

THE “VISIBLE HAND” IN THE VENTURE CAPITAL
INDUSTRY IN EUROPE

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Acknowledgments

This dissertation marks the final step of my academic life in this fine institution.

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“Deus quer, o homem sonha, a obra nasce”.

Fernando Pessoa

Abstract

Start-ups and SME's can be considered the engine of economies in the developed world. With them, we can see the thriving of a country's economy, but to invest, they need to find alternative sources of funding rather than banks and public funds. New funding trend shows the increase in the investment of Venture Capital in this kind of companies, which represents a big portion of what start-ups companies get to invest in their businesses and projects. Even though VC funds have a relevant importance in certain markets, in the European case the investment made in those firms continue to be carried out, mainly, by the traditional means: banks and government agencies, through European financing programmes. The lack of private investment made by corporations and market-funded VC funds represents a threat to the European countries and companies, which face serious troubles to find funding. Government-sponsoring arrived and could work as a solution, filling the gaps left by private investors and to serve as benchmark to these, creating a "push-pull" effect to get higher levels of capital available to companies. In this dissertation, two models were tested in order to explain the relation between the effect that the government-sponsoring funds have in the VC industry itself and how the industry could beneficiate with this kind of investment. The introduction of unconventional variables in these models can help to improve the importance of GVC in Europe and future contributions in this area.

KEYWORDS: Venture Capital, Venture Capital Funds, Europe, Government-Sponsoring.

JEL CLASSIFICATION: G20, G24, H54

Resumo

Start-ups e PMEs podem ser consideradas o motor das economias nos países desenvolvidos. Com elas, pode-se observar o sucesso da economia de um país, mas para que invistam, precisam de encontrar formas alternativas de financiamento sem estar dependentes de bancos ou capital público. Novas tendências de financiamento mostram um crescimento no investimento de capital de risco neste tipo de empresas, representando a maior parte do capital disponível que as start-ups têm para investir nos seus negócios e projectos. Apesar do capital de risco ter grande relevância em determinados mercados, na Europa o investimento feito nesse tipo de empresas continua, principalmente, a ser pelas entidades tradicionais: bancos e agências estatais, através de fundos comunitários europeus. A falta de investimento privado feito por empresas e fundos de investimento de capital de risco privados, representa uma ameaça para os países europeus e empresas, sofrendo com a necessidade de encontrar financiamento. Os “patrocínios” governamentais podem ser a solução, preenchendo as lacunas de investidores privados e servir de *benchmark*, criando um efeito *push-pull* de forma a atingir níveis superiores de capital disponível para as empresas. Nesta dissertação, dois modelos foram criados de forma a explicar a relação entre o efeito que os “patrocínios” governamentais têm na indústria de capital de risco e, como a mesma, poderá beneficiar com este tipo de investimento. Introduzindo novas e disruptivas variáveis nestes modelos poderá melhorar a importância que o capital de risco público tem na Europa e gerar contribuições futuras nesta área.

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List of Abbreviations

AIFMD-	Alternative Investment Funds Managers Directive
BVC-	Bank-affiliated Venture Capital
CVC-	Corporate Venture Capital
EU-	European Union
EVCA-	European Private Equity & Venture Capital Association
GDP-	Gross Domestic Product
GVC-	Government Venture Capital
IMF-	International Monetary Fund
IPO-	Initial Public Offering
IRR-	Internal Rate of Return
IVC-	Independent Venture Capital
LBO-	Leverage Buyout
MBO-	Management Buyout
PE-	Private Equity
PVC-	Private Venture Capital
R&D-	Research and Development
US-	United States of America
USD-	United States Dollars
VC-	Venture Capital

1. Introduction

Economic growth was always a challenge to modern world and developed economies. Mutations took place in order for countries to thrive and produce wealth not only to invest but to improve their people's lives. But with all challenges, come great difficulties. The recent events of the subprime crisis of 2008 left a damage in world economies and particularly in some countries that felt the need to receive bailouts from international institutions like the IMF. European countries suffered the most and this crisis, nowadays, still has its effects, leaving deeper problems like unemployment, deficits and low economic growth. But to every problem, comes a solution. According to Vermeulen and Nunes (2012:1) "*Venture capital drives innovation, economic growth and job creation. (...)*", presenting venture capital as solution for the economic problems and as way of improving the companies, in order to be more competitive and thrive, national and internationally.

With that in mind, this dissertation aims at studying the venture capital in the European industry and the effects in those economies. As the authors above said, in order to improve the European economic perspective, companies should aim at being back-funded by venture capital and invest their committed capital in innovation, creating jobs and improving their country's economic conditions. But there is a difference between the two largest Venture Capital industries, the United States of America and the European one, which is the type of investor. In the United States of America the most common is companies to be back-funded by private venture capital, either Corporate Venture Capital (CVC), business angels and family offices, whereas in European countries that investment in companies with venture capital is more public, with Government Venture Capital and government-sponsoring investment with the purpose of filling the funding gaps left by the private players.

In the first chapter, I propose the topic Venture Capital as an introduction to the topic to be discussed, doing a contextualization of the topic itself. Explaining the history, the reason why venture capital appeared and defining this topic is important to be done in order for the comprehension of the readers and to be introduced to this particular subject that is being study in this dissertation. Presenting the process by stages of investment, the legal parameters of VC in Europe, the strategies of investment

and the types of funds serves the purpose of expanding the knowledge of the reader about this subject.

In chapter two, titled “Venture Capital Industry (Europe)” is the beginning of the contextualization of the region itself and the importance that this industry has in Europe. Presenting data made available and collected from Invest Europe, (formerly EVCA, “European Private Equity & Venture Capital Association”), I show how important this industry could be to solve some of the issues that some European countries face.

In chapter three, one of the most important chapters of this dissertation, the chosen title is “Relative Weakness”. Here a literature review can be found, with the purpose of introducing relevant findings about the topic and enlightening the readers. This chapter connects with chapter 4 introducing the specific topic of study of this dissertation, which is the government-sponsoring in Europe. “The remedy? Government-sponsoring” is the title of this chapter which aims at explaining what government-sponsoring is, its purpose and, last but not least, its effects in the industry itself. It also creates a bridge to the following chapter, where the empirical research on this topic and the results obtained by that research are presented.

Chapter five is named based on an important question to this subject: does it work? As stated above, this chapter contains the empirical research made for this dissertation and presents unique results for the area, creating new opportunities for further studies. Using the Invest Europe data available with all the information needed to create a specific database, from 2010 to 2015, that suits the purposes of this dissertation, regression models were created based on two dependent variables, INV.TOT and V.C. ACT. The first one represents all the investment made in the country, private and publicly. The second one is named Venture Capital Activity, which represents the sum of the investment and divestment made in the country. The model is based on the model created by Jeng and Wells (2000) and the subsequent model of Félix et al. (2013), in order to achieve final equations to explain the regression models applied to those two dependent variables. The work made by La Porta et al. (1997) is important too to the creation of the regression models, mainly by the innovation at that time to introduce new and disruptive variables to study the effects that those ones could have in the countries capital markets.

Last but not least, the last chapter of this dissertation includes all the conclusions of this particular subject, the knowledge and limitations that can be explored due to the empirical results and some final thoughts on how this dissertation could contribute to this area, in the future.

2. Venture Capital

2.1- History

For capital expenditures to occur, investment was always needed. History showed that money transactions applied to particular expenditures were always considered investments. An example of that was the investment made by the Portuguese and Spanish crowns, in the mid-fifteenth century, to explore and discover “new worlds”. With those investments, these two countries discovered new continents and their influence was massive, and resulted in the colonization of a high number of territories. All the expeditions were a result of a great investment made by Portugal and Spain, who were considered leaders at that time, but the profits from those expeditions were correlated with high levels of risk. This could be similar with the venture capital itself, which only occurs if the investment is made to achieve high returns, due to the high levels of risk that these types of expenditures imply.

In the eighteenth century, the Industrial Revolution is another example of capital expenditures allocated to innovation, with high levels of risk. This period could be considered as one of the many foundations of the venture capital as it is, because it was the beginning of new investments that were made to support innovation and lead to periods of great discoveries such as the steam engine.

More recently, venture capital as we know it was created in the United States of America, in the mid-40s. American Research and Development (“ARD”) was the first company created with the single purpose of channelling capital to invest in high-risk emerging companies, making ARD was “*The first true venture capital firm (...)*”, according to Gompers and Lerner (2001:146). With this, a revolution happened and few years after the creation of ARD, the Silicon Valley era began. During the 60s and 70s, venture capital was one of the main sources of finance early-stage and expanding companies, which were exploring, through innovation, breakthroughs in electronic, medical and data-processing technology. The result of this investments was the association made between venture capital and technology finance.

The boom of venture capital happened in the 80s, mainly in the U.S. industry, due to successful deals like Apple and Genetech. Despite the crash of the stock markets

in 1987, the industry was facing a new and understandable proliferation. At this time and according to Brouwer and Hendrix (1998), we witnessed the boom of the European VC industry, being almost compared with his peer, the U.S. industry. In 1983, EVCA was created, presenting at the time of creation 43 members. With this, the VC industry boosted, reaching levels of capital similar to the U.S., of 29 billion USD and 30 billion USD respectively (Brouwer and Hendrix, 1998). The ECVA was founded in values like transparency and corporate responsibility, promoting the industry in the European countries (9 at that time) and the private investment by corporations/individuals rather than banks or public investment.

Currently and since the creation of these agencies, the European industry improved and tried to match the U.S. industry, but the subprime crisis of 2008 affected the investment by venture capital worldwide. Countries still face the consequences of that crisis, recovering slowly but efficiently. The appearance of more start-ups lead to private and public investment to be focused to this type of companies, that could proliferate and provide high returns to all investors, private or public ones.

2.2- Definition

According to Strömberg (2009), venture capital is a form of investment based on strategies with specific objectives and implies special agreements between the investors and the managers of the venture capital funds. Botazzi and Rin (2002) agree that, despite the fact that there is no standard definition of venture capital, represents the financing of early-stage companies that lack funding, using equity or equity-like instruments by professionals in order to extract the maximum performance of the company to provide profits to all the parties involved. The parties involved in this process are, mainly, the investors, that channel their capital to venture capital funds that are specialized in investing in young firms that present high growth rates and future profits for the investors, and the investees, that have the objective of apply the capital in their expenditures/projects in order to create wealth and distribute the profits for the investors. The third party is the fund itself, a channel for the investors to apply their capital and to investees have the possibility to raise capital for their companies.

In a venture capital fund, contractual terms are needed to assure that all the process of fund-raising, investment and divestment is complied. Strömberg (2009) presents nine commitments that need to be met in the relation between the investors and the fund managers, presenting this relation as a form of contract with limited partnership, giving oversight to investors, right of attendance at investors committee's and to participate in investment decisions that beneficiate the two parties. The author also suggests that this limited partnership structure provides protection to the investors that can be exempt from general liability of the fund. He also presents an important idea to this subject that venture capital funds are particularly marketed to professional investors, that commit their capital with no possibility of withdrawing it until the maturity of the fund. Vermeulen and Nunes (2012) state that the typical duration period of the fund is up to 10 years with an investment period of 5 years, in order to investors make their forecasts and predict when they can collect the profits of the investment.

2.3- Stages of investment

Bottazzi and Da Rin (2002) presents 4 stages of investment in venture capital. Each of this stages has individual particularities, due to the type of investors present in the industry.

The first stage is the seed finance, which is one of the most important stages for companies seeking financing. In this stage, venture capitalists make the investment with the purpose of testing the viability of the company and to evaluate the possibility of success. This access to capital allows the investee to test the feasibility of the project and attractiveness, in economic terms.

The second stage of investment is the start-up finance and is one of the most important stages for investors and investees. In this stage, the investment is made with the purpose of creating operational leverage to the firm, in order to attract workforce and managers. At this stage, the business is set on the developing the necessary procedures and prototypes, with trial runs on the implementation of marketing strategies that could benefit the investee. This stage is important too, because venture capitalists present a key role in the management decisions of the firm, contributing with their involvement in the organization and sharing corporate knowledge to the investee.

The third stage is the expansion finance, where investment is aimed at reaching the industrial production stage, supported by key elements like productivity and efficiency. This stage also contemplates the investment in upgrading the conditions of the firm, being those conditions the expansion of the production facilities or acquiring/attracting more employees with special skills, like marketing and business executives, to this one. This stage is important to the investee, because venture capitalists not only present their knowledge to the company but also may help seeking more funding.

The fourth and final stage of investment is the later stage finance. This stage is important to all the parties involved, as the others, but have a particular importance for venture capitalists. At this stage, the role of venture capitalists is set by developing and growing the investee capabilities in order to be a market leader in its particular business are, with the final purpose of unleash its final potential of generate profits for both parties. To the investors, the profits are made by setting the divestment in the firm, by trade sale or opening the capital to the public through an Initial Public Offer (“IPO”). To the investees, this stage means another opportunity to raise capital to the company, enhancing the capital available for new projects and expenditures.

2.4- Legal

To explain all the parts involved in venture capital, the legal aspects are among the most important. Only knowing the legal requirements and the procedures required, a venture capitalist can develop his activity. A particular subject in this topic is the exemptions practiced by financial market regulators when they talk about venture capital. According to Vermeulen and Nunes (2012:1) “(...) *policymakers and regulators acknowledge that venture capital funds should be exempted from the new stringent registration and reporting requirements for alternative investment fund advisers/managers. (...)*”. The conclusion of this authors shows that, despite the impact that these types of investment could have in the country’s economy, regulation should promote the industry itself, giving stability and efficiency to the financial markets where the regulators act.

But there are considerable differences between the two biggest VC industries, the United States and the European one. Under the Dodd-Frank Act, in the U.S., and the Alternative Investment Funds Managers Directive (AIFMD), in Europe, venture capitalism is encouraged in order to boost the industry and promote economic growth. As the scope of this dissertation is to study the European VC industry, the AIFMD should be more “dissected” in order to provide a better understanding of this topic. The AIFMD, according to Vermeulen and Nunes (2012), provides a European passport to fund managers with the purpose of managing and marketing funds to other member-states, not being obliged to only act in his own country. This set of rules and regulations also promotes the transparency and confers protection to investors and other market participants. This implies that the AIFMD act as a regulator, monitoring and providing oversight in order to ensure that funds managers comply with the full transparency and disclosure values that are the core of this set of rules. To support these claims by the authors, the Regulation (EU) N°345/2013 of the European Parliament and of the Council of 17 April 2013 on European venture capital funds is a good example. Article 7 predicts that the managers of qualified venture capital funds shall always act with honesty, fairness and conduct their businesses in order to promote the welfare between the investors, the funds they manage and the integrity of the markets. Article 10, 11 and 13 also implies those values that managers should comply and mentioned above, with the purpose of generate benefits to the relation between the parties involved.

In order to ensure that all these regulations are followed by fund managers, the regulation above mentioned have the principle to ensure that the competent authorities of each member state in the European Union act as supervisor and regulator. Article 14, 15, 18 and 19 provide the national regulators of the member states the legitimacy to supervise and act as regulator, in order to ensure the values foresaw in the AIFMD act. If the funds manager’s don’t comply with the national regulation, they should face penalties in the terms described in this European Regulation.

3. Venture Capital Industry (Europe)

Regarding the Venture Capital Industry in the European Union, there are many factors to consider in order to describe it. Using the data made available by Invest Europe it is possible to describe the industry, presenting important variables like the level of funding, both in monetary values and number of companies, and the level of investment, with the monetary values, stages of investment and the sectors where the venture capital activity is higher. The level of divestment is important too, in order to provide a notion of the values of divestment in Europe for venture capital-backed funded companies, the exit route used to divest and the sectors where the divestment is more present.

The values that are presented are a time series of 9 years, from 2007 to 2015, long enough to be robust for extrapolation purposes and to take in consideration the 2008 subprime crisis and its effects.

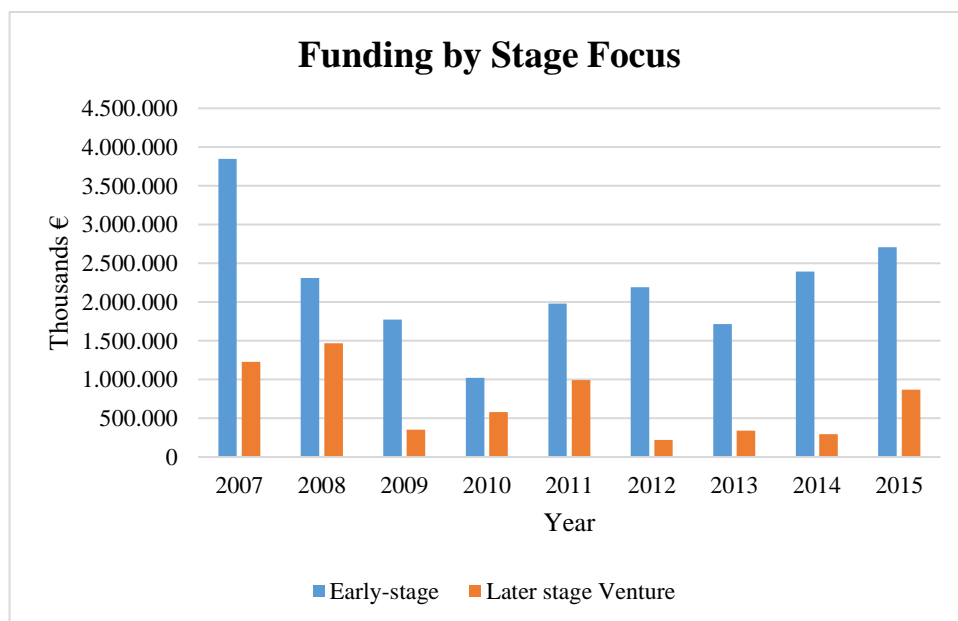


Fig.1- Level of Funding by Stage Focus

Source: Invest Europe

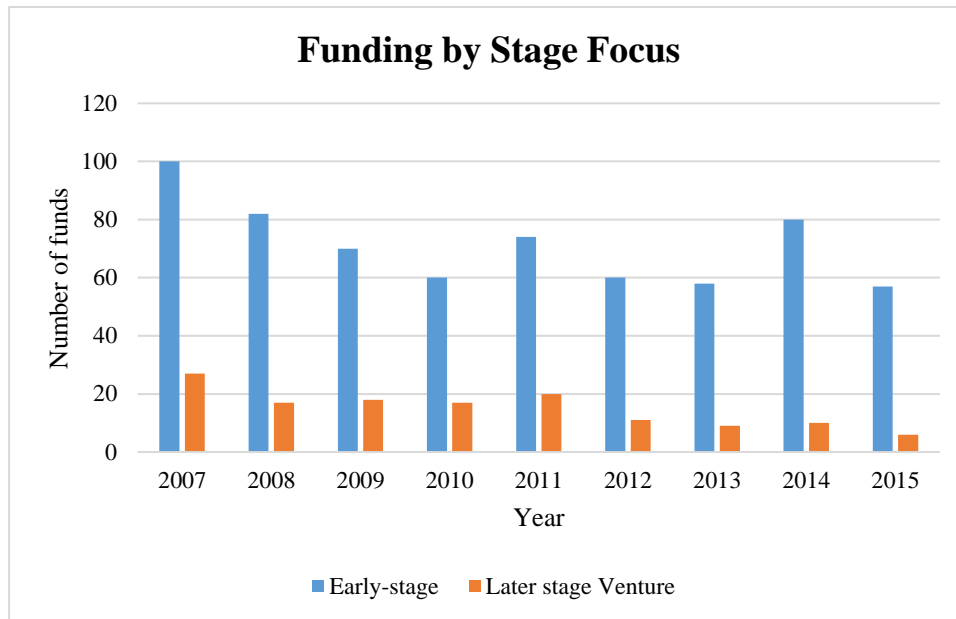


Fig.2- Level of Funding by Stage Focus

Source: Invest Europe

Presented in Fig.1 and Fig.2 are the level of funding by stage focus of VC in Europe, from 2007 to 2015.

Regarding the level of funding by stage focus in monetary values, a disparity between the values of funding in early stages and later stages is noteworthy. According to Invest Europe, early-stage funds represents the venture capital funds that focus on investment in companies in earlier stages of their lives¹. On the contrary, later stages ventures are related with venture capital funds that provide capital to an already operating company, profitable or not². With that in mind, and taking in consideration the values presented in Fig.1, we can observe that VC funds are more focused to raise money to invest in companies that are at their early stage of life, rather than companies that in companies which already have some activity in their market. The values of 2007 show a funding of almost 4 billion €, but in the following years a decrease in the level of funding to early stage focus is visible, a trend only reversed from 2010 to 2011 (2 billion € to 2.3 billion €, respectively). On the following years, a decrease is seen only from 2012 to 2013, and values recover to almost 2.7 billion € in 2015. For later stage focus, the levels of funding are quite constant, without big variations like the decrease

¹ See more in <https://www.investeurope.eu/research/about-research/glossary>

² See more in <https://www.investeurope.eu/research/about-research/glossary>

of 2008 in the early stage focus. Only from 2011 to 2012 a decrease of more than 500 million € occurs, which in the following years is reversed until 2015, presenting a level of funding of almost 1 billion €. A possible reason for those decreases in the years following 2008 could be the subprime crisis and its effects in European countries and markets.

In Fig.2, the level of funding by stage focus presents the number of funds that raised capital for investment. As noted in Fig.1, the same occurs in Fig.2 and the disparity exists between early stage and later stage venture, concluding that venture capital funds are more “interested” in investing at an early stage rather than a later stage. From 2007 to 2010, a decrease is noted in the number of funds that raised capital to invest in early stage companies (from 100 to 60 companies, respectively), only increasing that number in 2011, with almost 80 funds focused in investing in early stage firms. The following years present decreases and increases and despite these, the number of funds never reach the 2007 levels, ending 2015 with less than 60 funds. According to Fig.2 and as shown in the first exhibit, the numbers of companies with a focus of later stages venture is almost constant, fluctuating from more than 20 funds, in 2007, to almost 10, in 2015. Again, a motive for these variations could be the crisis, which had severe effects in Europe, in general.

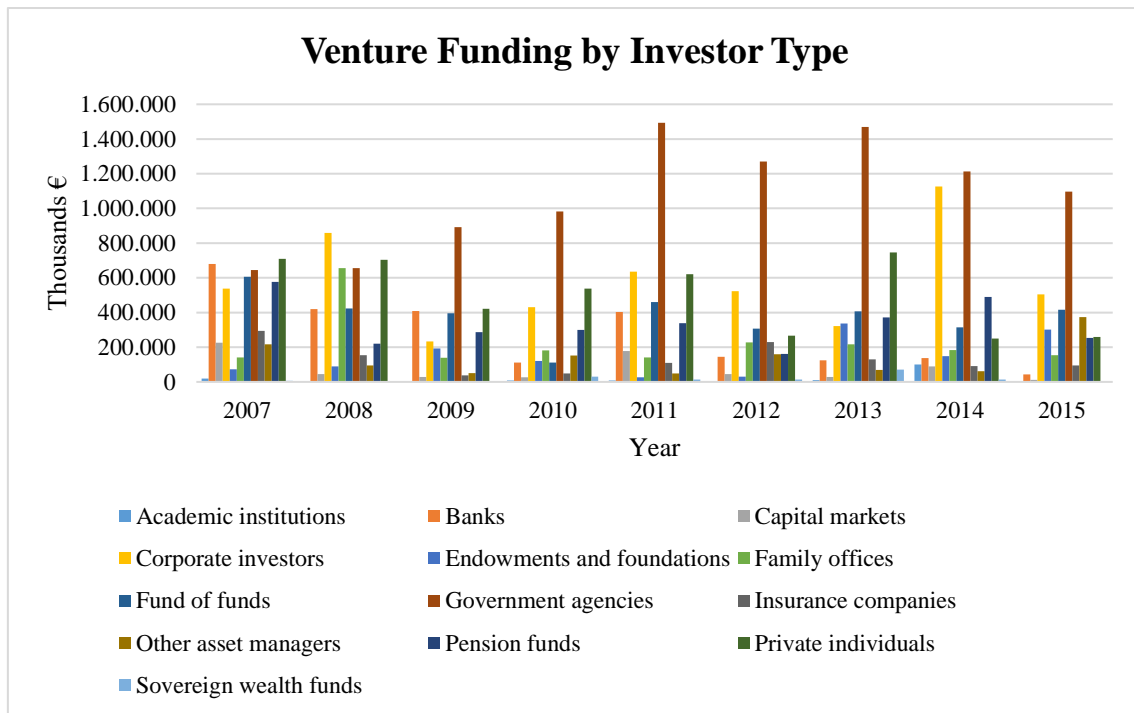


Fig.3- VC Funding by Investor Type

Source: Invest Europe

Fig.3 presents the venture funding by investor type, which has a big importance for this chapter, not only to highlight the investors that raise more capital in the European VC industry but for the conclusions that we can draw from this exhibit. The more active investors are in this industry, more capital is raised for future investment in companies. As noted in the exhibit, the investors more active in venture funding, from 2007 to 2015, are government agencies, corporate investors, private individuals and banks. These, from 2007 to 2015, present a notable decrease on a yearly basis, ending in 2015 with little or almost no level of capital raised. This could represent a paradigm change for the sources of finance that companies have available in the European countries, from bank-oriented economies to other sources like private investment (corporate investors, private individuals and funds of funds) and public investment, with government agencies. As showed in Fig.3, the levels of capital raised by those investors are the most relevant in the period studied, ranking government agencies as the investor that raised more capital, following corporate investors, funds of funds and private individuals, respectively. It's also important to refer that the level of funding by government agencies represents almost the level of the other three combined, with a

maximum of more than 1.4 billion € raised in 2011 and 2013, and more than 1.1 billion € in 2015.

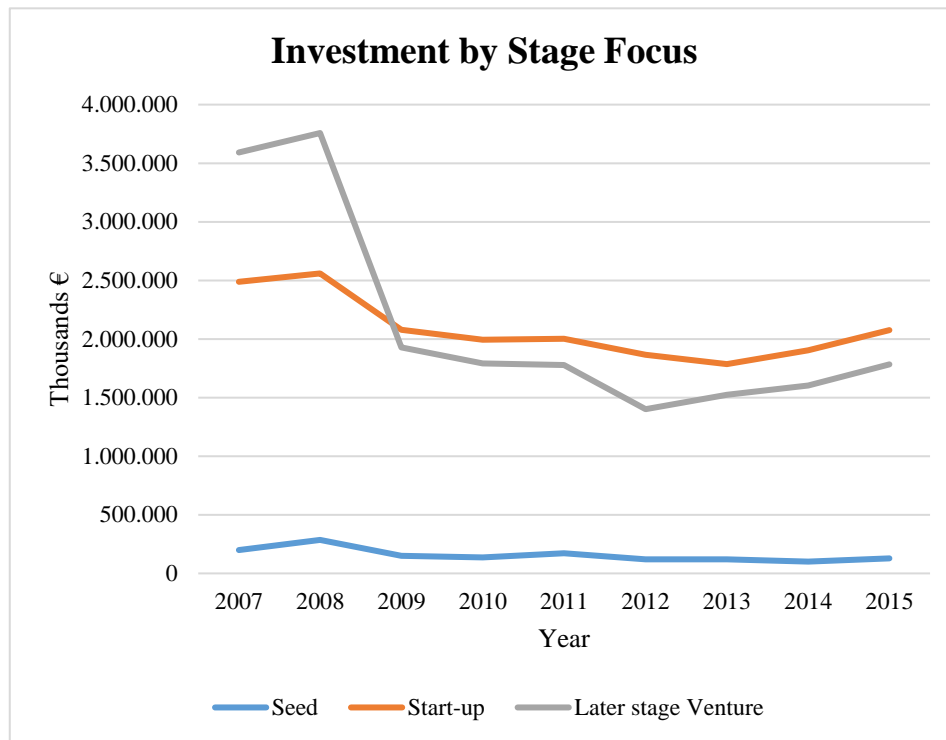


Fig.4- VC Investment by Stage Focus

Source: Invest Europe

Regarding the VC investment by stage focus in Europe, and with the support of the data collected from Invest Europe, we can observe differences between the stages of investment that are preferable to venture capital funds. According to Invest Europe, the Seed³ stage of investment consists in providing funding for the investee to complete their research, test the market and for the definition of product and creation of prototypes, not aiming at funding the start of mass production and distribution. The Start-up⁴ stage is ideally the provision of funding for companies to start the mass production/distribution of the product or service, with a short duration and the objective of the investment being for investees to cover the initial capital expenditures, marketing costs, and working capital. Finally, the Later Stage Venture, as explained above, is the investment made with the purpose of investing in a company already operating in the market, profitable or not.

³ See more in <https://www.investeurope.eu/research/about-research/glossary>

⁴ See more in <https://www.investeurope.eu/research/about-research/glossary>

As presented in Fig.4, the stages of investment that were preferred by venture capital funds, from 2007 to 2015, were the Start-up and Later Stage Venture. The values of the seed investment, from the years studied, never passed the barrier of the 500 million €. This could mean that, for venture capital funds, the preferable investments are in companies that have already defined their business model and have already a place in their market, despite the financial factors like profitability or market share. One may even state that the decrease of the investment, from 2008 until a small recovery in 2012, for Later Stage Venture focus, and 2013, for Start-up focus, is correlated with the 2008 crisis that devastated the European countries. At the 2015 year, the values of investment with a focus in start-up stage was more than 2 billions € and for Later Stage Venture were close to 1.8 billion €, thus this could mean that venture capitalists, at that time, were more interested in funding companies with the beginning of their life, possible acting positively in the management of those ones.

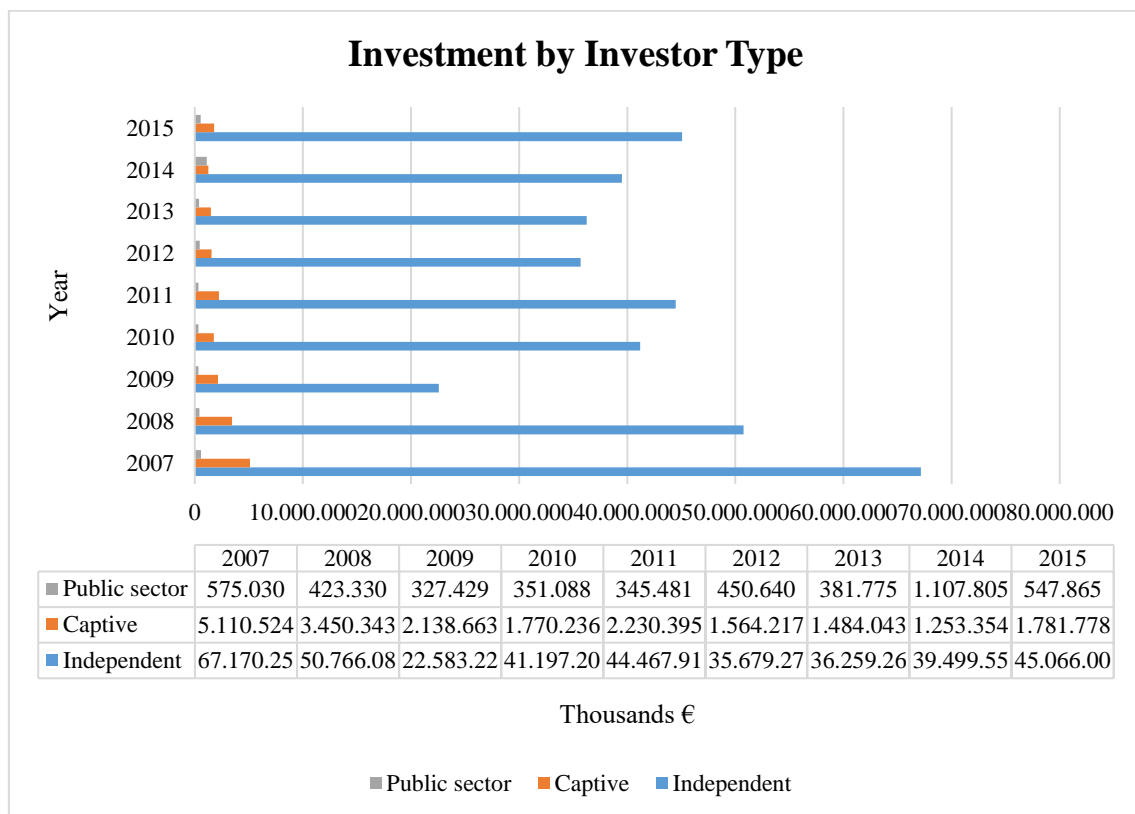


Fig.5- VC Investment by Investor Type

Source: Invest Europe

Fig.5 shows the VC investment by type of investor, showing the type of investors that were more active, or not, in the European industry, in the time period covered. As shown in the exhibit, the dominance of independent investors is clear, with values that are in some years ten times higher than the second more active type of investor, the captive ones. The public sector, that is the focus of this dissertation, is the type of investor that invests less in VC back-funded companies. The values of investment are quite constant for these 3 types of investors, presenting decreases in 2007 to the following years, recovering in 2010, for the independents, and 2011, for the captive and public sector ones. Again, a reason for those increases and decreases in the level of investment made by these investors could be the effects of the crisis.

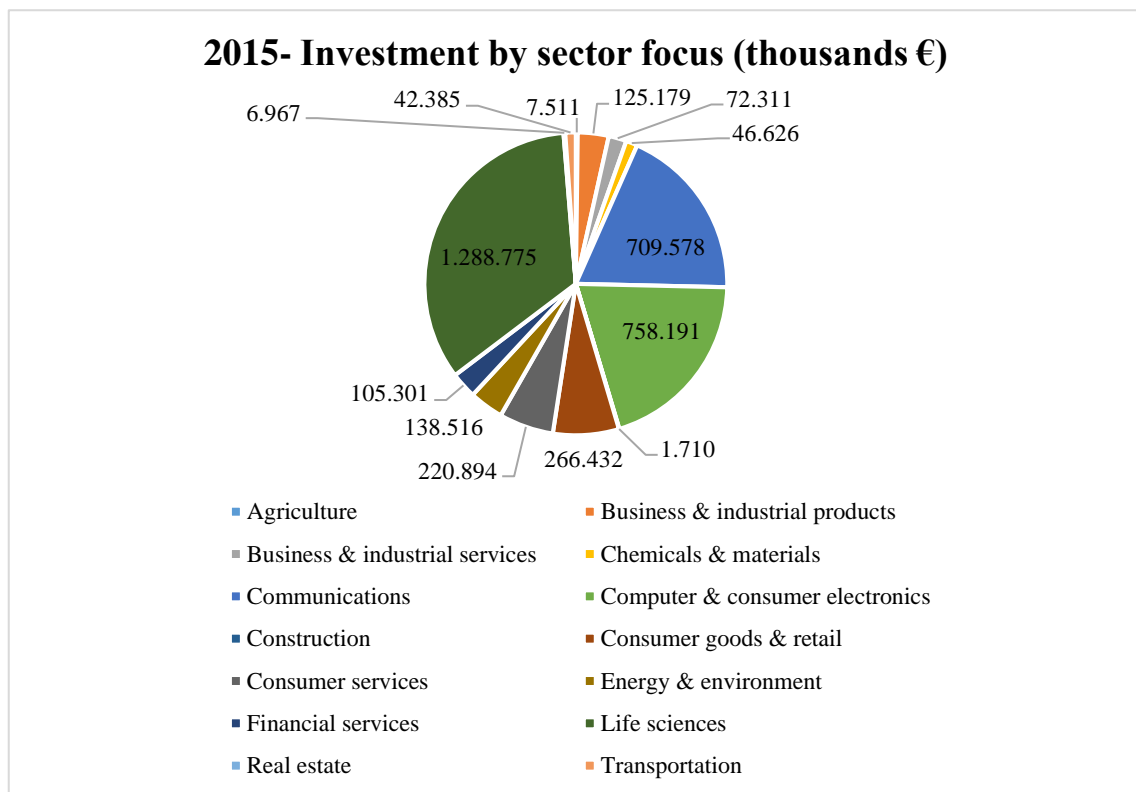


Fig.6- VC Investment by Sector Focus (2015)

Source: Invest Europe

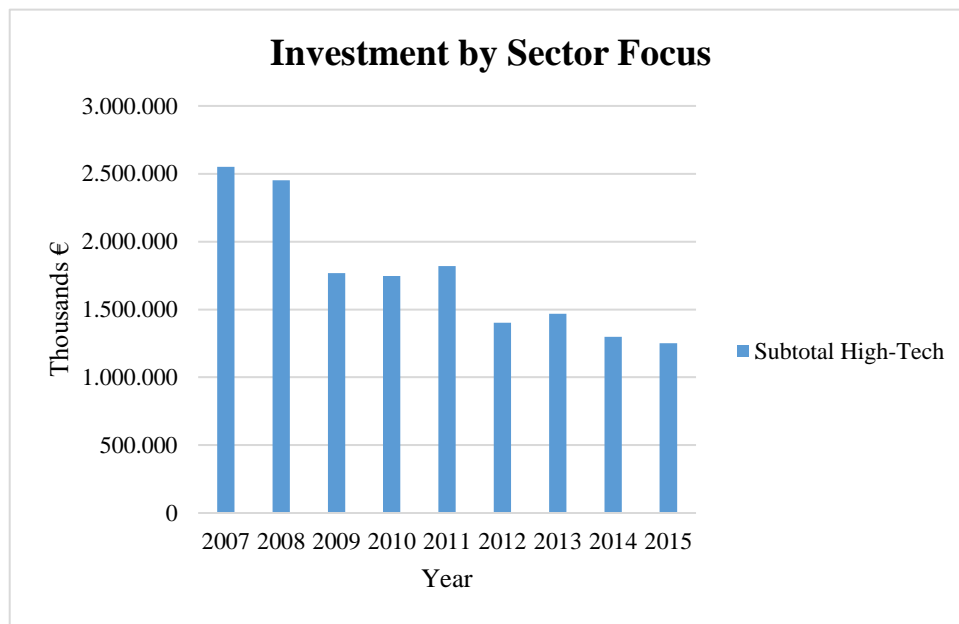


Fig.7- High-tech Investment

Source: Invest Europe

Fig.6 shows the VC investment by sector focus in the EU. From the data we could extrapolate that the sectors that are more relevant for venture capital funds are life sciences and all industries connected with in some way with technology, like communications and computer and consumer electronics. From 2007 to 2015, the sector focus for VC investment didn't change, only varying in the levels of investment made by VC funds. In 2015, these three sectors combined are two times higher than the rest of the other sectors combined, which can be a good indicator to describe the companies that can collect more investment from VC funds, operating in those three sectors. It's important to point out that the high-tech is considered separately, given its importance to the VC market, as showed in Fig.7. This sector, and comparing with all the others in 2015, benefited from an investment of more than 1.25 billion €, despite the decrease noted yearly from 2007.

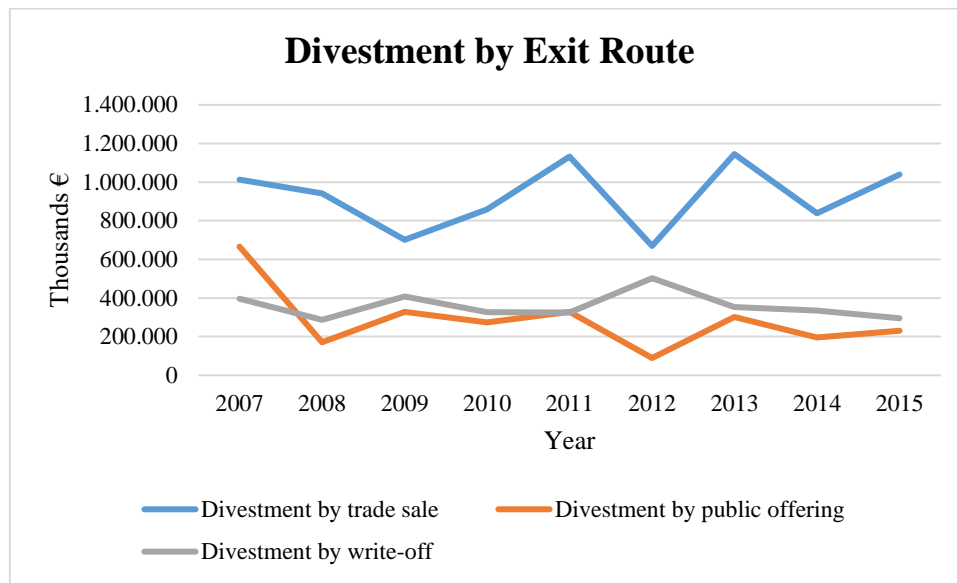


Fig.8- VC Divestment by Exit Route

Source: Invest Europe

Regarding the divestment made by VC funds in Europe, there are different routes that can be taken in order to exit the investment and collect the respective profits. According to Invest Europe, the divestment by trade sale⁵ means the sale of the company's shares by the venture capital fund, to industrial investors. These acquire the company, not only because of their interest to expand their "influence" in the market, but also to merge the targets into their own companies, if appropriate. Divestment by write-off⁶ is different from the trade sale. In this case, the value of the investment is written-off, creating a zero or negative return for the investors. The divestment by public offering⁷ is carried out in the financial markets where the investors sell their shares to the public, listing the formerly private company in a stock exchange for the first time. This exit is commonly known as an Initial Public Offering ("IPO") and has the purpose to raise the levels of equity present in the company, with the goal to capitalize the company and thus funding capital expenditures and projects.

Fig.8 allows an easy conclusion to be taken. The exit route that VC funds prefer to collect the profits from their investment is, by far, the divestment by trade sale. From

⁵ See more in <https://www.investeurope.eu/research/about-research/glossary>

⁶ See more in <https://www.investeurope.eu/research/about-research/glossary>

⁷ See more in <https://www.investeurope.eu/research/about-research/glossary>

2007, with more than 1 billion € of divestment, the values fluctuate yearly, presenting increases and decreases and reaching its pick in 2011 and 2013, with almost 1.2 billion € divested by trade sale, concluding in 2015 with more than 1 billion €. The second most frequent is the divestment by write-off, presenting values more constant throughout the years and ending with a value of more than 300 million € in 2015. The divestment by IPO is the less chosen by VC funds, despite the high values of 2007 of almost 700 million €, and ending 2015 with a divestment value of little more than 200 million €. One thus may point that the decreased in divestment by IPO, from 2007 to 2008, was due to the collapse of the financial markets worldwide and particularly in Europe. Other motive could be the weaker financial markets in European countries, in comparison with the US financial market, and their lack of capital availability, leaving VC funds with no choice than to divest by other means, like trade sale or write-off.

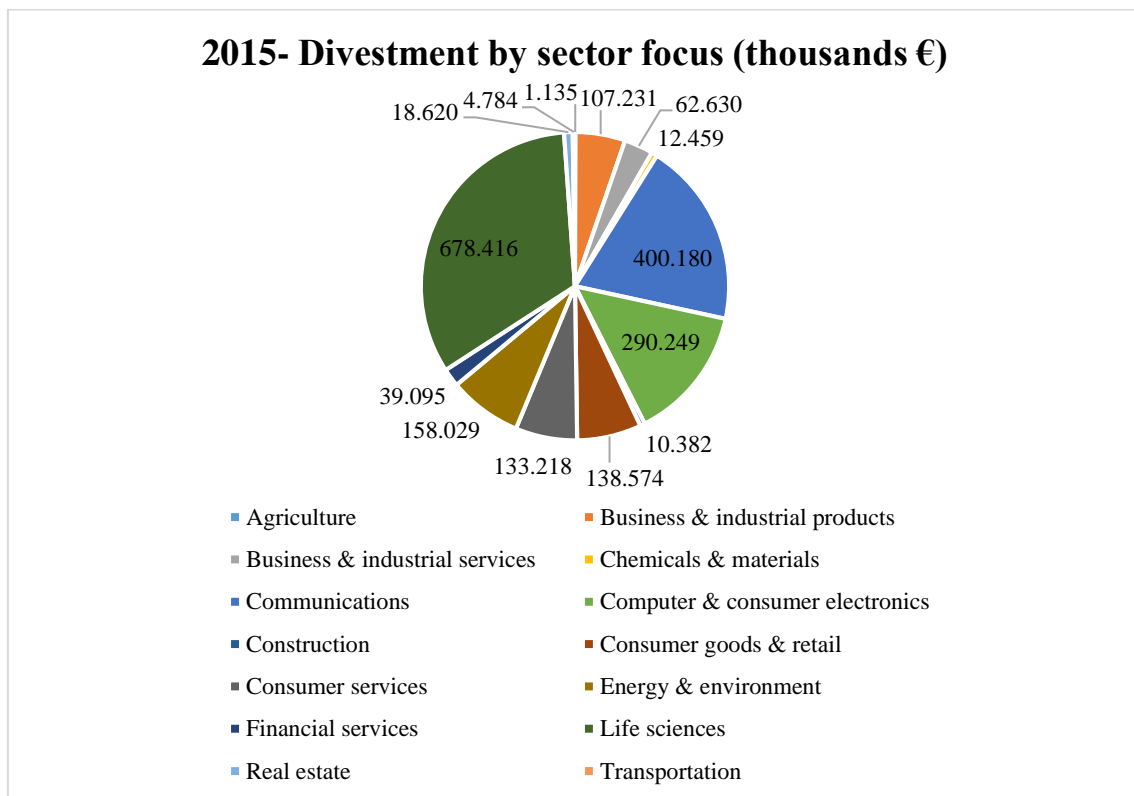


Fig.9- VC Divestment by Sector Focus

Source: Invest Europe

Fig.9 presents the VC divestment by sector focus, which, as mentioned above, are the sectors more relevant to VC funds to the divest and collect the profits from their investment. As noted in the exhibit, there are sectors that represents the high levels of divestment made by venture capitalists. Those are life sciences and sectors connected with technology, like communications and computer and consumer electronics. A special note for one sector that despite the investment values presented in Fig. 6, it's presented as the fourth sector where VC is focused: energy and environment. This could represent an opportunity for VC back-funded companies acting in that sector.

As is described above in the investment part, these three sectors (life sciences, communications and computer and consumer electronics) represent more than 65 % of the divestment made by VC funds in 2015. This could represent, again, an opportunity for future entrepreneurs when considering their options to which sector of the market their company should act.

All in all, and after this concise description of the venture capital industry of the European Union, one should refer that this industry has real attractiveness to young entrepreneurs, with disruptive business and ideas, and for investors, being presented to a source of increasing their investments and, consequently, their profits.

4. Relative Weakness

In this chapter the literature review about the topic is presented, in order to introduce the core subject under study, government-sponsored venture capital and its effects on the European industry. But the introductory name of this chapter could already be an explanation about the venture capital industry in Europe. So, what could be the reasons for this relative weakness?

The first reason for the relative weakness of the VC industry in Europe could be the consequences that the subprime crisis of 2008 had in the European countries. This had severe effects in the world economy, particularly in EU countries, that faced problems as government indebtedness, economic growth decreasing and its consequences, such as unemployment and lack of funding for companies. Currently, the economy is more stable, presenting good indicators of recovery and the investment increased as the consequences of this financial crisis were resolved. With that in mind, European countries should channel their efforts in order to revive the investments in companies, which are the engine of economies. As presented above in this dissertation, there are authors that consider venture capital as the solution for economic growth and that same venture capital industry could benefit with the improvements realized in areas like new technologies, life sciences, communications and energy.

Vermeulen and Nunes (2012) argue that venture capital funds sharpen and require innovation by companies, investing their committed capital into those that, probably, will thrive in their countries and create two important variables, which are economic growth and job creation. These two variables should be considered with the highest degree of responsibility, because only with job creation can private investment be generated and, as consequence, economic growth favourable to the country. With that in mind, how could the VC industry in Europe become as important as its peer, the US one?

First, and in order to create a deeper knowledge about the topic, a review about venture capital and its cycle is useful.

Lerner (1997) created a course overview with the purpose to extend the knowledge about the private equity and venture capital area, emphasizing that with the tremendous boom that the PE and VC industry accomplished, and stating that the future

growth and potential of this type of investment were very impressive. With this in mind, and at the year of writing, the author states that possibilities for the implementation of VC were increasing regularly and that, despite all those huge increases in this type of investment, the US PE and VC industry still had a significantly “advantage” in comparison with the European and Asian ones. He also states that the industry itself presented some important issues to be attended, like the illiquidity and risk of private equity, which could affect the investments due to the lack of satisfactory portfolio companies and the consequence instability created in the industry.

Zidder (1998) developed a paper that emphasized the processes of venture capitalism. In his work, the author states that venture capital fills a gap in the funding of companies, but stressing, at that time, that the VC only played a minor role in the funding activity and basic innovation. He also refers that VC is important in more developed stages of the company, like the innovation life cycle, where companies already market their products and create wealth to expand their businesses.

Gompers and Lerner (2001) worked the venture capital cycle as a whole, highlighting the most important factors that each stage of the VC cycle had, at that time, explaining that the venture capital cycle starts with the capital raising of a fund, the continuous oversight and monitoring of the investment, adding value to the firms and successful exiting investments and returning capital and profits to the investors. They also approach the factors that couldn't be studied at that time and contributed to the extension of literature on this subject. Measuring risk and return was a problem faced by VC investors, like public and private pension funds, that increased their investment with the hope that the returns were increased in correlation with the investment itself. Also, the correlation between the boom of high-technology companies and the growth of VC investment could mislead the investors, because the causal relationship between those variables, at that time, was a challenge and an empirical problem.

Regarding the fundraising and exit of the venture capital investments, there are some factors to be considered in order to understand the importance of the VC industry worldwide. In terms of fundraising, Gompers and Lerner (1999) studied the relation between the factors that affected the fundraising in the US, from 1972 to 1994, concluding that regulatory changes in the industry, like capital gains tax rates and pension funds, the expenditures in R&D and the overall economic growth have casual effect in fundraising. In their conclusions, the authors found positive relations between

variables such as GDP and capital gains tax rates, leading to an increase in the venture capital activity. Also, they argue about that fund's performance is important to determine how much new capital venture organizations could raise, though.

Exiting the investments is too an important subject dealt with in this chapter, as stated above. In terms of exit strategy, the following ones are the most common when talking about VC divestment: IPO, trade sales, write-offs, secondary sales and buybacks (Cumming and MacIntosh, 2001). The authors also refer that the choice of the exit vehicle from where the divestment happen is related with the total investment duration, which can impact significantly with levels of divestment, depending on the exit vehicle.

Gompers and Lerner (1997) studied the relation between the IPO exit strategy and conflict of interests and reputation that may arise due to the issuance of public securities. Using VC-backed initial public offerings in order to investigate those issues, the authors found that conflicts of interest are likely to happen, particularly in investment banks. The reason is related with the fact that investment banks also have their VC subsidiaries, which invest in private firms, and the relation between the two parties and the issuance of public securities by those investment banks could result in potential conflict of interests.

Black and Gilson (1998) contributed to the literature, studying the relations between the venture capital industry and bank and stock market-centred capital markets. In their paper, the authors explained a systematic difference between those two, which was related with a much stronger VC industry in stock market-centred systems, arguing that for a successful and thriving venture capital industry it is important that a well-established stock market exists, allowing a successful exit through IPO, most commonly in the US market. The authors found that the disparity related with other markets, such as the German, is due to the fact that the stock market isn't effective as the American one that the former being a bank-centred system, it's harder to achieve a successful exit by initial public offering.

There are authors arguing that the VC industry is highly volatile with factors such as the flowing of funds to VC companies, the investments made and the financial performance of the portfolio companies and VC firms, and explain that the volatility could be correlated with the valuations in the capital markets (Gompers et al, 2008). The authors also state that the increase of the divestments by IPO's drive more fundraising

to VC firms, meaning that the returns obtained by VC investments are highly correlated with the market returns. In their paper, they analysed more than 30000 VC investment decisions over the past two decades and found that the shifts occurred in the public markets weren't related with new or inexperienced VC companies, but with specialized firms with considerable notability in the industry.

As stated above, there are notable differences between the VC industries worldwide. The United States offer the most valuable industry, with a significant part of the research referring that, in comparison with his peers, the VC industry in the US is leading the "charts" and could work as role model to others. According to that, and being the scope of this dissertation to study the European industry, one should address other industries to better understand the former. Related with that, the US and Asian industries should be considered in order to provide an understanding of the differences between those two and the European industry.

According with Kaplan and Lerner (2010:2), "*It is generally believed that VC investing has been important to the U.S. economy. (...)*", representing the importance of this industry in the American economy. The authors found that regarding funding, companies only manage to receive a small percentage of capital, but in terms of divestment, a large number of those companies, despite the small levels of funding, went public, reaching levels of funding way above the initial ones. In their conclusions, and giving the fact that they tried to explain the past and the present of the US VC industry, the authors also state that although the lower returns that venture capital investments were related with periods of recession, like the bear market of 2001, the model is not broken and that for the future, high returns above the average capital investments could be a guaranty. In the Asian case, Naqi and Hettihewa (2007) deal with the topic on a general basis, discussing the importance of the venture capital industry and all the factors relevant to it. Reviewing the specific attributes of the VC development in Asia, they found different processes in venture capital and suggest how venture capitalists should address those issues. The fact that venture capital funds, in Asia, are structured as corporations, "*(...) Some venture capital management firms in Asia have a divisional or multi-national structures, and some are subsidiaries of investment banks or commercial banking firms.*" (Naqi and Hettihewa, 2007:340) could be an explanation of the differences between the American and European venture capital industry. Other differences are referred by the authors, such as the criteria

involved in the process to evaluate the investments like the investee's personality and experience. Another difference noted is related with the additional risk that venture capitalists need to be aware, like country and exchange rate risks. Also, the authors address the difficulties of divestment of VC back-funded companies as an important issue in the Asian market, due to the lack of experience and shortage of successful cases, suggesting that a way of overcome those difficulties is the sale to strategic investor or a merger with a company operating in the same business area.

After those considerations, one should wonder the differences between the US and European industry as the most important VC industries, argued by some authors. Considering those differences and addressing them will benefit this literature review, extending the knowledge about venture capitalism in Europe.

There are strong evidences that a disparity exists between the European and the US venture capital industry. Hege et al (2009) studied the disparity of the venture capital performance in the United States and Europe, seeking to explore the processes that lead to the economic value that the VC could create. Based on company-level data, the authors measured the value generated by portfolio companies, through their IRR (Internal Rate of Return), between the early stage of financing and the last round of valuation, prior to the exit. Their conclusion was correlated with the topic itself, presenting a disparity between the US and European industry, in terms of the active role of American venture capitalists, creating more value rather than the negative relationship that the frequency of monitoring and performance add to the European one. Jeng and Wells (2000) also worked on a model to explain the disparity between countries, such as the United States and European ones like United Kingdom, France, Germany, Portugal and others. In their paper, the author tried to identify the determinants for venture capital investments, considering “(...) *the importance of initial public offerings (IPO), gross domestic product (GDP) and market capitalization growth, labor market rigidities, accounting standards, private pension funds, and government programs.*” (Jeng and Wells, 2000:241) and concluding that disparity exists mainly in the preferred stage of investment, with the US with strong early stage investment and the European countries considered to be strong in later stage investments. Following this, other authors, also studied the differences between the two industries. Brouwer and Hendrix (1998) argued about the differences between the US VC industry and the European Dutch VC industry. Exploring the early stages

investment in these two industries, the authors analysed the differences noted at an institutional and organizational level. First, they state that at an early stage, the investments made in these two industries are substantially different, where European VC were more interested in LBO's and MBO's rather than investing in new firms. Also, they conclude that factors like high IPO multiples, overpricing, and the differences in organizational and legal forms created a deeper breach between those two industries.

Regarding the disparity factors of the US and European VC industries, with the purpose of extending the background on the venture capital most important industries and to continue the review about this subject in the European Union, several authors studied the EU venture capital industry and all its intrinsic factors.

Marti and Balboa (2001) argued about the determinants of venture capital and private equity fundraising in Western Europe, identifying key factors that are correlated with that one. In their paper, they studied 16 European countries from 1991 to 1999 in terms of investments and divestments as the representation of the key factors that are related with the development of the PE/VC market. The authors found that flow of investments is extremely important to the increase of the fundraising activity and that lack of preferable exits for investors have a significant effect in fundraising levels too.

Bottazzi and Da Rin (2002) state that one important pillar to achieve economic growth is the capability to encourage and sustain technological innovation, due to the entrepreneurial movements that enhanced the competitiveness and the growth of the country's economy, quoting several European documents from governments and institutions that proved the support of venture capital as a source of fixing the European economies difficulties and to improve factors like the unemployment. Their paper focused on a study that used a firm-level database on European venture capital, data exported from the Euro.nm market in 1997 which included all the innovative companies in high-growth industries in Amsterdam, Brussels, Frankfurt, Paris and Milan. With this database, the authors studied the venture capital effects in Europe's innovative companies, focusing in three main issues, which were the role of VC in the financing of innovative companies, the development of the VC in Europe and a comparison with the US and the effects that enable companies to raise funds, create growth and jobs through venture capital. Despite the positive effects that venture capital have, in terms of economic growth, the authors argue that VC back-funded companies do not grow at the same pace as that the non-venture back-funded ones, concluding that the lack of

“maturity” of the venture capital industry and companies that meet the requirements in terms of growth perspective. But the authors also state that venture capital could work as a crucial funding and financing to innovative companies, in their creation and development, and to boost the industry itself, being a high priority to policy makers and investors.

Da Rin et al. (2006) worked on the effectiveness that public policies could have in a creation of active venture capital markets, assessing the innovation ratios⁸ from early stage investments of venture capital. Studying this subject with a data panel from 14 European countries between 1998 and 2001, their focus was the governmental policies such as measures of taxation, the stock market availability for entrepreneurial investments and labour procedures like hiring and firing restrictions. Their conclusions were deeply correlated with the fact that certain policies affect the level of funding and investment in venture capital back-funded companies, taking in account that “(...) *policies which increase the expected return of innovative projects are more successful in altering the composition of venture capital markets towards early stage projects and projects in high-tech industries.*” (Da Rin et al, 2006:1719). They also conclude that, in terms of taxation measures, a reduction in the capital gains taxes increases the share of early stage investments and the availability of strong capital markets with an attractiveness for entrepreneurial firms have a positive effect on the innovation ratios. Thus, the authors conclude that policy-makers like European governments should take into consideration wider aspects in the development of their public policies, in order to attract more venture capital funding and investment in their countries.

Kelly (2011) stated that the poor European venture capital performance was due to several explanatory possibilities, such as insufficient investment, exiting to capital markets difficulties and fundraising difficulties linked with differing regulatory regimes. In his paper, the author used the IRR of VC investments in the European countries with the purpose of achieve an overlook at the magnitude of the issue, in order to conclude about the reasons for the poor performance of the VC industry in Europe. His conclusions are also of the utmost importance, because he argues that the poor performance of the industry could be related with the lack of VC investments and that the European VC industry hasn't reached its full potential, thus critical mass, due to the

⁸ Innovation ratios are, according with Da Rin et al (2006), the high-tech investment ratios to the total venture investments (high-tech ratios) and the ratio of early stage investments to the total venture investments (early stage ratios)

fragmentation of VC operations across countries, with different regulatory and legal regimes that decrease the possibility of the creation of a more homogenous VC ecosystem.

Felix et al (2013) also analysed the determinants of the European venture capital markets, following the work developed by Jeng and Wells (2000), and applying the equilibrium model created to a dataset of 23 European countries. In their paper, the authors suggested other determinants that could be important to study and thus improve on the work of other authors, namely pointing to the unemployment rate, trade sale divestment and price/book ratio as factors that could have impact in the European VC industry. The authors found that the determinants proposed to enhance the model already developed by Jeng and Wells (2000) have extreme relevance when analysing the VC industry, such as the unemployment rate and the trade sale divestments. Felix et al (2013) also conclude that the early stage and high-tech investments are correlated with macroeconomic factors, emphasizing that determinants like long terms interest rates and long term unemployment have a significance impact in those types of investments.

In terms of public policies that could improve the VC industry in Europe, two particular subjects should be considered and emphasized with the utmost importance, which are the regulatory and contract framework.

Regarding the regulatory framework in Europe, there are two main references: the AIFMD and the Regulation on Venture Capital Funds. This topic has extreme importance, due to the fact that Europe is a market made up of independent countries, which are sovereign up to certain point. So, in order to perform in the European market, venture capitalists should know that some constraints exist, like the difference in registration of venture capital offerings between member states. Vermeulen and Nunes (2012) emphasize that a single rulebook would benefit countries, companies and investors, to market their venture capital funds and incentivize investors to invest in foreign companies. With that in mind, the first option to overcome those fragmentation problems, the AIFMD allows managers and investors to protect their investments and facilitate the process. Regarding the AIFMD, Vermeulen and Nunes (2012: 5) refer that *“(...) Since AIF managers’ decisions affect investors in different member states, the AIFMD aims to introduce a comprehensive and secure regulatory framework that ensures proper monitoring and prudential oversight of alternative investments that pose*

systemic risk. (...)”. This would allow to investors protect their investments, due to the fact that venture capital funds and managers operating in the European Union are obliged to full transparency and disclosure agreements.

The second regulatory framework is the Regulation on European Venture Capital Funds, which was published by the European Commission in 2011. This regulation was aimed to propose a “tailor-made” rulebook for venture capital funds performing in the European Union and serve as a passport for managers market their funds over the EU member states. Vermeulen and Nunes (2012) argue that with this regulation, managers are obliged to disclose annual reports of their funds to the authorities that are competent to oversee the activity and with minimum standards in disclosure and transparency, this could create a more robust venture capital industry, attracting more investors.

All in all, there are factors that influence extremely the venture capital activity in Europe. With all the research cited above, a better understanding on the topic can be reached and put to use in the next chapter of this dissertation, titled “The remedy? Government sponsoring”, really the important point addressed in this dissertation.

5. The remedy: Government Sponsoring

Could government-sponsoring be the remedy for the problems that the VC industry in Europe faces? Several authors suggest that this type of investment from governments, taking an active role in the venture capital activity, could benefit the levels of capital available for funding and investment in thriving new companies that create innovation and economic growth for the European Union. In this chapter, an assessment is made in order to extend the knowledge about government-sponsored venture capital and how it can be useful to companies.

Manigart and Beuselinck (2001) studied the relation between the supply of venture capital and the European governments, focusing on the determinants that are correlated with those two. First, the authors argue that the lack of VC financing funded by private investors creates a gap and that governments could replace those ones, stimulating the VC activity in their countries by two means: indirectly, through public policies, that stimulate venture capitalism, and the development of liquid financial markets that could contribute to the development of young firms and the corresponding divestments; directly, taking active participation in the VC industry, through government-sponsored VC funds or direct participation in small companies. The authors used a database of 10 European countries, from 1989 to 1999, with yearly statistics by EVCA in order to study the impact that the public investments had on the supply of venture capital. They conclude, first, that the VC industry has the purpose to boost high growth entrepreneurial companies and governments, taking an active role in the industry, create and stimulate economic growth in their countries. Macroeconomics factors, like GDP, affect the supply of government VC investment, showing positive correlation, and that governments “fill the gap” to increase their country’s economic growth. Also, they conclude that an active role of governments could benefit the levels of private investment, serving as benchmark to private investors, and that policies created towards the development of exit opportunities, like strong stock markets, are deeply correlated with the supply of governmental investment. Leleux and Surlemont (2003) analysed the seeding and crowding out investment in public and private venture capital, at a Pan-European level over the period of 1990-1996 in 15 European countries. The authors developed this paper with the purpose of analysing the relationship between public and private sources of venture capital in Europe, taking in account that public

policies to stimulate the activity could be effective, but depend also on other factors than the governmental incentives, like the size of the country's VC industry. The authors also conclude, and in accordance with Manigart and Beuselinck (2001), that governmental engagement in the VC industry could be beneficial for a country's economy growth.

Lerner (2002) argues about the motivations that lie beneath the design of efficient public venture capital programs, with the effort of creating the conditions to young entrepreneurial firms act in the vibrant VC industries. The author explores the challenges that government faces when addressing the financing of those type of companies in order to conclude what kind of design that programs need to have to thrive and to encourage private investors too. Taking in account successful programs like the Advanced Technology Program and the Small Business Innovation Research, the author suggests key recommendations to conclude about the importance of governmental venture capital in the industry itself. All are related with the focus and efforts that governments should have in create successful appraisals of the companies, with rigor and criteria, in order to assess the risks of innovative companies and to transform those companies in "marketable material".

Jääskeläinen et al (2007) argued about the profit distribution and compensation structures in hybrid VC funds, held by public and private investors. According to the authors, hybrid funds can be defined as private VC vehicles from which public capital will be allocated and channelled. In their paper, Jääskeläinen et al (2007) assess the factors that lie beneath the public investment on those hybrid funds, stating that profit and structure compensation of that fund could represent an opportunity for governments to attract more private investment in their VC industries. The authors also conclude that although the design of those hybrid funds profit and compensation structure are well developed, governments should address the limitations in terms of market returns, which could affect directly the measurement of investor's returns.

Brander et al (2008) studied the relation between government sponsoring and private venture capital. Using a Canadian dataset, the authors wanted to understand the success that government sponsoring VC funds could have and how is the relation between the VC public back-funded funds and the private ones (PVC), suggesting an analysis of outcomes in three general areas: value creation, competitive effects and innovation. In their findings, the authors state that GVC's tend to outperform the private

ones in those general areas, but the authors also conclude that this outperformance could be a consequence of less skilled VC managers or problems such as attractive portfolio companies where GVC funds are specialized in investing on them.

Cumming and Johan (2009) analysed the government capital pre-seed fund (PSF) program with the objective of understanding the effectiveness of public policy as entrepreneurial financing. The PSF program was initiated in 2002, in Australia, and had the purpose to boost the investment in high-tech entrepreneurial companies and this funds was a partnership of private and public capital. In their paper, the authors emphasize the differences between VC markets, stating that government VC knowledge outside the US was harder to study and that in order to analyse what is the impact that GVC could have on a particular country, studies should be developed towards that purpose. The authors also tried to identify what were the significant insights that government programs like PSF had to the vibrant VC industry, such as the dependence factors that are related with the success, or not, of this type of programs. The PSF had the purpose of assisting and developing the R&D activities of universities and public sector research agencies, to create links between the “innovators” and the financial community, to build entrepreneurial activities throughout Australia and, last but not the least, to encourage the private investment in R&D activities that entrepreneurial firms were undertaking. The authors conclude that in order to establish a more competitive VC industry, where GVC work as an engagement factor to young and innovate firms, the design of the programs should be extremely important but, since public capital is allocated and managed by private managers, the selection of these is important too.

In 2010, a Private Equity Report, from the World Economic Forum, was developed with the purpose to evaluate and assess the economic impact of PE/VC worldwide. Brander et al (2010) assessed the impact of governments as venture capitalists, sponsoring funds to invest in the flourishing industry of innovative companies. In their paper, the authors' state that the interest related with entrepreneurship is highly considered by governments' worldwide, promoting and supporting venture capital as a mean to invest in high-tech entrepreneurship. The authors stated objective is to study the support provided by governments to venture capital, focusing on three main channels of investment: *“One channel is the direct provision of venture capital through government-owned venture capital funds. A second channel is investment in independently managed venture capital funds that also rely on*

private investors. A third channel is to provide subsidies or tax concessions to venture capitalists. These three types of government-supported venture capitalists (GVCs) are referred to as full GVCs, partial GVCs and indirect GVCs, respectively.” (Brander et al, 2010:27). Analysing 28800 firms, based in 126 countries, that received venture capital funding from 2000 to 2008, the authors tried to compare the performance of companies back-funded by GVC and private venture capitalists (PVC). Taking in account several factors that were considered by the authors in their analysis, like value creation correlated with successful events of divestments, by IPO or acquisition by a third party, and innovation, conclusions were made that corresponded with some of the initial insights made by Brander et al (2010). They conclude that a moderate level of GVC financing results in strong performances overall, rather than no GVC support and extensive GVC support, presenting as interpretation of that the contributions that public venture capital, managed and overlooked by PVC, in the strong performances stated above. They also conclude that the GVC support in the venture capital industry could be beneficial to the improvement of value creation and innovation in the countries studied, but it is important, according to the authors, to establish levels of investment that don't as counterproductive to their VC industries. Other authors, on their conclusions, found that the investment from government-sponsored venture capitals, in syndication with PVC and lead by managers of privately held VC funds are more likely to be successful.

Bertoni and Tykvová (2012) investigated the more supportive form of investment in Europe, assessing the impact of the type of investors, either governmental or private, and the transaction structures, with syndication or non-syndication, have in European VC industry. Studying the relation between those two variables from a data sample of 865 young biotech and pharmaceutical companies, between 1994 and 2004, the authors concluded that syndication is beneficial for the venture investments, where private VC lead but it's also composed by governmental venture capital. These syndication produces economic outcomes more favourable for the VC investment in Europe and, at the same time, increases the success of government-sponsored VC funds in the recapitalization and profitability of their investments. Luukkonen et al (2013) also suggest, based on their study that privately held VC funds have significantly impact on the VC industry, being more successful than GVC. They also imply that, despite the lower performances, GVC have an important role in the VC industry, working as bench markers to attract private investors.

Bertoni et al (2015) studied the patterns of venture capital investment in Europe, doing an approach to the different investment strategies done by VC investors, like independent VC (IVC), corporate VC (CVC), bank-affiliated VC (BVC) and governmental VC (GVC). The dataset was composed of data collected from the VICO database, a project developed and funded by the European Commission, and includes 1663 first VC investments, from 1994 and 2004, in several European countries, such as Belgium, Finland, France, Germany, Italy, Spain and the United Kingdom. These investments were sourced from 846 VCs in 737 entrepreneurial ventures and were characterized as being *“less than 10 years old at that of the VC investment, and operated in the high-tech manufacturing and service industries.”* (Bertoni et al, 2012:3). In their paper, the authors argued about the specialization of the investments, derived from that type of investors above, and compared those with factors like the investee company characteristics and the investment characteristics. They also state that the relevance of this study was based on 3 interesting factors: first, the position that Europe takes place worldwide in VC matters, being the second largest industry after the American one; second, the heterogeneity of the industry, mainly dominated by venture capital investors like BVCs and GVCs; third, the importance of this study in terms of public policy, where governments act as key role players in order to commit their resource to increase the VC industry and close the gap between the US and the European one. In their conclusions, the authors highlight that those 4 type of investors do not compete with each other, differing in terms of investment strategies, like syndication and exit strategies, playing a different role in the European VC ecosystem. They also conclude that GVCs, playing an important role in the VC industry in Europe, should continue to “fill the gap” and attract private investors and also use syndication with PVCs in order to increase their returns. Grilli and Murtinu (2014) also evaluated the relation between government-sponsoring venture capital funds and the growth of European high-tech entrepreneurial firms, using an unique dataset that analyse the impact of GVC in high-tech companies, in terms of sales and employee growth. The authors conclude that high-tech firms that receive VC could be the engine of today’s economies and have a positive impact in several factors, such as economic growth, innovation and the development of societies. They also conclude, and in accordance with the ideas mentioned above, that GVC plays an important role in the European VC ecosystem and, despite the conclusions about the lower performances, syndication

between GVC and PVC is the best “path” towards the success of a flourishing VC industry in the EU.

Brander et al (2014) assessed the impact of government-sponsored venture capital, in terms of international evidence. The authors discuss the importance that governments have in taking part of venture capital industries worldwide, engaging with financial investments in innovative companies. In their paper, the authors tried to answer two important questions, related with the “crowding out” effect that GVC could have in the VC industry and the level of investment made by governments, at market level. In their conclusions, the authors support the hypothesis that the “crowding out” effect doesn’t have impact on the levels of funding and that the higher the GVC financing, the higher the levels of funds available and, particularly, the levels of funding by PVC. Also, they conclude that the mix between government-sponsored and private venture capital has a positive effect and a direct impact in the levels of VC investment. The importance of the partnering between GVC and PVC is also argued by McCahery and Vermeulen (2016), contributing to the decrease of the “liquidity gap” in VC industries like the European, and that the involvement of public-private VC investment could contribute to the growth of young and innovative companies. The authors also suggest that new contributions to that partnering should be made, such as the targeting of new private investors from “overseas”, like family offices and rich individuals, to participate in the public-private venture capitalism in Europe. Also, they suggest that the development of an online marketplace platforms where venture capitalists could exchange knowledge and investment/divestment opportunities. Colombo et al (2016) emphasized the importance for governments worldwide in VC investments, with purpose to increase the levels of available funding but to foster the private venture capitalism and solve the lack of VC investment. In their paper, they analyse several successful GVC investment programs, designed by governments, and with the purpose of investing in young and innovative firms. They conclude that policy makers should attract more privately held venture capital and they find that the positive effects of syndication between those two type of investors’ benefits the companies and the VC industry itself.

With this in mind, how could government-sponsored venture capital funds act towards objectives like economic growth? In the next chapter, an empirical research is

conducted to evaluate the impact that public investment has in the European VC industry and how those results could enhance GVC as an important investor in Europe.

6. Does it work?

The literature review gave us insights on how the government-sponsoring can be important for the growth of the European VC industry. With the benefit that knowledge we set to develop empirical research about the topic, using variables that can explain the relation between the government-sponsoring venture capital and the industry itself, by investments or divestments. Many authors suggested a specific set of variables to study the correlations mentioned above. In this regression model, the developed work by Jeng and Wells (2000), and the subsequent one by Felix et al (2013) are the base for the construction of the database and the guide for the regression model proposed in this dissertation. As mentioned above, the authors studied the relation between the determinants of venture capital investment in several countries, using macroeconomic variables to explore the outcome of divestment by IPO in those countries. The subsequent work by Felix et al (2013) explores those determinants with a special focus on the European Union countries and with added variables, like unemployment rates, trade sale divestment and price/book ratios, that could be important in the relations mentioned above. Other variables were considered in this model with purpose to extend the knowledge of the dependent variables studied, rather than only economic ones, based on the studies developed by La Porta et al (1997) and La Porta et al (1998), where the authors studied the relation between regulatory frameworks and the financial markets and how that first one could improve the outcomes from the financial markets.

Regarding the database, the Invest Europe dataset was important in the construction of the variables analysed in this empirical research. Taking in account several factors, this database includes an analysis from 23 countries with 138 observation, all in the European continent, and is based time series from the year of 2010 to 2015. Some constraints surfaced in the development of this database, making it impossible to include more years and observations to study (2007, 2008 and 2009; 207 observations), due to the lack of values for some variables. Other problem was related with the inclusion of all countries analysed in the Invest Europe data, which included countries like Ex-Yugoslavia & Slovakia and the Baltics ones. As they were grouped and it was impossible to extract the individual values for the variables, they were excluded from this model.

With all of this said, and before presenting the results of regression model, it's important to extend the sample characterization, in order to extrapolate about the determinants present in the variables analysed. Table 13 in the annexes presents the complete database constructed to explore the hypothesis.

The dependent variables chosen to test the hypothesis that the government-sponsored venture capital could boost the VC industry were directly related with the venture capital strategies known and studied worldwide. In this research, the total investment, private and public, made into those countries from the years of study is one of the independent variables chosen to test the effects in the GVC investment. The reason is simple: how could the public investment be important in the total investment? To analyse that possibility, I combined the values of the private investment and public investment to reach the total investment made in the 23 countries analysed. The other independent variable chosen to participate and to test the hypothesis is related with the venture capital activity that those countries had, in the time series considered. Summing the total value of the investment with the total value of the divestment made in those countries, with the purpose of exploring the VC activity in the 23 countries studied. The variables are coded with the names INV.TOT and V.C. ACT.

Regarding the independent variables, some considerations were made in order to maximize the understanding of the correlations with the independent variables. With this said, I proposed two type of variables: quantitative ones, related with the GVC investments and financial markets related, and qualitative ones, codifying them into Dummy variables to control the effects of the regression and to explore other subjects that could be correlated with the dependent ones.

The quantitative ones, as said, are all related with the GVC investment and the financial markets related in the countries studied. WH.INV⁹ represents the weight of the public-sector investment, through the years studied, in the 23 countries considered. Also, and related with this variable, the variables WH.INV1, WH.INV2 and WH.INV3 were considered, which are related with the public-sector investment with a lag of 1, 2 and 3 years, respectively. The introduction of this lagged variables had purpose to infer about the possibility of public investment impact and how long could this impact need to be effective, according with the dependent variables. About the persistency of the

⁹ Source: Invest Europe

GVC investment, the variable COE.VAR (%) is based on the coefficient of variation in the years studied and in the countries considered and had the purpose to measure the persistency of public investment. The last quantitative variable is the Blue Chip IDX (%) ¹⁰ and this one represents the financial markets-related measure. In this variable, all the Blue Chip Indexes are considered, presenting the performance and yearly returns, in terms of percentage, of those ones in their country's financial markets.

Regarding the qualitative ones, all of them were considered to be important in this regression model. Coded as Dummy variables, these explore other fields of study that could be important to control and to test the effects in the correlation with the dependent variables. Covering fields like religion, legal determinants, politics and credit ratings, these variables could represent innovation and to contribute for future studies developed in the subject. The CAT/PRO variable represents the main religion practiced by the habitants of the country, being codified as 0 if the main religion is the catholic one and 1 if is protestant. The CL/RL variable is the representation of the origins of the civil code ruling in the country, being 0 if its origins are based on Common law and 1 if they are based on Roman law. The LW/RW¹¹ variable is to represent the political ideology of the governments ruling through the years considered, taking the value 0 if the governments' ideology is left wing-based and 1 if it is right wing-based. Last but not the least, the variable IG/NIG¹² represents the governments' sovereign debt credit rating, having 0 if the country had investment grade debt and 1 if it didn't have investment grade debt.

Following the sample description, it is possible to present the results of the regression model for the dependent variables chosen.

After running the model, the results presented in the following tables are related with the variable INV.TOT as the dependent one.

¹⁰ Sources: <http://www.1stock1.com>; <https://www.investing.com/indices>; <https://www.bourse.lu/indexes>

¹¹ Source: <http://www.nsd.uib.no/nsd/english/index.html>

¹² Source: <http://www.tradingeconomics.com/country-list/rating>

Regression Statistics	
Multiple R	0,75
R Square	0,56
Adjusted R Square	0,53
Standard Error	2747070,65
Observations	138

Table 1- INV.TOT MLRM Regression Statistics

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Sign. F</i>
Regression	10	1,22E+15	1,22E+14	1,62E+01	0,00
Residual	127	9,58E+14	7,55E+12		
Total	137	2,18E+15			

Table 2- F-Test Statistics Table

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	7513955,82	920334,80	8,164	0,000	5692779,340	9335132,305	5692779,340	9335132,305
WH. INV.	13,11	4,35	3,017	0,003	4,513	21,716	4,513	21,716
WH. INV1	7,14	4,44	1,610	0,110	-1,638	15,921	-1,638	15,921
WH. INV2	-37,94	17,00	-2,232	0,027	-71,578	-4,306	-71,578	-4,306
WH. INV3	41,82	11,96	3,498	0,001	18,162	65,485	18,162	65,485
COE. VAR. (%)	11692,64	6559,19	1,783	0,077	-1286,809	24672,089	-1286,809	24672,089
CAT/PRO	1923449,65	553331,52	3,476	0,001	828506,431	3018392,878	828506,431	3018392,878
CL/RL	-8384180,85	893681,20	-9,382	0,000	-10152614,672	-6615747,020	-10152614,672	-6615747,020
LW/RW	1113017,24	501357,51	2,220	0,028	120921,195	2105113,278	120921,195	2105113,278
IG/NIG	-1476883,86	680626,07	-2,170	0,032	-2823720,027	-130047,702	-2823720,027	-130047,702
Blue Chip IDX (%)	-32741,83	13225,84	-2,476	0,015	-58913,377	-6570,280	-58913,377	-6570,280

Table 3- T-test Statistics Table

After a careful analysis of the results obtained by the regression and above presented, one can conclude that this model is not the more suitable one to describe the correlations between the dependent and independent variables. Despite the good values obtained in R Square and Adjusted R Square, there are some variables that don't have statistical significance in this model, as presented in Table 3.

In Table 1, the values for R Squared and Adjusted R Squared for the 138 observations are represented. R Squared, which represents the percentage of total variance explained by the model, indicates that this model explains in 56% the total variance of the dependent variable INV.TOT. The Adjusted R Squared, which is the percentage of total variance of INV.TOT explained by the regression model, adjusted to the number of independent variables considered, presents an explanation value of 53% of the model.

Following the description of the regression model, one should analyse the F-test results presented in Table 2 in order to test if the variance of the dependent variable depends or not on the independent variables, where the hypothesis are:

H0- The variance of INV.TOT does not depend on the independent variables;

H1- The variance of INV.TOT depend of the independent variables.

Estimating a confidence level of 95% and accepting a significance level of $\alpha=5\%$, one can proceed to the verification of the hypothesis. As showed in Table 2, the significance level of F is $0,00 < 0,05$, so H0 is rejected and one can conclude that the variance of INV.TOT depends on the independent variables considered in this model.

After verified the F-test, we can proceed with the regression model and verify in the t-test if the independent variables are statistically significant, as showed in Table 3. Formulating the hypothesis to the test the statistical significance of each independent variable, those are:

H0- The independent variable is not statistically significant;

H1- The independent variable is statistically significant.

As proceeded in the t-test, the significance level accepted is $\alpha=5\%$ to verify the hypothesis. As presented in Table 3, the variables WH.INV, WH.INV3, CAT/PRO, CL/RL, LW/RW, IG/NIG and Blue Chip IDX (%) presents values of $0,003; 0,001; 0,001; 0,000; 0,028; 0,032; 0,015 < 0,05$, respectively, so we can reject the null and conclude that the variables are statistically significant. The variable WH.INV1 presents a value of $0,110 > 0,05$, so we do not reject the null and conclude that WH.INV1 is not statistically significant. Regarding the variables WH.INV2 and COE.VAR (%), those are considered differently from the others, due to the

other factors rather than significance ones. The independent variable WH.INV2, according to the significance level ($0,027 < 0,05$) and the hypothesis formulated, is statistically significant, but presents a negative relation in the t Stat value (-2,232). So, in order to continue the model, the variable was rejected. The COE.VAR (%) should be rejected according to the hypothesis ($0,077 > 0,05$), but due to explanatory reasons I accepted the variable and proceeded to run the final regression model for the dependent variable INV.TOT, only rejecting the ones above mentioned.

After running the regression model again, the final results are presented as follows.

<i>Regression Statistics</i>	
Multiple R	0,73
R Square	0,54
Adjusted R Square	0,51
Standard Error	2799605,48
Observations	138

Table 4- INV.TOT Final MLRM Regression Statistics

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Sign. F</i>
Regression	8	1,17E+15	1,46E+14	1,87E+01	0,00
Residual	129	1,01E+15	7,84E+12		
Total	137	2,18E+15			

Table 5- F-test Statistics Table

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	7693312,19	932020,29	8,254	0,000	5849287,216	9537337,162	5849287,216	9537337,162
WH. INV.	12,83	3,90	3,287	0,001	5,108	20,550	5,108	20,550
WH. INV3	21,18	6,45	3,282	0,001	8,412	33,943	8,412	33,943
COE. VAR. (%)	11363,67	6669,45	1,704	0,091	-1832,003	24559,342	-1832,003	24559,342
CAT/PRO	1691341,62	549903,55	3,076	0,003	603343,975	2779339,271	603343,975	2779339,271
CL/RL	-8478671,35	905924,64	-9,359	0,000	-10271065,447	-6686277,254	-10271065,447	-6686277,254
LW/RW	901587,11	501755,28	1,797	0,075	-91147,992	1894322,212	-91147,992	1894322,212
IG/NIG	-1309673,97	685684,31	-1,910	0,058	-2666317,165	46969,227	-2666317,165	46969,227
Blue Chip IDX (%)	-29244,80	13408,92	-2,181	0,031	-55774,677	-2714,914	-55774,677	-2714,914

Table 6- T-test Statistics Table

As presented above, it can be concluded that this regression model is more suitable for the description of the dependent variable, despite the decreases noted in the R Squared and Adjusted R Squared values. As presented in Table 4, the R Square value, that is related with to the percentage of total variance explained by the model is 54% and the Adjusted R Square, which represents the percentage of the total variance explained by the model, according to the independent variables considered, is 51%. One should conclude that the decrease in this values is related with the decrease of the number of variables included in the model.

Analysing the F-test to infer about the dependence or not between INV.TOT and the independent ones, the hypothesis are formulated as follows:

H0- The variance of the dependent does not depend on the independent variables;

H1- The variance of the dependent does depend on the independent variables.

Accepting, as above, a confidence level of 95% and a significance level of $\alpha=5\%$, the results were similar to the first run of the model. The significance level of F is $0,00 < 0,05$, as showed in Table 5, rejecting the null hypothesis and concluding that the variance of INV.TOT does depend on the independent variables considered in the model.

Proceeding to the verification of the statistical significance of the independent variables, Table 6 presents the values that need to be analysed. Accepting the same significance level as above, the hypothesis are formulated as follows:

H0- The independent variable is not statistically significant;

H1- The independent variable is statistically significant.

As showed in Table 6, the p-values of WH.INV, WH.INV3, CAT/PRO, CL/RL and Blue Chip IDX (%) are $0,001; 0,001; 0,003; 0,000; 0,031 < 0,05$, respectively, so the null can be rejected and I can conclude that those variables are statistically significant. The variables COE.VAR (%), LW/RW and IG/NIG present p-values of $0,091; 0,075; 0,058 > 0,05$, respectively, so H0 is not rejected and the conclusion is that those variables are not statistically significant. As happened in the first regression, the independent variables that are not statistically significant

will be included in the final regression model due to their explanatory importance to that one, despite the p-values being above the significance level of $\alpha=5\%$.

Also, to conclude about the statistical significance of the independent variables, one could analyse other factors rather than the p-value. One form of confirmation of that statistical significance is the condition that the value 0 needs to be “outside” the confidence intervals computed in this model. As showed in Table 6, all the independent variables mentioned above to be statistically significance respect this condition. Only the variables COE.VAR (%), LW/RW and IG/NIG don't respect that condition, and despite being considered to the final equation of the model, those ones are not statistically significant. Other form of confirmation to test the statistical significance of the independent variables is the verification of the t stat condition. The t stat represents the value of standard errors that deviates from 0 and in order to verify the statistical significance of the independent variable, the value of the t stat need to be higher than 2 standard errors. As showed in Table 6, the t stat condition is verified in all statistically significant variables already confirmed, not being confirmed in the variables COE.VAR (%), LW/RW and IG/NIG, due to their t stat values being lower than 2 standard errors (1,704, 1,797 and -1,910, respectively).

Regarding the final equation of the regression model, some considerations should be highlighted about the final results. According to the coefficients, the value of the intercept is $\beta_1=7693312,19$, which represents the expected value of the dependent variable INV.TOT if all the independent variables are equal to 0. To conclude, the value of $\beta_2=12,83$ is the expected variation on INV.TOT per unit of change on WH.INV (*ceteris paribus*), $\beta_3=21,18$ is the expected variation on INV.TOT per unit of change on WH.INV3 (*ceteris paribus*), $\beta_4=11363,67$ is the expected variation on INV.TOT per unit of change on COE.VAR (%) (*ceteris paribus*), $\beta_5=1691341,62$ is the expected variation on INV.TOT per unit of change on CAT/PRO (*ceteris paribus*), $\beta_6= -8478671,35$ is the expected variation on INV.TOT per unit of change on CL/RL (*ceteris paribus*), $\beta_7=901587,11$ is the expected variation on INV.TOT per unit of change on LW/RW (*ceteris paribus*), $\beta_8= -1309673,97$ is the expected variation on INV.TOT per unit of change on IG/NIG (*ceteris paribus*) and $\beta_9= -29244,80$ is the expected variation on INV.TOT per unit of

change on Blue Chip IDX (%) (*ceteris paribus*). The regression model final equation (1) is the following:

$$INV.TOT = 7693312,19 + 12,83WH.INV + 21,18WH.INV3 + 11363,67COE.VAR(\%) + 1691341,62CATPRO - 8478671,35CLRL + 901587,11LWRW - 1309673,97IGNIG - 29244,80BlueChipIDX(\%) \quad (1)$$

Regarding the other dependent variable considered in this dissertation, the V.C. ACT, the regression mode was developed as the same it was for the INV.TOT variable. The running of the model for the V.C.ACT variable presented the results in the following tables.

<i>Regression Statistics</i>	
Multiple R	0,75
R Square	0,56
Adjusted R Square	0,53
Standard Error	4894063,09
Observations	138

Table 7- V.C.ACT MLRM Regression Statistics

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Sign. F</i>
Regression	10	3,87E+15	3,87E+14	16,15	0,00
Residual	127	3,04E+15	2,40E+13		
Total	137	6,91E+15			

Table 8- F-test Statistics Table

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	13607850,72	1639628,96	8,299	0,000	10363320,909	16852380,523	10363320,909	16852380,523
WH. INV.	24,52	7,74	3,167	0,002	9,200	39,848	9,200	39,848
WH. INV1	12,97	7,90	1,641	0,103	-2,667	28,615	-2,667	28,615
WH. INV2	-66,44	30,28	-2,194	0,030	-126,367	-6,519	-126,367	-6,519
WH. INV3	71,84	21,30	3,372	0,001	29,684	113,991	29,684	113,991
COE. VAR. (%)	15537,72	11685,57	1,330	0,186	-7585,912	38661,345	-7585,912	38661,345
CAT/PRO	3222254,03	985791,67	3,269	0,001	1271550,211	5172957,855	1271550,211	5172957,855
CL/RL	-15222477,00	1592144,05	-9,561	0,000	-18373042,755	-12071911,245	-18373042,755	-12071911,245
LW/RW	2318054,59	893197,01	2,595	0,011	550578,893	4085530,292	550578,893	4085530,292
IG/NIG	-2484990,40	1212574,17	-2,049	0,042	-4884455,861	-85524,933	-4884455,861	-85524,933
Blue Chip IDX (%)	-58993,99	23562,59	-2,504	0,014	-105620,097	-12367,883	-105620,097	-12367,883

Table 9- T-test Statistics Table

According to the results obtained and above presented, one can confirm that this regression model isn't the more suitable to explain the correlation between the dependent and the independent variables, despite the generality of the results.

As showed in Table 7, the values of R Squared and Adjusted R Squared are good. The value of R Square, which represents the percentage of total variance of the dependent variable explained by the regression model, indicates that this one explains in 56% the total variance of V.C.ACT. The Adjusted R Squared, which represents the percentage of total variance of the dependent variable explained by the model, adjusted to the independent variables considered, present a value of 53% of explanation of the model.

Following the analysis of the regression model, one should consider the values presented in Table 8 in order to infer about the reliability of this one. Proceeding to the F-test, which represents if the variance of the dependent variable depends or not on the independent variables considered. The hypothesis are formulated as follows:

H0- The variance of the dependent does not depend on the independent variables;

H1- The variance of the dependent does depend on the independent variables.

Accepting a confidence level of 95% and a significance level of $\alpha=5\%$, the results indicates that the significance of F is $0,00 < 0,05$, rejecting H0 and concluding

that the variance of the variable V.C.ACT does depend on the independent variables considered in the regression model.

According to Table 9, the values of the t-test are presented to be inferred about the statistical significance of the independent variables studied. As the F-test, the hypothesis should be formulated and are as follows:

H0- The independent variable is not statistically significant;

H1- The independent variable is statistically significant.

As showed in Table 9, one can indicate that the same outcome of the first model for the dependent variable INV.TOT is presented, confirming that the variables WH:INV, WH:INV3, CAT/PRO, CL/RL, LW/RW, IG/NIG and Blue Chip IDX (%) are statistically significant in this regression model. The values 0,002;0,001;0,001;0,000;0,011;0,042; 0,014<0,05, rejecting H0 and concluding that those ones are statistically significant. The variable WH:INV1 presents a p-value of 0,103>0,05, not rejecting H0, according to the hypothesis formulate, and concluding that WH:INV1 is not statistically significant. As happened in the first regression model, the variables highlighted in Table 9, particularly WH:INV2 and COE.VAR (%) are considered in the same terms, rejecting the independent variable WH:INV2 and include COE.VAR (%) in the final run of the regression model.

After running the regression model again, the final results are presented as follows.

<i>Regression Statistics</i>	
Multiple R	0,73
R Square	0,54
Adjusted R Square	0,51
Standard Error	4986399,77
Observations	138

Table 10- V.C.ACT Final MLRM Regression Statistics

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Sign. F</i>
Regression	8	3,70E+15	4,63E+14	1,86E+01	0,00
Residual	129	3,21E+15	2,49E+13		
Total	137	6,91E+15			

Table 11- F-Test Statistics Table

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	13918829,22	1660028,81	8,385	0,000	10634421,555	17203236,881	10634421,555	17203236,881
WH. INV.	24,20	6,95	3,482	0,001	10,449	37,953	10,449	37,953
WH. INV3	35,82	11,49	3,117	0,002	13,081	58,555	13,081	58,555
COE. VAR. (%)	14992,47	11879,01	1,262	0,209	-8510,451	38495,386	-8510,451	38495,386
CAT/PRO	2818461,30	979437,63	2,878	0,005	880619,972	4756302,638	880619,972	4756302,638
CL/RL	-15382385,79	1613549,65	-9,533	0,000	-18574833,280	-12189938,290	-18574833,280	-12189938,290
LW/RW	1947794,88	893680,34	2,180	0,031	179626,431	3715963,330	179626,431	3715963,330
IG/NIG	-2195836,70	1221277,82	-1,798	0,075	-4612164,777	220491,368	-4612164,777	220491,368
Blue Chip IDX (%)	-52816,40	23882,74	-2,211	0,029	-100068,983	-5563,815	-100068,983	-5563,815

Table 12- T-test Statistics Table

As presented above, one can conclude that this regression model is more suitable for the description of the dependent variable. Again, it is noted that some decreases happen in the R Square and Adjusted R Square values, due to the exclusion of the independent variables above mentioned. Despite that decrease, the values are still interesting for the analysis of this regression model, as presented in Table 10. The R Square value is 54%, which represents that the total variance of the dependent variable explained by the model is 54%. The Adjusted R Square, representing the total variance of the dependent variable explained by the model, adjusted to the independent variables, is 51%.

Following the analysis of the results, one should analyse the significance of F, as presented in Table 11, in order to conclude about the variance of dependent variable depend or not on the independent variables. The hypothesis are formulated as follows:

H0- The variance of the dependent does not depend on the independent variables;

H1- The variance of the dependent does depend on the independent variables.

As the first run on this model, the significance level of F is $0,00 > 0,05$ and one can reject the null and conclude that the variance of the V.C.ACT does depend on the independent variables considered in the model, according to the significance level of $\alpha=5\%$.

Regarding the T-test results presented in Table 12, where the p-value is determinant to infer about the statistical significance of the independent variables, the results are similar with the ones in the final model of INV.TOT.

To infer about the statistical significance of the independent variables, the hypothesis are formulated as follows:

H0- The independent variable is not statistically significant;

H1- The independent variable is statistically significant.

Regarding the results presented in Table 12, p-values of WH.INV, WH.INV3, CAT/PRO, CL/RL, LW/RW and Blue Chip IDX (%) are $0,001; 0,002; 0,005; 0,000; 0,031; 0,029 < 0,05$, rejecting the null and concluding about the statistical significance of those ones. The independent variables COE.VAR (%) and IG/NIG present a p-value of 0,209 and 0,075, being higher than the significance level considered, not rejecting the null and concluding that those ones are not statistically significant. As happened in the previous model and the first regression of this one, the independent variables that are not statistically significant will be included in the final regression model due to their explanatory importance.

Also, to conclude about the statistical significance of the independent variables, one could analyse other factors rather than the p-value. One form of confirmation of that statistical significance is the condition that the value 0 needs to be “outside” the confidence intervals computed in this model. As showed in Table 12, all the independent variables mentioned above to be statistically significance respect this condition. Only the variables COE.VAR (%) and Blue Chip IDX (%) do not respect that condition, and despite being considered to the final equation of the model, those ones are not statistically significant. Other form of confirmation to test the statistical significance of the independent variables is the verification of the t stat condition. The t stat represents the value of standard errors that deviates from 0 and in order to verify the statistical significance of the independent variable, the

value of the t stat need to be higher than 2 standard errors. As showed in Table 12, the t stat condition is verified in all statistically significant variables already confirmed, not being confirmed in the variables COE.VAR (%) and Blue Chip IDX (%), due to their t stat values being lower than 2 standard errors (1,262 and -1,798, respectively).

Regarding the final equation, one should argue about some final considerations about the coefficients in order to elaborate the final equation of this regression model. According to the coefficients, the value of the intercept is $\beta_1=13918829,22$ which represents the expected value of the dependent variable V.C.ACT if all the independent variables are equal to 0. To conclude, the value of $\beta_2=24,20$ is the expected variation on V.C.ACT per unit of change on WH.INV (*ceteris paribus*), $\beta_3=35,82$ is the expected variation on V.C.ACT per unit of change on WH.INV3 (*ceteris paribus*), $\beta_4=14992,47$ is the expected variation on V.C.ACT per unit of change on COE.VAR (%) (*ceteris paribus*), $\beta_5=2818461,30$ is the expected variation on V.C.ACT per unit of change on CAT/PRO (*ceteris paribus*), $\beta_6= -15382385,79$ is the expected variation on V.C.ACT per unit of change on CL/RL (*ceteris paribus*), $\beta_7=1947794,88$ is the expected variation on V.C.ACT per unit of change on LW/RW (*ceteris paribus*), $\beta_8= -2195836,70$ is the expected variation on V.C.ACT per unit of change on IG/NIG (*ceteris paribus*) and $\beta_9= -52816,40$ is the expected variation on V.C.ACT per unit of change on Blue Chip IDX (%) (*ceteris paribus*). The regression model final equation (2) is the following:

$$V.C.ACT = 13918829,22 + 24,20WH.INV + 35,82WH.INV3 + 14992,47COE.VAR(\%) + 2818461,30CATPRO - 15382385,79CLRL + 1947794,88LWRW - 2195836,70IGNIG - 52816,40BlueChipIDX(\%) \quad (2)$$

7. Conclusion

This dissertation aimed at studying the impact of the government-sponsoring funds in European Union region, with the purpose of concluding about the efficiency and effectiveness that this type of investor could have in the European VC industry.

Many authors considered that GVC is important in the European context, providing the investments need to fill the gap of private investors and to capitalize their VC industry, in order to improve their economic growth. With that in mind, the empirical research was design with the purpose of studying the relations between the GVC and other variables, such as the total VC investment and VC activity in the countries considered. The results were in line with some of researchers, concluding that the government-sponsoring have an important impact in those determinants in the VC industry.

Many conclusions can be made about the results of regression models presented above, so I decided to highlight a few considerations about those ones and explore the limitations that dissertation faced.

Regarding the results of the regression models, as stated above, they are correlated with some of the authors' findings when researching about this topic. The impact that the GVC have in the industry as a hole is important and could serve as a leverage for investors and governments. The conclusions are simple: GVC has a positive impact in the VC industry investments and activity and, as presented in the models, are deeply correlated. Also, introducing new variables for this model could worked as an improvement to the study of those variables, concluding that qualitative variables of other nature, like legal and political ones, improve the relation between the government-sponsoring and the ones above mentioned. Also, it is important to highlight that the variable connected with the financial markets returns of each country considered provides a deeper understanding on how the GVC and European VC industry could benefit of the financial markets, improving those ones to grow the capacity of divestments through IPO's. Although the favourable results of the regression models, some variables present a higher level of explanation rather than others considered in the final models of the linear regression. With the dependent INV.TOT, it is noted in the exhibits' above that the independent variables that present

the highest level of explanation are CL/RL, WH.INV, WH.INV3, CAT/PRO and Blue Chip IDX (%), respectively, and for the dependent V.C.ACT, the independent that present the highest level of explanation are CL/RL, WH.INV, WH.INV3, CAT/PRO, Blue Chip IDX (%) and LW/RW, respectively. This can indicate that, despite the importance of the other variables considered in the regression models, those ones are the most important to explain the dependent chosen in those models. Taking in account those findings, one can argue about the efficiency of the relation between those relations and the level of GVC in the countries studied. Comparing the values presented in Table 13, some considerations can be made about the relation between the level of GVC present in the countries of study and the variables above mentioned. About the CL/RL, which is related with the origin of the country's legal code, one cannot conclude about the relevance of the relation, due to only two countries present a legal code based on Common Law (United Kingdom and Ireland) and the levels of GVC investment being strong in Ireland but in the United Kingdom, despite being one of the countries with the highest VC investment and VC activity, the GVC investment is 0, in the years of study.

WH.INV3, which is related with the GVC investment with a lag of 3 years, the only conclusion that can be made to explain the relation is related with the time of implementation and persistency of the GVC investment. According to the results, it is noted that the effects of the public-sector investment in their countries only present an explanatory reliability after the third of year of the GVC investment.

Regarding the CAT/PRO variable, one can also conclude that there is no relevance between the relation of the GVC investment and that one. The reason is related with the noted difference between the levels of public investment, despite the main religion practiced in the country. As presented in table 13, one can extrapolate that in protestants countries, a disparity exists between those ones, like the strong levels of GVC investment in Denmark, Finland, Germany, Norway and Sweden and 0-levels of investment in Bulgaria, Greece, Romania, Ukraine and United Kingdom. Also, in the catholic countries, this disparity exists too, presenting strong levels of GVC investment in countries like Austria, France, Ireland, Netherlands and Spain, some investment in Belgium, Hungary, Portugal and Switzerland, and 0-level of GVC investment in Czech Republic, Italy, Luxembourg and Poland.

There is an important relevance of the relation of the GVC investment and the variables Blue Chip IDX (%) and LW/RW. The first, which is related with financial

markets and main stock index of the country, presents an important relevance for the relation between the public-sector investment and the considered variables on the final models. In general, and taking in account the values presented in Table 13, one can argue about the relevance that countries with higher level of performance of their stock markets have the propensity to present strong and efficient levels of GVC investment. This relation could be important in the sense that one route of divestment that could be explored by shareholders is divest by IPO. Regarding the LW/RW variable, this one is also important and relevant in exploring the efficiency of the relation between the GVC investment and the political ideology of the country's government. Again, looking at the values presented in Table 13, one can present that a trend exists between the right-wing ideology and the efficiency of the GVC investment. This trend is noted comparing the levels of investment in the countries study when their government had right-wing or left-wing ideology, concluding that right-wing governments have the tendency to present strong and efficient levels of GVC investment, comparing with left-wing governments.

Also, it is important to refer that some limitations were noted through the process of this dissertation. Despite the important results achieved in the multiple linear regression models, one could argue about constraints noted in the design and development of the database.

First, the lack of more years of study that could improve the database and, as consequence, the results obtained. Given the fact that the time series only cover a 6-year time period, this could mean that the results could be influenced by the scope of the study. Also, in the beginning of the previous chapter it is highlighted that the number of observations decreased from 207 to 138, due to the fact that some variables lacked values in the database, obligating to cut-off the years 2007, 2008 and 2009 in order to achieve a homogenous database. In this topic, another important issue could be the fact that some countries weren't considered in the research, as mentioned above, because of being compound in 2 groups, not providing individual information essential to the variables considered.

The results limitation are correlated with the one above, giving the fact that the results were considerable optimistic for the limitations faced in the design of the regression models. The reasons for accepting some variables that weren't statistically significant in the final model was that these models were created only with academic

purpose to study the relation between the GVC and the dependent variables considered in the model. An important consideration for readers: this model was designed for academic purposes, only as an explanatory one. Is not advisable to consider this model as a forecasting model.

Regarding the contribution for the area and future research, all are connected with model proposed in this master dissertation. The contributions are simple: the improvement of the regressions models already studied by scholars, were I introduce some disruptive variables to extend the knowledge of this topic, and could benefit this field of study, taking in account that some future considerations and improvements should be made in order to continue to extend the knowledge referred in this dissertation. First, the improvement of the time series, with the purpose to increase the scope of study and explore more observations could improve the results, if correlated with the ones presented in here. Second, the improvement of the database, introducing other variables that could be important to study the relation between the government-sponsoring and European industry. Last but not the least, explore the non-linear relation presented in the regression models, in order to extend the knowledge on how the effect of the GVC is only noted with a 2 years' gap, but presents a negative relation comparing with a 3 years' gap. With all this considerations, one can argue that with all those improvements, the regression models will increase the level of explanation of the dependent variables chosen for this empiric study, increasing the values of R-Squared and Adjusted R-Squared, and improving, in general, the models, with the final purpose of adding more contributions to this field of study and to explore new opportunities for scholars, governments and individuals in increasing the importance of GVC in their country's economy.

All in all, governments acting as venture capitalists could improve the economic growth, innovation and competitiveness and the job creation in the European Union.

8. References

- Bertoni, F., & Tykvová, T. (2012). Which form of venture capital is most supportive of innovation? ZEW Discussion Papers, No. 12-018.
- Bertoni, F., Colombo, M. G., & Quas, A. (2015). The patterns of venture capital investment in Europe. *Small business economics*, 45(3), 543-560.
- Black, B. S., & Gilson, R. J. (1998). Venture capital and the structure of capital markets: banks versus stock markets. *Journal of financial economics*, 47(3), 243-277.
- Bottazzi, L., & Da Rin, M. (2002). Venture capital in Europe and the financing of innovative companies. *Economic policy*, 17(34), 229-270.
- Brander, J. A., Du, Q., & Hellmann, T. (2010). Governments as venture capitalists: Striking the right balance. Globalization of Alternative Investments, Working Papers Volume 3: The Global Economic Impact of Private Equity Report 2010, World Economic Forum.
- Brander, J. A., Du, Q., & Hellmann, T. (2014). The effects of government-sponsored venture capital: international evidence. *Review of Finance*, 19(2), 571-618.
- Brander, J. A., Egan, E., & Hellmann, T. F. (2008). *Government sponsored versus private venture capital: Canadian evidence* (No. w14029). National Bureau of Economic Research.
- Brouwer, M., & Hendrix, B. (1998). Two worlds of venture capital: what happened to US and Dutch early stage investment?. *Small Business Economics*, 10(4), 333-348.
- Colombo, M. G., Cumming, D. J., & Vismara, S. (2016). Governmental venture capital for innovative young firms. *The Journal of Technology Transfer*, 41(1), 10-24.
- Cumming, D. J., & MacIntosh, J. G. (2001). Venture capital investment duration in Canada and the United States. *Journal of Multinational Financial Management*, 11(4), 445-463.

- Cumming, D., & Johan, S. (2009). Pre-seed government venture capital funds. *Journal of International Entrepreneurship*, 7(1), 26-56.
- Da Rin, M., Nicodano, G., & Sembenelli, A. (2006). Public policy and the creation of active venture capital markets. *Journal of Public Economics*, 90(8), 1699-1723
- Félix, E. G. S., Pires, C. P., & Gulamhussen, M. A. (2013). The determinants of venture capital in Europe—Evidence across countries. *Journal of Financial Services Research*, 44(3), 259-279.
- Gompers, P. A., & Lerner, J. (1997). Conflict of Interest and Reputation in the Issuance of Public Securities: Evidence from Venture Capital.
- Gompers, P. A., & Lerner, J. (1999). *What drives venture capital fundraising?* (No. w6906). National bureau of economic research.
- Gompers, P., & Lerner, J. (2001). The venture capital revolution. *The Journal of Economic Perspectives*, 15(2), 145-168.
- 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.
- Grilli, L., & Murtinu, S. (2014). Government, venture capital and the growth of European high-tech entrepreneurial firms. *Research Policy*, 43(9), 1523-1543.
- Hege, U., Palomino, F., & Schwienbacher, A. (2009). Venture capital performance: the disparity between Europe and the United States. *Finance*, 30(1), 7-50.
- Jääskeläinen, M., Maula, M., & Murray, G. (2007). Profit distribution and compensation structures in publicly and privately funded hybrid venture capital funds. *Research Policy*, 36(7), 913-929.
- Jeng, L. A., & Wells, P. C. (2000). The determinants of venture capital funding: evidence across countries. *Journal of corporate Finance*, 6(3), 241-289.

- Kaplan, S. N., & Lerner, J. (2010). It ain't broke: The past, present, and future of venture capital. *Journal of Applied Corporate Finance*, 22(2), 36-47.
- Kelly, R. (2011). The performance and prospects of European Venture Capital. *The European Investment Fund, Working Paper*, (2011-09).
- Leleux, B., & Surlemont, B. (2003). Public versus private venture capital: seeding or crowding out? A pan-European analysis. *Journal of Business Venturing*, 18(1), 81-104.
- Lerner, J. (1997). Venture capital and private equity: A course overview.
- Lerner, J. (2002). When bureaucrats meet entrepreneurs: the design of effective public venture capital programmes. *The Economic Journal*, 112(477).
- Luukkonen, T., Deschryvere, M., & Bertoni, F. (2013). The value added by government venture capital funds compared with independent venture capital funds. *Technovation*, 33(4), 154-162.
- Manigart, S., & Beuselinck, C. (2001). Supply of venture capital by European governments. *Ghent University*.
- Marti, J., & Balboa, M. (2001, October). Determinants of private equity fundraising in Western Europe. In *Social Science Research Network Working Paper, presented at the EFMA 2001 Lugano Meetings*.
- McCahery, J. A., & Vermeulen, E. P. (2016). Venture capital 2.0: From venturing to partnering. *Annals of Corporate Governance*, 1(2), 95-173.
- Naqi, S. A., & Hettihewa, S. (2007). Venture capital or private equity? The Asian experience. *Business Horizons*, 50(4), 335-344.
- Porta, R. L., Lopez-de-Silanes, F., Shleifer, A., & Vishny, R. W. (1998). Law and finance. *Journal of political economy*, 106(6), 1113-1155.
- Porta, R., Lopez-de-Silanes, F., Shleifer, A., & Vishny, R. W. (1997). Legal determinants of external finance. *The journal of finance*, 52(3), 1131-1150.

- Strömberg, P. (2009). The economic and social impact of private equity in Europe: Summary of research findings
- Vermeulen, E. P., & Pereira Dias Nunes, D. (2012). The evolution and regulation of venture capital funds.
- Zider, B. (1998). How venture capital works. *Harvard business review*, 76(6),131-139.

9. Attachments

Table 13- Database

Country	Time (t)	DIV. TOT	V.C. ACT.	INV. TOT	WH. INV.	WH. INV1	WH. INV2	WH. INV3	COE. VAR. (%)	CAT/P RO	CL/ RL	LW/ RW	IG/N IG	Blue Chip IDX (%)
Austria	2010	52944	182538	129594	6209	7927	5087	4785	18,23	0	1	1	0	16,39
	2011	287441	411497	124056	8914	6209	7927	5087	14,55	0	1	1	0	-34,78
	2012	180850	335728	154878	7953	8914	6209	7927	14,56	0	1	1	0	26,94
	2013	384779	470870	86091	10567	7953	8914	6209	11,81	0	1	1	0	6,05
	2014	181494	287305	105811	12765	10567	7953	8914	18,86	0	1	1	0	-15,18
	2015	566522	675105	108583	12020	12765	10567	7953	7,75	0	1	1	0	10,97
Belgium	2010	582330	1058061	475731	0	32369	8590	21261	100,28	0	1	0	0	2,67
	2011	619945	1210286	590341	0	0	32369	8590	141,42	0	1	0	0	-19,2
	2012	541681	1063603	521922	0	0	0	32369	0	0	1	0	0	18,83
	2013	752487	1677477	924990	4215	0	0	0	141,42	0	1	0	0	18,01
	2014	916692	1580656	663964	0	4215	0	0	141,42	0	1	0	0	12,36
	2015	1134851	1856578	721727	75	0	4215	0	137,73	0	1	0	0	12,63
Bulgaria	2010	5390	9948	4558	0	0	0	0	0	1	1	1	0	-15,19
	2011	7447	18447	11000	0	0	0	0	0	1	1	1	0	-11,11
	2012	57350	122438	65088	0	0	0	0	0	1	1	1	0	7,25
	2013	5652	7250	1598	0	0	0	0	0	1	1	1	0	42,28
	2014	80967	82407	1440	0	0	0	0	0	1	1	1	0	6,22

	2015	178924	194924	16000	0	0	0	0	0	1	1	1	1	11,72
Czech Republic	2010	35295	71808	36513	0	0	0	0	0	0	1	1	0	9,62
	2011	19070	211623	192553	0	0	0	0	0	0	1	0	0	-25,61
	2012	16009	32616	16607	0	0	0	0	0	0	1	0	0	14,01
	2013	17287	41321	24034	0	0	0	0	0	0	1	0	0	-4,78
	2014	37210	51106	13896	0	0	0	0	0	0	1	0	0	-4,28
	2015	117206	130050	12844	0	0	0	0	0	0	1	0	0	1,02
Denmark	2010	198468	637698	439230	13414	13852	16631	29343	10,36	1	1	1	0	35,91
	2011	531570	952854	421284	14664	13414	13582	16631	4,48	1	1	1	0	-14,78
	2012	826015	1519567	693552	12913	14664	13414	13582	5,73	1	1	1	0	27,24
	2013	463014	1947333	1484319	11155	12913	14664	13414	11,1	1	1	1	0	24,05
	2014	700521	1363757	663236	9126	11155	12913	14664	13,98	1	1	1	0	20,95
	2015	393850	1556042	1162192	11325	9126	1115	12913	9,48	1	1	1	0	36,23
Finland	2010	219775	661462	441687	66841	31280	27564	27095	42,26	1	1	1	0	29,32
	2011	336539	773327	436788	54299	66841	31280	27564	28,98	1	1	1	0	-26,11
	2012	263241	746434	483193	41134	54299	66841	31280	19,4	1	1	1	0	13,8
	2013	710112	1265826	555714	42154	41134	54299	66841	13,04	1	1	1	0	28,29
	2014	323613	890111	566498	48364	42154	41134	54299	7,18	1	1	1	0	5,39
	2015	387423	899605	512182	28946	48364	42154	41134	20,26	1	1	1	0	12,43
France	2010	3805322	9763854	5958532	29849	61978	234490	328633	82,61	0	1	0	0	-3,34

	2011	5617538	14881596	926405 8	13806	29849	61978	23449 0	56,88	0	1	0	0	-16,95
	2012	2772503	8019837	524733 4	42636	13806	29849	61978	41,01	0	1	0	0	15,23
	2013	5622078	11546877	592479 9	39936	42636	13806	29849	40,47	0	1	0	0	17,99
	2014	7433407	16431085	899767 8	67858 8	39936	42636	13806	118,41	0	1	0	0	-0,54
	2015	7209764	16660716	945095 2	27805 4	67858 8	39936	42636	79,33	0	1	0	0	8,53
Germany	2010	2215709	7041387	482567 8	92701	79773	63669	67703	15,09	1	1	1	0	16,06
	2011	4714985	9154409	443942 4	77418	92701	79773	63669	8,07	1	1	1	0	-14,69
	2012	2982838	8298168	531533 0	12339 8	77418	92701	79773	19,54	1	1	1	0	29,06
	2013	4632411	10778875	614646 4	66006	12339 8	77418	92701	27,89	1	1	1	0	25,48
	2014	3752212	9674097	592188 5	64635	66006 8	12339	77418	32,34	1	1	1	0	2,65
	2015	6074723	12070961	599623 8	35858	64635	66006	12339 8	25,05	1	1	1	0	9,56
Greece	2010	1180	16180	15000	0	0	0	0	0	1	1	0	1	-28,6
	2011	664	9955	9291	0	0	0	0	0	1	1	0	1	-54,29
	2012	19000	19000	0	0	0	0	0	0	1	1	0	1	-1,86
	2013	0	1129	1129	0	0	0	0	0	1	1	1	1	16
	2014	32541	32739	198	0	0	0	0	0	1	1	1	1	-44,03

	2015	0	0	0	0	0	0	0	0	0	1	1	0	1	14,97
Hungary	2010	12135	57339	45204	0	0	0	1836	0	0	1	0	0	0	-12,49
	2011	13134	91245	78111	0	0	0	0	0	0	1	1	0	0	-28,94
	2012	12980	117288	104308	41657	0	0	0	141,42	0	1	1	1	1	12,84
	2013	23499	45596	22097	1229	41657	0	0	135,39	0	1	1	1	1	3,95
	2014	13960	114605	100645	47763	1229	41657	0	68,33	0	1	1	1	1	-26,79
	2015	3043	121041	117998	256	47763	1229	41657	135,05	0	1	1	1	1	24,21
Ireland	2010	42882	91237	48355	766	3734	4746	5596	54,8	0	0	0	0	0	-3,02
	2011	10827	75615	64788	576	766	3734	4746	85,46	0	0	0	0	0	0,58
	2012	16296	108877	92581	1273	576	766	3734	33,75	0	0	0	0	0	17,05
	2013	38655	129741	91086	1147	1273	576	766	30,37	0	0	0	0	0	33,64
	2014	27455	165265	137810	1955	1147	1273	576	24,34	0	0	0	0	0	15,09
	2015	5157	166070	160913	882	1955	1147	1273	34,36	0	0	0	0	0	30
Italy	2010	542259	1447481	905222	0	0	0	0	0	0	1	1	0	0	-12,23
	2011	820586	2031500	1210914	0	0	0	0	0	0	1	1	0	0	-25,2
	2012	714670	1906530	1191860	0	0	0	0	0	0	1	1	0	0	7,84
	2013	855257	2013816	1158559	0	0	0	0	0	0	1	1	0	0	16,56
	2014	1311338	2046836	735498	0	0	0	0	0	0	1	0	0	0	0,23
	2015	620903	1780870	1159967	0	0	0	0	0	0	1	0	0	0	12,66

Luxembourg	2010	66884	168012	101128	0	0	0	0	0	0	1	0	0	12,44
	2011	68858	309302	240444	0	0	0	0	0	0	1	0	0	-26,39
	2012	29845	279382	249537	0	0	0	0	0	0	1	0	0	9,95
	2013	101664	172377	70713	0	0	0	0	0	0	1	0	0	16,1
	2014	143442	210055	66613	0	0	0	0	0	0	1	0	0	4,93
	2015	44203	117730	73527	0	0	0	0	0	0	1	0	0	-8,53
Netherlands	2010	609863	1936355	132649 2	13662	16880	11585	25653	15,51	0	1	1	0	5,74
	2011	1239217	3340345	210112 8	22184	13662	16880	11585	19,99	0	1	1	0	-11,87
	2012	873087	2199246	132615 9	23187	22184	13662	16880	21,72	0	1	1	0	9,68
	2013	995070	1996795	100172 5	28038	23187	22184	13662	10,45	0	1	1	0	17,24
	2014	1391063	3295388	190432 5	83441	28038	23187	22184	60,89	0	1	1	0	5,64
	2015	1747784	3455495	170771 1	70179	83441	28038	23187	39,01	0	1	1	0	4,09
Norway	2010	138408	1074692	936284	40944	24333	0	0	77,27	1	1	0	0	15,8
	2011	228044	934198	706154	50276	40944	24333	0	27,86	1	1	0	0	-9,05
	2012	354060	1233990	879930	47213	50276	40944	24333	8,42	1	1	0	0	10,86
	2013	670359	1553149	882790	25315	47213	50276	40944	27,15	1	1	0	0	22,89
	2014	792867	2079413	128654 6	53429	25315	47213	50276	28,72	1	1	0	0	2,81
	2015	503298	1668617	116531 9	27507	53429	25315	47213	36,05	1	1	0	0	4,71

Poland	2010	59194	563626	504432	0	0	0	0	0	0	1	0	0	14,88
	2011	134224	826381	692157	0	0	0	0	0	0	1	0	0	-21,85
	2012	140293	680881	540588	0	0	0	0	0	0	1	0	0	20,45
	2013	247068	598588	351520	0	0	0	0	0	0	1	0	0	-7,05
	2014	539588	876628	337040	0	0	0	0	0	0	1	0	0	-3,54
	2015	592801	1394998	802197	0	0	0	0	0	0	1	0	0	-19,72
Portugal	2010	32282	235745	203463	0	0	0	0	0	0	1	0	0	-10,34
	2011	102360	544630	442270	0	0	0	0	0	0	1	0	1	-27,6
	2012	107675	336642	228967	28486	0	0	0	141,42	0	1	1	1	2,93
	2013	109032	382205	273173	20945	28486	0	0	73,14	0	1	1	1	15,98
	2014	103388	340717	237329	10703	20945	28486	0	36,36	0	1	1	1	-26,83
	2015	344260	494313	150053	17499	10703	20945	28486	25,97	0	1	1	1	10,71
Romania	2010	33536	113874	80338	0	0	0	0	0	1	1	0	1	12,32
	2011	5083	53158	48075	0	0	0	0	0	1	1	0	0	-17,68
	2012	97543	121819	24276	0	0	0	0	0	1	1	0	1	18,74
	2013	35902	84602	48700	0	0	0	0	0	1	1	1	1	26,1
	2014	46341	86937	40596	0	0	0	0	0	1	1	1	0	9,07
	2015	65121	114622	49501	0	0	0	0	0	1	1	1	0	-1,11
Spain	2010	494085	2973813	2479728	25133	18251	19631	12495	14,15	0	1	0	0	-17,43
	2011	875916	2849847	1973931	40600	25133	18251	19631	33,38	0	1	0	0	-13,11
	2012	519121	1994375	1475254	21483	40600	25133	18251	28,5	0	1	1	0	-4,66
	2013	1282477	2036817	754340	28565	21483	40600	25133	26,12	0	1	1	0	21,42

	2014	1259363	2216962	957599	2250	28565	21483	40600	63,78	0	1	1	0	3,66
	2015	2012949	3063524	105057 5	3360	2250	28565	21483	106,67	0	1	1	0	-7,15
Sweden	2010	786814	3921705	313489 1	59777	35191	27634	50439	33,58	1	1	0	0	21,42
	2011	2356579	4523002	216642 3	61648	59777	35191	27634	23,09	1	1	1	0	-14,51
	2012	776231	2798031	202180 0	47401	61648	59777	35191	11,23	1	1	1	0	11,83
	2013	2070848	3627792	155694 4	93732	47401	61648	59777	28,67	1	1	1	0	20,66
	2014	1399476	3015748	161627 2	88559	93732	47401	61648	27,07	1	1	1	0	9,87
	2015	1872264	3593806	172154 2	54584	88559	93732	47401	21,99	1	1	1	0	-1,21
Switzerland	2010	178591	1733770	155517 9	0	0	0	0	0	0	1	1	0	-1,68
	2011	264794	905285	640491	0	0	0	0	0	0	1	1	0	-7,77
	2012	374272	1036031	661759	10649	0	0	0	141,42	0	1	1	0	14,93
	2013	351268	960673	609405	7296	10649	0	0	74,32	0	1	1	0	20,24
	2014	275806	1512971	123716 5	2833	7296	10649	0	46,23	0	1	1	0	9,51
	2015	404636	1044462	639826	4759	2833	7296	10649	36,83	0	1	1	0	-1,84
Ukraine	2010	5556	99842	94286	0	0	0	0	0	1	1	1	1	57,48
	2011	595	60638	60043	0	0	0	0	0	1	1	0	1	-42,48
	2012	1161	68123	66962	0	0	0	0	0	1	1	0	1	-35,73

	2013	55678	76227	20549	0	0	0	0	0	1	1	0	1	-8,59
	2014	34686	38800	4114	0	0	0	0	0	1	1	0	1	11,44
	2015	25225	46418	21193	0	0	0	0	0	1	1	1	1	-30,82
United Kingdom	2010	9878954	29413302	19534348	0	259	2208	191	119,84	1	0	0	0	9
	2011	13251148	34336273	21085125	0	0	259	2208	141,42	1	0	1	0	-5,55
	2012	10328350	26564655	16236305	0	0	0	259	0	1	0	1	0	5,84
	2013	15563118	31648777	16085659	0	0	0	0	0	1	0	1	0	14,43
	2014	19482230	35652586	16170356	0	0	0	0	0	1	0	1	0	-2,71
	2015	17736741	38258023	20521282	0	0	0	0	0	1	0	1	0	-4,93