, tendo o capital garantido do seu lado, se preocuparam com as decisões de investimento. Esta situação, juntamente com a política de investimento forçada por parte do Estado, contribuiu para questionar o desempenho do fundo. Assim, estudei o impacto do Revitalizar no desempenho do seu portfólio de empresas medido pelo crescimento dos capitais próprios, estimando uma regressão através do modelo com efeitos aleatórios, e também analisei o retorno do fundo para investidores, comparado com o Pathena, um fundo que não teve a mão do Estado. Os resultados mostraram que receber investimento do Revitalizar não tem impacto sobre o desempenho das empresas, mas, no final de 2018, o fundo registou uma menor TIR líquida e TVPI, que demonstra a sua menor capacidade de desinvestimentos bem-sucedidos até agora. Esta situação não está de acordo com a literatura anterior que afirma que os sindicatos INV-GVC têm melhor desempenho; isto pode ser um reflexo do contexto específico em que o Revitalizar foi criado ou da fragilidade geral destes sindicatos em Portugal, questão que poderá ser estudada por futuros investigadores.

Classificação do Journal of Economic Literature (JEL): G24, G01

Palavras-chave: Capital de risco, Performance da empresa, Retornos do fundo de capital de risco, Crise financeira de 2008

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LIST OF ABBREVIATIONS

ARD - American Research and Development
BCP - Banco Comercial Português
BPI - Banco Português de Investimento
CAE - *Classificação Portuguesa das Atividades Económicas*
CEO - Chief Executive Officer
CMVM - Comissão do Mercado de Valores Mobiliários
DPI - Distributed over Paid In capital
ECB - European Central Bank
EU - European Union
GDP - Gross Domestic Product
GP - General Partner
GVC - Government Venture Capital
IAPMEI - Instituto de Apoio às Pequenas e Médias Empresas
INE - Instituto Nacional de Estatística
IPO - Initial Public Offering
IRR - Internal Rate of Return
IVC - Independent Venture Capital
IMF - International Monetary Fund
LP - Limited Partner
NAV - Net Asset Value
NUTS - *Nomenclatura das Unidades Territoriais para Fins Estatísticos*
OLS - Ordinary Least Squares
PE - Private Equity
QREN - *Quadro de Referência Estratégica Nacional*
RVPI - Residual Value to Paid capital
R&D - Research and Development
SBICs - Small Business Investment Companies
SME - Small and medium-sized enterprises
TVPI - Total Value to Paid In capital
VC - Venture Capital

1. INTRODUCTION

Venture Capital (VC), equity financing to private companies, usually in an early stage, has been increasing in terms of its importance, having reached a global value of 48,5 billion dollars (almost two thirds represented by the United States) (Tekler, Tekler, & Teraman, 2016). Similarly, in the last 25 years, VC research has been steadily increasing (Cancino, Merigo, Torres, & Diaz, 2018). In Portugal, VC became present in the 80's; according Comissão do Mercado de Valores Mobiliários (CMVM), the Portuguese regulator of the financial instruments market, VC industry importance has been increasing in the last fifteen years, representing 4,6 billion euros in 2018 (CMVM, 2019a), especially due to changes in regulations in 2003 and 2007 (Caldeira, 2012).

In Portugal, Small and Medium Enterprises (SMEs) represented 99,9% of total firms in Portugal in 2017 (INE & PORDATA, 2019a). In a lot of cases, these companies are over-indebted and still need capital to boost their growth, so VC becomes an interesting alternative, not only for SMEs in financial distress or looking for further growth but also for startups that are yet too risky so unable to ask for debt.

The financial crisis of 2008 triggered by the fall of the investment bank Lehman Brothers caused a sovereign debt crisis in the Euro Zone. Portugal, as one of the most financially vulnerable countries, was specially affected in 2010, so in 2011 the Portuguese prime minister decided to ask for help from the International Monetary Fund (IMF), the European Central Bank (ECB) and the European Union (EU), which came to be known as the "Troika". Portuguese banks in financial distress received money from Troika: Banif, Banco Português de Investimento (BPI) and Banco Comercial Português (BCP). In return, and among other conditions, they had to invest in VC. These banks chose the VC fund Revitalizar, promoted by the Ministry of Economy with the goal of revitalizing companies hurt by the 2008 crisis, with focus on Portuguese innovative and/or Small and Medium Enterprises (SMEs), with some pre-defined investment policies.

Banks had the obligation to invest in VC and VC firms had the capital guaranteed by their side, so there is a doubt if they both cared about the investment decisions or not. More specifically, if VC firms were motivated enough to carry out a due diligence and neglected the choice of companies they were investing. This situation, together with the fact that there was a forced investment policy in Revitalizar, contribute to question if there

was a lower positive impact of this fund investments on firms' performance and lower returns for investors than a typical VC fund.

It would be interesting to study if banks and venture capitalists (VCs) do not deserve its perception of being careless in their investment decisions and the forced investment policy did not affect the funds' performance. I tested this by comparing Revitalizar with a VC fund with similar characteristics but not in the context of Troika and with free investment policies (a fund called Pathena) the impact of the fund on companies' performance, as well as the returns for the investors.

Revitalizar had a hand of the State where not only it created the fund but also imposed some investment policies but companies managing the fund are private, so the fund can be considered a mix of Independent VC and Government VC. Regarding this type of VC funds, literature found, based on European and worldwide data, that these perform better than its individual types, where it eliminates the disadvantages of Government Venture Capital (GVC) and combines the advantages of both (Cumming et al., 2017; Grilli & Murtinu, 2014; Bertoni & Tykvová, 2015; Dahaj & Cozzarin, 2019). But it is also agreed that public and private entities have different goals that may bring agency and transaction problems (Cumming, Grilli, & Murtinu, 2017), which may be the case of Revitalizar, where VC firms may have different investment preferences than the established investment policies, impacting negatively its performance.

To measure Revitalizar impact on its portfolio of firms' performance I used proprietary data with 329 observations: 106 companies, which 7 were invested by Pathena and 99 by Revitalizar and different time periods. I estimated a regression with panel data, using the Random effects model and robust standard errors to correct possible heteroskedasticity and autocorrelation problems. I also compared both funds' returns for investors, for all 10 companies of Pathena and 103 of Revitalizar, focusing on the Internal Rate of Returns (IRR) and Total Value to Paid In capital (TVPI).

Results have shown that whether a company receives Revitalizar or Pathena investment it has no impact on its performance measured by equity growth. On the other hand, at the end of the last reported year, 2018, Pathena has registered so far better performance in terms of returns for investors and the reason behind this is that it has already distributed more money to investors, as a result of divestments in 2018. Therefore, there may not be a difference in the impact on company's performance measured by equity growth but there is in terms of exit performance, favouring Pathena, which may be

caused by the differences between them: the forced investment policy and the possible lack of concern by banks and VC firms. These findings are not in accordance with literature findings, based on European and countries from different parts of the world, a possible evidence of GVC-IVC syndicates' general fragility in Portugal or by the forced investment policy and the possible lack of concern by banks and VC firms Revitalizar was created. This subject may be further studied by researchers.

2. LITERATURE REVIEW

2.1. *Venture capital definition and process*

Venture capital is a form of equity financing, usually to young and innovative companies with high growth potential (IAPMEI, 2013). Individual venture capitalists are rare, with 80% of the global VC market being represented by VC firms, small organizations with approximately 10 employees.

Unlike mutual funds that invest in public equity (shares and bonds), VC focuses on private companies, thus it is called a private equity financing type, together with the 3 F's (family, friends and fools) and business angels. Business angels or angel investors are wealthy and business experienced individuals, very similar to VCs with the difference that they invest their own money, thus having a lower cost of capital. Besides this, unlike VC, business angels only focus on young firms and exiting is not crucial since they take a more personal investment (Metrick & Yasuda, 2017).

To mitigate principal-agent conflicts of interest with entrepreneurs, VCs structure financial contracts, screen the market and after investing they monitor and advise their companies (Kaplan & Stromberg, 2001). Besides, VCs also advise companies to contact with other companies that already received VC financing to also avoid these conflicts (Fernandes, 2011)

2.1.1. *Screening and selection*

It is very important to choose a company with potential to add value through monitoring and support (Kaplan & Stromberg, 2001) and, consequently, with an exit opportunity, since this is the main way of making money for VC firms and investors. So, screening the market for new investments is of special relevance, and if the VC firm invests in its core sectors, screening, as well as monitoring, are improved (Conti, Dass, Di Lorenzo, & Graham, 2019).

When screening the market, the venture capitalist takes into consideration the concept (competitive advantage or reasonable funding needs, for instance), the management team (for example, it must be hard working and realistic) and income (potential for high return). Some VCs give more importance to the management team and others to financial and marketing perspectives (Monika & Sharma, 2015). For instance, in the Portuguese case, the management team characteristics are considered as the main

aspect when considering investment alternatives (Fernandes, 2011). Specific aspects are also considered such as the market size, the strategy, technology and customer adoption (Kaplan & Stromberg, 2001).

In 1985, VC investors visited the portfolio of companies, on average, 19 times per year (Gorman & Sahlman, 1989); the cost associated with this is the reason why geographic location of firms is one of the main factors when considering the investment. Ethnic minorities, women as CEOs, and foreign owned establishments have a lower probability of receiving VC (Paglia & Harjoto, 2014), so social aspects are also a criteria for investment. High industry experienced VCs may also use public markets shifts as a source of information of when to invest (Gompers, Kovner, Lerner, & Scharfstein, 2008).

After this search, the venture capitalist chooses a few companies to make a preliminary offer with a term sheet that includes a proposal of the valuation and of the control rights and the type of security. Control rights are in the form of votes, board seats or as an increase in the equity position (if certain milestones are not achieved) to better monitor and decrease management risk (Kaplan & Stromberg, 2001). VC firms usually have preference for convertible preferred shares, preferred stocks¹ that give the possibility to be converted into common stocks. (Kenton, 2018).

Once the companies have accepted the term sheet, the VC firm makes a due diligence in order to have deep knowledge about the companies. Both the review of the term sheet and due diligence are essential to prevent future agency costs (Gompers, 1995), costs that arise from conflicts of interest between the VCs and the entrepreneurs. Finally, if the VC firm is satisfied after this analysis, contracts are signed in the final closing.

2.1.2. Investment and monitoring

The venture capitalist then invests individually or collectively, in the second case acting as a financial intermediary, creating and managing a limited life VC fund with a maximum lifetime of ten years usually (Metrick & Yasuda, 2017). In this case, the VC firm, the general partner (GP) raises money from limited partners (LPs): individuals and families, banks, pension funds, insurers, foundations, endowments and corporations, partners that have, unlike the GP, a limited involvement in the management of the portfolio of companies. Collective investors are predominant in Portugal, with VC funds representing in 2017 more than 95% of VC industry (CMVM, 2017).

¹ Preferred stocks benefit its shareholders to receive the dividends first than the common shareholders and in case of liquidation of a company, these shareholders are paid first.

Capital is required from LPs on a planned schedule or at the venture capitalist discretion, called a capital call, drawdown or takedown. As soon as the VC firm has raised all the committed capital by LPs (promised capital by LPs over the lifetime of the fund), the fund is closed, and the capital is invested within typically five years in the portfolio of companies in exchange for a percentage of ownership in the firm (Metrick & Yasuda, 2017). The European VC firms hold their shares, on average, 6,3 years (Tekler et al., 2016).

Then, the VC firm supports the portfolio of companies financially, technically, commercially and in the administration, value added services that will be further explained in detail, to boost the portfolio companies' growth, taking a "hands-on" approach (Rosenbusch, Brinckmann, & Müller, 2013). It can also take a "hands-off" approach, where they just allocate the financial resources to the portfolio of companies. The "hands-on" approach is considered very valuable by the invested companies and has been characterizing VC essence.

After the first round of financing (or series A), the firm might invest in several rounds (series B, C and so on) every year or two (Tekler et al., 2016), in case the company still needs more financing and has been showing a good performance, having reached some previous established milestones such as a value for cash flows or acquisition of a big customer (Metrick & Yasuda, 2017). Additionally, if the company has been showing good performance, entrepreneurs start having more responsibilities and control (Kaplan & Stromberg, 2001).

Finally, it exits and returns the (possible) proceeds to the LPs and the fund changes from an unrealized to a realized fund. In addition, LPs may also receive dividends, depending on the companies' performance. On the other hand, GPs have their returns as management fees and carried interests. Management fees are used to pay most of the VC firm operational expenses such as salaries and due diligence. In the investment period, these fees are computed as usually 2% of the committed capital per year, and after this period a big part of VC funds change the fee base to the net invested capital (invested capital² minus the cost basis of realized and written-off investments).

Carried interest gives a variable return, a percentage from the exit proceeds minus committed capital most of the times, that for most VC firms represents 20%. According Metrick and Yasuda (2017), this is the most profitable source of money for GPs.

² Capital that has been deployed for the investment in the portfolio of firms, not considering management fees

Carried interest may be seen by GPs as a call option on the fund portfolio of companies; since they do not invest their own money, there is only upside potential. This situation can cause them to increase volatility to have the possibility to win a big return by either focusing the investment in one company or take on debt. But LPs may suffer from these choices. Another common situation is when GPs invest their own money and put more attention to these funds, while neglecting others. These are, among other reasons, why LPs require restrictive covenants on the partnership agreement.

2.1.3. Divestment

Divestment for VC firms and limited partners is crucial, since this is when they are seeing their investment being paid back with a surplus or not, if the portfolio of companies was successful overall. Thus, it is very important for them to choose a company with an exit opportunity, which usually includes firms in the high-tech industry which have a higher probability of growing fast enough to become big and be sold or go public (Metrick & Yasuda, 2017).

The success of a VC deal depends on the entrepreneurial spirit present in the company's culture, on the financial success, access to advanced science, and fair and open capital market. Statistically, only a sixth of companies have a successful exit through an IPO and a third through a sale (Tekler et al., 2016).

According to Instituto de Apoio às Pequenas e Médias Empresas e à Inovação (IAPMEI) (2013), there are the three ways of exiting a company. One way is to sell back the shares to the previous owners, through put or call options, contracts or management buy-out operations. The other is to sell the equity position to other investors. The last one is through an Initial Public Offering (IPO), selling the VC firm stake in the stock market. This divestment type is historically the most profitable one (Metrick & Yasuda, 2017), but not relevant in Portugal since the Portuguese stock market is not developed especially for small and medium enterprises (SMEs), having registered zero IPO operations between 2000 and 2011 (Caldeira, 2012). This makes divestments in Portugal difficult.

In 2017, the most common exits in Portugal were selling the stake to other investors and write-offs (total amount divested is equal to the total amount invested). As expected, IPOs were inexistent (figure 1). Only 16,1% of the divestments were successful, producing capital gains relative to the acquisition value (CMVM, 2017).

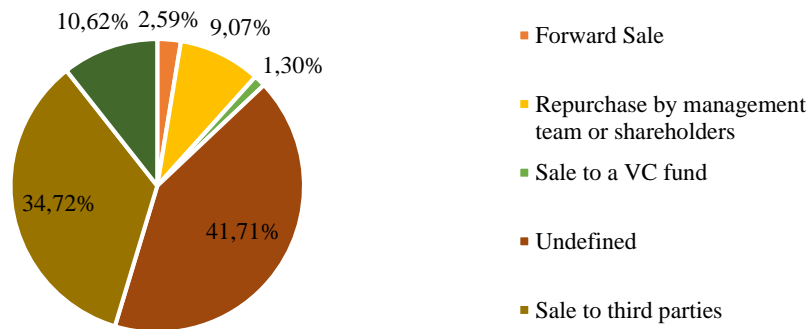


Figure 1: Proportion of number of divestments in VC in 2017, according to the VC divestment type

Source: CMVM (2017)

So, the venture capitalist goal is to find high growth potential companies to invest and help them grow to finally divest in a short or medium-term, expecting to collect capital gains (IAPMEI, 2013).

2.2. Venture capital history

It all started in an unorganized way, with wealthy people in the late 19th century and beginning of 20th century investing in high-tech companies with potential for high returns.

In the 30s and 40s, an attempt to organize this business drove the creation in 1946, in the United States, of the first VC firm, the American Research and Development (ARD) Corporation, that invested mainly in commercial applications of technologies developed in the context of the World War II. The company was founded by Karl Compton (MIT president), Massachusetts Investors Trust chairman Merrill Griswold, Federal Reserve Bank of Boston president Ralph Flandera and a Harvard Business School Professor named George Doriot, who was the driving force behind the company. Doriot's main goal was not making money but helping ideas that would have a positive impact on humans, which translated into a huge success.

With the support of the U.S. government, the Small Business Act was created and other companies started emerging, small business investment companies (SBICs), with

the advantage of being able to finance themselves at lower rates. But these companies adopted a hands-off approach, which quickly led to problems.

Many individuals following George Doriot's example, created their own VC companies, with the intent of not only providing money but also value-added activities such as access to investment bankers, corporate lawyers, accountants, and industry experts. VC grew as SBICs started fading in the 70s, and eventually in the 80s it boomed with the development of public markets and legislative changes (decrease in the capital gains tax in 1978 and allowance of pension funds to invest in 1979). VC had so far invested in successful tech companies like Apple, Intel and Microsoft, promoting the rise of the tech industry in the U.S. (Gompers, 1994). The fall of junk bonds and the internet and real estate bubble threatened the VC industry in the U.S, in the next few decades.

In the 80s, Europe started to have its first VC deals first in the United Kingdom and then in France but, unlike the U.S., it focused on later stage companies. In Portugal, it came along with the new legislation, in 1986, which allowed the set-up of VC firms. It initially had bad reputation: it was seen as a last alternative of financing to struggling companies since EU funds were abundant and bank credits had few restrictions. Therefore, VC only became more present when the first Portuguese VC firm was formed in 1988, because of the Portuguese government's incentive, through public banks or IAPMEI (an institution that supports SMEs) (Caldeira, 2012).

Nowadays, the VC country of origin, the U.S., detains about two thirds of VC global invested value, followed by Europe and China (figure 2). VC concentration is related with a high Gross Domestic Product (GDP) and innovation support in the respective countries (Teker et al., 2016).

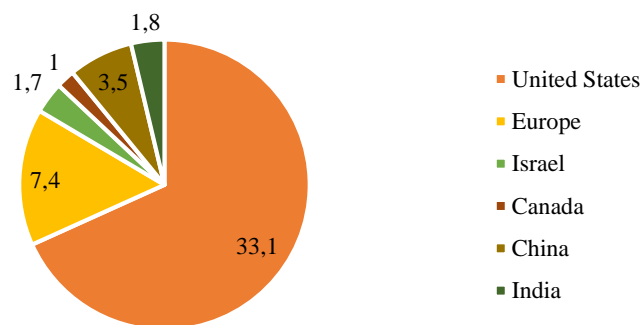


Figure 2: Global annual VC investments in 2013 (in billion dollars)

Source: Teker et al. (2016)

2.3. Venture capital firms' types

Sometimes in big corporations a venture capital division is created, which is called corporate venture capital. In this case, since their intention is to keep their stake in a long-term because of strategic and not financial objectives, their primary goal is not to exit (Metrick & Yasuda, 2017).

Captive VC firms raise money from their parent companies: subsidiaries of insurers and banks but also corporations, governments and universities.

Finally, the most common, independent VC (IVC) firms raise money with several outside investors. Its process has already been described in the first topic. In contrast, there is also government VC, which will be further explained.

2.4. Venture capital investment types

There are several designations to indicate the VC investment type, that depend on the stage of the company at the moment of the investment (IAPMEI, 2013).

Unlike the United States, VC in Portugal includes not only young firms that need managerial and administration support to grow in the future, American VC, but also firms independently of its size, already showing their good performance that need support for further growth, American private equity (PE) (Franca, 2014). Although the number of investments in Portugal between VC and PE are not very different (771 vs. 843, respectively), the invested value of the American PE has been having along the years a lot more expression than VC. For instance, in 2017, 80,3% of invested capital was accounted for by PE (CMVM, 2017).

With that being said, seed capital is directed to entrepreneurs that are still analysing an idea before having a company, so the commitment of the venture capitalist in the management is required to be larger. This involves an investment by the venture capitalist in market research to analyse the product or service viability and, consequently, in the product development.

Startups defines an investment in early stage companies, of less than one year old, that are already selling the product or not (but ready to start doing so, with a finished project). The investment usually goes to initial marketing or product/service launch. These are potentially the most profitable deals because these companies carry a lot of risk since they are very young so the participation in the company is cheaper. Young companies struggling to be successful in marketing their product might also resort to VC

financing to improve their marketing and manufacturing process; this is called “other early stage”.

When a company is in a mature stage but has no financial capacity to expand its business it provides the opportunity for an expansion investment. Bridge or mezzanine financing is intended for a company that is going to be listed soon; the venture capital firm supports the company in this process and takes the risk of an IPO, that includes the cash-out of founders and the shareholding restructure.

Some companies might be in distress and about to go bankrupt but still have potential. Investments in these firms are known as turnaround investments. Venture capitalists make a low or null investment and usually take control over the company, taking responsibility for the company’s debt and stabilizing and reconstructing the company operationally and financially.

Apart from the previous designations, there are some other designations that are related with an investor buying shares of a company and taking control of it. In a management buy-out investment, the VC firm supports the administration or shareholders to take control of the company. On the other side, management buy-In refers to external managers taking control of the firm. Buy-in management buy-out is a mixture between the previous two, it helps the administration to take control of the company, together with the support of external managers. An institutional buy-out investment allows the VC firm to take control over the company and a replacement equity any other investor that not a VC firm. Finally, in a public to private investment a company is acquired from the stock market and turned into a private company.

The most frequent investment phases in Portugal are turnaround, expansion and management buy-out, which also produced more capital gains (except turnaround) than investment phases related to the American VC: startups, seed capital and other early stage (figure 3). Turnarounds weight has been decreasing, while management buy-out increased since 2016 (CMVM, 2017).

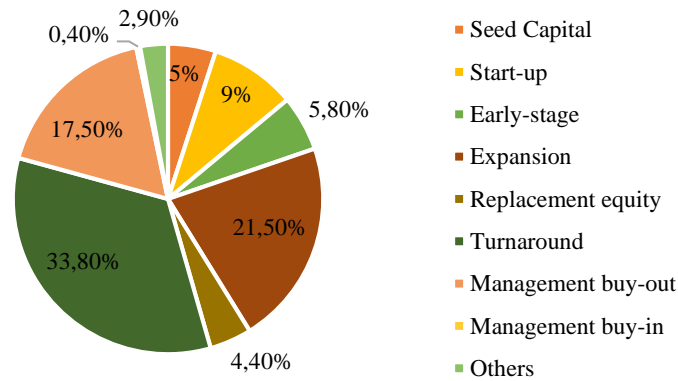


Figure 3: Proportion of invested value in VC in 2017, in Portugal, according the VC investment type

Source: CMVM (2017)

VC funds are most of the times separated according to the investee company's stage (Metrick & Yasuda, 2017). For instance, an early-stage fund focuses only in young firms and a late-stage fund on expansion or late stage companies. When VC firms do not focus the funds on a stage, they are called multistage funds. Funds may also be categorized according the company's industry and geography.

2.5. Advantages and disadvantages of venture capital

VCs can have a major impact in their portfolio of firms, especially for the ones in an early stage (Hellmann & Puri, 2002), and can bring both advantages and disadvantages to their portfolio of companies. Besides the traditional view that VCs provide money and monitoring, they also add value adding activities suitable to the specific needs of each firm by taking a position in the board of directors (Rosenbusch et al., 2013; Teker et al., 2016). VCs undertake these costly activities since they have an equity position in the companies so it is of their interest to increase their potential to grow (Kaplan & Stromberg, 2001).

These activities include coaching, mentoring, access to investment bankers that can have a signalling effect to potential stakeholders, and access to VC network of contacts (Croce, Martí, & Murtinu, 2013). This network of contacts may open doors to debt financing used as a complement to the VC financing, to tax benefits, state support and to recruit new high-quality workers.

Many other value-added activities are referred in the literature; Engel (2002) points out that integrating in external firms' networking as a consequence of the VC investment is beneficial because there is an exchange of knowledge, capital and networks, although it can also bring a disadvantage which is being dependent of these firms'

decisions. In addition, VC also has an organizational impact on companies with a focus on professionalization: human resource policies, take stock option plans, hire a vice president of sales and marketing (Hellmann & Puri, 2002; Kaplan & Stromberg, 2001) and strengthen the management team (Kaplan & Stromberg, 2001).

According to the pecking order theory, firms' preference in terms of external financing specially tends to go to debt rather than equity since investors tend to under value companies due to information asymmetries between them and managers to consider the risk they are taking (Majluf & Myers, 1984). So it will reasonable to compare venture capital with debt financing to better explain its advantages and disadvantages:

DEBT	VENTURE CAPITAL
Startups represent a high business risk for creditors since they have no assets and no history of success, therefore credits at an early stage of companies are usually rejected. For instance, in Portugal, in 2017, only 56,7% of companies survived to the first two years of activity (INE & PORDATA, 2019b).	VC is known to assume high risks, thus investing in young firms.
Does not get involved in companies' management (Ramos, 2012).	Supports their growth and development in this initial stage through coaching.
Companies have to pay back the principal plus interests independently of its circumstances, sometimes leading the company to bankruptcy and assets seizure. Creditors only guarantee that the company can pay back (IAPMEI, 2013).	Earnings are dependent on the portfolio of companies' success, so they work along the companies towards their growth until divestment. This brings a lot more flexibility to companies.
Creditors do not have as much influence in companies' decisions, giving managers much more freedom and do not take dividends (Ramos, 2012)	Can affect negatively future performance of its companies when there are conflicts of interest between the management team and the venture capitalist (Hellmann & Puri, 2002). Usually VC firms guide the company towards short-term growth compromising future growth, whereas managers concern about making decisions that will benefit the company in the long run (Koo, 2016).

Table 1: Comparison of advantages and disadvantages between venture capital and debt

Besides this, VC has a major role in promoting entrepreneurship, leading to a positive impact in the respective countries: it creates jobs, wealth in terms of GDP and impulses innovation, especially in tech companies (Franca, 2014). But money provided by the VC firm may cause a false sense of security: when companies are more financially relaxed, they may not worry that much about the company's success. Also, since exiting is crucial for venture capitalists, sometimes there are IPO's when the firm is not structurally ready (Brinkmann et. al, 2012).

In Portugal, some negative aspects are yet to solve in the VC industry: entrepreneurs claim there is a difficulty in contacting the VC firm, the VC firms' stake is often higher than 50% thus having higher control over the company and both investment and decisions take longer than a loan. In general, firms say VC work as a business partner and its intervention is not taken as very effective. However, VC is considered as more attractive than debt and very important for companies' success; companies assume that taking VC brings them new opportunities and they can benefit from the VCs expertise and network of contacts (Ramos, 2012).

2.6. Venture capital in Portugal

VC became present in Portugal in the 80's and, when compared for instance, with the United States or the United Kingdom, Portuguese VC is a very young and low developed market. For example, a public to private investment has never happened in Portugal (IAPMEI, 2013). Data from Invest Europe shows that, in 2017, Portugal was quite below Europe's average investment in VC in proportion to GDP (figure 4) (Invest Europe, 2017). This means that, though Portuguese VC activity has been growing along the years, there is still a lot of work to do to improve this industry.

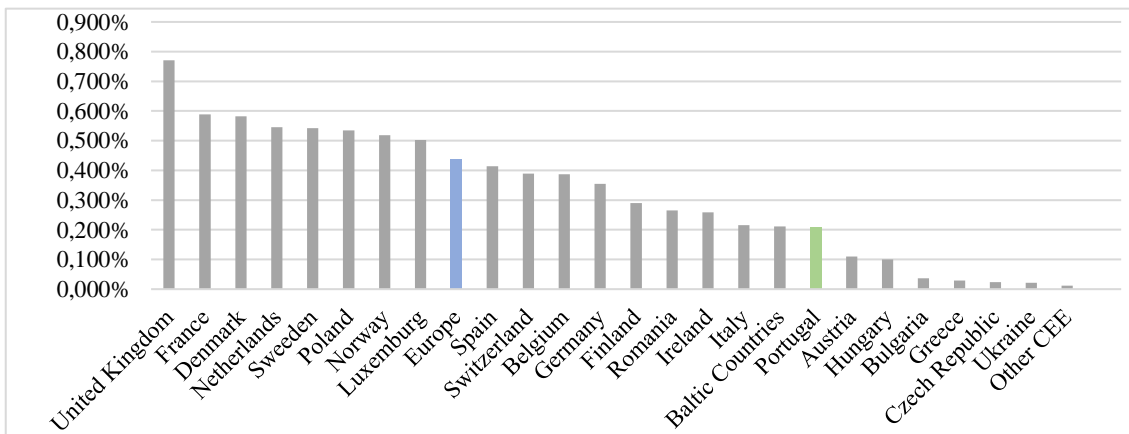


Figure 4: European countries' investment in VC in proportion to GDP (according the origin of the invested company)

Source: INE & PORDATA (2019)

The existence of few, and of small dimension, specialized VC firms, as well as the discrepancy of the different VC firms' dimensions and performance conditions the improvement of the Portuguese VC activity. Also, Portuguese people are known to have high risk aversion, meaning that members of a certain culture feel a high degree of discomfort and threat towards uncertain or unknown situations (Burton, 2015). This feeling in the country might negatively influence the emergence of new investments, VC especially since it presents higher risk than other types of investments because:

- The American VC, although it has a big potential for high returns it is also associated with high risk since typically young firms have high business risk with no guarantee they will actually grow;
- Of liquidity risk: the limited partners have to wait between four to seven years (or more) to exit the investment and collect possible capital gains; with other financial instruments such as company stocks, mutual funds or exchange-traded funds the investor has higher flexibility to sell off the investment (Horton, 2015).

The Portuguese VC market is regulated by Comissão do Mercado de Valores Mobiliários (CMVM), the Portuguese regulator of the financial market. More specifically, CMVM regulates the investment in venture capital and guarantees it is informed by VC funds and VC firms, about their portfolio of companies, investments done and accounting documents. According to its website, it regulates currently forty-eight VC firms and 122 VC funds (CMVM, 2019b).

Portuguese VC activity is characterized by investing essentially in small amounts; about 83% of total investments in 2017 were below 500.000 euros. Portuguese VC value under management represented nearly 4,6 billion euros in 2018, that has been increasing in the last fifteen years by almost thirteen times, also in terms of asset value and number of VC funds/firms (CMVM, 2019a) (appendix A.1). This growth was driven by the VC funds' value growth, more specifically to other ways of VC investment such as derivatives (CMVM, 2017). Changes in legal regulations in 2003 and 2007, allowed a more simple and flexible VC and, consequently, this increase (Caldeira, 2012).

Although VC industry has been increasing, the 2008 financial crisis affected the Portuguese economy. Portuguese companies started to underperform since 2008 (figure 5) (INE & PORDATA, 2019c) and raising money from investors became more difficult. As a consequence, VC activity was affected in 2010 and slightly in 2008 in terms of value under management and number of VC funds and firms (figure 6, appendix A.1) (CMVM, 2019a).

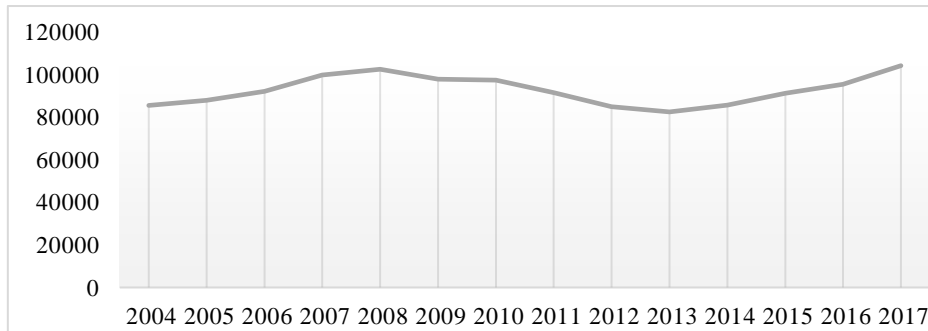


Figure 5: Gross value added by Portuguese firms between 2004 and 2017

Source: INE & PORDATA (2019)

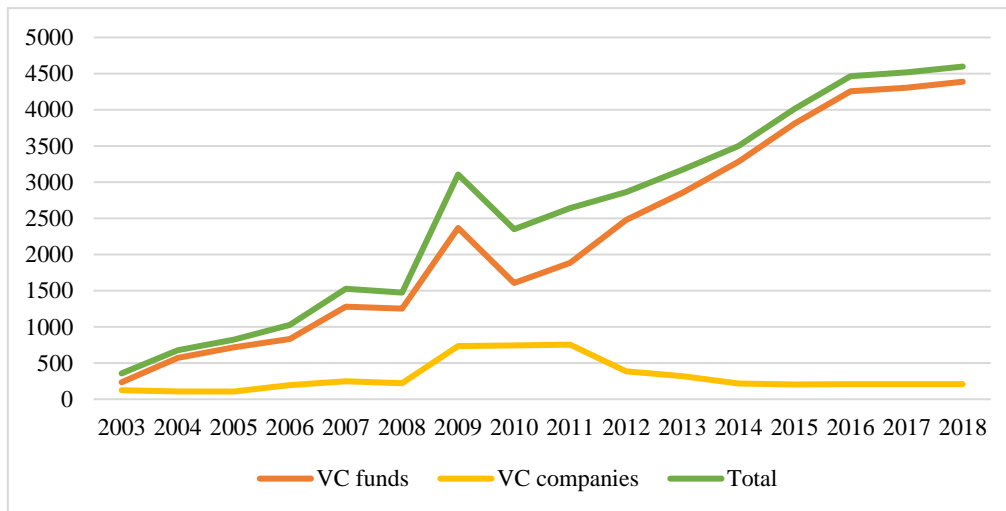


Figure 6: Venture Capital value under management evolution in Portugal from 2003 to 2018

Source: CMVM (2019)

A few years later, a recovery seemed to be emerging, as well as new business opportunities. Many companies in distress faced, after the crisis, very high interest rates and access to credit became stricter. But some of these companies with potential to recover and grow, were possibly good turnaround investments. That is exactly what happened; after the 2008 crisis, the weight of turnaround investments characterized for having a larger size and investment period, started to increase, replacing the once most relevant one, expansion investments.

This increase was stimulated by banks and the Portuguese government. It was of both their interest to avoid bankruptcy of these companies, which would cause them not to pay back their debt and also social and economic implications in the country. So, new VC funds were created, with money pooled by banks and State support but managed by VC firms, with banks being equity holders instead of debt holders (Barreto, 2014). The tendency of growth of the turnaround investment phase seems to be fading: in 2017, its

weight was 33,8%, while in 2012 represented 41% (CMVM, 2017). Thus, this seems to be just a punctual phenomenon due to the 2008 crisis.

The CMVM (2017) report states that Portuguese VC firms invested mainly in financial, insurance and construction companies (figure 7). On the other side, VC funds and VC in general, mostly invested in real estate, manufacturing and tourism related activities (figure 8). The manufacturing's sector importance has been decreasing in the last 5 years, giving space to the real state sector. In contrast, the most developed VC market (the US) invests mainly in information technology (Teker et al., 2016). In the same report, it is stated that Portuguese VC firms seem to have a better performance than VC funds, producing more capital gains than losses.

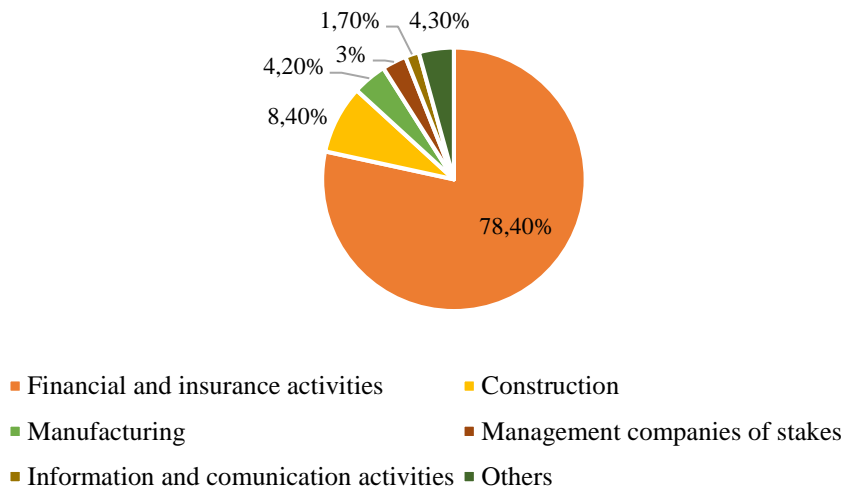


Figure 7: Invested Value by Portuguese VC Firms, According Activity Sector (2017)

Source: CMVM (2017)

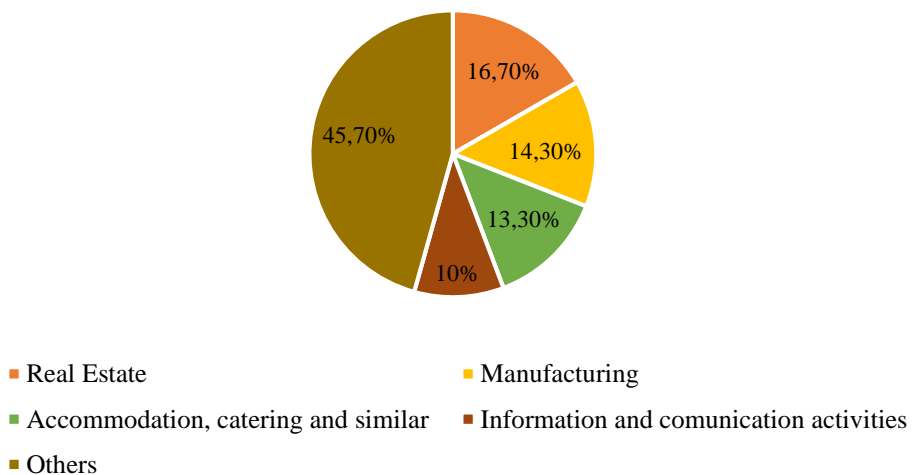


Figure 8: Invested Value by Portuguese VC Funds, According Activity Sector (2017)

Source: CMVM (2017)

The most relevant VC firms, in terms of the assets value under their management, are ECS, Oxy Capital (which together almost have half the market share) and Caixa Capital (table 2). The VC industry in Portugal seems to be concentrated in just a few VC firms, which is in accordance with the fact it is small country, with a poorly developed VC market and few investment opportunities.

VC FIRM	GLOBAL MARKET SHARE (2017)
ECS - Sociedade Gestora de Fundos de Capital de Risco, SA	25,8%
Oxy Capital - Sociedade Gestora de Fundos de Capital de Risco, SA	22,5%
Caixa Capital - Sociedade de Capital de Risco, SA	9,6%
Explorer Investments - Sociedade de Capital de Risco, SA	7,7%
Others	34,4%

Table 2: Portuguese VC firms' global market shares in 2017

Source: CMVM (2017)

Both VC firms and VC funds, besides purchasing stakes in high growth potential companies, can also provide or acquire credits on their portfolio of firms, invest in financial instruments or exchange rates. They are not allowed to invest more than 25% of their assets in the same company and 35% in the same group of companies under a certain period. Portuguese law defines two different types of VC funds: the ones in which the companies' stake is acquired by qualified investors (state, financial institutions, VC firms, insurance companies, among others) and the Restructuring and Enterprise Internationalization Funds; what distinguishes the latter from the VC funds is that these are open funds and their goal is to only invest in companies seeking for restructuring.

When not listed, VC funds' assets are valued according the fair value method or the conservative value method every six months. The fair value method uses the following methods: analysing the transactions of the fund entities within the last six months, multiples of similar firms according activity sector, dimension and profitability or through the Discounted Cash Flows method (used by the majority of Portuguese VC investments). On the other side, the conservative value method uses the acquisition value, which may also be used within the first year of the fund or without a limit if the investors are qualified (IAPMEI, 2013).

Nowadays, in Portugal, VC firms are taxed according the tax on corporate income while VC funds are tax free and only taxed at the exit with the revenue for the participants

(except for the non-residents) of VC funds taxed at the 10% rate. The activity inside the VC fund and the portfolio of companies' revenue transfer to VC funds are tax free (RSA, n.d.).

Although the VC industry in Portugal is not developed when compared with other European countries, Portuguese VC firms seem to be performing well, having positive impacts on their portfolio of firms. This impact is visible in terms of growth, profitability and productivity (Veloso, 2012) and also professionalization, through information systems, discipline and investment and strategy reflection (Fernandes, 2011). It is also referred that VC-backed firms have a more solid capital structure and an improvement in employability (D. Silva, 2016)

2.7. Troika in Portugal and Revitalizar

The subprime crisis created a domino effect that rapidly spread to the Euro Zone as a sovereign debt crisis affecting the most financially vulnerable countries, Portugal included (B. Silva, 2017). It harmfully influenced the European countries' GDP, employment and the availability of credit and investors.

This crisis was the result, in the long term, of the following aspects (Toarna & Cojanu, 2015):

- The lack of focus of economists on the world economy to pay attention only on personal rewards;
- The information asymmetry present in banks: lack of knowledge in other fields than economy made possible successful projects that would benefit the economy disregarded, foreign banks did not know the local economy so preferred consumer, real estate and government loans rather than companies' projects, and rating agencies replacing personal relationships between lenders and borrowers so the information became inaccurate;
- "Too big to fail" theory: big size financial and non-financial organizations took high risks and governments would save them to avoid negative consequences in the population, without having any punishments. With no penalties, these institutions kept on taking risks and there was no fair competition since governments come to the rescue of big organizations and smaller ones are forgotten. The result is that smaller financial institutions, although not taking big risks and better regulated, are not chosen by clients. Countries also suffer the same

problem; if it is not rich enough and does not benefit from the government rescue, clients will have preference for other countries;

- Need for level playing field for the ECB and the Fed: Supporting on the “too big to fail” theory, the U.S. played by its own rules, printing money whenever a crisis hit and possibly causing international debt. For this reason, there is a need to make common worldwide regulations;
- Capital control: investors did not give time for some countries’ economy to recover since “time is money” so there was a withdrawal of large amounts of capital in the period of crisis leaving these countries exposed (for instance, viable projects were left apart due to lack of funding and successful business went bankrupt). Exchange rates suffered from speculative actions and a lot of money was spent by national banks to stabilize them.

The crisis hit Portugal in 2010, and in 2011 the Portuguese Prime Minister decided to ask for help to the International Monetary Fund, the European Commission and the European Central Bank, which together came to be known as the “Troika”. In return, Portugal had to comply with a restructuring program imposed by the institution, contributing to an environment of social protest.

This crisis affected negatively most European banks, increasing their volatility and perceived uncertainty among investors (Choudhry & Jayasekera, 2014). Three Portuguese banks in financial distress received €5.400 million from Troika: Banif, Banco Português de Investimento (BPI) and Banco Comercial Português (BCP) (Gago, 2014). These banks, in return and among other conditions, had the obligation to invest part of the funds in VC; Revitalizar was the fund chosen.

As mentioned previously, the VC industry in Portugal changed after the crisis. It switched from its typical goal of appreciating its portfolio of companies’ equity stakes to also act as Portuguese Government economic policy instruments and bad debt management vehicles of the major banks operating in Portugal (Barreto, 2014).

In 2012, Revitalizar programme promoted by the Portuguese Government to revitalize (as the name says) and recover Portuguese companies from the 2008 crisis was created. One of the goals of this programme was to strengthen the financial means available for the capitalization of companies, so Revitalizar VC funds were created. This Government initiative was specially relevant since, in a context of a financial crisis, VC firms would surely reduce their portfolio size and only concentrate on their core sectors of expertise (Conti et al., 2019).

Revitalizar is an active VC fund founded in 2013, half financed by FINOVA, an autonomous Government fund financed by the EU under QREN (that executes the EU cohesion policy) to boost Portuguese companies by creating or supporting financing instruments for small and medium size enterprises (SMEs) and/or innovative companies (QREN, n.d.). The other half of invested capital came from seven banks: BPI, Banco Espírito Santo (BES), BCP, Banif, Montepio, Crédito Agrícola and Caixa Geral de Depósitos (Lusa, 2017). This fund contributes with 220 million euros to finance Portuguese SMEs that have potential to grow. As at 2018, 209,9 million had already been deployed to mainly medium size companies.

Revitalizar is split in three funds, according to the NUTS³ II of the portfolio of companies: Revitalizar Norte, Revitalizar Centro and Revitalizar Sul (which includes Lisbon Metropolitan Area, Alentejo and Algarve). Revitalizar Centro has invested the highest amount so far (Lusa, 2017). These three funds are managed by three different VC firms: Explorer Investments, Oxy Capital and Capital Criativo, respectively. The first two funds will receive 80 million euros and Revitalizar Sul 60 million (PME Investimentos, n.d.).

Explorer Investments was founded in 2003 and had a 7,5% market share in 2017 (CMVM, 2017). It specially focuses on PE investments, having created the Explorer I, Explorer II and Explorer III VC funds in 2004, 2007 and 2009 respectively. The company has raised a total of 550 million euros for these funds and invested the capital in firms such as Holmes Place Iberia, Nutricafés, Starfoods, Espaço Casa and BrandCare (Explorer Investments, n.d.). More recently, the firm closed Explorer I and created Explorer IV with an initial value of 125 million euros (Fiúza, 2018). Besides this, the company also invests in real estate and tourism, having invested in a fund called Discovery valued in 800 million euros to fund hotels and another fund dedicated to offices in Lisbon (Veríssimo, 2017).

Oxy Capital, founded in 2012 and also present in Italy, has the second highest market share in Portugal. Besides managing Revitalizar Centro, it also has three funds dedicated to companies' restructuring: *Fundo de Reestruturação Empresarial* (2012), *Fundo Aquarius* (2014) and *Fundo Cometa* (2016). The company also has two expansion

³ NUTS stands for *Nomenclatura das Unidades Territoriais para Fins Estatísticos*, a system that divides Portuguese geographical regions into different names for statistical purposes. In specific, NUTS II divides the country into seven regions: North, Centre, Alentejo, Algarve, Lisbon Metropolitan Area, Autonomous Region of Azores and Autonomous Region of Madeira.

VC funds: Oxy Capital Mezzanine fund (2014) and Oxy Capital II (2018), that raise capital from institutional investors, family offices and Portuguese entrepreneurs. These two funds have invested in successful companies such as Fitness Hut, Nonius and Ceriart; some of the companies were invested as “Management Buyout” operations (Oxy Capital, n.d.).

Managing Revitalizar Sul, the 2009 VC firm Capital Criativo is also responsible for three other funds with a total asset value of 340 million euros and a global market share of 4,9% in 2017 (CMVM, 2017). Founded in 2011 and 2017, Capital Criativo I and Capital Criativo II funds invest in companies, essentially SMEs, with demonstrated good performance but potential to grow further (expansion investment phase). The most valuable fund, created in 2017, invests in tourism and real estate and mainly in companies in the turnaround phase.

2.7.1. Investment policies of Revitalizar

As one of the major investors, the Portuguese Government imposed certain restrictions on the investment, that are relevant to refer since these can differentiate from the generality of the other Portuguese VC funds and already present in the Portuguese legislation, so influencing the fund performance. For instance, not only activities that are directed to support exports are excluded but also the ones that give priority to imported products. VC firms managing Revitalizar Funds can only invest in the following sectors: manufacturing, energy, construction, trade, tourism, transportation/logistics or services; the coal, steel, shipbuilding and synthetic fibre sectors are excluded. The manufacturing sector got almost half of the investment distributed to the portfolio of firms.

Companies can be in financial distress, as long as they are in a restructuring process. The funds can only finance projects that intend to keep a company growing through expansion, innovation, modernization or new projects. Companies with an expansion strategy received three quarters of the total invested. Also, the funds are not allowed to finance restructuring processes, credit acquisitions and shares acquisitions not related to SMEs' projects.

Some specific restrictions were also imposed in the constitution of the funds, namely the value invested in each company cannot exceed 1.500.000€ per year and at least 70% of the fund liquidity must be invested in the firms' shares; the other part can be used to grant credits. Each company can receive through financial instruments a maximum of 30% of the total fund's investment value or 33% in the case of the total

funds' assets. The investment in companies that manage other companies' stakes is also conditioned and securities cannot represent more than 50% of the fund's assets. Divestment must be done in credit repayment or selling the stakes to other investors.

2.7.2. Government Venture Capital

So far, I have been talking about Independent VC, which is the most usual form of VC. But, in an emergence to increase the VC market importance in Europe due to its benefits to the economy and to close the funding gap to very early stage companies or high risk firms (Dahaj & Cozzarin, 2019; Luukkonen, Deschryvere, & Bertoni, 2013), government VC has been developing. GVC is when a VC fund is managed by a VC firm owned by the State and, unlike IVC, it is not organized as a limited partnership and their only goal is not focused on generating financial returns and making a successful exit but having a positive economic and social impact in the country (Cumming et al., 2017).

Literature agrees that, according their tests, IVC funds perform better than GVC in terms of sales growth (Grilli & Murtinu, 2014) and exit performance, because:

- Covenants are not agreed in the contract between LPs and GPs but by regulators so the exposure to agency problems is higher;
- Political involvement does not allow GVC to be independent in its decisions;
- Compensation terms are fixed so there is no motivation to strive for the best fund performance, losing their best fund managers (Cumming et al., 2017) and having no improvement in invention and innovation (Bertoni & Tykvová, 2015).

Besides this, GVC seem to induce IVC to invest cross-border (Dahaj & Cozzarin, 2019) and are weaker in terms of value-added services such as the development of the business idea, professionalization and exit orientation (Luukkonen et al., 2013).

There is also the case when there is a mixed IVC-GVC syndicate that, not only mitigates the disadvantages above mentioned of GVC, but also brings other advantages that are not present in pure GVC, for example having contacts from both sectors - public and private. Thus, it is agreed in the literature that this form of VC performs better than sole IVC or GVC in terms of improving exit performance (Cumming et al., 2017), sales growth if GVC has a minority position (Grilli & Murtinu, 2014) innovation and invention (Bertoni & Tykvová, 2015) and attracting foreign and domestic IVC (Dahaj & Cozzarin, 2019). Although this partnership type brings more success, having different investors with a possible divergence of goals may bring agency and transaction costs (Cumming et al., 2017).

In Portugal, GVC firms such as Caixa Capital and Portugal Capital Ventures have been losing their market share to private VC firms, having in 2017 nearly 15% of market in share. GVC firms used to have a major importance in Portuguese VC activity; their market share represented 27,4% in 2011 and 37,5% in 2007 (Caldeira, 2012).

Although the VC firms managing Revitalizar are not public, this fund cannot be either considered an IVC since the government created the fund and participated in the fund's investment policies. So, Revitalizar fits better in the IVC-GVC syndicate definition and consequently, according the previous literature, it is probable this fund will perform better than the control group. But, since this fund was created in a different context than other "typical" funds, where banks had an obligation to invest and VC firms had this capital secured by their side (therefore they may not have cared about investment choices) and investment policies were imposed thus no freedom of investment in the companies with most potential of growth, there is concern regarding investment decisions.

Did Revitalizar perform well when comparing with other funds not working in this environment? Did banks and VC firms actually not care about for which companies the money was distributed? And did the forced investment policies have a negative impact on Revitalizar performance? I will further analyse these questions by both measuring Revitalizar impact on the portfolio of firms' performance and the returns for investors, when compared with a fund not created in this context. First, it is necessary to look at what literature has to say about these subjects.

2.8. Impact of venture capital on firms' performance

There are mixed conclusions in the literature regarding the effect of VC on firms' performance. Some researchers defend that VC does not improve firms' profitability (return on sales, return on equity and return on assets) and growth (sales growth) in Korea (Koo, 2016) and globally in terms of profitability, growth and stock market valuation (Rosenbusch et al., 2013).

However, other authors reach different conclusions. When studying six European countries, Croce et al. (2013) reveal that VCs' value-adding activities have a positive impact on companies' productivity growth and Paglia & Harjoto (2014) conclude that, in the U.S., VC firms also influence positively their portfolio of firms in terms of sales and employment growth. When combining both European and U.S., the conclusions are the

same: venture capitalists' involvement on growth is three times higher when compared to external firms' financing (Engel, 2002).

Literature regarding this theme will be especially relevant to find the best econometric procedure for this research, so researchers' methodology is summarized in appendix A.2.

Regarding the traditional view that VC only cares about short-term results by stripping assets or reducing investments, cutting large numbers of jobs, and raising leverages for tax benefits, jeopardizing long-term growth, literature is not in agreement. Some say that VC does not compromise any of those factors (Koo, 2016) and that the positive effect on productivity holds after VC's exit (Croce et al., 2013). Others seem to disagree, that VC has an immediate significant positive impact when compared to the control group but only lasts for two years (Paglia & Harjoto, 2014).

2.8.1. Screening effect

It is interesting to notice that almost every article, from the ones studied in this research, refer the screening process, by either controlling for its effect or examining its impact. The reason behind this is that it is an important aspect that might influence the analysis of VC impact on firms' performance. Therefore, it must be considered in order to analyse the real influence of VC (provided funds and value adding activities).

Some authors state that, besides that screening does not drive superior performance for VC-backed firms (only in the U.S. because the market is more developed), it does not even exist based on past performance and potential to grow (Croce et al., 2013).

On the other hand, others assume there is a high probability of a screening work to exist based on past performance and this screening work might as well influence future performance (Engel, 2002; Paglia & Harjoto, 2014). The reasons that explain this relationship between screening and future performance are: a monopoly power by the venture capitalist, inframarginal investments and that VCs are constantly learning (Kaplan & Stromberg, 2001). So, a doubt remains regarding screening presence and its effect on companies' performance.

Screening effect on companies' performance fades for very young firms. They do not benefit from VC as much as firms in a growth stage since uncertainty and lack of information might be excessive, so VCs cannot select the most promising firms. The same

happens for very mature firms; when there is a long past performance history, venture capitalists do not have the competitive advantage of screening and their effect on performance is lower. This also suggests screening influences VC impact on firms' performance (Rosenbusch et al., 2013).

2.8.2. Other influencers

Apart from screening, literature also refers other aspects that can influence the effect of VC on firms' performance: performance measure utilized (profitability is disregarded), going public, uncertainty avoidance (Rosenbusch et al., 2013), firm age (Croce et al., 2013; Paglia & Harjoto, 2014; Rosenbusch et al., 2013), the industry type selection (Croce et al., 2013; Engel, 2002; Paglia & Harjoto, 2014; Rosenbusch et al., 2013) and the venture capitalist reputation (Croce et al., 2013).

The location of the investment and differences across time were controlled, thus they can have an influence on the analysis of VC impact on performance (Croce et al., 2013; Paglia & Harjoto, 2014). Companies' characteristics such as firm size, legal form, team foundation and firms' environment (Engel, 2002) and leader gender, change in Paydex score, change in credit score, business form and existing government contracts (Paglia & Harjoto, 2014) may also have an impact on growth, thus they were also controlled.

When VCs choose the industry of the firms they are investing in, the effect of VC on performance rises (growth and stock market measures are increased but profitability is ignored) and when industry selection is controlled the effect vanishes. So, most of the positive effect on performance is due to VC industry selection and not due to provided resources, screening and/or value-added effect.

Very mature firms benefit less from the VC presence since too much information enables other investors to select more promising firms (as said previously), and also since these firms already have the knowledge and systems to manage growth, are more financially stable and, besides, have other financing types available with lower costs (e.g. debt). Very young firms also seem to benefit less from VC for the reasons already explained and, with that being said, researchers agree on an "ideal" firm age for investment which is between six to twelve years old.

The IPO effect also supports the previous theory. When there is an IPO, plenty of public information becomes available for many investors, it attracts other investors

because it is a positive signal of success so the competitive advantage of VCs of selecting the most promising firms disappears. Moreover, the stock market provides more financial resources, managerial support and monitoring is replaced by publicly listed firms' systems. These findings are in line with the theory that venture capitalists invest in (relatively) high uncertainty and lack of information environments (Rosenbusch et al., 2013).

Smaller sized firms have higher growth and the older the firm the less it grows, which is consistent with the cycle of life of a firm. Dependent foundations and public limited companies also have a higher growth. Diversified firms and team foundations have higher growth. Regarding the firms' environment, companies with employees in the same branch (which measures the localization of the same industries) is positively related with growth, while R&D activity seems to affect negatively companies' growth; for instance, regions with R&D workers in manufacturing and agglomerations of R&D centers (Engel, 2002).

All above mentioned aspects that can influence the impact of VC on companies' performance analysis were confirmed, except for the VCs reputation (Croce et al., 2013), uncertainty avoidance of each country where the investment is located (Rosenbusch et al., 2013), industry type when comparing low and high-tech industries (Engel, 2002) and change in Paydex score, change in credit score, and existing government contracts (Paglia & Harjoto, 2014).

2.9. Venture capital fund return

Regarding the VC fund performance measures, there are quite a few mentioned in the literature. The Internal Rate of Return (IRR) and multiples are the most used measures of VC fund returns.

2.9.1. Internal Rate of Return

This is one of most used measures and it can be already computed in an aggregated form from the database studied or we can compute it ourselves. It is typically the discount rate that makes the discounted cash inflows and outflows (Net Present Value) from the VC fund to investors equal to zero. A net IRR differentiates from the gross IRR because it represents the actual return for the LPs, since carried interests and management fees paid to the VC firm (cash outflows) are included in the equation.

IRR can be calculated for both liquidated funds and unrealized funds as long as they had a positive cash flow (Ljungqvist & Richardson, 2003). When a fund has not yet matured, an interim estimate for IRR is computed by adding the “net asset value” (NAV, the value of the asset at current valuations) which evaluates expected future cash flows (Ballek, 2014). So, the general formula for IRR calculation is the following:

$$0 = \sum_{t=0}^T \frac{\text{cash flows}_t}{(1 + IRR)^t} + NAV \quad (2.1)$$

But, according to Metrick & Yasuda (2017), the IRR has some weaknesses. First, it cannot be compared to the popular annualized returns, since their differences may be big; annualized returns weight each year equally which is not economically correct. Second, in some cases, when IRR is annualized, reinvestment is assumed which not always happens. Third, unrealized investments have a subjective valuation and count as a positive cash flow so the IRR may be misleading in the initial fund lifetime. Finally, the IRR does not inform how much money LPs made for every monetary unit they invested. Because of this last issue, multiples are used.

2.9.2. Multiples

The Distributed over Paid In capital (DPI) represents the proportion of cash distributions that has been paid to LPs relative to the money that has been raised by the GP. It is the sum of all cash distributions to investors divided by the sum of all cash contributed by LPs, which includes invested capital and management fees (Phalippou & Gottschalg, 2009):

$$DPI = \frac{\text{capital distributions}}{\text{contributed capital}} \quad (2.2)$$

This multiple is only suitable to compute the return of realized funds, since it does not consider the value of unrealized investments measured by the NAV.

On the other hand, the Residual Value to Paid In capital (RVPI), often called the “net asset valuation” only gives the value of unrealized investments, relative to all capital given to GPs by LPs (Ballek, 2014):

$$RVPI = \frac{NAV}{\text{contributed capital}} \quad (2.3)$$

The cumulative Total Value to Paid In capital (TVPI) is another possible measure of VC performance and the most suitable multiple to measure funds that are still active since it measures both realized and unrealized investments. Thus, it is computed as the ratio between cash distributions to LPs plus, for unrealized investments, accounting values (NAV), and contributed capital by LPs (Ljungqvist & Richardson, 2003):

$$TVPI = DPI + RVPI = \frac{\textit{capital distributions} + NAV}{\textit{contributed capital}} \quad (2.4)$$

The weakness of multiples is that they do not discount the cash flows, not considering the time value of money and they do not inform about risk, leverage and early exits, so the results for IRR and the multiples can be very different (Ballek, 2014).

Revitalizar has both realized and unrealized investments, so the most suitable multiple is the TVPI. Therefore, I will further focus on the IRR and the TVPI.

3. DATA AND SAMPLE DESCRIPTION

The sample I used in this thesis for Revitalizar and Pathena, the control fund, was collected from proprietary data which includes information about the companies that were invested by the funds as well as the amounts of investment and divestment between the period of 2013 and 2019.

More specifically, this data includes information that will be needed such as equity growth, VC investment type, firm size (micro, small or medium), industry and location. Firm size was not available for Pathena but, according Instituto Nacional de Estatística (INE), firm size classifications are obtained through annual turnover, annual balance sheet and number of employees⁴. Since I only had the turnover value available, I concluded about Pathena firms' size using this value only. Firms' age was obtained through Racius website (racius.com).

Pathena VC fund was founded in the same year as Revitalizar, 2013, in Luxemburg but did not have forced investment policies and also invested in mostly Portuguese firms, thus constituting a good control group. It is managed by a Portuguese VC firm, Pathena, which has been active since 2007 and has a value of assets under management of €70 million, focusing on investing in Information Technology (IT) and digital health companies (Pathena, n.d.).

I included all surviving and non-surviving companies. Pathena comprises ten companies. Regarding the regression model that will be used to measure Revitalizar impact on companies' performance, two non-Portuguese company were eliminated in this fund since these are not comparable with the Portuguese ones. A company which the investment started in 2018 was also removed since it is not possible to compute equity growth, the performance measure that will be used. Thus, the final sample for Pathena is composed by 7 companies.

Revitalizar Norte invested in a total of 33 companies along its lifetime so far and one was excluded since the initial time of investment was in 2018. 44 companies were invested in by Revitalizar Centro and 3 were removed since the holding period was not

⁴ A micro company employs less than ten people and its annual turnover or annual balance sheet is no more than two million euros. A small company has less than fifty workers and its annual turnover or annual balance sheet have a maximum value of ten million euros and is not classified as a micro company. A medium company is not classified as a small or micro company employs less than 250 people and its annual turnover is 50 million euros or less or total annual balance sheet does not exceed 43 million euros.

sufficient to compute equity growth. Revitalizar Sul invested in a total of 26 companies and none of them was in need to be eliminated.

Therefore, the final sample is composed by a total of 106 companies, which 7 were invested in by Pathena and 99 by Revitalizar. When combined with the number of years for each company, I had a total of 329 observations.

When analysing the funds' returns through IRR, TVPI, DPI and RVPI, I will have to analyse all companies because these measures are only available already computed for the whole sample. So, I will include all 10 companies invested by Pathena and 103 by Revitalizar.

3.1. Sample distribution

As shown in table 3, industry types are very equally distributed among companies, with no predominance for any of them. Revitalizar invested mainly in manufacture of metal products and accommodation companies, with each of them representing 9% of the total companies. On the other hand, 29% of the companies invested by Pathena were in the computer consulting and programming and related activities industry.

Industry type (CAE)	Revitalizar		Pathena		TOTAL
	Observations	Percentage	Observations	Percentage	
8 - Other extractive industries	2	2%	0	0%	2
10 - Food industry	6	6%	0	0%	6
11 - Drink industry	2	2%	0	0%	2
13 - Textile industry	2	2%	0	0%	2
14 - Clothing industry	5	5%	0	0%	5
16 - Wood and cork and its manufacture industry	4	4%	0	0%	4
17 - Manufacture of pulp, paper and paper products	1	1%	0	0%	1
22 - Manufacture of rubber and plastic products	4	4%	0	0%	4
23 - Manufacture of other non-metallic mineral products	5	5%	0	0%	5
24 - Basic metallurgical industries	2	2%	0	0%	2
25 - Manufacture of metal products, except machinery and equipment	9	9%	0	0%	9
26 - Manufacture of computer equipment, equipment for communications and electronic and optical products	0	0%	1	14%	1

27 - Manufacture of electrical equipment	1	1%	0	0%	1
28 - Manufacture of machinery and equipment	1	1%	1	14%	2
33 - Repair, maintenance and installation of machinery and equipment	0	0%	1	14%	1
35 - Electricity, gas, steam, hot and cold water and cold air	1	1%	0	0%	1
38 - Collection, treatment and disposal of waste; valuation of materials	1	1%	0	0%	1
43 - Specialized construction activities	1	1%	0	0%	1
46 - Wholesale trade (including agents), except of motor vehicles and motorcycles	4	4%	0	0%	4
47 - Retail trade	8	8%	0	0%	8
52 - Storage and auxiliary transport activities	1	1%	0	0%	1
55 - Accommodation	9	9%	0	0%	9
56 - Catering and similar	5	5%	0	0%	5
58 - Editing activities	1	1%	0	0%	1
62 - Computer consulting and programming and related activities	5	5%	2	29%	7
63 - Activities of information services	0	0%	1	14%	1
64 - Activities of financial services, except for insurance and pension funds	6	6%	1	14%	6
68 - Real estate activities	1	1%	0	0%	1
71 - Activities of architecture, of engineering and related techniques; activities of testing and technical analysis	6	6%	0	0%	6
72 - Activities of scientific research and development	1	1%	0	0%	1
73 - Advertising, market studies and opinion surveys	2	2%	0	0%	2
82 - Activities of business administrative and support services	2	2%	0	0%	2
93 - Sports, entertainment and recreational activities	1	1%	0	0%	1
TOTAL	99	100%	7	100%	105

Table 3: Sample distribution across 33 CAE

Source: Proprietary Data

Table 4 shows that Revitalizar final sample is composed by mostly companies located in the Central region of Portugal (41%), followed by the North (32%), while Pathena invested primarily in Northern companies and did not invest in Southern and Central companies.

	Revitalizar		Pathena		TOTAL
	Observations	Percentage	Observations	Percentage	
Location - North	32	32%	4	57%	36
Location - Lisbon	14	14%	3	43%	17
Location - South	12	12%	0	0%	12
Location - Centre	41	41%	0	0%	41
TOTAL	99	100%	7	100%	106

Table 4: Sample distribution across companies' location

Source: Proprietary Data

In terms of companies' size, both funds invested in its majority in small and medium firms (table 5) and the expansion investment type seems to be the predominant, which is in accordance with the Portuguese VC statistics (table 6).

	Revitalizar		Pathena		TOTAL
	Observations	Percentage	Observations	Percentage	
Micro	17	17%	1	14%	18
Small	33	33%	3	43%	36
Medium	49	49%	3	43%	52
TOTAL	99	100%	7	100%	106

Table 5: Sample distribution across companies' size

Source: Proprietary Data

	Revitalizar		Pathena		TOTAL
	Observations	Percentage	Observations	Percentage	
Startup	15	15%	0	0%	15
Expansion	82	83%	6	86%	88
Early Stage	2	2%	1	14%	3
TOTAL	99	100%	7	100%	106

Table 6: Sample distribution across investment type

Source: Proprietary Data

I will further analyse the Pearson correlation coefficients between companies' performance (EQGROWTH) and the other variables for both Pathena and Revitalizar VC funds (Appendix A.3 provides the variables definitions that will also be used in the regression analysis). Table 7 represents the correlations coefficients between the

variables, which shows there is no statistically significant correlation, at the 5% significance level, between companies' performance and receiving Revitalizar fund. Therefore, there is no evidence that the fact that companies receive or not Revitalizar influences their performance, based on the correlation coefficients.

Moreover, I found a positive and significant correlation between companies' performance and companies located in the central region, medium sized companies, the year of 2015 and the CAE 71 industry (activities of architecture, of engineering and related techniques; activities of testing and technical analysis). In contrast, I found that companies' performance is negatively and significantly correlated with small sized companies and the year of 2016. I also did not find strong correlations between the explanatory variables REVITALIZAR, FIRMAGE and the control variables, therefore I do not expect multicollinearity issues.

Correlation Probability	EQGROWTH				
	1.000000	NUM10	0.055308	NUM47	-0.105115
EQGROWTH	-----		0.3172		0.0568
		NUM11	-0.051072	NUM52	0.048343
REVITALIZAR	0.001077		0.3558		0.3821
	0.9845	NUM13	-0.055250	NUM55	-0.089746
FIRMAGE	-0.048383		0.3178		0.1042
	0.3817	NUM14	-0.014879	NUM56	-0.084722
LOCATION___CE...	0.197537		0.7880		0.1251
	0.0003	NUM16	0.027771	NUM58	-0.046550
LOCATION___LIS...	-0.056471		0.6157		0.4000
	0.3072	NUM17	0.005519	NUM62	-0.034196
LOCATION___NO...	-0.094513		0.9206		0.5365
	0.0870	NUM22	0.075739	NUM63	0.076293
LOCATION___SO...	-0.089054		0.1705		0.1674
	0.1069	NUM23	0.105393	NUM64	0.019833
MEDIUM	0.203576		0.0562		0.7200
	0.0002	NUM24	-0.055250	NUM68	-0.035947
MICRO	-0.005361		0.3178		0.5159
	0.9228	NUM25	0.107316	NUM71	0.188680
SMALL	-0.211600		0.0518		0.0006
	0.0001	NUM26	0.036949	NUM72	-0.041572
EARLY_STAGE	0.007888		0.5042		0.4524
	0.8867	NUM27	0.020545	NUM73	-0.004437
EXPANSION	-0.079071		0.7104		0.9361
	0.1524	NUM35	-0.035947	NUM8	-0.046550
STARTUP	0.080457		0.5159		0.4000
	0.1453	NUM38	-0.035947	NUM82	-0.055250
NUM2014	0.089714		0.4524		0.3178
	0.1043	NUM43	-0.041572	NUM93	-0.041572
NUM2015	0.383857		0.7880		0.4524
	0.0000	NUM46	-0.014879		
NUM2016	-0.220694		0.7880		
	0.0001	NUM47	-0.105115		
NUM2017	-0.061861		0.0568		
	0.2632				
NUM2018	-0.075027				
	0.1746				

Table 7: Pearson correlation coefficients and respective probabilities

4. METHODOLOGY

Literature gave an idea of what could be the methodology to be used in this thesis to compare the fund Revitalizar with Pathena and conclude if the peculiarity previously referred of Revitalizar had an influence on the portfolio on firms and, if yes, what kind of influence. Hence, I decided to test Revitalizar fund impact on firms' performance using a panel data regression model with Eviews software. Panel data refers to observations for different periods of time and multiple individuals, units or entities. Furthermore, since there are different time periods between companies this data is unbalanced.

4.1. Structural model

I will use the following regression model to test Revitalizar impact on companies' performance:

$$\begin{aligned} EQGROWTH_{it} &= \beta_1 + \beta_2 REVITALIZAR_{it} + \beta_3 FIRMAGE_{it} \\ &+ \sum \varphi_k \text{Firm size dummies}_{it} + \sum \alpha_k \text{Investment type dummies}_{it} \\ &+ \sum \mu_p \text{Location dummies}_{it} + \sum \delta_k \text{Industry dummies}_{it} \\ &+ \sum \theta_m \text{Year dummies}_{it} + \varepsilon_{it} \end{aligned} \quad (4.1)$$

Unlike previous studies regarding VC impact on performance which used profitability and sales and employment growth as measures of firms' performance, I will use equity growth due to data availability in the data set used. Equity is the invested amount in a company by its owners or shareholders plus retained earnings or losses and represents the money that would be given to shareholders in case of the assets' liquidation and all company's debt payment. This measure will then be used as the dependent variable (EQGROWTH) and as the percentage change of annual equity between the last day of year $t-1$ and the last day of year t , where t is the number of years after VC first round (Pathena lacks data regarding the equity value in December 2016, so I used the value correspondent to September 2016). Therefore, I contained data for each company from the year after the initial date of investment (to be able to compute equity growth) until the end of the year before divestment or until 2018 (the last reported year), thus with t starting

in 1, the year after investment. In this case, due to lack of data, equity will be represented by the value of investment by the fund, measured by acquisition cost.

Due to lack of data prior to the VC funds first round, I cannot consider Revitalizar impact on performance, relative to not receiving the fund. Therefore, the explanatory variables will be a dummy with value one if the company i is invested by Revitalizar fund and 0 if it is invested by Pathena (REVITALIZAR) and firms' age (FIRMAGE). If REVITALIZAR coefficient is positively statistically significant, then Revitalizar has a statistically higher impact on firms' performance than Pathena.

Based on previous literature, I included some factors that may have an influence on the analysis of the VC financing and firm performance relationship, thus these were controlled so that they do not have an influence on this relationship. With that being said, I added control variables, which include: firms' size (micro, small and medium sized companies), VC investment type (expansion, startup or early stage), location (Lisbon, north, south or central region of Portugal), industry and year dummies. Industries were classified based on the first two digits of the Portuguese industrial classification, the *Classificação Portuguesa das Atividades Económicas* (CAE).

Dummy trap means there is a multicollinearity between independent variables, they are highly correlated with each other because one can be predicted from the values of the other. To solve this problem, I excluded one dummy in each category - STARTUP, LOCATION_SOUTH, SMALL, NUM2018 and NUM93.

4.2. Panel data models

Having structured the multivariate regression model, the next step was finding the correct panel model: Independently Pooled OLS regression model, Fixed effects model or the Random effects model.

The Independently Pooled OLS regression model assumes all sections of data are homogeneous, i.e., there are no individual effects - cross sections (in my example, companies) and time series are treated as a single set. If there is heterogeneity, it may cause the violation of two of the five OLS assumptions: exogeneity and homoscedasticity and no autocorrelation. On the other hand, both Fixed effects and Random effects models allow for heterogeneity. A Fixed effect model analyses the impact of heterogeneity on individual intercepts (which remain the same over time in both models) of each cross section, while a Random effect model interprets the different error variance structures associated to each individual and/or time. Errors in a Fixed effect model are assumed to

not vary randomly over each entity and time, whereas in a Random effect model these are assumed to be randomly distributed. Another assumption is that slopes should remain the same in both models. The main difference between the two models is that the unique characteristics of individuals (individual effect) must not be correlated with any independent variable in the case of the Random effect model (Park, 2011).

To find the best model between the three in Eviews, the first step is to find the most appropriate one between Fixed effects model and the Random effects model using the Correlated Random effects-Hausman test. If the null hypothesis is not rejected, then the main assumption that the random effects are not correlated with the explanatory variables is not violated and the Random effects model is appropriate, no further testing is needed, and this model will be adopted. If, on the other hand, the null hypothesis is rejected, I have to proceed to further testing. The further testing would be between Fixed effects model and Independently Pooled Ordinary Least Squares (OLS) model by estimating the equation through the Fixed effects model, with one dummy for each coefficient, and running the Wald test for the coefficients of the dummy variables all equal to zero. If the null hypothesis is not rejected, the pooled OLS regression model is appropriate, and if it is rejected then the Fixed effects model is the appropriate one (Adefemi, 2017).

When running the Correlated Random effects-Hausman test, the probability value was 1, which is higher than the significance level of 5%, therefore I accepted the null hypothesis and concluded the Random effects model is appropriate and will be the model adopted. As a robustness check, I estimated the Pooled OLS and performed the Breusch-Pagan Lagrange Multiplier (LM) test, which compares the OLS with the random effect model by testing if cross section or time variances are zero; if yes, the null hypothesis is not rejected and there are no random effects. The result shows the hypothesis has been rejected, therefore the random effects is, indeed, a suitable model.

Eviews automatically finds the estimation method when running the model, the estimated generalized least squares (EGLS). This method is used when a covariance structure of an individual is unknown. I also used the White period method to compute the coefficient standard errors, when estimating my equation to avoid any autocorrelation (between time periods, which is the most common correlation) and heteroskedasticity problems.

5. RESULTS

In the panel data regression, I examined the impact of being a company invested by Revitalizar in their performance by analysing the statistical significance of the estimate for REVITALIZAR coefficient. Table 8 shows that the estimate for the coefficient is not statistically significant (at 5% significance level). This means that the fact that companies were invested or not by Revitalizar is statistically irrelevant for determining their performance. Furthermore, I cannot conclude about whether the particular conditions Revitalizar was created had a positive or negative impact on its portfolio of companies' performance.

Firms' performance seems to be determined by other factors. One of them may be the firms' age, which the estimate for its coefficient is statistically significant at 10% level of significance. The younger the company, the better the impact on its performance. Other factors not predicted in the model must explain the performance of companies, reflected by the low R-squared.

	EGLS
REVITALIZAR	-0,002023
FIRMAGE	-0,005312*
Firm size dummies	Yes
Investment type dummies	Yes
Location dummies	Yes
Industry dummies	Yes
Year dummies	Yes
INTERCEPT	-0,034647
R-squared	0,312278
Observations	329

Table 8: Regression results for the impact of receiving Revitalizar fund on firms' performance

Estimates of equation 4.1, derived from EGLS regressions with robust standard errors. The dependent variable is equity growth. The independent variables are a dummy to indicate when a company receives Revitalizar fund, firms' age and firm size dummies, investment type dummies, location dummies, industry dummies and year dummies (coefficients omitted in the table). Standard errors in round brackets.

**indicates statistical significance at the 10% level*

Table 9 presents the returns for investors of both funds, measured by the net IRR and multiples. I was not able to compute the net IRR for the whole Revitalizar fund due to lack of data, but I could conclude that, at the end of 2018, Pathena had a net IRR of 6,33% while Revitalizar Norte, Centro and Sul all produced lower net IRR's. Pathena also performed better than Revitalizar in terms of the TVPI and DPI, with the latter measure indicating that this fund has returned, so far, more capital to investors than Revitalizar. But it performed worse for RVPI, meaning that, possibly, since the NAV gives an expected valuation, in the future there may be more cash distributions relative to cash contributions to Revitalizar LP's than to Pathena LP's.

When analysing each division of Revitalizar individually, Revitalizar Centro registered the highest TVPI. Revitalizar Centro produced the highest returns for investors within Revitalizar fund while Revitalizar Sul produced the lowest ones. Inside Revitalizar Sul, Lisbon Metropolitan Area contributed with the lowest net IRR (-3,24%), while Algarve with the highest (0,96%); the same happened when looking at the multiples.

Being the net IRR and TVPI the most relevant measures in this case since both funds have realized and unrealized investments, I can conclude that Pathena had a better performance in 2018 than Revitalizar, registering higher returns for both measures.

VC return measure	Pathena	Revitalizar Norte	Revitalizar Centro	Revitalizar Sul	Revitalizar
Net IRR	6,33%	3,76%	4,33%	-0,50%	-
DPI	0,09	0	0,03	0	0,01
RVPI	1,08	1,16	1,15	0,979	1,11
TVPI	1,17	1,16	1,18	0,979	1,12

Table 9: Pathena and Revitalizar returns for investors at the last day of 2018

Source: Proprietary Data

Analysing the cash inflows (plus NAV) and outflows for investors per company of Revitalizar and Pathena, I found that Pathena investors have put more money in the fund than Revitalizar but have also gained more and assets are more valuable. Actually, the increase in capital inflows plus NAV is higher (87%) than the increase in the outflows (80%), which explains the different TVPI (table 10). The subjective valuation of NAV could be one of the reasons, but it is not the case since Revitalizar actually has a higher NAV relative to invested capital, reflected in the RVPI. On the contrary, what makes Pathena have a higher TVPI is the distributions of capital to investors. Pathena has been able, so far, to distribute more money to investors relative to capital invested due to its

partial realizations of two companies at the end of 2018. Thus, Pathena has been showing a better exit performance than Revitalizar, which reflects on a higher net IRR and TVPI.

	Pathena	Revitalizar	Revitalizar vs. Pathena
Cash inflows per company + NAV (€)	4 288 600	2 291 828	1 996 772 (+87%)
Cash outflows per company (€)	3 666 300	2 037 732	1 628 568 (+80%)

Table 10: Pathena and Revitalizar cash inflows plus NAV and cash outflows

Source: Proprietary Data

In summary, although the regression analysis has shown me that the receipt of Revitalizar or Pathena is irrelevant for determining their firms' performance, the returns for investors show in favour of Pathena because of its higher distributions to investors. Hence, the fact that Revitalizar was created in a context where the application of the funds was questioned due to a pre-established investment policy and a possible lack of concern by the investors (the banks) and VC firms, may not have had an influence on its companies' performance but it might have had a negative influence to investors' returns due to its weaker exit performance, when compared with a fund not created in these conditions.

Furthermore, these findings are not in agreement with previous literature, that says IVC-GVC syndicates perform better than individual IVC and GVC since GVC disadvantages can be mitigated and brings other advantages present in IVC such as contacts inside the industry (Cumming et al., 2017; Grilli & Murtinu, 2014; Bertoni & Tykvová, 2015; Dahaj & Cozzarin, 2019). In this case, Revitalizar, an IVC-GVC syndicate, has performed worse, so far, in terms of returns for investors, than a sole IVC fund Pathena. Besides the reasons explained before, another explanation may be one referred by researchers: Portuguese State and the private VC firms have different goals (social issues vs. returns, respectively) that may bring agency and transaction problems (Cumming, Grilli, & Murtinu, 2017).

6. CONCLUSION

In this thesis, I decided to study a specific case of a Portuguese VC fund created as a consequence of the 2008 crisis, Revitalizar. This fund was founded in 2013 inside the 2011 Revitalizar programme created by the Portuguese government, with the goal of regenerating Portuguese SME's by strengthening the financial means available for the capitalization of companies. It was a Government initiative, but it is managed by private VC firms, so it should be considered an IVC-GVC syndicate. It was half financed by FINOVA (which invests EU funds from the cohesion policy) and by seven Portuguese banks: BPI, BES, BCP, Banif, Montepio, Crédito Agrícola and Caixa Geral de Depósitos. BPI, BCP and Banif faced financial difficulties due to the 2008 crisis, thus, they received 5.400 million euros but, in return, they had to invest in VC and Revitalizar was chosen. Banks were forced to invest, VC firms had the capital to invest by their side and investment policies were imposed by the Portuguese government, so Revitalizar performance was questioned.

Therefore, I decided to study the fund impact on its portfolio of companies' performance and its returns for investors provided by the net IRR and the TVPI (the most suitable multiple to funds that have both divested and firms under investment), when compared with an IVC fund, also created in 2013, that invested mainly in Portuguese firms, also managed by a Portuguese VC firm, but not in the same conditions as Revitalizar - Pathena. The results show that receiving Revitalizar or Pathena investment is irrelevant for determining the invested companies' performance but Pathena performs better in terms of returns for investors due to divestments in two companies in the last year of 2018. This means that the particular conditions Revitalizar was created might not have had an impact on firms' performance, but it might have had a negative impact on the returns to investors due to a lower exit performance, so far.

My results are not in accordance with previous literature, which states that when mixing IVC and GVC translates into better performance than sole IVC and sole GVC. One of the reasons may be one referred in the literature, private companies seem to work more towards returns while when VC has a hand by the State, it focuses on social issues, contributing to conflicts of interests between the two entity types. Thus, my thesis brings a relevant question whether mixing public and private entities in the organization of VC in Portugal is, in fact, positive for their performance.

I had some limitations in the thesis in terms of available data regarding finding measures of growth such as employment and sales growth and profitability measures, which are the measures of performance used in previous literature. Therefore, I decided to work with equity growth. Another limitation is that Pathena forms a small sample, comprising only ten companies when compared with the 103 by Revitalizar, which may question the validity of my study. Thirdly, in the regression analysis 4 companies were removed from Revitalizar and 3 from Pathena, while in the returns analysis they were kept due to data availability; this may also interfere in the results. Finally, the fact that the funds are still active, may also interfere in the accuracy of my analysis since NAV is a subjective valuation, thus, once the companies have all been divested, it is probable the returns and conclusion will be different.

7. FUTURE RESEARCH

My thesis has some limitations especially regarding available data. It would be interesting in future research to have a more similar approach to previous literature. Include different measures of performance (profitability measures, sales and employment growth) and control variables since my model is poorly specified as the R-squared shows (with special focus on screening which is one of the most relevant). It would also be relevant to compare Revitalizar with a larger sample for a higher statistical accuracy since Pathena only invested in 10 companies and perform the same tests in the future once all companies have been divested. Another possible approach, also based in literature, would be to test the impact of the VC fund when compared with the period before receiving the VC fund, which was also not possible due to lack of data.

Plus, regarding the literature comparison, further researchers could investigate other cases of IVC-GVC syndicates to check if actually, in Portugal, conclusions are different than other countries in the world and Europe or it was just the specific case of Revitalizar.

REFERENCES

Scientific articles:

- Bertoni, F., & Tykvová, T. (2015). Does governmental venture capital spur invention and innovation? Evidence from young European biotech companies. *Research Policy*, 44(4), 925–935. <https://doi.org/10.1016/j.respol.2015.02.002>
- Burton, E. (2015). The impact of risk aversion on economic development in Portugal. *Perspectives on Business and Economics* (Vol. 33). <https://doi.org/10.1201/9780203859759.ch63>
- Cancino, C. A., Merigo, J. M., Torres, J. P., & Diaz, D. (2018). A bibliometric analysis of venture capital research. *Journal of Economics, Finance and Administrative Science*, 23(45), 182–195. <https://doi.org/10.1108/JEFAS-01-2018-0016>
- Choudhry, T., & Jayasekera, R. (2014). Market efficiency during the global financial crisis: Empirical evidence from European banks. *Journal of International Money and Finance*, 49(PB), 299–318. <https://doi.org/10.1016/j.jimonfin.2014.03.008>
- Conti, A., Dass, N., Di Lorenzo, F., & Graham, S. J. H. (2019). Venture capital investment strategies under financing constraints: Evidence from the 2008 financial crisis. *Research Policy*, 48(3), 799–812. <https://doi.org/10.1016/j.respol.2018.11.009>
- Croce, A., Martí, J., & Murtinu, S. (2013). The impact of venture capital on the productivity growth of European entrepreneurial firms: “Screening” or “value added” effect? *Journal of Business Venturing*, 28(4), 489–510. <https://doi.org/10.1016/j.jbusvent.2012.06.001>
- Cumming, D. J., Grilli, L., & Murtinu, S. (2017). Governmental and independent venture capital investments in Europe: A firm-level performance analysis. *Journal of Corporate Finance*, 42, 439–459. <https://doi.org/10.1016/j.jcorpfin.2014.10.016>
- Dahaj, A. S., & Cozzarin, B. P. (2019). Government venture capital and cross-border investment. *Global Finance Journal*, 41(November 2018), 113–127. <https://doi.org/10.1016/J.GFJ.2019.03.001>
- Engel, D. (2002). The Impact of Venture Capital on Firm Growth: An Empirical Investigation. *Ssrn*, (02). <https://doi.org/10.2139/ssrn.319322>
- Gompers, P. (1994). The Rise and Fall of Venture Capital. *Business and Economic History*, 23(2).
- Gompers, P. (1995). Optimal investment, monitoring, and the staging of venture capital. *The Journal of Finance*, 50(5), 1461–1489.
- Gompers, P., Kovner, A., Lerner, J., & Scharfstein, D. (2008). Venture capital investment cycles: The impact of public markets. *Journal of Financial Economics*, 87(1), 1–23. <https://doi.org/10.1016/j.jfineco.2006.12.002>

- Gorman, M., & Sahlman, W. (1989). What do venture capitalists do? *Journal of Business Venturing*, 4(4), 231–248.
- Grilli, L., & Murtinu, S. (2014). Government, venture capital and the growth of European high-tech entrepreneurial firms. *Research Policy*, 43(9), 1523–1543. <https://doi.org/10.1016/j.respol.2014.04.002>
- Hellmann, T., & Puri, M. (2002). Venture Capital and the Professionalization of Start-Up Firms: Empirical Evidence. *Journal of Finance*, LVII(1). <https://doi.org/10.1111/1540-6261.00419>
- Kaplan, S. N., & Stromberg, P. (2001). *Venture capitalists as Principals Contracting, screening, and monitoring* (Vol. 3).
- Koo, J. (2016). Private Equity as an Alternative Corporate Restructuring Scheme: Does Private Equity Increase the Operating Performance of PE-Backed Firms? *Journal of Economic Policy*, 38(2), 44.
- Ljungqvist, A., & Richardson, M. P. (2003). The Investment Behaviour of Private Equity Fund Managers. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.482546>
- Luukkonen, T., Deschryvere, M., & Bertoni, F. (2013). The value added by government venture capital funds compared with independent venture capital funds. *Technovation*, 33(4–5), 154–162. <https://doi.org/10.1016/j.technovation.2012.11.007>
- Majluf, N. S., & Myers, S. C. (1984). Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics*. 13(2), 187–221.
- Monika, & Sharma, A. K. (2015). Venture Capitalists' Investment Decision Criteria for New Ventures: A Review. *Procedia - Social and Behavioral Sciences*, 189, 465–470. <https://doi.org/10.1016/j.sbspro.2015.03.195>
- Paglia, J. K., & Harjoto, M. A. (2014). The effects of private equity and venture capital on sales and employment growth in small and medium-sized businesses. *Journal of Banking and Finance*, 47(1), 177–197. <https://doi.org/10.1016/j.jbankfin.2014.06.023>
- Park, H. M. (2011). *Practical Guides To Panel Data Modeling : A Step by Step Analysis Using Stata*. Public Management and Public Analysis Program, 1–53.
- Phalippou, L., & Gottschalg, O. (2009). The performance of private equity funds. *Review of Financial Studies*, 22(4), 1747–1776. <https://doi.org/10.1093/rfs/hhn014>
- Rosenbusch, N., Brinckmann, J., & Müller, V. (2013). Does acquiring venture capital pay off for the funded firms? A meta-analysis on the relationship between venture capital investment and funded firm financial performance. *Journal of Business Venturing*, 28(3), 335–353. <https://doi.org/10.1016/j.jbusvent.2012.04.002>
- Teker, D., Teker, S., & Teraman, Ö. (2016). Venture Capital Markets: A Cross Country Analysis. *Procedia Economics and Finance*, 38(October 2015), 213–218. [https://doi.org/10.1016/S2212-5671\(16\)30192-7](https://doi.org/10.1016/S2212-5671(16)30192-7)

Toarna, A., & Cojanu, V. (2015). The 2008 Crisis: Causes and Future Direction for the Academic Research. *Procedia Economics and Finance*, 27(15), 385–393. [https://doi.org/10.1016/s2212-5671\(15\)01010-2](https://doi.org/10.1016/s2212-5671(15)01010-2)

Others:

Adefemi, A. (2017). Panel Data Regression Models in Eviews : Pooled OLS , Fixed or Random effect model ?

Ballek, R. (2014). *Private Equity Fund Performance : The Comparison of Venture Capital Funds and Buyout Funds in Europe and the Determinants of their Returns*. Charles University in Prague.

Barreto, J. P. (2014). *Fundos de capital de risco - As implicações da crise económica e financeira*. ISCTE Business School.

Caldeira, M. C. (2012). *O Capital De Risco Em Portugal : Tendências Da Última Década*. ISCTE Business School.

CMVM. (2017). *Relatório Anual da Atividade de Capital de Risco*.

CMVM. (2019a). Séries Longas. Retrieved April 9, 2019, from <https://www.cmvm.pt/pt/Estatisticas/SeriesLongas/Pages/default.aspx>

CMVM. (2019b). Sistema de difusão de informação. Retrieved April 8, 2019, from https://web3.cmvm.pt/sdi/capitalrisco/pesquisa_nome_fcr.cfm

Explorer Investments. (n.d.). Private Equity, Áreas de Negócio - Explorer Investments líder no mercado português de Private Equity. Retrieved March 23, 2019, from <https://www.explorerinvestments.com/areas-de-negocio/Private-Equity/17/>

Fernandes, M. L. (2011). *Venture Capital in Portugal: investments' selection criteria, intervention forms and impact on venture capital backed firms*. Universidade do Minho

Fiúza, M. (2018). Explorer lança fundo de €125 milhões. *Expresso*. Retrieved from <https://expresso.pt/economia/2018-04-14-Explorer-lanca-fundo-de-125-milhoes#gs.2q8mte>

Franca, J. E. da. (2014). Portuguese Experience on Venture Capital Instruments, (February).

Gago, M. J. (2014). Bancos já devolveram quase 40% do dinheiro da troika. *Jornal de Negócios*. Retrieved from https://www.jornaldenegocios.pt/empresas/banca---financas/detalhe/bancos_ja_devolveram_quase_40_do_dinheiro_da_troika

Horton, M. (2015). How does the risk profile of private equity investments compare to those of other types of investments? Retrieved April 9, 2019, from <https://www.investopedia.com/ask/answers/040615/how-does-risk-profile-private-equity-investments-compare-those-other-types-investments.asp>

IAPMEI. (2013). Guia Prático do Capital de Risco. Retrieved from <http://www.iapmei.pt/resources/download/GuiaPraticodoCapitaldeRisco.pdf>

INE, & PORDATA. (2019a). Pequenas e médias empresas em % do total de empresas: total e por dimensão. Retrieved March 26, 2019, from <https://www.pordata.pt/Portugal/Pequenas+e+médias+empresas+em+percentagem+do+total+de+empresas+total+e+por+dimensão-2859>

INE, & PORDATA. (2019b). PORDATA - Taxa de sobrevivência das empresas a 1 e 2 anos: por forma jurídica. Retrieved March 26, 2019, from <https://www.pordata.pt/Portugal/Taxa+de+sobrevivência+das+empresas+a+1+e+2+anos+por+forma+jurídica-2890-248087>

INE, & PORDATA. (2019c). Valor acrescentado bruto das empresas: total e por dimensão. Retrieved April 9, 2019, from <https://www.pordata.pt/Portugal/Valor+acrescentado+bruto+das+empresas+total+e+por+dimensão-2916-246649>

Invest Europe. (2017). European Private Equity Activity, (June). Retrieved from www.investeurope.eu

Kenton, W. (2018). Convertible Preferred Stock. Retrieved March 26, 2019, from <https://www.investopedia.com/terms/c/convertiblepreferredstock.asp>

Lusa. (2017). Fundos de capital de risco Revitalizar apoiaram 100 PME com 207 milhões de euros. *Público*. Retrieved from <https://www.publico.pt/2017/02/08/economia/noticia/fundos-de-capital-de-risco-revitalizar-apoiaram-100-pme-com-207-me-1761247>

Metrick, A., & Yasuda, A. (2017). *Venture Capital & the Finance of Innovation*. Wiley (Vol. 91).

Oxy Capital. (n.d.). Capital de Expansão e Substituição. Retrieved March 25, 2019, from <http://www.oxycapital.pt/?pg=mezz>

Pathena. (n.d.). About us | Pathena. Retrieved June 19, 2019, from <http://www.pathena.com/about-us>

PME Investimentos. (n.d.). Fundos Revitalizar | PME Investimentos. Retrieved March 15, 2019, from <https://www.pmeinvestimentos.pt/capital-de-risco/fcr-revitalizar/fundos-revitalizar/>

QREN. (n.d.). Finova - Fundo de Apoio ao Financiamento à Inovação. Retrieved March 22, 2019, from <http://www.pofc.qren.pt/media/noticias/entity/finova-fundo-de-apoio-ao-financiamento-a-inovacao?fromlist=1>

Ramos, M. (2012). *Capital de risco e financiamento bancário: custos e benefícios jurídico-económicos para as empresas portuguesas*. Universidade do Porto.

RSA. (n.d.). Organismos de Investimento Imobiliário (FII/SICAFI) Fundos de Capital de Risco.

Silva, B. (2017). Como está o mundo 10 anos depois da crise do subprime? *Dinheiro Vivo*. Retrieved from <https://www.dinheirovivo.pt/banca/como-esta-o-mundo-10-anos-depois-da-crise-do-subprime/>

Silva, D. (2016). *A indústria do capital de risco em Portugal : a influência do investimento de capital de risco nas empresas*. Universidade Católica Portuguesa. Retrieved from <https://repositorio.ucp.pt/handle/10400.14/21707>

Stephanie. (2017). Propensity Score Matching - Statistics How To. Retrieved March 26, 2019, from <https://www.statisticshowto.datasciencecentral.com/propensity-score-matching/>

Veloso, S. (2012). *Venture Capital em Portugal – Análise do impacto ao nível das empresas*. Universidade do Porto.

Veríssimo, A. (2017). Explorer lança fundo de 200 milhões para investir em Lisboa. *Jornal de Negócios*. Retrieved from <https://www.jornaldenegocios.pt/empresas/banca--financas/detalhe/explorer-lanca-fundo-imobiliario-de-200-milhoes-para-investir-em-lisboa>

APPENDICES

Appendix A.

Date	VENTURE CAPITAL FUNDS		VENTURE CAPITAL COMPANIES		TOTAL
	Net Asset Value	Number of Funds	Assets under Management	Number of Active Venture Capital Companies	Total Value under Management
2003	234,9	29	122,7	10	357,6
2004	571,0	32	108,0	14	679,0
2005	715,4	38	108,4	18	823,8
2006	831,8	39	197,5	20	1 029,3
2007	1 278,9	42	246,5	23	1 525,4
2008	1 251,7	41	221,0	21	1 472,7
2009	2 369,8	50	737,4	24	3 107,2
2010	1 607,7	51	743,8	21	2 351,5
2011	1 887,6	70	754,9	21	2 642,5
2012	2 476,2	72	385,8	31	2 862,0
2013	2 854,2	77	320,5	32	3 174,7
2014	3 282,9	73	215,7	34	3 498,6
2015	3 809,3	85	204,0	35	4 013,3
2016	4 256,3	84	208,7	37	4 464,9
2017	4 307,1	95	209,7	46	4 516,7
2018	4 387,9	106	209,9	48	4 597,8

Table A.1: Evolution of Portuguese VC funds and firms' value between 2003 and 2018

Source: CMVM (2019)

Appendix B.

	METHOD	MODEL	CONTROL VARIABLES	TESTS
Koo (2016)	Regression model through OLS, Feasible Generalized Least Squares (FGLS) and Random Effect	Dependent variable: Return On Equity (ROE) Independent Variable: PE investment size	Industry type Current asset to current liabilities ratio Firm age Assets and current asset ratio	T-tests Visual evidence (graphs)

	Propensity Score Matching (PSM) ⁵ for year 2012			
Rosenbusch et al. (2013)	Meta-analysis Pearson's correlation r as the effect size	Dependent variable: growth, profitability and stock market Independent variable: VC investment Moderator variables: industry effects, age, IPO, country uncertainty avoidance, study publication and the performance measure used	Industry type	
Croce et al. (2013)	Regression model through OLS and a two-step system generalized method of moments estimator (GMM-SYS) PSM	Dependent variable: total factor productivity (TFP) that allows to isolate financial from value-added effects or partial growth (labour productivity growth or capital productivity growth) Independent variables: firm age, firm-fixed effects and 3 dummies: if the firm gets VC financing until 2 years before the first round, if firm gets VC financing in VC's holding period and if	Country Industry type Time	Wald test for the difference between the second and the first dummies' coefficients to correct for a possible screening effect

⁵ This method finds pairs for VC-backed firms of non-VC-backed firms that are comparable according some characteristics. These comparable firms, the control group, have similar propensity scores - probabilities of receiving VC investment. Probabilities are obtained by estimating a probit regression model for the whole sample, with the dependent variable as the probability of receiving Revitalizar investment and the dependent variables the characteristics considered as determinants of receiving the investment. PSM allows to correct from the fact that receiving VC funds is not the result of a random process, so there could be a possible selection bias, that results from the fact that firms choose if they apply to VC funds and VCs choose the firms they want to invest. This selection bias is reduced or eliminated by balancing covariates (the characteristics between Revitalizar and non-Revitalizar-backed firms) (Stephanie, 2017).

		gets VC financing after its exit		
Paglia & Harjoto (2014)	Differences-in-differences regression model through OLS Inverse-Mills ratio to correct from self-selection bias PSM	Dependent variable: sales and employment growth Independent variables: dummies to indicate the establishments that received VC any time, establishments that receive funding during the holding period and thereafter and a dummy interaction between the first two that captures the difference between VC-backed and control group prior vs after financing	Country Industry type Time	
Engel (2002)	Regression model Descriptive statistics Heckman's approach to solve potential bias resulting from lack of information and controls for screening	Dependent variable: employment growth Independent variables: vectors regarding four dummies that indicate if a firm in high/low-tech industry receives VC, if a firm in high/low-tech industry receives funds from other external firms and performance determinants (e.g. firm size, age or legal form)		

Table B.1: Methodologies used by different researchers

Appendix C.

Variable	Variable description
PERFORMANCE	Companies' equity growth between the end of the previous year and the last day of the respective year
REVITALIZAR	A dummy variable that takes the value 1 if the company was invested by Revitalizar and 0 if by Pathena during 2013-2018
FIRMAGE	Age of the respective firm counted from the day of its constitution
MICRO	A dummy variable that takes the value 1 if the company is considered as micro sized
SMALL	A dummy variable that takes the value 1 if the company is considered as small sized
MEDIUM	A dummy variable that takes the value 1 if the company is considered as medium sized
STARTUP	A dummy variable that takes the value 1 if the VC investment type at the company is categorized as Startup
EXPANSION	A dummy variable that takes the value 1 if the VC investment type at the company is categorized as Expansion
EARLY__STAGE	A dummy variable that takes the value 1 if the VC investment type at the company is categorized as Early Stage
NUM8	A dummy variable that takes the value 1 if the company is the CAE 8 industry
NUM10	A dummy variable that takes the value 1 if the company is the CAE 10 industry
NUM11	A dummy variable that takes the value 1 if the company is the CAE 11 industry
NUM13	A dummy variable that takes the value 1 if the company is the CAE 13 industry
NUM14	A dummy variable that takes the value 1 if the company is the CAE 14 industry
NUM16	A dummy variable that takes the value 1 if the company is the CAE 16 industry
NUM17	A dummy variable that takes the value 1 if the company is the CAE 17 industry
NUM22	A dummy variable that takes the value 1 if the company is the CAE 22 industry
NUM23	A dummy variable that takes the value 1 if the company is the CAE 23 industry
NUM24	A dummy variable that takes the value 1 if the company is the CAE 24 industry
NUM25	A dummy variable that takes the value 1 if the company is the CAE 25 industry
NUM26	A dummy variable that takes the value 1 if the company is the CAE 26 industry

NUM27	A dummy variable that takes the value 1 if the company is the CAE 27 industry
NUM28	A dummy variable that takes the value 1 if the company is the CAE 28 industry
NUM33	A dummy variable that takes the value 1 if the company is the CAE 33 industry
NUM35	A dummy variable that takes the value 1 if the company is the CAE 35 industry
NUM38	A dummy variable that takes the value 1 if the company is the CAE 38 industry
NUM43	A dummy variable that takes the value 1 if the company is the CAE 43 industry
NUM46	A dummy variable that takes the value 1 if the company is the CAE 46 industry
NUM47	A dummy variable that takes the value 1 if the company is the CAE 47 industry
NUM52	A dummy variable that takes the value 1 if the company is the CAE 52 industry
NUM55	A dummy variable that takes the value 1 if the company is the CAE 55 industry
NUM56	A dummy variable that takes the value 1 if the company is the CAE 56 industry
NUM58	A dummy variable that takes the value 1 if the company is the CAE 58 industry
NUM62	A dummy variable that takes the value 1 if the company is the CAE 62 industry
NUM63	A dummy variable that takes the value 1 if the company is the CAE 63 industry
NUM64	A dummy variable that takes the value 1 if the company is the CAE 64 industry
NUM68	A dummy variable that takes the value 1 if the company is the CAE 68 industry
NUM71	A dummy variable that takes the value 1 if the company is the CAE 71 industry
NUM72	A dummy variable that takes the value 1 if the company is the CAE 72 industry
NUM73	A dummy variable that takes the value 1 if the company is the CAE 73 industry
NUM82	A dummy variable that takes the value 1 if the company is the CAE 82 industry
NUM93	A dummy variable that takes the value 1 if the company is the CAE 93 industry
NUM2014	A dummy variable that takes the value 1 if the observation corresponds to the year of 2014
NUM2015	A dummy variable that takes the value 1 if the observation corresponds to the year of 2015
NUM2016	A dummy variable that takes the value 1 if the observation corresponds to the year of 2016

NUM2017	A dummy variable that takes the value 1 if the observation corresponds to the year of 2017
NUM2018	A dummy variable that takes the value 1 if the observation corresponds to the year of 2018
LOCATION_NORTH	A dummy variable that takes the value 1 if the company is headquartered in the NUTS II region of North
LOCATION_LISBON	A dummy variable that takes the value 1 if the company is headquartered in the NUTS II region of Metropolitan Area of Lisbon
LOCATION_SOUTH	A dummy variable that takes the value 1 if the company is headquartered in the NUTS II region of Alentejo and Algarve
LOCATION_CENTRE	A dummy variable that takes the value 1 if the company is headquartered in the NUTS II region of Centre

Table C.1: Description of the regression variables