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# Does Private Equity sponsorship affect post-IPO performance?

## Empirical evidence from European stock markets

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# Introduction

This research is aimed at investigating whether Private Equity sponsorship has an effect on the aftermarket performance of European initial public offerings. The Private Equity market has experienced incredible growth in the past decades, reaching a record $4,11 trillion of assets under management (as of June 2019)[1], gaining the attention of the press and scholars over years. However, the private equity industry is known to have a bad reputation. Associated historically with aggressive strategies seeking short-term gains, one may ask whether private equity deals benefit society. While the answer to this question falls beyond the scope of this study, it is interesting to bear in mind this point in the analysis of the importance of private equity for growth.

Over the last decades, scholars have sought to uncover the effect on the performance of private equity sponsorship. Historically researchers focused mainly on US and UK markets, which are the most active private equity markets. However, the last decades have witnessed increasing attention to European countries, alongside an increase in private equity transactions. Several studies are strictly relevant to this dissertation. Literature in modern finance analysing performance phenomena of initial public offerings (e.g. Logue, 1973; Ibbotson, 1975; Ritter, 1991) provides a general framework for our analysis: underpricing and long-term underperformance phenomena are well documented in finance.

Seminal contributions on PE-backed IPOs have been made by Muscarella and Vetsuypens (1990), documenting the improvement in the operating performance for companies brought public after a period of private ownership under a private equity sponsor. Scholars have argued that the involvement of a private equity sponsor contributes to having closer monitoring and lower information asymmetries (e.g. Kaplan and Stein, 1993; Jensen, 1989). There have been numerous studies to investigate the aftermarket performance of PE-backed IPOs, with a large consensus on the positive impact of both buyout sponsorship (Levis, 2011; Cao and Lerner, 2009; Von Drathen and Faleiro, 2007) and venture capital sponsorship (Von Drathen, 2007; Gompers and Lerner, 1999; Brav and Gompers, 1997). While a slew of studies has been conducted for US and UK, most of the evidence for Europe adopts a national perspective rather than a pan-

[1] 2020 Preqin Global Private Equity & Venture Capital Report.

European approach. Moreover, few studies take a comprehensive look at the phenomenon, differentiating between the different types of private equity.

The purpose of this study is to investigate the performance of Private Equity-backed IPOs in Europe. To address this problem, we study the performance of 1026 European PE-backed (both buyout and venture capital) and non-PE-backed IPOs between 1st January 2005 and 31st December 2016. With this sample, we run three studies in order to shed light on the topic: (i) a short-run analysis on underpricing; (ii) a long-run analysis through an event study approach; and (iii) a cross-sectional regression to identify key variables impacting performance. Building upon an established stream of literature, the main contribution of this paper is twofold. First, we adopt a European perspective, which is uncommon for these studies, that commonly adopt a national perspective. We found theoretical support to this choice in previous studies, such as Povaly (2006), that supports the idea of a pan-European perspective for the buyout market, and Bergström, Nilsson and Wahlberg (2006). Second, very few studies take into account the post-crisis period. Therefore, we decided to cover a wider time period, in order to include data of the years before the global financial crisis.

The results of the study provide empirical evidence that:

- PE-backed IPOs (both buyout- and VC-backed) experience a lower underpricing than their non-sponsored counterparts, confirming the role of PE firms in signalling or certificating the quality of an IPO;
- While buyout-backed IPOs outperform the other groups of IPOs, but results are not significant, VC-backed IPOs experience severe long-run underperformance;
- Much of the underperformance of VC-backed IPOs seems to be driven by smaller deals;
- There is evidence that buyout sponsorship is positively associated with the three-year aftermarket performance and that leverage is a value creation tool in the buyout context.

The dissertation is organized as follows. Chapter I provides a theoretical and practical overview of the private equity industry and activity. It also reviews the potential exit routes, introducing the topic of initial public offerings. Chapter II reviews extensively academic literature on PE-backed IPOs, framing the topic within a broader theoretical framework (agency theory) and a more specific stream of literature (performance

phenomena of typical IPOs). Then, we propose a classification of variables impacting the performance of PE-backed IPOs. In the last section of the chapter, research questions are stated together with the main assumptions. Chapter III describes the sample, the methodology and presents the main results. Finally, we report the conclusions linking the three separate parts of the empirical analysis. Suggestions for future research are then provided.

# Chapter I

# An overview on Private Equity

This chapter provides a background on Private Equity funds in order to understand the outline of the analysis. Relying both on academic literature and practical evidence, the main features of a PE fund are discussed. Particular emphasis is placed on the definition of the perimeter of the different types of investments that fall within the scope of Private Equity. Then, we will narrow down the analysis to a subset of Private Equity investments: Leveraged Buyouts (LBOs). Indeed, LBOs represent the most active and valuable subset of investment activities within the PE scope and present some peculiarities relative to the other investments. Differences between Leveraged Buyouts and Venture Capital investments – the second largest subset of Private Equity - are highlighted. A deep analysis on LBOs is conducted highlighting how they create value during the holding period and how value is realized through the exit. The overall purpose is to give a clear understanding of the dynamics in progress in the Private Equity universe.

## 1.1 Private Equity background

There is no consensus among researchers on the definition of Private Equity. It can be defined as an alternative investment class and a medium/long-term investment, in which mainly accredited investors invest directly in private companies or engage buyout of publicly listed companies. It is also an alternative form of financing for private companies that do not intend to go public. The Private Equity market is an important source of funds for private firms, both small startups and big companies, and for publicly traded firms looking for buyout financing (Fenn, Liang and Prowse, 1997).

Even though Private Equity experienced incredible growth in the last decades, it traces back its origin to the beginning of the XX century. It is considered that the first Leveraged buyout was made by J.P. Morgan & Company in 1901, with the acquisition of a steel-producing company, Carnegie Steel Company. Since then thousands of Private Equity

deals have occurred, but only in the 80s the phenomenon became established, with its growth driven by the broad diffusion of junk bonds.[2]

Two major waves can be identified from the 80s (Kaplan and Stromberg, 2009). The first wave took place between 1982 and 1989, mainly across the USA, Canada and UK. These countries accounted for almost the entire value of PE transactions worldwide. Private Equity concerned companies in mature industries with a large dominance of big deals. Going-private deals were common, but experienced a drop at the end of the 80s consequently to the fall of the junk bond market. It was at that time that middle-market buyouts grew significantly and that transactions started involving several new sectors, characterized by a greater need for innovation. Private Equity industry witnessed a steady growth in the following years, with the exception of the dotcom bubble of 2000/01, and PE activities spread across European countries. The second wave took place between 2003 and 2007 and emphasized some previous trends, such as large deals and going-private transactions. A record amount was committed to private equity investments in the years 2006/2007. However, the global financial crisis that hit the economy marked a slowdown in this massive growth. Today, we are experiencing a new rise in PE investments, which warrants our full interest in this field.

### 1.1.1 A simple classification of Private Equity investments

Private Equity appears as a broad category, including different forms of investment. But here too, there is no consensus among academics on a common classification of investment activities. According to Stowell (2013), it includes Leveraged buyouts (LBOs), Venture capital (VC), Growth capital and Mezzanine capital, while according to Cumming (2012) major types of Private Equity activities are Leveraged buyouts (LBOs), Venture capital, Mezzanine Capital and Distressed (turnaround) investments and, finally, for Metrick (2006) it includes Buyout, Venture Capital, mezzanine and distress investments. Different classifications arise due to the circumstance that more and more

[2] Junk bonds are bonds that are rated below investment grade by the big three rating agencies. Junk bonds carry a higher risk of default than other bonds, but they pay higher returns. The main issuers of junk bonds are capital-intensive companies with high debt or young companies (source: Corporate Finance Institute).

PE funds invest in activities that previously did not fall within their traditional investment scope, making it difficult to define the boundaries of PE funds.

There is no doubt that the most important categories are LBOs and VC and, in particular, LBOs account for the largest fraction of PE transactions. For the scope of the analysis, adopting a comprehensive approach of past literature, these subcategories will be analysed and classified as follows (Figure 1).

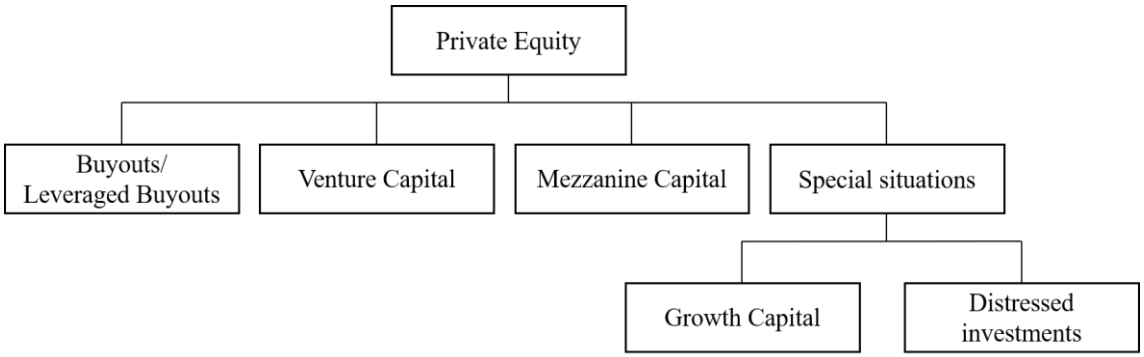


*Figure 1. Classification of different Private Equity investments.*

Leveraged buyouts represent the most important and largest subset of PE activities and refer to the purchase of a majority stake in a company using both equity and a large amount of debt. A broader analysis is conducted in the next paragraph.

Venture Capital can be defined as a subset of private equity and refers to equity investments made for the launch, early development, or expansion of a business, with a strong focus on entrepreneurial undertakings (EVCA, 2007). VC capital investments are illiquid and risky, but potentially lead to high returns. VC industry has always had an important role in providing funds to typically small and innovative enterprises, enabling economic growth and technological developments. So, venture capitalists play a fundamental role in the entrepreneurial process (Tyebjee and Bruno, 1984). Not only do they provide funds to companies that are not publicly traded, but also they are typically directly involved in the strategic decisions of the ventures (Gupta and Sapienza, 1992).

Mezzanine capital, growth capital and distressed investments are less important in terms of value and are typically considered as independent investment activities. Nevertheless, for the sake of completeness, a brief definition of the three is provided. Mezzanine capital is the investment in subordinated debt or preferred stock of a company without vote rights.

Growth capital refers to the purchase of minority stakes into mature companies that seek capital to pursue growth. Finally, distressed investments are investments in equity or debt securities of companies in financial distress and have become more and more common among PE firms.

It is worth pointing out the main differences between PE activity, which is typically identified with LBO investments, and Venture Capital investing, since they represent the two most relevant subsets. Their definitions have some similarities and both of them aim at achieving high returns by investing in private companies. However, we can identify these as the main differences:

- LBOs typically regard mature companies in traditional sectors with operational inefficiencies, while VC regards in general early-stage and high growth companies seeking funds and mentoring;
- LBOs involve the acquisition of a majority stake of the portfolio company, while VC funds acquire a minority stake in fast-growing young companies.
- LBOs are realized with large use of leverage (that will be discussed in §1.3.2), while VC funds typically use equity to realize their investments.

Now, the main features of the different PE investment subsets have been clarified. However, for the scope of our analysis, in this chapter we will narrow down our attention to LBOs, using the terms Private Equity and Leveraged Buyouts interchangeably, as well as terms buyout funds and Private Equity funds.

## 1.2 Private Equity business model

Before the 70s, the majority of the investments in private companies were undertaken directly by wealthy families, big corporations and financial institutions. However, in the following decades, investments in private companies became established through specialised intermediaries, organised as limited partnerships (Prowse, 1998). This form has emerged as a solution to the problem of information asymmetry that characterizes private equity investments and, more in general, investments in private companies. To

date, the form of limited partnership is the most commonly adopted by Private Equity companies.

Private Equity firms raise funds from institutional investors and wealthy individuals, through a fundraising period that lasts between six months and one year, and establish one or more investment funds. Funds are closed-end vehicles and have a predetermined life of ten years, generally with an option to extend by 2 to 5 additional years.

Two main categories of players are involved in this structure: General Partners (GPs) and Limited Partners (LPs).

- General Partners are the members of the Private Equity firm responsible for the investments made by the fund in the interest of investors. Their room for decision is limited according to the contractual agreements made with the investors. Furthermore, in order to align the interests of the GPs with those of the investors and to avoid opportunistic behaviours (moral hazard), they are required to invest at least 1% of the fund's capital. The choice of the right fund manager is crucial. In the past years, it was noted that GPs who achieved top quartile performance used to repeat their performance subsequently. However, this tendency, known as persistency of outperformance, has decreased especially since 2007 (McKinsey, 2019).
- Limited Partners consist of institutional investors, such as banks, pension funds and insurance companies, wealthy individuals and other investors. They are the main investors providing capital commitments to the fund over time and assume liability for their individual investment. In addition, they sign agreements that lock up their money throughout the whole life of the fund. Hence, the investment horizon of the LPs has to be in line with the life of the fund. Finally, it is remarkable that money – the so-called *committed capital* - is not provided at the beginning by LPs. Instead, committed capital is drawn down over time. As GPs identify investment opportunities, they perform *capital calls* and LPs are thus required to pay the proportion of the *committed capital*. The year in which the fund makes the first capital call is referred to as *vintage year*. Refusing to meet *capital calls* implies reputational as well as economic consequences. This may be a source of liquidity concerns for investors, in case short notice is given, or liquidity is tight.

Portfolio companies are the companies in which the PE fund invests and are known as *target companies*. Typically, each fund invests in about 10-15 companies over its entire life span, depending on its size. However, investments are usually made in the first half of the fund's life, while the second part is focused on exits, which will determine the return achieved for the LPs.

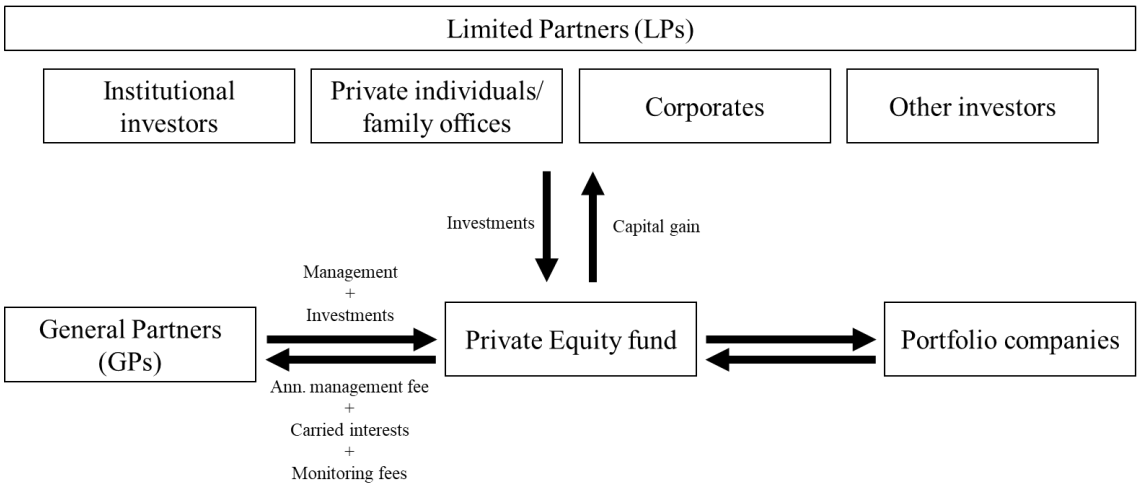


*Figure 2. Structure of Private Equity funds.*

There are three ways PE firms make money: through fees, carried interest and monitoring fees. This compensation structure, which has been under scrutiny of practitioners and academics for years, consists of both a fixed and a variable part. Management fees are a fixed annual fee received from LPs and are typically 2% of the assets under management (AUM). With regard to carried interests, they represent the variable part of the compensation and are computed as a proportion of the profits generated. Most of the PE funds set the level of carried interests at 20% (Gompers and Lerner, 1999; Kaplan and Stromberg, 2009; Metrick and Yasuda, 2010). This variable part of the compensation represents a strong incentive for GPs to generate profits for LPs, which in turn will be rewarded with the remaining part of profits. Finally, a third and less common component of the compensation is represented by the monitoring fees, which are paid by the portfolio companies to the PE firm.

## 1.3 A focus on Leveraged Buyouts

Leveraged Buyouts represents the most important investment subset within PE investments, to such an extent that the whole PE universe is usually identified with LBO activity. When talking about LBOs, we refer to a transaction in which "a company is acquired by a specialized investment firm using a relatively small portion of equity and a relatively large portion of outside debt financing" (Kaplan and Strömberg, 2009). The so-called target company can be either private or public - the latter is referred to as public-to-private deals, that reached in 2019 the highest level since 2007 (Bain & Company, 2020).

An LBO is financed by a large portion of debt – typically 60% to 70% of debt-to-equity ratio – while the remaining part of the acquisition cost is provided by the financial sponsor in equity. The use of debt increases the return on equity for the PE firm, even though this return must be risk-adjusted to take into account the leverage. The debt will be repaid using the operating cash flow generated by the target company. Given the only goal of generating returns for investors, PE firms put in place different strategies to create value, which will be later discussed, together with the drivers of performance.

Choosing the right target is crucial and affects the performance of the fund. The targets of LBO transactions are typically mature companies with strong and steady - actual or potential - free cash flows. Often PE funds target large conglomerate or companies that show inefficiencies, therefore having room for cost-cutting and sales of assets. Moreover, the price must be low in order to generate sufficient returns. Regarding the balance sheet, an ideal target has low debt. PE firms usually do not invest in high-tech companies or in fast-changing sectors, giving preference to companies with low capital expenditures[3]. With regard to the market position of the target company, it should be a market leader in its sector or operate in a niche market. The asset structure is of great importance, especially with reference to the guarantees necessary to obtain loans. Finally, non-core assets can be sold, in order to realize additional cash flows thorough *asset stripping*[4] (Baldi, 2016).

[3] As a reminder, capital expenditures (Capex) reduce the cash flow available to pay off the debt and to pay out dividends.

[4] Asset stripping refers to the process of purchasing an undervalued company and then separately selling its assets (source: Corporate Finance Institute).

### 1.3.1 The investment process

The investment process of a buyout consists of multiple stages. An overview of the main steps of the investment process is provided by Loos (2007), which classifies the process into four phases: (1) Target selection, (2) Due Diligence and deal structuring, (3) Post-acquisition management and (4) Exit (Figure 3).

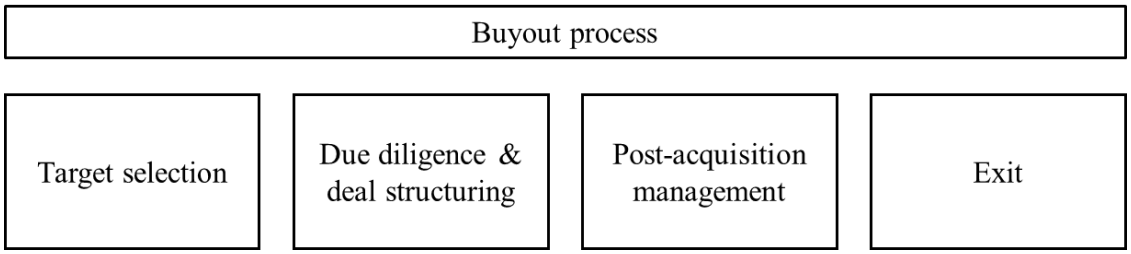


*Figure 3. The buyout process (Loos, 2007).*

The process starts with the target selection, in which the PE firm scans the market in order to find potential targets to acquire. As highlighted in the previous paragraph, targets of LBOs share some common characteristics, such as high and steady cash flows and mature business. Moreover, they must also have the potential to provide high returns for funds 'investors. These first steps are generally confidential, and negotiations are realized privately. Also, in the target selection, PE funds can distinguish themselves by implementing specific investment strategies (e.g. geography, small-size vs. mid-size, buy-and-build strategy, etc.).

Then, once the target is identified, the due diligence and the deal structuring take place. During this phase, a business plan is developed and presented by the management of the target company, while the PE firm negotiates and prepares financial details of the transaction. The Due Diligence process is highly structured and often involves external participants. Typically, three parallel due diligence are conducted during a target assessment. The *strategic due diligence* allows assessing the growth and profitability potential of the target, together with a better understanding of the business model and the industry. It is often conducted by strategic consulting firms. The *financial due diligence* is mainly focused on the financial evaluation of the target through different valuation

model and a financial statement analysis, and is typically conducted by accounting firms. The *legal due diligence* is conducted by law firms and is focused on legal problems related to the agreement and the assessment of regulatory issues regarding the target company's business. Finally, other due diligence may be conducted, such as *technological due diligence*, *environmental due diligence* or *human resources due diligence*. Moreover, Loos (2007) highlights that acquisitions nowadays take place in a similar way to "limited auctions", as an increasing number of companies are competing in the selection of the most profitable targets.

Next, the post-acquisition management phase takes place. It is crucial since most of the value is created through the different actions taken by the PE firm after the takeover. The different strategies that can be adopted and the value creation drivers are discussed in paragraphs §1.3.2 and §1.3.3.

The last phase is the exit. Returns for investors are realized during this phase, which is when the PE firm exits the investments made. Indeed, any LBO deal is structured to have a limited time horizon, typically from 3 to 5 years. The different exit routes (trade sale, secondary buyout and IPO) are deeply discussed in paragraph §1.4. However, another potential - and less likely – scenario is bankruptcy, especially for LBOs involving a large amount of debt.

### 1.3.2 Value enhancing strategies

After the target company is acquired, the PE firm identifies the improvement targets and the program to follow during the ownership period. Having a clear roadmap is crucial. Kaplan and Strömberg (2009) identify three different categories of changes done by PE funds, which are: financial engineering, governance intervention and operational improvements. These are not mutually exclusive, and the overall effect can be amplified with a mixed approach. In order to deliver the expected return to the investors, fund managers plan meticulously the actions to take during the holding period.

*A. Financial engineering*

Financial engineering is referred to both the financial structure and the financial accounting of the company (Baker, Filbeck and Kiymaz, 2015). Specifically, when the LBO is completed, the old capital structure gets replaced with the new one. The cash flow generated by the company is then used to pay down the debt and interests. Repeated interactions with financial institutions reduce information asymmetries and allow to have favourable loan terms[5] (Ivashina and Kovner, 2011), which is crucial when structuring deals that require a large amount of debt.

Financial leverage has a positive effect on value creation via two different effects. First, interest expenses are tax-deductible, therefore increasing cashflow and creating greater value. The gain is referred to as *interest tax shield*, which is the reduction in the tax liability due to the interest expenses (Berk and DeMarzo, 2017). It can be computed as[6]:

$$V^L = V^U + PV(Interest\ tax\ shield)$$

where $V^L$ is the Value Levered and $V^U$ is the Value Unlevered. Given that, the Interest tax shield can be determined as:

$$Interest\ tax\ shield_t = tax\ rate * interest\ expenses_t$$

Secondly, the equity value of the target company increases over time through the repayment of the debt, similarly to what happens with mortgage repayments. This effect is defined by Baker, Filbeck and Kiymaz (2015) *mortgage effect*.

Finally, academics (e.g. Jensen, 1989) point out the important effect of leverage in disciplining managerial behaviours. This point will be further developed in the next paragraph.

*B. Governance intervention*

Governance interventions mainly consist of restructuring the governance of the target company. Jensen (1986 and 1989) argues that LBOs create value because the governance

[5] Favourable terms refer to lower interest rates on debt and few covenants, which could limit the scope for action.

[6] This version does not take into account the cost of financial distress due to leverage: trade-off theory of Myers (1977).

structure adopted as a result of this type of operations provides incentives for managers to operate efficiently, which is not the case for publicly traded companies. Based on this, Liebeskind, Wiersema and Hansen (1992) propose the *incentive-intensity hypothesis*, according to which the changes in governance increase managerial incentives. Thus, it can be argued that governance restructuring has the main goal to reduce agency costs. PE firms typically target companies with a bad governance system, and intervene by replacing the company's management with a new one. Interests are then aligned through the transfer of ownership stakes to the new management of the target company. In addition, fund managers have positions on the board in order to closely monitor the activities.

Corporate restructuring in LBOs tends to increase the proportion of equity stakes hold by managers and to increase the concentration of equity, that respectively lead to align interests between managers and shareholders and to increase the incentives to monitor managerial behaviours. Finally, the level of debt characterizing LBOs reduces the potential for managers to waste cash on initiatives that do not increase the value of the company, thereby encouraging them to operate efficiently (Jensen, 1989; Liebeskind, Wiersema and Hansen, 1992). As a result, the company's performance following a buyout is proven to be enhanced through the aforementioned actions, using the agency theory as a theoretical foundation (Bruton, Keels and Scifres, 2002).

### *C. Operational improvements*

PE firms develop knowledge of the sector in order to make the operations of target companies more efficient. Operational improvements can be achieved through several actions, such as a reduction of corporate overheads through layoffs and divestitures. The purpose is either to increase revenue and reduce costs, in order to increase the cash flow from operating activities. Muscarella and Vetsuypens (1990) argued that the increased profitability observed in their sample of 72 reverse LBOs resulted from the ability to reduce costs rather than to increase revenue or asset turnover. Holthausen and Larcker (1996) highlighted the increase in operating performance resulting from the aforementioned operational improvements and a slight decrease in performance after the exit. Finally, it is worth mentioning among the operational corrections the asset sales.

This is realized through the sale of unprofitable or cash consuming divisions or product lines.

### 1.3.3 Value generation

The purpose of PE firms is to generate the highest possible returns for investors, by selling portfolio companies at a higher value than the cost of the investment. Therefore, fund managers seek to realize a high internal rate of return (IRR), which compensates investors for the low liquidity and riskiness of their investments. With this goal in mind, fund managers make assumptions on some indicators: free cash flow (FCF) generation, EBITDA and earnings growth, and multiple expansion (Baker, Filbeck and Kiymaz, 2015).

Firstly, free cash flow allows to repay down the debt and to make new investments. However, the higher the value of free cash flow the higher the value that can be attributed to the company.

Secondly, fund managers focus on boosting the EBITDA and/or the earnings. Typically, the price of the investment and of the exit are expressed as multiples of one of these measures. Thus, assuming that the EBITDA multiple remains fixed over the investment period, an increased EBITDA results in an increase in the value of the company.

Thirdly, fund managers seek to increase exit multiples in various ways, such as improving the competitive positioning of the company and the growth prospects. Market timing is also crucial, since investments should be realized when market multiples are low and exits when market multiples are high.

## 1.4 Typical Exit routes for PE funds

Successful exits require skillful execution. The exit phase is crucial and represents the way in which the PE fund cashes out investments - typically investments are realized in the first five years of the fund's operations. The purpose of the fund is to realize the highest

possible return on investment, choosing the right timing and the most profitable way of disinvestment. An improperly planned or poorly executed exit can impact negatively on the return, despite having correctly performed all the actions necessary for the value creation (McKinsey, 2018). As regards the holding periods, the median holding has decreased steadily over the last 5 years and settled at 4.3 years in 2019 (Bain & Company, 2020).

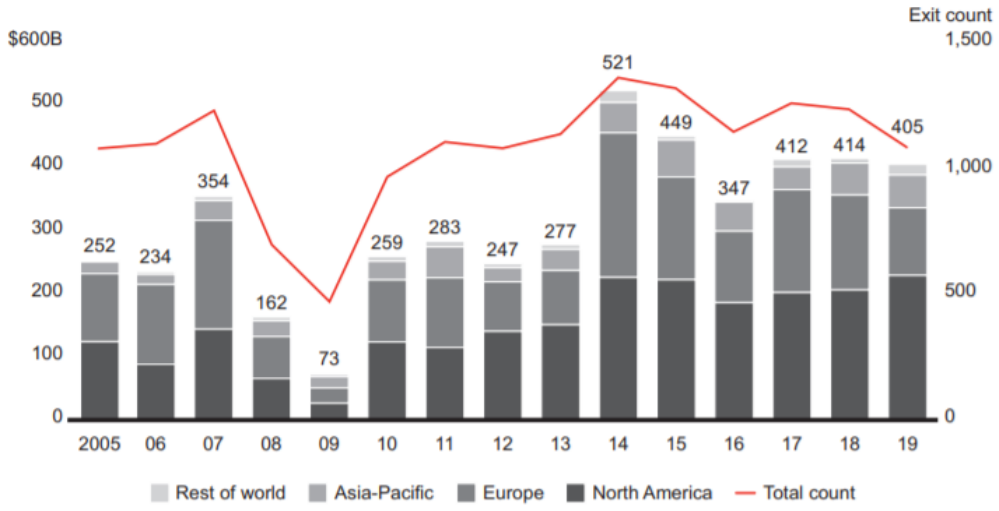


*Figure 4. Global buyout-backed exit value, by region. (Bain & Company, 2020)*

Turning to exit values, the total value of buyout-backed exits in 2019 settled at $405 billion, with a modest decrease relative to the previous year (Figure 4). Bain & Company (2020) reports that 1078 PE-backed exits occurred in 2019, and Figure 4 shows the breakdown by region with regard to exit activity. North America and Europe confirmed themselves as the most active regions, although the latter reported a decrease in exit activity relative to the previous year in favour of America.

Figure 5 also shows the evolution across the different exit channels of PE funds between 2005 and 2019. The most common exit strategy is the strategic sale (trade sale), followed by sponsor-to-sponsor exits (secondary buyout) and IPOs, which are the least common exit route. In general, the number of deals and the exit strategy chosen are related to the general economic conditions. Between 2008 and 2009, the exit value and the number of deals fell sharply. More specifically, the number of IPOs declined significantly as a result of a weak stock market.

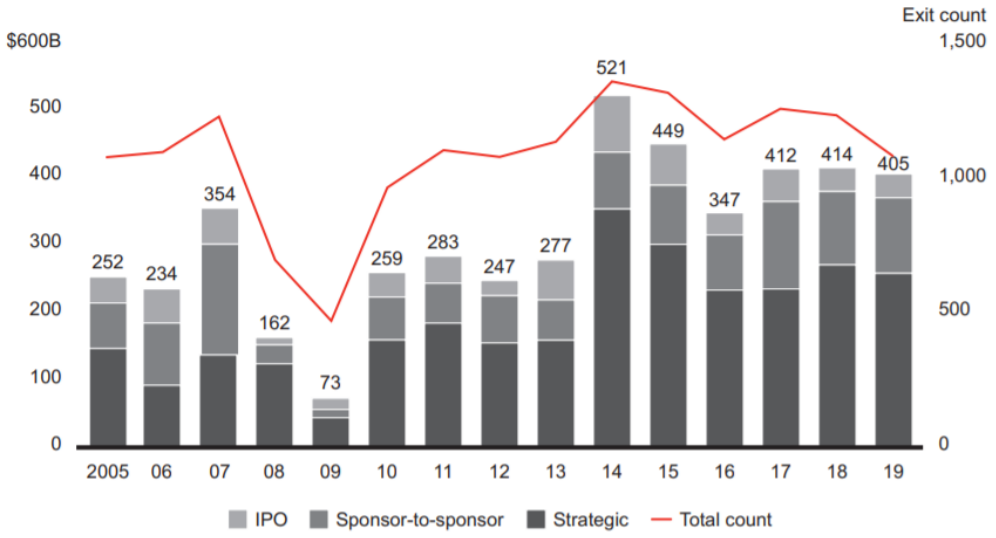


*Figure 5. Global buyout-backed exit value, by channel. (Bain & Company, 2020)*

Generally, three different exit strategies for PE funds can be identified: trade sale, secondary buyout and Initial Public Offering (IPO) (Stowell, 2013; Povaly, 2006). Empirical evidence shows that sales to a strategic counterparty or another fund are the most frequently adopted options. However, the IPO is certainly the one that potentially provides the best outcome, with a series of additional costs and risks. Various factors such as economic and financial market conditions, the stability and reputation of the fund and the debt commitments influence the choice of the exit strategy.

Within the scope of the range of exit strategies, it is worth mentioning the *dividend recapitalization* – also referred to as *dividend recap* or *leveraged dividend recapitalization* (Baker, Filbeck and Kiymaz, 2015). It is a partial exit method that allows the PE firm to provide an immediate return to investors. In a *dividend recapitalization*, a portfolio company issues new debt in order to pay a special dividend to shareholders. While this reduces the risk for PE firms and investors, it also implies an increase in leverage for the portfolio company, without the debt being used to finance the company's growth. Thus, a *dividend recapitalization* directly impacts the portfolio company's capital structure.

The three main exit routes are discussed in detail below.

### 1.4.1 Trade Sale

A first exit strategy for PE funds is the trade sale, which represents the most common exit route. It involves selling the portfolio company to a strategic counterparty. The buyer expects to receive an advantage from the acquisition in terms of competitive advantage over competitors and market share growth. A trade sale is the preferred option for PE funds for at least two reasons (Baker, Filbeck and Kiymaz, 2015). First, the PE fund is often able to charge a higher price, as the counterparty may have a strategic interest in the acquisition and therefore be willing to pay a higher price. Second, negotiations are faster, cheaper and subject to fewer regulatory obligations compared to transactions involving public markets, such as an Initial Public Offering.

Although it is an attractive alternative for the fund, these transactions often meet resistance from management who are concerned about being replaced at the end of the takeover.

### 1.4.2 Secondary Buyout

The second way to exit an investment is the secondary buyout, also known as sponsor-to-sponsor buyout. In this case, the portfolio company is sold to another financial sponsor. Typically, these are cases in which the company's management and the fund believe that a larger financial sponsor is needed to continue the development. In other cases, a secondary buyout may occur when the PE fund has already achieved a high rate of return and needs to exit the investment. Alternatively, in some cases, the fund may not have the means to continue financing the portfolio company, regardless of the stage of development achieved.

The secondary buyout is a useful option in some circumstances as it allows the fund to exit the investment often faster than the other two alternatives. In addition, unlike other exit routes, the secondary buyout enables to keep the partial ownership of the target company, thus creating a partial exit.

### 1.4.3 Initial Public Offering

Initial Public Offering (IPO) is the most complex way to exit an investment for PE funds and is realized through the listing of the portfolio company and the sale of the shares owned. The complexity of this solution stems from the regulatory requirements and the high fixed costs associated with a listing. Moreover, it is not a suitable alternative if the fund wants to exit the investment completely and quickly, as it would be a sign of lack of confidence for investors. In addition, the possibility of disinvestment at the IPO date is often partially or completely limited by lock-up agreements. On the other hand, an IPO provides the opportunity to achieve the highest returns when market conditions are favourable. Moreover, this exit strategy is particularly suitable for companies with high profitability.

Schmidt, Steffen and Szabo (2010) analysed and compared the different types of exit in order to understand the determinants of the choice of the exit strategy and the impact on the IRR. They found a positive correlation between the length of the holding period and the profitability of an exit via IPO relative to other strategies. As already highlighted, they also found out that the exit via IPO is the most profitable exit route when economic conditions are good. Smith, Pedace, and Sathe (2011) studied exits via IPO with regard to US Venture Capital funds and found out that they represent the main driver of the funds' performance, further confirming the high profitability of PE-backed IPOs. Finally, Jenkinson and Sousa (2015) compared different exit routes and questioned the status of IPO as the most successful exit strategy. Indeed, they find that the choice between IPO and secondary buyout is greatly influenced by the conditions of debt and equity markets. When debt is cheap, a rise in secondary buyouts is observed, relative to IPOs, which are related to the conditions of the stock market.

However, even though an IPO may generate the highest returns for fund investors, not all deals are suitable for this exit strategy, neither are the macroeconomic conditions always favourable. In general, the rise of public markets supports IPOs, because of the growing investors' risk appetite. When exiting a portfolio company via an IPO, timing is critical because of the long path that lasts between 6 and 12 months.

PE funds are not generally allowed to sell their shares immediately after the IPO and need to wait until the end of the *lock-up period*. In this case, returns are not realized at the IPO,

but are dependent on the share price at the time of the exit. In case the full value of the investment is not realized at the IPO date, holding the shares allows PE funds to realize greater returns, but it requires continued monitoring of investments. After the lock-up period has expired, financial sponsors can either decide to sell the entire stake in the company or partially divest it. Furth and Rauch (2014) documented an important result with regard to the involvement of buyout funds after the listing, that is, on average they sell their position about three years after the listing.

Aftermarket performance of PE-backed IPOs is critical for PE funds, since they usually do not sell all the shares immediately. Nevertheless, according to a recent study, PE-led IPOs[7] underperformed their benchmark public indexes. However, there is a large spread between funds with significant experience in IPOs and those where this exit is less relevant (Bain & Company, 2020). PE firms that more effectively manage IPOs perform a range of activities in an optimal way, such as conceiving the IPO as a long-term value creation process as well as understanding the different motivations of post-IPO investors.

[7] PE-led IPOs have a PE fund as the majority stakeholder.

# Chapter II

# PE-backed IPOs: literature review and research hypotheses

The purpose of this chapter is to analyse past studies on the topic of Private Equity-backed IPOs and, in doing so, positioning Private Equity exit activity within a theoretical framework to understand the reasons underlying the existence (or non-existence) of performance patterns of PE-backed IPOs.

Since the 80s, a growing amount of literature on Private Equity has emerged, in order to describe a relatively new phenomenon. A typical problem of this kind of studies is the difficulty in gathering reliable data due to the confidentiality of the transaction. Many databases are nowadays available but some of them gather self-reported data, which may suffer from selection bias. Moreover, most of the studies on PE exits focus on IPO as an exit route, which is surprising given that the vast majority of exits are secondary sales (Jenkinson and Sousa, 2015).

Many studies have been conducted over the past decades on the topic of PE-backed IPOs. Some of them focus on the buyout segment (e.g. Levis, 2011; Muscarella and Vetsuypens, 1990), while others on the venture capital segment (e.g. Brav and Gompers, 1997). Within the first group, some scholars analyse the phenomenon of Reverse Leveraged Buyouts (RLBOs), which refers to companies going public after a period of private ownership following a leveraged buyout. It is worth noting that a large part of the literature addresses the VC segment rather than the buyouts. As far as geographical areas are concerned, most of the previous studies focus on two markets: US and UK. With regard to Europe, no study at the European level has been conducted for the post-crisis period, whereas many studies have been performed at a country level. Findings from previous studies cannot clearly be extended to different countries and time periods, nor evidence from the venture capital segment can be applied to buyout studies[8].

In order to address such a complex topic, different streams of literature are reviewed in this chapter. The following scheme (Figure 6) provides an outline of the literature review.

[8] Buyout and VC transactions present many differences, such as the companies targeted or the sponsor's approach to create value. Therefore, the two groups of transactions need to be analysed separately.

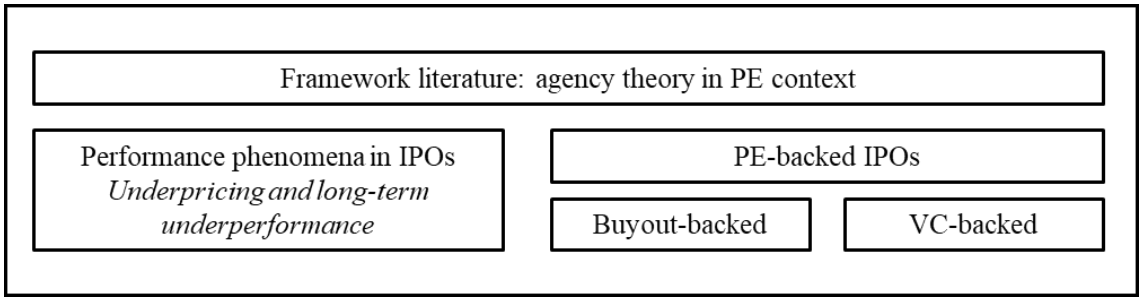


*Figure 6. Structure of the literature review. Own elaboration.*

First, based on previous literature, agency theory is proposed as a theoretical framework to analyse PE exit activity. Previous research showed that agency theory provides a sound theoretical background to explain the value creation in the PE model and the exit phase.

Then, two broad streams of literature are analysed:

- Two anomalies of "typical" IPOs are reviewed: underpricing and long-term underperformance. Some studies are reported in order to provide insights into the magnitude of these phenomena across different countries and time periods. The main theories explaining these phenomena are reported.
- Private Equity-backed IPOs performance studies are then analysed. This section provides past evidence on the impact of PE sponsorship on performance (both stock and operating performance). First, the main findings are reviewed in order to gain an understanding of the phenomenon. Then, a classification of the main factors related to PE ownership impacting aftermarket performance is proposed.

There is a broad consensus that IPOs experience underpricing and long-term underperformance, and that PE sponsorship tends to positively impact IPO performance. This consensus is based mainly on US and UK studies, while evidence lacks at the European level. Moreover, scholars tried to identify the main drivers of performance of PE-backed IPOs, investigating several dimensions related both to firms' and funds' characteristics.

## 2.1 Agency theory as a framework to explain PE exit activity

Agency theory is used as a theoretical framework to explain private equity investments and exit (Povaly, 2006). This theory is related to the separation of ownership and control and is based on the relationship between principals and agents. In this relationship, the problem is the existence of asymmetric information. According to agency theory, several contractual mechanisms can be used to reduce the conflicts arising between principals and agents. In the context of Private Equity, Jensen (1989) argues that buyout can significantly attenuate conflicts, focusing the analysis on the role of debt. Therefore, managers are forced to use free cash flow to repay debt, while restructuring the organization to reduce inefficiencies. Other scholars (e.g. Kaplan and Stein, 1993) argue that in most of the buyouts a portion of equity is owned by management, as an incentive and alignment instrument. In this perspective, managers act as owners and look for reducing inefficiencies to increase the value of their equity stakes.

Sahlman (1990) studies the agency problem in the context of venture capital financing, highlighting three conflicts arising between the actors involved in the deals. Firstly, VC firms may act in their own best interest over the interests of investors, and can be considered agents of the investors. Secondly, the entrepreneur can have incentives to act in its own best interest over those of VC firms, and can be considered an agent of the VC firm. Finally, VC firms may be motivated to act at their own best interests over those of the entrepreneurs, and can be considered as agents of the entrepreneur (Sahlman, 1990). Cumming and MacIntosh (2003) contend that a fourth agency problem exists within the venture capital context. At the time of the exit, venture capitalists may behave opportunistically, thus creating agency problems between the sellers of the company and the buyers. Among the exit routes, the IPO is the one involving the greatest information asymmetry between the seller and the new owners (Cumming and MacIntosh, 2003). This scheme (Figure 7) can be applied more in general to PE transactions and involves PE firms, investors, entrepreneurs or managers, and new purchasers (Povaly, 2006).

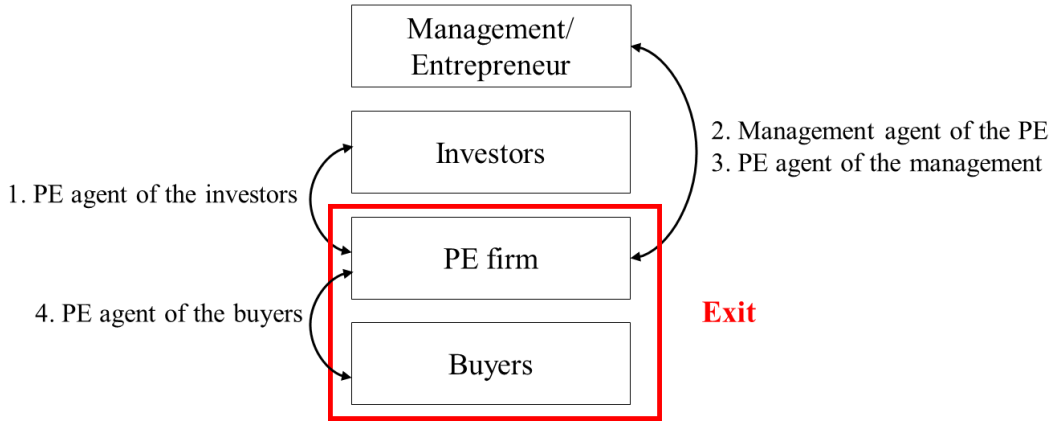


*Figure 7. Agency problem in the PE context. Own elaboration based on Povaly (2006).*

Bruton, Keels and Scifres (2002) narrow their focus to information asymmetries in the context of buyouts. In particular, they find that agency theory provides sound foundations to explain the performance throughout the whole buyout cycle. It is demonstrated that the new ownership structure mitigates information asymmetries and that managerial ownership leads to better performance. At the time of the exit, in the case of IPOs, we might expect a decline in performance because part of the equity in the firm is sold. Their study shows that, even after the listing, it takes generally three years for the decline in profitability and the increase in inefficiencies to happen.

At the time of the exit, PE firms may opportunistically sell a portfolio firm exploiting "insider" information, given the information asymmetries arising towards the time of the exit (Povaly, 2006). However, scholars have highlighted the importance for private equity funds and venture capital investors of establishing a reputation (Lin and Smith, 1998), since they need to be well perceived by stock markets as they bring companies public.

## 2.2 Performance phenomena in IPOs

This section provides an overview of past academic research on the topic of IPO short-run and long-run performance in general. Two performance phenomena have been reported in the standard literature: underpricing and long-run underperformance. A slew of studies has shown that, while IPOs appear to be underpriced in the short-run, they tend to perform poorly in the long-run (three to five years from the date of issue).

### 2.2.1 Underpricing

Underpricing is the “issue of securities below their market value” and can be defined as the excess return experienced by companies at the end of their first trading day (Brealey, Myers, Allen and Mohanty, 2012). The underpricing phenomenon first began to catch the attention of scholars in the early 70s.

Several studies demonstrate that the phenomenon of underpricing can be observed in almost every country (Loughran, Ritter and Rydqvist, 1993; Boulton, Smart and Zutter, 2010). Early studies on IPO underpricing were provided by Logue (1973) and Ibbotson (1975), both finding evidence of significant underpricing. Particularly, Ibbotson (1975) found that on average first-day performance was positive and equal to 11,4% in the US market between 1960 and 1969. Later, Ibbotson, Sindelar and Ritter (1994) examined a sample of US IPOs between 1960 and 1992, finding evidence of average initial returns between 10 to 15%. In the following years, several streams of research emerged, resulting in multiple explanations of the underpricing phenomenon. Almost all theoretical models that explain this phenomenon have their theoretical basis in the existence of information asymmetries between the different parties involved. However, a distinction can be made between models in which underpricing is a voluntary strategy and those in which underpricing derives from the interactions of the different parties involved in the new offering.

A substantial stream of research provides the existence of information asymmetry as an explanation for the underpricing phenomenon at the IPO date. Rock (1986) draws a distinction between informed and uninformed investors, assuming that the informed investors face costs in order to gather information about the intrinsic value of the company, while the uninformed ones do not acquire information and buy shares of every new market issue. He proposes the existence of a form of adverse selection referred to as the *winner’s curse*. Underpricing is necessary in order to compensate uninformed investors for this form of adverse selection and to keep them participating in the IPO market.

Within the framework of information asymmetry, some scholars developed another theory known as the *signalling hypothesis* (e.g. Allen and Faulhaber, 1989; Welch, 1989). This model makes a distinction between "high quality" issuers, who seek to signal their

quality to the market, and "bad quality" issuers. Under the assumption that firms have the best information about their prospects, underpricing is used as a signal of quality and to generate interest among investors. Therefore, high-quality firms may use underpricing in order to differentiate themselves from low-quality firms. The underpricing leave "a good taste in investors' mouth" and increase the potential for subsequent emissions to be placed in the market to higher conditions.

Another stream of studies proposes that irrational behaviours of investors can explain the underpricing phenomenon. Among the several behavioural models, the work of Welch (1992) is widely accepted in literature. He states that late investors tend to ignore their own information and act like early investors, leading to *informational cascades.* Differently from the model of *the winner's curse* (Rock, 1986), investors can observe earlier demand of shares. Thus, issuers may underprice their IPOs in order to induce early investors to buy, and attract late investors through the *informational cascade effect*.

Finally, it is worth mentioning another stream of theories, known as institutional explanations, that address the phenomenon of underpricing. From a different perspective, it can be argued that overpricing is much worse than underpricing. Some scholars (e.g. Ibbotson, 1975) believe that shares may be deliberately underpriced to boost demand and avoid potential lawsuit of investors.

### 2.2.2 Long-run performance

As discussed in the previous paragraph, IPOs generally perform very well on the first day of listing. Surprisingly enough, there is evidence of negative returns compared to the market in the long run. Some of the early studies on long-run underperformance are provided by Aggarwal and Rivoli (1990) and Ritter (1991) with a focus on the US market. Following these studies, other scholars have observed the phenomenon of IPO underperformance across different countries and time periods.

Aggarwal and Rivoli (1990), contrary to the widespread hypothesis that IPOs are priced below the intrinsic value, argue that underwriters set the offering prices at true values and provide empirical evidence supporting the existence of fads at the time of the listing. They find that purchasing shares in the first trading day and holding for one year leads to

negative returns. Thus, they argue that the long-run underperformance is determined by the overvaluation of IPOs in the early aftermarket and that initial prices reflect the intrinsic value.

Ritter (1991) documents the existence of a significant long-term underperformance of IPOs between 1975–84 in the US, finding that the average three-year holding period return was 34,47% in the three years after the IPO, while the return produced by a control sample over the same period is 61,86%. As an explanation for this phenomenon, he argues that the IPO market is characterized by fads and that firms strive to take advantage of these waves of optimism. This is known as the *window of opportunity hypothesis* and was first documented by Ritter (1991). According to this hypothesis, firms going public during high volume periods, the so-called hot periods, are more likely to underperform in the long run. Thus, there is a relationship between the timing of the IPO and the underperformance in the long run.

Carter, Dark and Singh (1998) document the relationship between long-term IPO performance and several measures of underwriter reputation. Besides confirming previous evidence that IPOs with more reputable underwriters experience less underpricing, they also find that these IPOs also have a less severe long-term underperformance over a period of three years compared to the market. Brau, Couch and Sutton (2012) propose an additional factor to the existing theories, providing an M&A explanation for IPO underperformance. They find that acquisition activities done within the first year after the issuing significantly affect IPO performance. Indeed, newly public companies undertaking acquisitions during the first year after the IPO significantly underperform the market over a five-year period, whereas firms that do not undertake such activities do not underperform over the same time horizon.

Even if there is a large consensus among researchers, some studies diverge from the prevailing view on the long-run underperformance phenomenon. Brav and Gompers (1997) and Brav, Geczy and Gompers (2000) show that the underperformance documented in previous research is mainly driven by IPOs of firms with low book-to-market ratio. In general, it is worth noting that results are dependent on the choice of the

methodology[9] and the benchmark. A more detailed explanation of the methodologies used to compute the long-term performance of IPOs can be found in the next chapter.

## 2.3 The impact of PE sponsorship on IPO performance

Drawing from previous literature, this section provides an in-depth analysis of the impact of Private Equity sponsorship on the performance of IPOs. The majority of past studies have pointed out the superior performance of PE sponsored relative to non-PE sponsored IPOs. Even though there is a large consensus on this performance pattern, differences in the scale of the phenomenon arise from the use of different samples (different regions, different sources and different periods) and the adoption of different methodologies. In contrast, some scholars do not find any statistically significant correlation between PE sponsorship and performance. With regard to the scope of previous studies, scholars have analysed three types of IPOs: PE-backed IPOs[10], Reverse Leveraged Buyouts[11] and VC-backed IPOs.

As a premise of this section, emphasis must be placed on the role of "active investors" of Private Equity firms (Jensen, 1989), meaning that they conduct activities to add value to portfolio firms, they are involved in restructuring, monitoring and control activities and, lastly, they have a certification role when bringing companies public. It is also worth noting that a large number of studies are focused on VC-backed IPOs. This can be attributed to several reasons, such as the greater confidentiality of transactions of buyout funds that do not advertise their investments. Furthermore, most of the studies cover the most active regions for PE deals, namely the US and UK (e.g. Levis, 2011; Muscarella and Vetsuypens, 1990). Next, empirical evidence on short- and long-term performance across different countries is reported.

Among the first studies, Muscarella and Vetsuypens (1990) analyse the operating performance of a sample of 72 RLOBs – companies that undergo a (full or divisional)

[9] The two most common methodologies used to calculate long-term returns of IPOs, introduced by Ritter (1991), are the Cumulative Average Adjusted Returns (CAR) and the Buy-and-Hold Returns (BHR).
[10] In Levis (2011), a PE-backed IPO is "a company where the PE sponsor(s) has a controlling interest acquired at the time of the buyout".
[11] RLBOs are a subset of PE-backed IPOs, but they are often studied separately from other PE investments.

LBO and then go public again – between 1976 and 1987 in the US. They find evidence of significant improvements in operating performance in these companies. Most relevant to our analysis is Levis (2011), that conducts extensive research on the performance of PE-backed IPOs in the UK between 1992 and 2005. He compares the performance of three different groups of IPOs: PE-backed, VC-backed and non-PE-backed IPOs. He shows that PE-backed IPOs are larger than their VC and non-backed counterparts, and exhibit less underpricing. With regard to long term performance, PE-backed IPOs generate positive buy-and-hold abnormal returns over a three-year period after going public, while the other groups of IPOs have poorer performance.

Mian and Rosenfeld (1993) examine a sample of 85 RLBOs in the US between 1983 and 1988, finding evidence of significant positive cumulative abnormal returns, computed over a 36-month trading period after going public, excluding the first-day return in order to isolate long-run performance from the underpricing phenomenon. Exploring the high incidence of takeover activities, they find that the strong aftermarket performance of RLBOs can be explained as a result of the takeover activities.

With regard to studies outside the US, scholars have focused mainly on UK (Levis, 2011; Von Drathen and Faleiro, 2007), but some studies can be found with regard to Germany (Von Drathen, 2007) and Italy (Viviani, Giorgino and Steri, 2008). Evidence of superior performance of PE-backed IPOs can be found in the UK between 1990 and 2006 and in Germany between 1990 and 2007, where VC-backed IPOs are found to outperform the buyout segment and all other IPOs (Von Drathen, 2007; Von Drathen and Faleiro, 2007). Such evidence of outperformance is not found in Viviani, Giorgino and Steri (2008). Using a sample of 68 PE deals from 1995 to 2005, they find that Private Equity's participation negatively affects the performance over a three-year period, supporting the studies claiming for the underperformance of PE-backed IPOs relative to their counterparts.

A more comprehensive study on the phenomenon of PE-backed IPOs in Europe is performed by Bergström, Nilsson and Wahlberg (2006). They try to shed light on performance patterns in order to fill the gap in the academic literature on the European market and, specifically, on the buyout segment. They investigate the underpricing and long-run performance of a sample of 142 European buyout-backed IPOs - London Stock Exchange (UK) and the Paris Stock Exchange (France) - from 1994 to 2004, comparing

it to a sample of non-PE-backed IPOs. They show that buyout-backed IPOs exhibit both a lower degree of underpricing and better long-term performance (six months and three and five years) than non-sponsored IPOs.

Most of the studies seek to determine the factors that drive the performance of PE-backed IPOs. These variables, as shown in Figure 8, are clustered in Pre- and Post-IPO involvement, Reputation & Certification and Firm's characteristics. Table 1 (reported at the end of the chapter) summarises the studies reviewed on a chronological basis, highlighting the main findings.

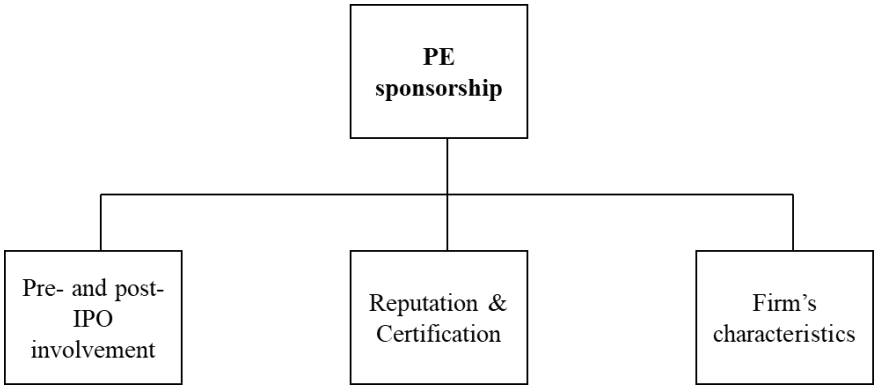


*Figure 8. PE Sponsorship – Variable families from previous studies. Own elaboration.*

## 2.3.1 Pre- and post-IPO involvement

One of the factors that are commonly associated with the improvement in performance in Private Equity deals is the continuous involvement of PE firms in the activities of the portfolio firms. Both buyout funds and venture capitalists undertake several activities during the holding period in order to add value to the companies they invested in. However, at the date of the listing, pre-IPO investors are generally prohibited from selling all their shares because of lock-up agreements[12]. It is reasonable to argue that they continue to be involved in several ways in the portfolio companies and, therefore, their involvement post-listing is of great importance both for academics and practitioners.

[12] Contractual characteristics and length of the lock-up period may vary across deals and countries. For example, Brav and Gompers (2003) report that the typical duration of lock-up agreements in the US is 180 days.

Cao (2008) analyses the role of buyout sponsors in Reverse Leveraged Buyouts, examining the incentives in IPO decisions. He shows that funds exit their investments several years after the IPO, and consequently are interested in the performance of the publicly-traded company and monitor the management. As a measure for the buyout sponsor's incentive, he uses the relative size of LBOs to buyout sponsor's capital. He finds that buyout sponsors maintain equity and an active role in portfolio companies, especially larger ones. Concerning IPO timing, buyout funds tend to bring companies public when the restructuring has achieved the greatest benefits; in contrast, quick flips, which result from weak incentives, are characterized by lower operating performance. Moreover, Cao (2011) finds that buyout funds spend less time on restructuring before the IPO when facing favourable IPO conditions or high industry valuations.

Katz (2009) gains further empirical evidence on the role and effects of PE sponsorship on the stock price performance of PE-backed IPOs. Firstly, he finds that PE-backed firms generally have higher earnings quality than non-PE-backed firms. Then, the sponsorship and the monitoring of PE funds tend to reduce the tendency to engage in upward *earnings management* in the period surrounding the IPO and lead to more timely *loss recognition*. Finally, consistently with the control and monitoring role of PE funds, PE-backed firms that are majority-owned by a PE sponsor have better long-term stock performance than firms with a minority ownership and larger size of the fund is correlated to better long-term performance. Indeed, PE sponsor size can be used as a proxy for PE sponsor reputation (Cao and Lerner, 2009) and it can be argued that larger financial sponsors can implement better governance mechanisms and exert tighter control over portfolio firms.

Brav and Gompers (1997) investigate the phenomenon of long-run underperformance of VC-backed IPOs. Consistently with Levis (2011), they find that the outperformance of VC-backed IPOs relative to non-VC-backed offerings stems from better management teams and corporate governance systems of VC-backed firms.

Finally, according to Brau, Brown and Osteryoung (2004), PE may have a relevant role in bringing companies public, which could be a success factor itself. Using a sample of small VC-backed manufacturer firms IPOs, they find no significant differences in performance relative to non-VC-backed IPOs. None of the four used measures of post-IPO performance (underpricing, three-year sales growth, three-year cumulative stock

return, and three-year survivability) support either the hypothesis of outperformance or underperformance relative to the control sample.

### 2.3.2 Reputation & Certification

Private Equity firms play an important role in IPOs since PE sponsorship should legitimate the offering. This is strictly related to the area of the fund's reputation. There is a broad consensus on the relationship between the reputation of the fund and the better aftermarket performance of the portfolio firm.

Megginson and Weiss (1991) explore the certification role of venture capitalists in IPOs and its impact on pricing. Indeed, IPOs are characterized by high information asymmetry between investors and issuers, which is primarily identified as a cause of underpricing. The authors support venture capital sponsorship as a way to certify the quality of the issue, thus showing that VC-backed IPOs exhibit lower initial returns and gross spreads than non-VC-backed offerings, lowering the cost of going public. Furthermore, they show that VCs tend to maintain significantly large holdings in the companies after the IPO date.

Krishnan, Ivanov, Masulis and Singh (2011) investigate the post-IPO long-run performance and its relationship with VC reputation. Similarly to Megginson and Weiss (1991), they use the IPO market share as a measure of reputation, calculated as the venture investor's past market share of completed venture-backed IPOs. With regard to long-run performance, they test four performance measures over a three-year period: (1) industry-adjusted rate of return on assets (ROA), (2) market-to-book ratio, (3) long-run exchange listing survival, and (4) long-run abnormal stock returns. They show that VC reputation is significantly and positively associated with all the mentioned performance measures. Venture capitalists with better reputation are not only associated with better long-term performance, but also exhibit more active involvement in the portfolio firms after the IPO.

Cumming (2012) finds evidence of the certification role of buyout groups in initial public offerings, using a sample of Reverse Leveraged Buyouts. In particular, the sponsorship of a buyout fund leads to lower the underpricing, providing a sort of economically valuable certification.

### 2.3.3 Firm's characteristics

Together with the previous variables, that are mostly related to the fund, firms' characteristics have been widely tested in literature in order to find correlations with the aftermarket performance. In particular, two variables related to the firm are analysed below: size and leverage.

There is a large consensus among scholars that larger PE-backed IPOs experience better performance. For example, Cao and Lerner (2009) examine a sample of nearly 500 US Reverse Leveraged Buyouts and show that RLBOs experienced positive abnormal returns when compared to other IPOs and the stock market as a whole. This outperformance seems to be driven especially by larger RLBOs, but this in turn seems to be driven by the sponsorship of larger PE funds. Bergström, Nilsson and Wahlberg (2006) find additional evidence that larger IPOs exhibit lower underpricing, which may be explained by the lower information asymmetries of larger IPOs, and better long-term performance, which is driven by larger IPOs.

With regard to the leverage, some scholars have investigated the impact of debt on the performance of PE-backed IPOs, which is especially important in the case of LBOs. Cao and Lerner (2009) find that greater leverage in Reverse Leveraged Buyouts does not negatively impact IPO performance. Conversely, Levis (2011) find that a greater level of leverage after the listing in PE-backed IPOs is related to better long-term performance. This is consistent with the common knowledge that the use of debt is one of the fundamental value drivers of PE deals.

## 2.4 Hypotheses statement

Prior research suggests that IPOs show specific performance patterns, with high initial returns (underpricing) and poor long-term performance (long-term underperformance). In addition, a number of studies investigated the role of Private Equity sponsorship in IPOs. Several theories have been proposed to address this topic, some focusing on buyouts, others on venture capital. There is a large consensus that PE-backed IPOs

perform better than their non-PE-backed counterparts, for a number of reasons that were previously analysed.

Previous studies have almost exclusively focused on the US and UK markets. Concerning previous research in Europe, most of the studies focused on specific countries, that are separately analysed. To the best of our knowledge, no previous academic study has investigated in a comprehensive manner the phenomenon of PE-backed IPOs at the European level post-2007/2008 global financial crisis. To fill this literature gap, this thesis analyses the performance of European PE-backed IPO, taking into account the three largest European PE markets: UK, France and Germany.

While the short-run underpricing is a universally accepted phenomenon in typical IPOs, it is reasonable to assume that PE funds prefer to minimize the amount of "money left on the table". Therefore, by the means of the internal competencies of the management, IPOs backed by Private Equity investors should experience less underpricing than their non-PE-backed counterparts. As a result, the first hypothesis is the following:

> ***Hypothesis 1.*** *PE-backed IPOs (buyout-backed and venture capital-backed) have lower first-day returns than Non-PE-backed IPOs.*

Also, Cao (2008) has shown that Private Equity investors do not fully exit their investment, either because they can't because of the lock-up contractual provisions or because they want to retain the shares in the portfolio company in order to exit the investment later at better conditions. Thus, it is reasonable to expect that the post-IPO involvement of PE firms may lead to better long-term results. In order to test the robustness of this hypothesis, different time horizons will be considered. In light of these considerations, the second hypothesis is formalized as follows:

> ***Hypothesis 2.*** *PE-backed IPOs (buyout-backed and venture capital-backed) have better long-run performance than Non-PE-backed IPOs over all the considered time horizons (12 months, 24 months and 36 months).*

These two research hypotheses allow investigating both the short-term and long-term performance, in order to identify specific performance patterns related to PE sponsorship. Finally, a cross-sectional regression analysis is performed in order to investigate the relationship between the aftermarket performance of the four groups of IPOs and a

number of variables taken from previous literature, that will be discussed more extensively in the following paragraphs.

| Authors | Market segment | Period | Sample (n) | Country | Findings |
|---|---|---|---|---|---|
| **Muscarella and Vetsuypens (1990)** | PE (RLBOs) | 1976-87 (11 years) | 72 | US | Significant improvements in operating performance in companies. |
| **Megginson and Weiss (1991)** | VC | 1983-87 (4 years) | 320 | US | VC-backed IPOs exhibit significantly lower underpricing (certification role). |
| **Mian and Rosenfeld (1993)** | PE (RLBOs) | 1983-88 (5 years) | 85 | US | RLBOs outperform their peers over a three-year period. |
| **Brav and Gompers (1997)** | VC | 1972-92 (20 years) | 934 | US | VC-backed IPOs outperform their non-VC-backed counterparts using equal-weighted returns. |
| **Brau, Brown and Osteryoung (2004)** | VC | 1990-96 (6 years) | 126 | US | VC-backed IPOs do not exhibit differences in performance relative to non-VC-backed IPOs. |
| **Bergström, Nilsson and Wahlberg (2006)** | PE (Buyout) | 1994-2004 (10 years) | 142 | EU (UK and FR) | Buyout-backed IPOs exhibit lower underpricing and perform better in the long run than non-buyout-backed IPOs. |

| | | | | | |
|---|---|---|---|---|---|
| **Von Drathen (2007)** | PE (Buyout)<br>VC | 1990-2007<br>(17 years) | 33<br>105 | Germany | PE-backed IPOs outperform the stock market over a three-year period; VC-backed-IPOs outperform buyout-backed IPOs. |
| **Von Drathen and Faleiro (2007)** | PE (LBO) | 1990-2006<br>(16 years) | 128 | UK | LBO-backed IPOs outperform both the stock market and non-LBO backed IPOs. Outperformance seems to be driven by the share capital held by the fund. |
| **Viviani, Giorgino and Steri (2008)** | PE | 1995-2005<br>(10 years) | 143 | Italy | Private Equity participation negatively impacts firms' long-run performance. |
| **Cao and Lerner (2009)** | PE (RLBOs) | 1980-2002<br>(12 years) | 496 | US | RLBO experienced positive abnormal stock returns relative to "typical" IPOs and the stock market. |
| **Krishnan, Ivanov, Masulis and Singh (2011)** | VC | 1993-2004<br>(9 years) | 822 | US | VC-backed IPO performance is strongly related to VC reputation measures (continued post-IPO support). |
| **Levis (2011)** | PE (Buyout)<br>VC | 1992-2005<br>(13 years) | 204<br>250 | UK | PE-backed IPOs exhibit lower underpricing and outperform other IPOs (VC and non-backed) and the market over a three-year period. |

*Table 1. Summary of the main studies. Own elaboration. This table summarises the most relevant studies on Private Equity backed-IPO performance. Special focus is put on the category of PE, the time span, sample size and geographical location. These are the most important variables enabling to compare different studies. The last column presents the main findings – generally the finding of superior or inferior performance relative to non-sponsored IPOs.*

# Chapter III

# Econometric model and empirical analysis

In this section, we examine the phenomenon of PE-backed IPOs in Europe, testing the hypotheses stated in the last paragraph. Little dispersed evidence is documented for European PE-backed IPOs, which drives the choice of a sample of European companies for our study. At first, the intention was to analyse all the European PE-backed IPOs. However, having analysed the distribution of PE-backed IPOs - both buyout-backed and VC-backed – across European countries (Figure 9), we then decided to focus on the three most active countries in PE in Europe, that are UK, France and Germany, with an approach similar to Bergström, Nilsson and Wahlberg (2006)[13]. These countries account for more than half of all the PE-backed IPOs in Europe.

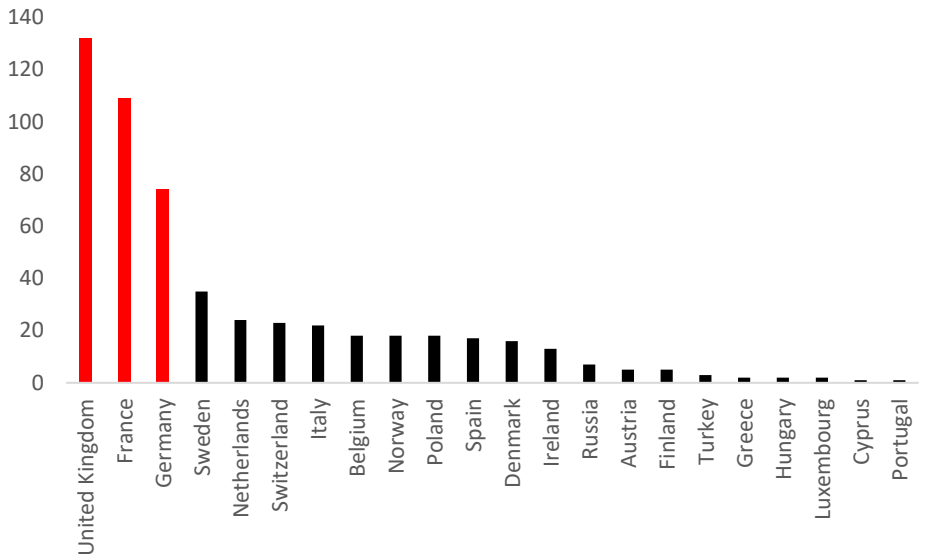


*Figure 9. PE-backed IPOs per country (Europe) between 2005-2016. Own elaboration (source: Thomson ONE).*

The chapter is structured as follows. First, the data collection process and the sample are described. Second, we provide a theoretical overview of the adopted methodology, highlighting the reasons behind the choice of the measures of performance and the

[13] According to Bergström, Nilsson and Wahlberg (2006), UK and France give an idea of the European patterns of PE-backed IPOs in the period ranging from 1994 to 2004. Given the upward trend of PE-backed IPOs in Germany, we decided to broaden the scope of the analysis and include Germany in the sample.

statistical tests adopted. Finally, we present the regression used to identify the cross-sectional determinants of the long-run market performance of IPOs, providing an overview of the results.

To shed light on the interpretation of the outcome of the study, each analysis will clearly show results making a distinction between buyout- and venture capital-backed IPOs.

## 3.1 Data collection

This study uses a sample of 1026 IPOs of European – UK, France and Germany - firms listed on European stock exchanges, from 01.01.2005 to 31.12.2016.

### 3.1.1 Sample selection and sources

As stated earlier, this study is focused on European Private Equity-backed IPOs, which is a phenomenon that has received limited attention from scholars. To our best knowledge, no comprehensive studies have been conducted on the European market in the after financial crisis period. Furthermore, differently from many academic studies that are focused on specific types of transactions, such as Reverse Leveraged Buyouts and VC-backed IPOs, we try to explain performance differences across different types of Private Equity investments (buyout and venture capital deals), as in Levis (2011).

Several steps were required to create the dataset and more than one database was used. Firstly, a list of all the IPOs that took place in UK, France and Germany between 01.01.2005 and 31.12.2016 was extracted from Thomson Reuters. We excluded from the sample relistings and investment trusts. Missing values in the dataset were retrieved from Zephyr. Subsequently, additional data on the sponsorship of the IPO by a buyout or a VC fund were collected on Thomson ONE.

The database provides an indication of the sponsorship, separating buyout deals and venture capital deals. In order to have a representative sample, only companies backed by Private Equity firms (and not other investment companies) were considered. In addition, real estate investments were excluded from the sample as well. Buyout-backed IPOs are companies with at least one buyout investment, while VC-backed IPOs are companies

with at least one venture capital investment (including startup/seed, early, expansion and later stage). Then, we excluded deals where the participation of a PE sponsor could not be verified. Finally, daily stock prices and financial information were retrieved from Datastream and Zephyr (offer price, market capitalization, leverage, asset turnover).

### 3.1.2 Sample description

The final sample is composed by 1026 IPOs, that are divided into four different portfolios:

1. 1026 IPOs (All IPOs)
2. 96 buyout-backed IPOs (Buyout)
3. 110 venture capital-backed IPOs (VC)
4. 820 Non-PE-backed IPOs (Non-PE).

Table 2 provides an overview of the annual distribution of the IPOs. It is interesting to note that the most intense IPO activity is concentrated in the period between 2005 and 2007, that is the period immediately before the global financial crisis. Following the global financial crisis, IPO activity dramatically dropped in 2008 and 2009. The drop was particularly important for buyout and VC backed IPOs. It is possible to argue that, due to the unfavourable market conditions and uncertainty in the market, private equity firms were deterred to exit their investments via IPO in the years immediately after the crisis.

| IPOs annual distribution | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Portfolio** | All IPOs | | Buyout-backed | | VC-backed | | Non-PE-backed | |
| | **n** | **%** | **n** | **%** | **N** | **%** | **n** | **%** |
| **2005** | 158 | 15,40% | 17 | 17,71% | 14 | 12,73% | 127 | 15,49% |
| **2006** | 212 | 20,66% | 19 | 19,79% | 28 | 25,45% | 165 | 20,12% |
| **2007** | 164 | 15,98% | 10 | 10,42% | 17 | 15,45% | 137 | 16,71% |
| **2008** | 19 | 1,85% | - | 0,00% | 1 | 0,91% | 18 | 2,20% |
| **2009** | 17 | 1,66% | - | 0,00% | - | 0,00% | 17 | 2,07% |
| **2010** | 61 | 5,95% | 5 | 5,21% | 8 | 7,27% | 48 | 5,85% |
| **2011** | 48 | 4,68% | 3 | 3,13% | 4 | 3,64% | 41 | 5,00% |
| **2012** | 32 | 3,12% | - | 0,00% | 9 | 8,18% | 23 | 2,80% |
| **2013** | 62 | 6,04% | 12 | 12,50% | 5 | 4,55% | 45 | 5,49% |
| **2014** | 108 | 10,53% | 18 | 18,75% | 13 | 11,82% | 77 | 9,39% |
| **2015** | 80 | 7,80% | 11 | 11,46% | 8 | 7,27% | 61 | 7,44% |
| **2016** | 65 | 6,34% | 1 | 1,04% | 3 | 2,73% | 61 | 7,44% |
| **Total** | 1026 | 100% | 96 | 100% | 110 | 100% | 820 | 100% |

*Table 2. IPO annual distribution. For each portfolio, both the absolute number and the percentage of the column are reported.*

Table 3 provides a breakdown of the four IPO portfolios by industry. We notice that the majority of buyout-backed IPOs concerns traditional and mature sectors, as we expected from the discussion of the first chapter: buyouts tend to be concentrated in non-high-technology sectors. For example, consumer cyclicals and industrials account for slightly less than half of the total number of buyout-backed IPOs. Secondly, it is interesting to note that, on the contrary, VC-backed IPOs typically take place in sectors characterized by fast pace innovation and greater instability: more than half of the IPOs for the considered period took place in the healthcare and technology sectors.

| IPO distribution by industry | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Portfolio** | All IPOs | | Buyout-backed | | VC-backed | | Non-PE-backed | |
| | **n** | **%** | **n** | **%** | **N** | **%** | **n** | **%** |
| **Basic materials** | 69 | 6,73% | 4 | 4,17% | 4 | 3,64% | 61 | 7,44% |
| **Consumer cyclicals** | 165 | 16,08% | 24 | 25,00% | 9 | 8,18% | 132 | 16,10% |
| **Consumer non-cyclicals** | 37 | 3,61% | 3 | 3,13% | - | 0,00% | 34 | 4,15% |
| **Cyclical consumer goods and services** | 14 | 1,36% | 1 | 1,04% | - | 0,00% | 13 | 1,59% |
| **Energy** | 49 | 4,78% | 3 | 3,13% | 5 | 4,55% | 41 | 5,00% |
| **Financial** | 195 | 19,01% | 16 | 16,67% | 2 | 1,82% | 177 | 21,59% |
| **Healthcare** | 119 | 11,60% | 8 | 8,33% | 49 | 44,55% | 62 | 7,56% |
| **Industrials** | 182 | 17,74% | 22 | 22,92% | 10 | 9,09% | 150 | 18,29% |
| **Technology** | 159 | 15,50% | 8 | 8,33% | 29 | 26,36% | 122 | 14,88% |
| **Telecommunication service** | 22 | 2,14% | 6 | 6,25% | 2 | 1,82% | 14 | 1,71% |
| **Utilities** | 15 | 1,46% | 1 | 1,04% | - | 0,00% | 14 | 1,71% |
| **Total** | 1026 | 100% | 96 | 100% | 110 | 100% | 820 | 100% |

*Table 3. IPO distribution across different industries. For each portfolio, both the absolute number and the percentage of the column are reported.*

Finally, Table 4 shows the summary statistics for the four portfolios with regard to market capitalization and leverage. As we were expecting, the median value of the market capitalization of buyout-backed IPOs is larger than the other groups, with results that are in line with those of Cao and Lerner (2009). Also, leverage is greater for buyout-backed IPOs and lower for VC deals, that typically do not involve the use of debt as a value creation leverage.

| Portfolio | All IPOs | Buyout | VC | Non-PE |
|---|---|---|---|---|
| **Market capitalization ($ million) (median)** | 84,13 | 653,13 | 85,9 | 66,79 |
| **Leverage (median)** | 7,60% | 31,19% | 3,15% | 7,05% |

*Table 4. Descriptive statistics of the four IPO portfolios - median values of market capitalization and leverage.*

## 3.2 Methodology

The empirical study can be broken down into three parts. First, we test underpricing to shed light on the first hypothesis, seeking to find evidence of a role of private equity funds in the reduction of first-day returns. Then, using an event study approach, long-term returns are calculated to investigate the second hypothesis of overperformance of PE-backed IPOs relative to their non-sponsored counterparts. Finally, a cross-sectional regression is performed in order to investigate relationships between the long-run performance and a number of variables.

### 3.2.1 Performance analysis

*A. First-day returns – underpricing measurement*

First, the focus is placed on the short-run performance. Initial returns are tested in order to assess the underpricing phenomenon by comparing PE-backed and non-PE-backed IPOs. Underpricing is computed using the following formula:

$$Underpricing = \frac{(First\text{-}day\ closing\ price - Offer\ price)}{Offer\ price}$$

We expect to find on average positive initial returns, but lower in PE-backed IPOs (both buyout- and venture capital-backed) than in non-PE-backed IPOs.

*B. Long run – abnormal performance measurement*

Previous literature on IPOs – including PE-backed IPOs – reports different methods to compute abnormal returns. The two most used approaches to calculate long-term abnormal returns of IPOs are Cumulative abnormal returns (CAR) and Buy-and-hold abnormal returns (BHAR). Generally, for longer observation periods, scholars use BHARs to measure investors' returns. Therefore, we decided to run our study using Buy-and-hold abnormal returns. Several studies, indeed, point out that Cumulative abnormal returns do not significantly reflect the investors' experience in the long run and prefer Buy-and-hold abnormal returns (see Lyon, Barber and Tsai, 1999; Barber and Lyon, 1997; Ritter, 1991).

In order to have a reasonable estimate of the abnormal returns, it is important to choose a benchmark that is exposed to similar risks of the sample. The choice of the benchmark is crucial because it highly influences results. Since we are analysing a European sample, we use as a benchmark the MSCI Europe Index[14] for the abnormal returns' estimation.

Barber and Lyon (1997) define buy-and-hold abnormal returns as "the return on a buy-and-hold investment in the sample firm less the return on a buy-and-hold investment in an asset/portfolio with an appropriate expected return", proposing the following formula:

$$BHAR_{i,T} = \left[\prod_{t=1}^{T}(1 + r_{i,t}) - 1\right] - \left[\prod_{t=1}^{T}(1 + r_{b,t}) - 1\right]$$

where $r_{i,t}$ is the raw return of firm i in period t and $r_{b,t}$ is the benchmark return in the same period.

Buy-and-hold abnormal returns are calculated with an event time approach, meaning that abnormal returns are aggregated irrespectively of the specific IPO date, enabling us to focus on performance patterns after the issue. When a company from the sample is delisted, as in Ritter (1991) and Levis (2011), BHARs are calculated as an equal-weighted average of the abnormal returns of the remaining firms of the portfolio. Due to mergers, bankruptcies and other reasons, the number of firms in the sample is expected to decrease with the increase of months of seasoning.

In the computation of long-term performance measure, we exclude first-day returns, as in Levis (2011) and Bergström, Nilsson, and Wahlberg (2006), in order not to take into

[14] The MSCI Europe Index includes a collection of stocks of 15 Developed Markets countries in Europe.

account price phenomena that do not reflect the intrinsic value of the firm (see underpricing in §2.2.1). BHARs are calculated over a 12 months, 24 months, and 36 months period.

Finally, we test the significance of our results with the skewness-adjusted version of the t-statistics as proposed by Lyon, Barber and Tsai (1999):

$$t - stat = \sqrt{n}\,(S + \frac{1}{3}\hat{\gamma}S^2 + \frac{1}{6n}\hat{\gamma})$$

with

$$S = \frac{\overline{BHAR}}{\sigma(BHAR)} \qquad\qquad \hat{\gamma} = \frac{\sum_{i=1}^{n}(BHAR_i - \overline{BHAR})^3}{n\sigma(BHAR)^3}$$

where S is the ratio between the sample mean of buy-and-hold abnormal returns and the cross-sectional sample standard deviation, and γ is an estimate of the skewness coefficient. This methodology is used in order to take into account the well-known phenomenon in the literature of the right-skewness of BHARs. In order to eliminate this bias, the null hypothesis should be tested more reliably using the adjusted version of t-statistics.

### 3.2.2 Regression model

After having computed short-term and long-term returns, we investigate the factors affecting long-run abnormal performance via a regression model. We follow the same procedure of Levis (2011) and Cao and Lerner (2009) and, as in previous studies, we highlight that results might not be interpreted as evidence of causality, since "the explanatory variables are endogenous choices of the VC or PE sponsors" (Levis, 2011). Scholars modelling such relationships have generally employed standard OLS regressions. Notwithstanding, we need to be aware that we have a risk for endogeneity when interpreting results. To get an idea of the problem, not every company is seeking private equity financing and, moreover, specific preferences of PE funds might be reflected in IPO characteristics (Lee, 2017). To capture such selection effects related to

endogenous choices of PE firms, previous studies almost always employ controls for industry preferences and other firm-related variables (Lee and Wahal, 2004)[15].

Following the approach of Viviani, Giorgino and Steri (2008), we use the 36 months BHAR as dependent variable of our regression model. As in Levis (2011), eight separate regressions are performed for the four different portfolios of IPOs mentioned in §3.1.2: (1) all IPOs (ALL), (2) buyout-backed IPOs (BO), (3) venture capital-backed IPOs (VC) and (4) non-PE-backed IPOs (NB). The following regressions are performed:

Portfolio 1 (All IPOs):

$$BHAR36m = \beta_0 + \beta_1 UND + \beta_2 SIZE + \beta_3 Crisis + \beta_4 PE + \beta_5 VC + Controls$$

$$BHAR36m = \beta_0 + \beta_1 UND + \beta_2 SIZE + \beta_3 Crisis + \beta_4 LEV + \beta_5 AT + \beta_6 PE + \beta_7 VC + Controls$$

Portfolio 2 (buyout-backed IPOs):

$$BHAR36m = \beta_0 + \beta_1 UND + \beta_2 SIZE + \beta_3 Crisis + \beta_4 TIME + Controls$$

$$BHAR36m = \beta_0 + \beta_1 UND + \beta_2 SIZE + \beta_3 LEV + \beta_4 Crisis + \beta_5 AT + \beta_6 TIME + Controls$$

Portfolio 3 (VC-backed IPOs):

$$BHAR36m = \beta_0 + \beta_1 UND + \beta_2 SIZE + \beta_3 Crisis + \beta_4 TIME + Controls$$

$$BHAR36m = \beta_0 + \beta_1 UND + \beta_2 SIZE + \beta_3 LEV + \beta_4 Crisis + \beta_5 AT + \beta_6 TIME + Controls$$

Portfolio 4 (non-PE-backed IPOs):

$$BHAR36m = \beta_0 + \beta_1 UND + \beta_2 SIZE + \beta_3 Crisis + Controls$$

$$BHAR36m = \beta_0 + \beta_1 UND + \beta_2 SIZE + \beta_3 LEV + \beta_4 Crisis + \beta_5 AT + Controls$$

[15] See Lee and Wahal (2004) and Bruton et al. (2010) for further details on the endogeneity issue within the PE context.

**Independent variables**

*Initial returns (UND).* As we have seen in the previous chapter, IPOs that are strongly underpriced (high initial returns) tend to perform poorly in the long run. We expect a negative correlation with the long-term performance.

*Market capitalization (SIZE).* Market capitalization is measured at the IPO date. In the regression, the logarithm of the market capitalization is used, in order to reduce the influence of outliers. A large consensus can be found in the literature that larger IPOs have a better performance in the long run. Therefore, we could expect the market capitalization to have a positive effect on the aftermarket performance, showing a positive coefficient.

*Financial leverage (LEV).* Financial leverage is computed as the ratio between total debts and total assets and is measured at the end of the first year after the IPO. We expect that leverage is positively correlated to buyout-backed IPOs performance, and to have a negative or no correlation for all the other groups. This hypothesis is based on the notion of leverage as a value creation driver in buyouts, which was discussed in §1.3.2. Evidence on this point in literature is mixed. For example, in contrast to the common hypothesis of Jensen (1989) of leverage as the driver of performance of private equity deals, Cao and Lerner (2009) find no empirical evidence of the influence of leverage on aftermarket performance.

*Asset turnover.* Asset turnover is computed as the ratio between total sales and total assets and provides a measure of the efficiency of the company to generate sales from assets. Therefore, we expect that higher levels of asset turnover are associated with better aftermarket performance.

*Time to exit (TIME).* Time to exit measures the length of the fund investment in the portfolio company and is a proxy of the fund's efforts in the restructuring (Cao, 2011). In previous literature, there is evidence that the so-called quick flips[16] tend to have a deterioration in performance in the post-IPO years (Cao, 2011). Based on Levis (2011), however, we expect the length of the investment to have a positive or neutral impact on performance.

[16] A quick flip occurs when funds exit a portfolio company quickly after the investment because of favourable conditions. Cao (2011) studies quick flips in the RLBO context in relation with IPO market conditions and performance.

*Financial crisis dummy (Crisis).* We introduced in our regression model a dummy variable with regard to the period in which the IPO takes place. Notwithstanding the original purpose was to create a dummy variable indicating IPOs that occurred during the outbreak of the financial crisis[17], we encountered complications in defining an exact period to be considered for the analysis. Therefore, considering the year 2007 as a break in the financial market, we introduced a dummy that takes a value of 1 for IPOs that occurred between 2005 and 2007, and 0 otherwise.

*PE and VC dummy.* With regard to the portfolio containing all the IPOs, we introduced in the regression two dummy variables: a dummy variable assuming a value of 1 if the IPO is buyout sponsored and 0 otherwise, and a dummy variable assuming a value of 1 if the IPO is VC sponsored and 0 otherwise. We expect both to be positively correlated with the aftermarket performance.

**Controls**

All the eight regressions are controlled for industry fixed effects and country fixed effects. Specifically, following previous literature (e.g. Levis, 2011 and Cao and Lerner, 2009), we believe that controlling for industry effects allows having a better understanding of the correlation between the dependent and the independent variables for several reasons. First, PE funds do not select randomly their investments, but target specific industries more than others. Second, differences in performance might be explained by industry-related characteristics, and not by PE sponsorship. Finally, adding to previous literature, we also control for country effects to capture differences among the countries included in the sample.

**Model diagnostic**

Before running the regression, the soundness of the models was tested in several ways. Therefore, first we investigated potential issues of correlation among the independent variables through the correlation matrix. This tool is used to depict the correlation between pairs of independent variables in a regression.

[17] Similarly to the dot-com bubble period dummy used in Levis (2011).

Another test that is widely adopted before running the regression is multicollinearity, which is the state when independent variables show a very high correlation among them. Multicollinearity is tested through the Variance Inflation Factor (VIF), that is computed as follows:

$$VIF = \frac{1}{(1-R^2)}$$

where $R^2$ is the coefficient of determination and (1- $R^2$) is the tolerance.

Concerning the interpretation of the VIF, several thresholds have been identified in previous literature. Hair et al. (1998) argue that a risk of multicollinearity arises when VIF is higher than 10. However, other scholars argue that multicollinearity issues may arise when VIF is higher than 5. Finally, the choice of the threshold to consider is a choice depending on the intuition of the researcher and the goal of the study. However, the lower the value of VIF the better.

These tests will be performed in order to exclude independent variables that are highly correlated between them, therefore reducing multicollinearity risk in the regression. Results of both tests are reported in the following section.

## 3.3 Empirical results

*A. First-day returns*

Table 5 provides summary statistics for underpricing estimation. As we expected, and consistently with previous literature, we find evidence of positive initial returns across all the IPO groups. However, both buyout and VC-backed IPOs exhibit lower underpricing – 4,69% and 4,67% compared to an average of 12,80% of non-PE-backed IPOs. These results are statistically significant. Therefore we can accept the first hypothesis. Both for buyout and venture capital funds, we find evidence of a "certification role". Internal competencies of the managers, together with the information and knowledge that they have in portfolio companies, enable them to lower underpricing.

| Underpricing | | | | |
|---|---|---|---|---|
| | n | Mean | St. dev. | t |
| **All IPOs** | 1005 | 11,18%*** | 55,23% | 6.41 |
| **Buyout-backed** | 95 | 4,69%*** | 8,21% | 5.54 |
| **VC-backed** | 106 | 4,67%*** | 10,89% | 4.42 |
| **Non-PE-Backed** | 804 | 12,80%*** | 61,43% | 5.91 |

**** Significant at the 0,01 level*
*** Significant at the 0,05 level*
** Significant at the 0,10 level*

*Table 5. Summary statistics and tests of underpricing for the four groups of IPOs.*

*B. Long term performance*

Table 6 provides results of the long-run buy-and-hold abnormal returns.

| Buy-and-hold abnormal returns (BHAR) | | | | |
|---|---|---|---|---|
| Equal-weighted | | | | |
| **Portfolio** | All IPOs | Buyout | VC | Non-PE |
| **12 months** | -8,78***<br>(-4,27) | 5,30<br>(1,07) | -16,88***<br>(-3,09) | -9,35***<br>(-3,89) |
| **24 months** | -25,19***<br>(-8,84) | 7,35<br>(1,12) | -29,14***<br>(-3,89) | -28,67***<br>(-7,91) |
| **36 months** | -24,48***<br>(-11,98) | 6,26<br>(0,90) | -30,73***<br>(-3,49) | -27,37***<br>(-11,30) |

**** Significant at the 0,01 level*
*** Significant at the 0,05 level*
** Significant at the 0,10 level*

*Table 6. Equal-weighted buy-and-hold returns for the four IPO portfolios (with MSCI Europe Index as benchmark). The skewness-adjusted version of the t-statistics (Lyon, Barber and Tsai, 1999) is in parentheses.*

Results are interesting but only partially consistent with previous literature. At an aggregate level, the general hypothesis of long-term underperformance of IPOs is confirmed. Indeed, BHARs for the portfolio of IPOs are negative and significant for all the time periods. Some interesting results arise when we consider the breakdown of the entire sample in three sub-portfolios.

First, we can see that BHARs are positive across all the considered time horizons for the group of buyout-backed IPOs. However, these results lack statistical significance. On the contrary, VC-backed IPOs do not show this path of overperformance, but underperform the portfolio of all the IPOs. Several explanations could be given to explain this underperformance. First, one explanation could be related to timing. As we see in Table A.1, nearly 50% of VC-backed IPOs took place between 2005 and 2007, which are characterized by highly negative long-term abnormal returns (see Table A.1 in the Appendix). Second, this underperformance might be related to the intrinsic characteristics of the deals, such as size. Indeed, VC-backed IPOs are smaller in size than their buyout-backed counterparts. The next section will shed further light on this phenomenon.

*C. Regression results*

In this section, we present the result of the cross-sectional study conducted for the four IPO portfolios. Before analysing the coefficients, as we previously mentioned, we report correlations coefficients of the independent variables (see Appendix for further details on correlation matrices – Tables B1-B4). Independent variables do not exhibit high values of correlation coefficients in none of the regressions that will be performed.

Then, we tested for the statistical phenomenon of multicollinearity by computing the variance inflation factors for all the regressions. No critical issues of multicollinearity arose during the analysis. While all the values of VIF were under the prudential threshold of 5, we conducted further sanity checks on the industry dummy variables. In conclusion, all the values of VIF for the eight regressions were lower than 2. Therefore, we can argue that no issue of multicollinearity concerns our independent variables in the model. Now that we can safely accept the choice of the variables of the regression model, we present the main results of the regressions (Table 7).

As previously mentioned, we divided the sample into four portfolios and, for each of them, we run two separate regressions, following Levis (2011). The first one considers only a set of independent variables related to IPO characteristics at the listing date (market

capitalization, underpricing, buyout and VC sponsorship, crisis dummy), while in the second one we add operating characteristics measured at the end of the first year of the IPO (leverage and asset turnover). We also consider for both regressions of the portfolios of buyout- and VC-backed IPOs a variable (time to exit), that measures the length of the investment.

When we first look at Table 7, we notice the significantly positive coefficient of the Buyout dummy, denoting a positive correlation between the buyout sponsorship and the long-term (36 months) aftermarket performance. On the contrary, the coefficient of the VC dummy is negative but not significant in both regressions. These results are similar to those of Levis (2011), even if the relationship between buyout sponsorship and aftermarket performance seems to be less strong.

Underpricing shows negative coefficients for the group of all the IPOs and the non-PE-backed IPOs, while coefficients are positive for buyout- and VC-backed IPOs. However, coefficients are only significant for regressions (1) and (7), thus confirming the hypothesis that high initial returns are associated with lower long-run performance. These results support Aggarwal and Rivoli (1990), in that high returns in the first-trading day are the result of fads and do not reflect the intrinsic value of the company. Positive coefficients (even though not significant) are related to the lower degree of underpricing of buyout- and VC-backed IPOs, having a lower impact on the long-term performance.

Market capitalization coefficients are positive and significant for all the regressions, except for buyout-backed IPOs. This is consistent with previous literature stating that larger IPOs tend to perform better in the long run.

The variable concerning leverage does not support any positive or negative effect on the long-run performance for any of the portfolios except regression (4). Indeed, leverage coefficient is positive and significant for buyout-backed IPOs. This result is in contrast with Cao and Lerner (2009) but in line with Levis (2011). It confirms the idea that was stated in the previous chapters, that buyout funds use leverage to create value. This result supports the evidence that higher leverage does not lead to a deterioration of price performance in the long run.

| Portfolio | ALL IPOs | | Buyout-backed | | VC-backed | | Non-PE-backed | |
|---|---|---|---|---|---|---|---|---|
| **Time period** | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| **Underpricing** | -0,045**<br>(-2,22) | -0,015<br>(-0,79) | 0,280<br>(0,25) | 0,255<br>(0,25) | 0,492<br>(1,02) | 0,320<br>(0,63) | -0,045**<br>(-2,18) | -0,016<br>(-0,82) |
| **Market cap** | 0,071***<br>(4,11) | 0,060***<br>(3,07) | -0,048<br>(-0,63) | -0,055<br>(-0,76) | 0,113**<br>(2,00) | 0,121**<br>(2,01) | 0,075***<br>(3,92) | 0,062***<br>(2,78) |
| **Leverage** | | 0,162<br>(1,60) | | 0,608**<br>(1,97) | | -0,0002<br>(-0,00) | | 0,083<br>(0,66) |
| **Crisis dummy** | -0,134***<br>(-2,61) | -0,134**<br>(-2,47) | -0,305<br>(-1,54) | -0,334<br>(-1,66) | 0,005<br>(0,04) | 0,009<br>(0,07) | -0,147**<br>(-2,44) | -0,145**<br>(-2,29) |
| **Asset turnover** | | 0,0004<br>(1,42) | | 0,0007<br>(0,53) | | -0,0009<br>(-1,51) | | 0,0005<br>(1,45) |
| **Time to exit** | | | -0,004<br>(-0,21) | -0,022<br>(-0,87) | -0,015<br>(-0,77) | -0,012<br>(-0,59) | | |
| **Buyout dummy** | 0,192**<br>(2,16) | 0,157*<br>(1,78) | | | | | | |
| **VC dummy** | -0,056<br>(-0,72) | -0,041<br>(-0,52) | | | | | | |
| **$R^2$** | 0,0795 | 0,0844 | 0,0721 | 0,1450 | 0,1186 | 0,1292 | 0,0788 | 0,0811 |
| **N. observation** | 880 | 772 | 84 | 83 | 98 | 95 | 698 | 594 |
| **Industry and country effects** | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

**** Significant at the 0,01 level*
*** Significant at the 0,05 level*
** Significant at the 0,10 level*

*Table 7. Regression results. The dependent variable is the three-year BHAR (with MSCI Europe Index as benchmark). On the column on the left, independent variables are reported. Two sets of independent variables are used: characteristics of the IPO (underpricing, market capitalization, crisis dummy, time to exit and PE/VC dummies) and operating characteristics at the end of the first year after the IPO (leverage and asset turnover). All regressions control for industry and country fixed effects. Numbers in parentheses are heteroskedasticity-robust t statistic as in White (1980).*

The coefficients for the crisis dummy, meant as IPOs that occurred between 2005 and 2007, are negative for all the portfolios, except VC-backed IPOs, and are significant for the portfolios of all the IPOs and non-PE-backed IPOs. We can state that IPO activity during those years is associated with a lower aftermarket performance. These results can be attributed to the economic downturn and macroeconomic factors.

Finally, two other variables have been tested. Time-to-exit variable does not provide any evidence both for buyout and VC-backed IPOs: coefficients are negative but lack of statistical evidence. Asset turnover coefficients are positive for all portfolios (in line with the hypothesis that we stated of positive correlation), with the exception of the VC-backed IPOs (regression 6); however, they lack statistical significance.

Some interesting considerations stem from these results. First, in combination with the results of BHARs, it is interesting to reflect on the coefficients of the PE and VC dummies in the first two regressions. Only the PE dummy coefficient is positive and significant, thus showing a positive correlation with performance. It remains an open question to investigate the drivers of VC-backed IPOs performance, which is lower than all the other groups of IPOs. One possible explanation might reside in the coefficient of market capitalization, which is positive. The smaller size of VC-backed IPOs (Table 4) could be an explanation of such underperformance.

Widening the scope of the analysis to the two sets of regressions concerning buyout and VC, it is worth noting that we focused on firm-specific characteristics, without any reference to fund-related variables, such as reputation or size. This represents a limitation of this study, which will be further analysed in the next section.

# Conclusions

The aim of this research was to shed light on the phenomenon of Private Equity-backed IPOs in Europe in the post-crisis period. The work moved from a general analysis of the performance phenomena of IPOs on a sample of PE-backed companies, to an analysis of the determinants of such performance.

While at first the aim of the research was to analyse all the European countries, it appeared evident that the approach of Bergström, Nilsson and Wahlberg (2006) in selecting the most active countries in the PE market was more suitable for the scope of our analysis. The empirical analysis is divided into three inherently connected parties (short term, long term and determinants analysis), which allows to derive interesting results and connections.

The first result of our study provides confirmatory evidence of the role that PE firms play in initial public offerings in reducing underpricing. In our sample, companies backed by buyout and venture capital funds experience lower first-day returns, less than the half relative to non-sponsored IPOs. Importantly, our results provide supporting evidence for the "economically valuable certification" (Cumming, 2012) provided by private equity firms in IPOs.

Second, we investigated long term performance across three different time horizons (one, two and three years). Even if our results provide strong evidence of the phenomenon of general long-term underperformance for all IPOs, the second hypothesis does not find evidence supporting the better performance of IPO sponsored by private equity actors. While buyout-backed IPOs experience positive buy-and-hold abnormal returns but results are not significant, VC-backed IPOs exhibit a significant and severe underperformance across all the considered time horizons.

Finally, we analysed the determinants of such long-term performance, bearing in mind that results cannot be interpreted as evidence of causality. Analysing the coefficients, it is possible to highlight that: (i) IPO size is significantly associated to better aftermarket performance and much of the underperformance of VC-backed IPOs seems to be driven by smaller deals; (ii) leverage is confirmed as a performance driver of buyout deals, validating the positive effect of the use of debt by buyout funds (Jensen, 1989); (iii) IPOs

occurred in the period before the crisis are associated to poorer performance; (iv) buyout sponsorship is positively associated to the aftermarket performance, being a signal for investors in the market at the IPO date.

However, rather than being the final answer to our research questions, these results provide a basis for further reflection. Do VC-backed IPOs underperform because of bad luck or is there any flaw of the European venture capital ecosystem and fund's ability to bring startups public? Or, is this result linked to particular characteristics of the European stock markets? The marked differences in performance between buyout- and VC-backed IPOs provide food for thought and comparisons for practitioners. Industry professionals might question themselves on the possibility to signal the quality of their offerings by different means, taking a cue from buyout funds. We believe that an effective way to reflect upon this point is to jointly consider the European ecosystem for companies and the regulatory environment. Some of these points will be further detailed in the next section.

While this work provided interesting results on the performance and its determinants for European PE-backed IPOs, some limitations were encountered during the research. First, buyout and VC funds are known to have a low level of disclosure on their deals. Some databases track in a more complete manner the private equity activity and could have provided a larger and more significant sample. Similarly, variables concerning fund-related characteristics and fund's involvement could not be studied for the lack of data. However, as we highlighted in the previous chapter, it would be interesting to include these variables in the cross-sectional regression. We believe that the size of IPOs might be related to fund's characteristics – such as size, reputation and number of companies brought public (typically larger IPOs are sponsored by larger funds). This would provide further evidence on the determinants of performance, potentially leading to different results.

Second, results on the long-term performance are highly dependent on the choice of the benchmark. The use of a different benchmark would have led to different results.

Third, even if we selected the most active countries in PE-backed IPOs on the basis of an approach proposed by previous literature, we should be aware of the differences of these countries in terms of economic strength, regulatory requirements and stock market characteristics.

## Suggestions for future research

The focus of this work is the market of European Private Equity-backed IPOs. While this study does not intend to reach a final answer on the nature of this market in Europe, it certainly provides a basis for future research and leaves several questions open.

First, differences in performance between buyout-backed and VC-backed IPOs have emerged. The cross-sectional regression that we performed only partially explains these differences. As a consequence, it would be interesting to investigate the internal processes and undertaken actions that lead to such differences. Most of the studies, including this work, are entirely based on quantitative analysis. Given the particular nature of private equity deals, it could be relevant to include higher degrees of qualitative analysis in order to understand these differences.

Second, the European Private Equity market is not represented by IPOs only. In order to have a clearer picture of exits realized by PE funds, other exit routes should be analysed together with initial public offerings, thus unveiling differences in performance as well as determinants leading to the choice of the exit route. It would be interesting to understand the conditions under which IPO represents the "most profitable exit route", as it is often defined in the literature.

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# Appendix

**Table A.1 Three-year buy-and-hold abnormal returns months by year of issuance**

| Three-year buy-and-hold abnormal returns months by year of issuance | | | | |
|---|---|---|---|---|
| **Portfolio** | All IPOs | Buyout-backed | VC-backed | Non-PE-backed |
| **2005** | -52,72% | 4,56% | -62,57% | -59,87% |
| **2006** | -17,67% | -10,84% | -27,41% | -16,73% |
| **2007** | -37,50% | -16,08% | -14,01% | -42,33% |
| **2008** | -4,34% | - | 4,52% | -4,93% |
| **2009** | 4,09% | - | - | 4,09% |
| **2010** | -36,24% | 39,06% | -63,27% | -40,59% |
| **2011** | -35,50% | 24,45% | -44,45% | -39,40% |
| **2012** | -13,55% | - | -11,75% | -14,27% |
| **2013** | -13,26% | -8,53% | -0,69% | -15,71% |
| **2014** | 5,84% | 17,12% | -29,13% | 9,01% |
| **2015** | -2,99% | 33,18% | -22,70% | -7,20% |
| **2016** | -34,66% | 15,16% | -52,60% | -34,59% |

*Table A.1 Three-year buy-and-hold abnormal returns months by year of issuance. This table provides a breakdown of mean buy-and-hold returns (with MSCI Europe Index as benchmark) for the four IPO portfolios between 2005 and 2016, categorized by year of issuance.*

## Table B.1 Correlation matrix - portfolio of all IPOs

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) | (19) | (20) | (21) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Crisis | 1.0000 | | | | | | | | | | | | | | | | | | | | |
| Buyout | -0.0533 | 1.0000 | | | | | | | | | | | | | | | | | | | |
| VC | -0.0166 | -0.1251 | 1.0000 | | | | | | | | | | | | | | | | | | |
| UND | 0.0441 | -0.0413 | -0.0434 | 1.0000 | | | | | | | | | | | | | | | | | |
| Leverage | -0.0447 | 0.2426 | -0.1147 | -0.0508 | 1.0000 | | | | | | | | | | | | | | | | |
| AT | 0.0358 | 0.0844 | -0.0824 | -0.0287 | 0.0352 | 1.0000 | | | | | | | | | | | | | | | |
| Size | -0.2178 | 0.3328 | -0.0253 | -0.0968 | 0.2168 | 0.0796 | 1.0000 | | | | | | | | | | | | | | |
| Industry1 | 0.0414 | -0.0393 | -0.0500 | -0.0073 | -0.0564 | -0.0988 | -0.0781 | 1.0000 | | | | | | | | | | | | | |
| Industry2 | -0.0658 | 0.0858 | -0.0796 | -0.0247 | 0.0485 | 0.2587 | 0.0803 | -0.1260 | 1.0000 | | | | | | | | | | | | |
| Industry3 | 0.0042 | -0.0048 | -0.0720 | -0.0211 | 0.0710 | 0.0511 | 0.0094 | -0.0566 | -0.0859 | 1.0000 | | | | | | | | | | | |
| Industry4 | -0.0193 | -0.0050 | -0.0424 | -0.0150 | 0.0160 | 0.0295 | -0.0109 | -0.0333 | -0.0505 | -0.0227 | 1.0000 | | | | | | | | | | |
| Industry5 | 0.0217 | -0.0412 | -0.0148 | -0.0148 | -0.0562 | -0.1033 | 0.0132 | -0.0655 | -0.0994 | -0.0446 | -0.0263 | 1.0000 | | | | | | | | | |
| Industry6 | -0.0524 | 0.0157 | -0.1473 | -0.0082 | 0.0549 | -0.1463 | 0.1631 | -0.1237 | -0.1877 | -0.0843 | -0.0496 | -0.0976 | 1.0000 | | | | | | | | |
| Industry7 | -0.0975 | -0.0466 | 0.3637 | -0.0173 | -0.0405 | -0.2081 | -0.0503 | -0.1093 | -0.1658 | -0.0745 | -0.0438 | -0.0862 | -0.1629 | 1.0000 | | | | | | | |
| Industry8 | 0.0817 | 0.0299 | -0.0789 | 0.0504 | 0.0240 | 0.0959 | -0.0219 | -0.1370 | -0.2079 | -0.0934 | -0.0549 | -0.1081 | -0.2042 | -0.1804 | 1.0000 | | | | | | |
| Industry9 | 0.0614 | -0.0646 | 0.1006 | 0.0263 | -0.1002 | 0.0801 | -0.1402 | -0.1265 | -0.1920 | -0.0862 | -0.0507 | -0.0998 | -0.1886 | -0.1666 | -0.2088 | 1.0000 | | | | | |
| Industry10 | 0.0218 | 0.0843 | -0.0289 | 0.0017 | 0.0500 | 0.0339 | 0.0060 | -0.0428 | -0.0649 | -0.0291 | -0.0171 | -0.0337 | -0.0637 | -0.0563 | -0.0706 | -0.0652 | 1.0000 | | | | |
| Industry11 | 0.0312 | -0.0082 | -0.0443 | -0.0074 | 0.0665 | -0.0752 | 0.0398 | -0.0348 | -0.0528 | -0.0237 | -0.0140 | -0.0274 | -0.0519 | -0.0458 | -0.0574 | -0.0530 | -0.0179 | 1.0000 | | | |
| France | 0.0331 | -0.0729 | 0.2712 | -0.0915 | -0.0382 | -0.0658 | -0.0912 | -0.1474 | 0.0148 | 0.0019 | 0.0291 | -0.0816 | -0.1139 | 0.1771 | 0.0135 | 0.0802 | -0.0297 | -0.0011 | 1.0000 | | |
| Germany | 0.0360 | 0.1111 | 0.0239 | -0.0071 | 0.0588 | 0.0165 | 0.2382 | 0.0443 | 0.0009 | -0.0286 | 0.0404 | 0.0298 | 0.0065 | -0.0873 | 0.0359 | -0.0096 | 0.0308 | -0.0504 | -0.2436 | 1.0000 | |
| UK | -0.0555 | -0.0159 | -0.2581 | 0.0864 | -0.0088 | 0.0465 | -0.0918 | 0.0987 | -0.0138 | 0.0190 | -0.0551 | 0.0508 | 0.0964 | -0.0939 | -0.0380 | -0.0642 | 0.0041 | 0.0375 | -0.7109 | -0.5089 | 1.0000 |

## Table B.2 Correlation matrix - portfolio of buyout-backed IPOs

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) | (19) | (20) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Crisis | 1.0000 | | | | | | | | | | | | | | | | | | | |
| UND | 0.1071 | 1.0000 | | | | | | | | | | | | | | | | | | |
| TIME | -0.2630 | -0.0456 | 1.0000 | | | | | | | | | | | | | | | | | |
| Leverage | -0.1190 | -0.0944 | 0.2953 | 1.0000 | | | | | | | | | | | | | | | | |
| AT | 0.1708 | 0.2466 | -0.0264 | -0.1264 | 1.0000 | | | | | | | | | | | | | | | |
| Size | -0.3201 | 0.0460 | 0.0128 | 0.1848 | -0.1613 | 1.0000 | | | | | | | | | | | | | | |
| Industry1 | 0.0177 | -0.0873 | -0.1026 | -0.0443 | 0.1054 | 0.1195 | 1.0000 | | | | | | | | | | | | | |
| Industry2 | -0.1653 | -0.0729 | -0.0295 | 0.0335 | 0.1548 | 0.0437 | -0.1277 | 1.0000 | | | | | | | | | | | | |
| Industry3 | 0.0785 | -0.0685 | 0.0521 | 0.2619 | 0.1015 | 0.0377 | -0.0415 | -0.1099 | 1.0000 | | | | | | | | | | | |
| Industry4 | -0.0995 | 0.0260 | 0.2635 | -0.0077 | 0.0212 | -0.1091 | -0.0237 | -0.0627 | -0.0204 | 1.0000 | | | | | | | | | | |
| Industry5 | 0.0124 | 0.0267 | -0.0086 | -0.1105 | 0.0136 | 0.0727 | -0.0337 | -0.0892 | -0.0290 | -0.0165 | 1.0000 | | | | | | | | | |
| Industry6 | -0.0547 | -0.0047 | -0.0540 | -0.0671 | -0.2771 | -0.0452 | -0.1002 | -0.2655 | -0.0863 | -0.0492 | -0.0700 | 1.0000 | | | | | | | | |
| Industry7 | 0.0663 | 0.0214 | 0.0411 | -0.0320 | -0.1011 | -0.1556 | -0.0649 | -0.1721 | -0.0559 | -0.0319 | -0.0454 | -0.1350 | 1.0000 | | | | | | | |
| Industry8 | 0.1822 | 0.0141 | -0.0042 | -0.1305 | 0.1733 | 0.0106 | -0.1160 | -0.3075 | -0.0999 | -0.0570 | -0.0811 | -0.2413 | -0.1564 | 1.0000 | | | | | | |
| Industry9 | -0.0541 | 0.0954 | 0.1585 | 0.0036 | -0.0422 | -0.0751 | -0.0699 | -0.1851 | -0.0601 | -0.0343 | -0.0488 | -0.1452 | -0.0941 | -0.1682 | 1.0000 | | | | | |
| Industry10 | 0.0695 | 0.0831 | -0.1807 | 0.1882 | -0.1252 | 0.0902 | -0.0542 | -0.1437 | -0.0467 | -0.0266 | -0.0379 | -0.1127 | -0.0730 | -0.1305 | -0.0786 | 1.0000 | | | | |
| Industry11 | -0.0995 | -0.0103 | 0.0491 | 0.0698 | -0.0963 | 0.0520 | -0.0237 | -0.0627 | -0.0204 | -0.0116 | -0.0165 | -0.0492 | -0.0319 | -0.0570 | -0.0343 | -0.0266 | 1.0000 | | | |
| France | 0.0981 | -0.0834 | 0.0671 | -0.1541 | -0.0776 | 0.0197 | -0.0961 | -0.1108 | -0.0828 | 0.2462 | 0.1415 | -0.0343 | 0.1005 | 0.0714 | -0.0311 | 0.0263 | -0.0472 | 1.0000 | | |
| Germany | 0.1268 | -0.0922 | -0.2326 | -0.0515 | -0.0730 | 0.1114 | 0.2417 | 0.0110 | 0.0296 | -0.0646 | -0.0920 | -0.1356 | -0.1773 | 0.0616 | 0.0798 | 0.0759 | -0.0646 | -0.2625 | 1.0000 | |
| UK | -0.1861 | 0.1442 | 0.1576 | 0.1604 | 0.1228 | -0.1140 | -0.1442 | 0.0725 | 0.0351 | -0.1254 | -0.0232 | 0.1464 | 0.0835 | -0.1080 | -0.0481 | -0.0873 | 0.0928 | -0.5091 | -0.6969 | 1.0000 |

## Table B.3 Correlation matrix - portfolio of VC-backed IPOs

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Crisis | 1.0000 | | | | | | | | | | | | | | | | |
| UND | 0.0770 | 1.0000 | | | | | | | | | | | | | | | |
| TIME | -0.1364 | -0.0219 | 1.0000 | | | | | | | | | | | | | | |
| Leverage | -0.1440 | -0.0021 | -0.0140 | 1.0000 | | | | | | | | | | | | | |
| AT | 0.2205 | -0.1174 | -0.0037 | 0.0196 | 1.0000 | | | | | | | | | | | | |
| Size | -0.0086 | 0.1508 | -0.0038 | -0.0455 | 0.1072 | 1.0000 | | | | | | | | | | | |
| Industry1 | 0.0964 | 0.1561 | -0.0512 | -0.0384 | -0.0979 | -0.0654 | 1.0000 | | | | | | | | | | |
| Industry2 | -0.0090 | -0.0964 | -0.0752 | -0.0553 | 0.4520 | 0.1530 | -0.0608 | 1.0000 | | | | | | | | | |
| Industry3 | 0.0964 | 0.0234 | -0.1586 | -0.0432 | 0.0672 | 0.0334 | -0.0421 | -0.0608 | 1.0000 | | | | | | | | |
| Industry4 | 0.0980 | -0.0491 | 0.0078 | -0.0404 | 0.0476 | 0.0982 | -0.0207 | -0.0300 | -0.0207 | 1.0000 | | | | | | | |
| Industry5 | -0.2915 | -0.2517 | 0.0321 | 0.0654 | -0.4817 | -0.0312 | -0.1873 | -0.2707 | -0.1873 | -0.0922 | 1.0000 | | | | | | |
| Industry6 | 0.1240 | 0.3074 | 0.0281 | 0.0430 | 0.1124 | 0.2712 | -0.0688 | -0.0994 | -0.0688 | -0.0339 | -0.3060 | 1.0000 | | | | | |
| Industry7 | 0.1197 | 0.0599 | 0.1069 | -0.0137 | 0.1859 | -0.2383 | -0.1225 | -0.1769 | -0.1225 | -0.0603 | -0.5448 | -0.2000 | 1.0000 | | | | |
| Industry8 | 0.0980 | 0.0219 | -0.1045 | -0.0436 | 0.0225 | -0.0655 | -0.0207 | -0.0300 | -0.0207 | -0.0102 | -0.0922 | -0.0339 | -0.0603 | 1.0000 | | | |
| France | -0.1784 | -0.2777 | 0.1308 | -0.1015 | -0.0382 | -0.3189 | -0.2390 | -0.0454 | -0.2390 | -0.1177 | 0.1679 | -0.1192 | 0.1872 | -0.1177 | 1.0000 | | |
| Germany | 0.3345 | 0.0984 | -0.0524 | -0.0676 | 0.0640 | 0.0667 | 0.1786 | -0.0367 | 0.1786 | 0.2219 | -0.1467 | 0.2029 | -0.1500 | -0.0460 | -0.5304 | 1.0000 | |
| UK | -0.0874 | 0.2305 | -0.1033 | 0.1741 | -0.0122 | 0.3049 | 0.1169 | 0.0836 | 0.1169 | -0.0587 | -0.0637 | -0.0405 | -0.0827 | 0.1738 | -0.6771 | -0.2646 | 1.0000 |

## Table B.4 Correlation matrix - portfolio of non-PE-backed IPOs

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) | (19) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Crisis | 1.0000 | | | | | | | | | | | | | | | | | | |
| UND | 0.0423 | 1.0000 | | | | | | | | | | | | | | | | | |
| Leverage | -0.0010 | -0.0540 | 1.0000 | | | | | | | | | | | | | | | | |
| AT | -0.0036 | -0.0344 | 0.0357 | 1.0000 | | | | | | | | | | | | | | | |
| Size | -0.2222 | -0.0995 | 0.1702 | 0.0786 | 1.0000 | | | | | | | | | | | | | | |
| Industry1 | 0.0343 | -0.0146 | -0.0586 | -0.1220 | -0.0855 | 1.0000 | | | | | | | | | | | | | |
| Industry2 | -0.0538 | -0.0243 | 0.0294 | 0.2453 | 0.0509 | -0.1342 | 1.0000 | | | | | | | | | | | | |
| Industry3 | -0.0068 | -0.0253 | 0.0395 | 0.0426 | 0.0107 | -0.0653 | -0.0928 | 1.0000 | | | | | | | | | | | |
| Industry4 | -0.0130 | -0.0187 | 0.0193 | 0.0292 | 0.0012 | -0.0384 | -0.0546 | -0.0266 | 1.0000 | | | | | | | | | | |
| Industry5 | 0.0095 | -0.0200 | -0.0444 | -0.1331 | 0.0252 | -0.0734 | -0.1043 | -0.0507 | -0.0299 | 1.0000 | | | | | | | | | |
| Industry6 | -0.0642 | -0.0155 | 0.0678 | -0.1571 | 0.2027 | -0.1419 | -0.2016 | -0.0980 | -0.0577 | -0.1102 | 1.0000 | | | | | | | | |
| Industry7 | -0.0705 | 0.0111 | -0.0099 | -0.1445 | -0.0397 | -0.0916 | -0.1303 | -0.0633 | -0.0373 | -0.0712 | -0.1377 | 1.0000 | | | | | | | |
| Industry8 | 0.0632 | 0.0466 | 0.0373 | 0.0743 | -0.0629 | -0.1501 | -0.2134 | -0.1037 | -0.0611 | -0.1166 | -0.2255 | -0.1456 | 1.0000 | | | | | | |
| Industry9 | 0.0623 | 0.0291 | -0.1089 | 0.0942 | -0.1219 | -0.1319 | -0.1875 | -0.0912 | -0.0537 | -0.1025 | -0.1982 | -0.1280 | -0.2097 | 1.0000 | | | | | |
| Industry10 | 0.0088 | 0.0020 | -0.0183 | 0.0623 | -0.0445 | -0.0422 | -0.0600 | -0.0291 | -0.0172 | -0.0328 | -0.0634 | -0.0409 | -0.0670 | -0.0589 | 1.0000 | | | | |
| Industry11 | 0.0464 | -0.0103 | 0.0731 | -0.0809 | 0.0470 | -0.0404 | -0.0574 | -0.0279 | -0.0164 | -0.0313 | -0.0606 | -0.0392 | -0.0641 | -0.0564 | -0.0180 | 1.0000 | | | |
| France | 0.0693 | -0.0869 | 0.0502 | -0.0392 | -0.0600 | -0.1353 | 0.0754 | 0.0352 | 0.0251 | -0.0762 | -0.0861 | 0.0612 | 0.0554 | 0.0315 | -0.0168 | 0.0177 | 1.0000 | | |
| Germany | -0.0216 | -0.0018 | 0.0789 | 0.0168 | 0.2524 | 0.0123 | -0.0058 | -0.0367 | 0.0636 | 0.0299 | 0.0271 | -0.0815 | 0.0096 | 0.0117 | 0.0152 | -0.0506 | -0.2031 | 1.0000 | |
| UK | -0.0448 | 0.0766 | -0.0991 | 0.0221 | -0.1261 | 0.1086 | -0.0613 | -0.0047 | -0.0666 | 0.0449 | 0.0555 | 0.0044 | -0.0547 | -0.0356 | 0.0039 | 0.0204 | -0.7232 | -0.5293 | 1.0000 |

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# Does Private Equity sponsorship affect post-IPO performance?

## Empirical evidence from European stock markets

## (Summary)

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# Introduction

This research is aimed at investigating whether Private Equity sponsorship has an effect on the aftermarket performance of European initial public offerings. The Private Equity market has experienced incredible growth in the past decades, reaching a record $4,11 trillion of assets under management in 2019 (Preqin, 2020), gaining the attention of the press and scholars over years. Over the last decades, scholars have sought to uncover the effect on the performance of private equity sponsorship. While most of the studies are focused on US and UK markets, last decades have witnessed increasing attention to European countries, alongside an increase in private equity transactions.

Several studies are strictly relevant to this dissertation. Finance literature (e.g. Logue, 1973; Ibbotson, 1975; Ritter, 1991) provides a general framework for our analysis: underpricing and long-term underperformance are well-documented phenomena. Seminal contributions have been made by Muscarella and Vetsuypens (1990), documenting the improvement in the operating performance in reverse LBOs. Scholars have argued that the involvement of a PE sponsor contributes to having closer monitoring and lower information asymmetries (e.g. Kaplan and Stein, 1993; Jensen, 1989). There have been numerous studies to investigate the aftermarket performance of PE-backed IPOs, with a large consensus on the positive impact of both buyout sponsorship (Levis, 2011; Cao and Lerner, 2009; Von Drathen and Faleiro, 2007) and VC sponsorship (Von Drathen, 2007; Gompers and Lerner, 1999; Brav and Gompers, 1997).

The purpose of this study is to investigate the performance of Private Equity-backed IPOs in Europe. To address this problem, we study the performance of 1026 European PE-backed (both buyout and venture capital) and non-PE-backed IPOs between 1st January 2005 and 31st December 2016. With this sample, we run three studies in order to shed light on the topic: (i) a short-run analysis on underpricing; (ii) a long-run analysis through an event study approach; and (iii) a cross-sectional regression to identify key variables impacting performance. Building upon an established stream of literature, the main contribution of this paper is twofold. First, following the studies of Povaly (2006) and Bergström, Nilsson and Wahlberg (2006) we adopt a European perspective, which is uncommon for these studies, that commonly adopt a national perspective. Second, very few studies take into account the post-crisis period. Therefore, we decided to cover a wider time period, in order to include data of the years before the global financial crisis.

# Chapter I

# An overview on Private Equity

This chapter provides a background on Private Equity funds in order to understand the outline of the analysis. Relying both on academic literature and practical evidence, the main features of Private Equity and PE funds are discussed.

## 1.1 Private Equity background

There is no consensus among researchers on the definition of Private Equity. It can be defined as an alternative investment class and a medium/long-term investment, in which mainly accredited investors invest directly in private companies or engage buyout of publicly listed companies. It is also an alternative form of financing for private companies that do not intend to go public. The Private Equity market is an important source of funds for private firms, both small startups and big companies, and for publicly traded firms looking for buyout financing (Fenn, Liang and Prowse, 1997). Private Equity appears as a broad category, that includes different forms of investment. Several classifications have been proposed by scholars over the past decades (Stowell, 2013; Cumming, 2012; Metrick, 2006). For the scope of the analysis, adopting a comprehensive approach of past literature, the following classification is proposed (Figure 1).

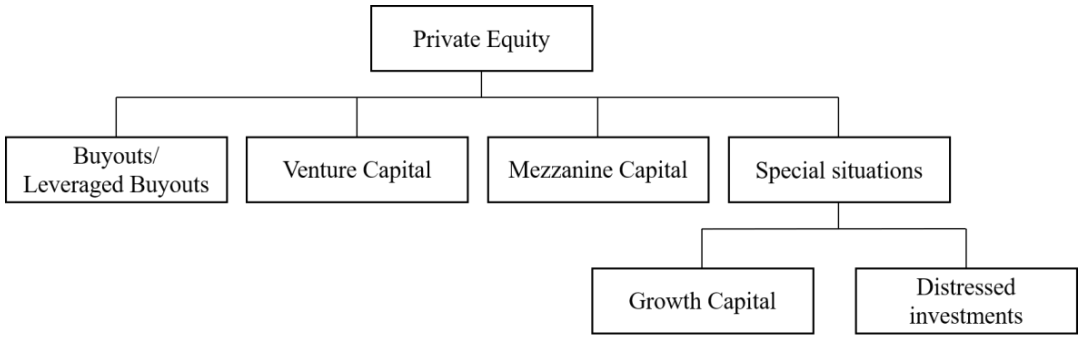


*Figure 1. Classification of different Private Equity investments.*

It is worth pointing out the main differences between Leveraged buyouts and VC since they represent the two most important subsets. First, while their definitions have some similarities, buyout funds typically invest in mature companies in traditional sectors, while VCs targets young companies in high technology sectors. Second, buyout funds usually acquire a majority stake, while VCs acquire minority stakes. Third, differently from VCs, buyout investments are realized with large use of leverage.

## 1.2 Private Equity business model

PE funds are typically organised as limited partnerships (Prowse, 1998), as a solution to the problem of information asymmetry that characterizes private equity investments. Figure 2 shows the typical structure of Private Equity funds. General Partners are the members of the Private Equity firm responsible for the investments made by the fund in the interest of investors. In order to align the interests of the GPs with those of the investors and to avoid opportunistic behaviours (moral hazard), they are required to invest at least 1% of the fund's capital. The remuneration of GPs is composed of a fixed part (management fee) and a variable part (carried interests). Limited Partners consist of institutional investors, such as banks, pension funds and insurance companies, wealthy individuals and other investors.

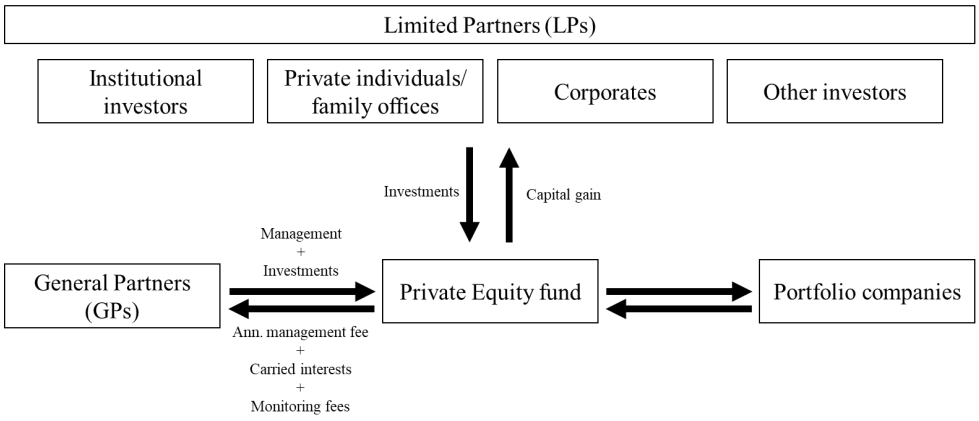


*Figure 2. Structure of Private Equity funds.*

## 1.3 A focus on Leveraged Buyouts

Leveraged Buyouts represents the most important investment activities within PE investments and are referred to as transactions in which "a company is acquired by a specialized investment firm using a relatively small portion of equity and a relatively large portion of outside debt financing" (Kaplan and Strömberg, 2009). The investment process of a buyout consists of four stages: (i) Target selection, (ii) Due diligence & deal structuring, (iii) Post-acquisition management and (iv) Exit (Loos, 2007). Kaplan and Strömberg (2009) identify three different categories of changes done by PE funds during the ownership period, that are not mutually exclusive, which are: financial engineering, governance intervention and operational improvements.

Financial engineering is referred to both the financial structure and the financial accounting of the company (Baker, Filbeck and Kiymaz, 2015). Financial leverage has a positive effect on value creation via two different effects: interest tax shield (Berk and DeMarzo, 2017) and the mortgage effect (Baker, Filbeck and Kiymaz, 2015).

Governance interventions mainly consist of restructuring the governance of the target company. Jensen (1986 and 1989) argues that LBOs create value because the governance structure adopted as a result of this type of operations provides incentives for managers to operate efficiently (Liebeskind, Wiersema and Hansen, 1992)

Finally, with regard to operational improvements, PE firms develop knowledge of the sector in order to make the operations of target companies more efficient. Operational improvements can be achieved through several actions, such as a reduction of corporate overheads through layoffs and divestitures (Holthausen and Larcker, 1996).

## 1.4 Typical Exit routes for PE funds

The exit phase is crucial and represents the way in which the PE fund cashes out investments. Generally, three different exit strategies for PE funds can be identified: trade sale, secondary buyout and Initial Public Offering (IPO) (Stowell, 2013; Povaly, 2006).

Trade sale is the most common exit route and involves selling the portfolio company to a strategic counterparty. It generally allows to charge a higher price and to conduct faster and cheaper negotiations (Baker, Filbeck and Kiymaz, 2015).

Secondary buyout occurs when the portfolio company is sold to another financial sponsor. Potential reasons underlying the choice of a secondary buyout are: (i) the need for a larger financial sponsor, (ii) the need to exit the investment rapidly and (iii) the need to exit the investment because of the lack of the necessary means.

Initial Public Offering (IPO) is the most complex way to exit an investment for PE funds, because of the regulatory requirements, the high fixed costs and the length of this type of exit (due to lock-up contractual provisions). However, IPOs are often considered as the most profitable exit route (Schmidt, Steffen and Szabo, 2010). While not every company is suitable for an IPO, favourable economic conditions are necessary for a successful listing (Jenkinson and Sousa, 2015; Smith, Pedace, and Sathe, 2011; Schmidt, Steffen and Szabo, 2010).

# Chapter II

# PE-backed IPOs: literature review and research hypotheses

The purpose of this chapter is to analyse past studies on the topic of Private Equity-backed IPOs. Private Equity exit activity is analysed within the theoretical framework of the agency theory, to understand the reasons underlying the existence (or non-existence) of performance patterns of PE-backed IPOs.

## 2.1 Agency theory as a framework to explain PE exit activity

Agency theory is often used as a theoretical framework to explain private equity investments and exit (Povaly, 2006). In the context of Private Equity, Jensen (1989) argues that buyout can significantly attenuate conflicts, focusing the analysis on the role of debt. Therefore, managers are forced to use free cash flow to repay debt, while restructuring the organization to reduce inefficiencies. Other scholars (e.g. Kaplan and Stein, 1993) argue that in most of the buyouts a portion of the equity is owned by management, as incentive and alignment instrument. Figure 3 shows the potential conflicts arising in the PE context in light of the agency theory (Cumming and MacIntosh, 2003; Sahlman, 1990).

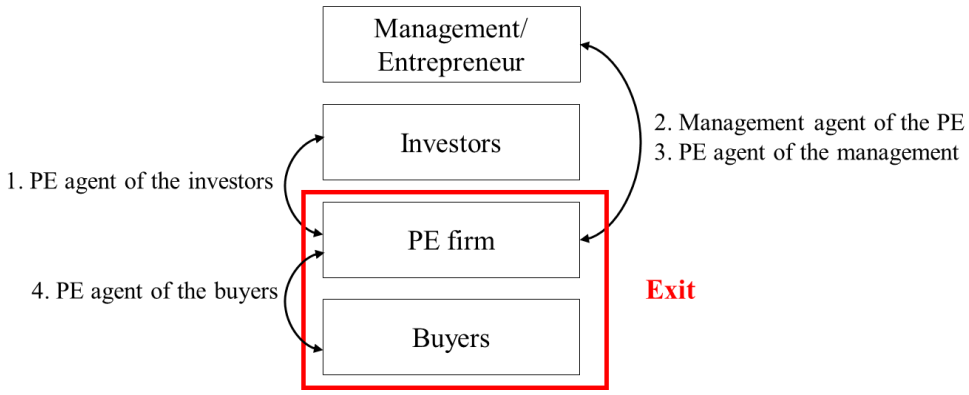


*Figure 3. Agency problem in the PE context. Own elaboration based on Povaly (2006).*

While, according to the agency theory, at the time of the exit we might expect a decline in performance, Bruton, Keels and Scifres (2002) find that it takes generally three years to observe a decline in profitability and an increase in inefficiencies. Finally, scholars have highlighted the importance for private equity firms of avoiding opportunistic behaviours at the time of the exit to establish a good reputation (Povaly, 2006; Lin and Smith, 1998).

## 2.2 Performance phenomena in IPOs

Two performance phenomena have been reported in the academic literature on IPOs: underpricing and long-run underperformance.

Underpricing is the "issue of securities below their market value" and can be defined as the excess return experienced by companies at the end of their first trading day (Brealey, Myers, Allen and Mohanty, 2012). Several streams of research emerged, resulting in multiple explanations of the underpricing phenomenon. A distinction can be made between models in which underpricing is a voluntary strategy and those in which underpricing derives from the interactions of the different parties involved in the IPO.

Despite the high returns on the first day of listing, there is evidence of negative returns compared to the market in the long run. Several explanations have been proposed. Aggarwal and Rivoli (1990), contrary to the widespread hypothesis that IPOs are priced below the intrinsic value, argue that the long-run underperformance is determined by the overvaluation of IPOs in the early aftermarket and that initial prices reflect the intrinsic value. Ritter (1991) proposes that markets are characterized by fads and firms going public during high volume periods are more likely to underperform in the long run (*window of opportunity hypothesis*).

A large number of empirical studies have investigated the performance of PE-backed IPOs, generally pointing out the superior performance of PE sponsored relative to non-PE sponsored IPOs. Emphasis must be placed on the role of "active investors" of Private Equity firms (Jensen, 1989). Moreover, a bulk of studies investigate the factors driving the outperformance of PE-backed IPOs. Variables, as shown in Figure 4, have been clustered into three categories.

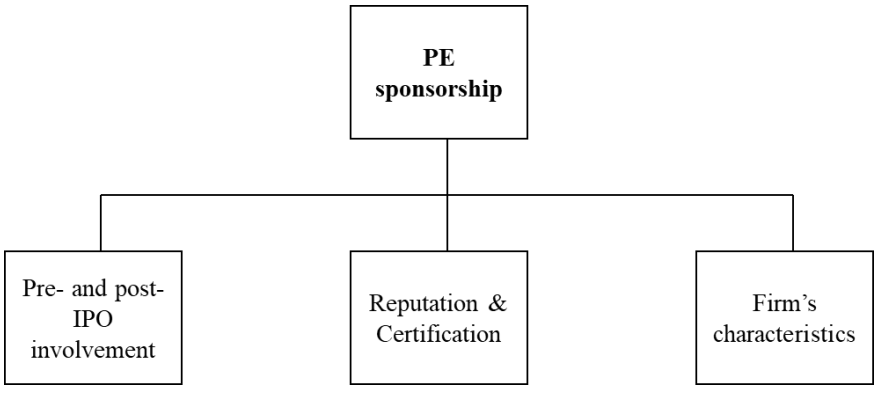


*Figure 4. PE Sponsorship – Variable families from previous studies. Own elaboration.*

## 2.3 Hypotheses statement

As aforementioned, prior research suggests that IPOs show specific performance patterns (underpricing and long-term underperformance). While several studies were conducted in the US and the UK and in many European countries, no previous academic study has investigated in a comprehensive manner the phenomenon of PE-backed IPOs at the European level after the global financial crisis. To fill this literature gap, this study analyses the performance of European PE-backed IPO and, following the approach of Bergström, Nilsson and Wahlberg (2006), we include in our sample the three largest European PE markets: UK, France and Germany.

While the phenomenon of underpricing is a widely accepted phenomenon in literature, we believe that, because of the PE sponsorship, PE-backed IPOs should experience less underpricing than their non-PE-backed counterparts. As a result, the first hypothesis is the following:

> ***Hypothesis 1.*** *PE-backed IPOs (buyout-backed and venture capital-backed) have lower first-day returns than Non-PE-backed IPOs.*

Also, PE investors do not fully exit their investment at the IPO date (Cao, 2008) and are interested in the long-run performance of the newly listed company, potentially continuing to be involved in the company. In light of these considerations, the second hypothesis is formalized as follows:

> ***Hypothesis 2.*** *PE-backed IPOs (buyout-backed and venture capital-backed) have better long-run performance than Non-PE-backed IPOs over all the considered time horizons (12 months, 24 months and 36 months).*

These two research hypotheses allow investigating both the short-term and long-term performance, in order to identify specific performance patterns related to PE sponsorship. Finally, a cross-sectional regression analysis is performed in order to investigate the relationship between the aftermarket performance of the four groups of IPOs and a number of variables taken from previous literature, that will be discussed more extensively in the following paragraphs.

# Chapter III

# Econometric model and empirical analysis

## 3.1 Data collection and sample description

This study uses a sample of 1026 IPOs of European – UK, France and Germany - firms listed on European stock exchanges, from 01.01.2005 to 31.12.2016.

Several steps were required to create the dataset and more than one database was used. Firstly, a list of all the IPOs that took place in UK, France and Germany between 01.01.2005 and 31.12.2016 was extracted from Thomson Reuters. We excluded from the sample relistings and investment trusts. Missing values in the dataset were retrieved from Zephyr. Subsequently, additional data on the sponsorship of the IPO by a buyout or a VC fund were collected on Thomson ONE. We separate buyout deals and venture capital deals. In order to have a representative sample, only companies backed by Private Equity firms (and not other investment companies) were considered. In addition, real estate investments were excluded from the sample as well. Buyout-backed IPOs are companies with at least one buyout investment, while VC-backed IPOs are companies with at least one venture capital investment (including startup/seed, early, expansion and later stage). Finally, daily stock prices and financial information were retrieved from Datastream.

The final sample is composed by 1026 IPOs, that are divided into four different portfolios: (i) 1026 IPOs (All IPOs); (ii) 96 buyout-backed IPOs (Buyout); (iii) 110 venture capital-backed IPOs (VC); (iv) 820 Non-PE-backed IPOs (Non-PE).

Regarding the annual distribution of the sample, it is interesting to note that the most intense IPO activity is concentrated in the period between 2005 and 2007. Following the global financial crisis, IPO activity dramatically dropped in 2008 and 2009. The drop was particularly important for buyout and VC backed IPOs. It is possible to argue that, due to the unfavourable market conditions and uncertainty in the market, private equity firms were deterred to exit their investments via IPO in the years immediately after the crisis. Regarding the distribution of the sample by industry, we notice that the majority of buyout-backed IPOs concerns traditional and mature sectors (e.g. consumer cyclicals and industrials), while VC-backed IPOs typically take place in sectors characterized by fast pace innovation and greater instability (e.g. healthcare and technology). Finally, the median value of the market capitalization of buyout-backed IPOs is larger than the other

groups, with results that are in line with those of Cao and Lerner (2009). Also, leverage is greater for buyout-backed IPOs and lower for VC deals, that typically do not involve the use of debt as a value creation leverage.

## 3.2 Methodology

First, we test underpricing to shed light on the first hypothesis, seeking to find evidence of a role of private equity funds in the reduction of first-day returns, by comparing PE-backed and non-PE-backed IPOs. Underpricing is computed using the following formula:

$$Underpricing = \frac{(First\text{-}day\ closing\ price - Offer\ price)}{Offer\ price}$$

Second, using an event study approach, long-term returns are calculated to investigate the second hypothesis of overperformance of PE-backed IPOs relative to their non-sponsored counterparts. Previous literature on IPOs reports different methods to compute abnormal returns, namely Cumulative abnormal returns (CAR) and Buy-and-hold abnormal returns (BHAR). Generally, for longer observation periods, scholars use BHARs to measure investors' returns (see Lyon, Barber and Tsai, 1999; Barber and Lyon, 1997; Ritter, 1991). For the scope of our study we decided to compute BHARs, using the following formula:

$$BHAR_{i,T} = \left[\prod_{t=1}^{T}(1 + r_{i,t}) - 1\right] - \left[\prod_{t=1}^{T}(1 + r_{b,t}) - 1\right]$$

where $r_{i,t}$ is the raw return of firm i in period t and $r_{b,t}$ is the benchmark return in the same period. We use as a benchmark the MSCI Europe Index.

In the computation of long-term performance measure, we exclude first-day returns, as in Levis (2011) and Bergström, Nilsson, and Wahlberg (2006), in order not to take into account price phenomena that do not reflect the intrinsic value of the firm.

Finally, in order to take into account the well-known phenomenon in the literature of right-skewness of BHARs, we test the significance of our results with the skewness-adjusted version of the t-statistics as proposed by Lyon, Barber and Tsai (1999):

$$t - stat = \sqrt{n}\,(S + \frac{1}{3}\hat{\gamma}S^2 + \frac{1}{6n}\hat{\gamma})$$

with

$$S = \frac{\overline{BHAR}}{\sigma(BHAR)} \qquad \hat{\gamma} = \frac{\sum_{i=1}^{n}(BHAR_i - \overline{BHAR})^3}{n\sigma(BHAR)^3}$$

where S is the ratio between the sample mean of buy-and-hold abnormal returns and the cross-sectional sample standard deviation, and γ is an estimate of the skewness coefficient.

Finally, a cross-sectional regression is performed in order to investigate relationships between the long-performance and a number of variables. Following the approach of Viviani, Giorgino and Steri (2008), we use the 36 months BHAR as dependent variable of our regression model. Eight separate regressions are performed for the four different portfolios of IPOs. Following the approach of Levis (2011), we perform the following regressions:

Portfolio 1 (All IPOs):

$$BHAR36m = \beta_0 + \beta_1 UND + \beta_2 SIZE + \beta_3 Crisis + \beta_4 PE + \beta_5 VC + Controls$$

$$BHAR36m = \beta_0 + \beta_1 UND + \beta_2 SIZE + \beta_3 Crisis + \beta_4 LEV + \beta_5 AT + \beta_6 PE + \beta_7 VC + Controls$$

Portfolio 2 (buyout-backed IPOs):

$$BHAR36m = \beta_0 + \beta_1 UND + \beta_2 SIZE + \beta_3 Crisis + \beta_4 TIME + Controls$$

$$BHAR36m = \beta_0 + \beta_1 UND + \beta_2 SIZE + \beta_3 LEV + \beta_4 Crisis + \beta_5 AT + \beta_6 TIME + Controls$$

Portfolio 3 (VC-backed IPOs):

$$BHAR36m = \beta_0 + \beta_1 UND + \beta_2 SIZE + \beta_3 Crisis + \beta_4 TIME + Controls$$

$$BHAR36m = \beta_0 + \beta_1 UND + \beta_2 SIZE + \beta_3 LEV + \beta_4 Crisis + \beta_5 AT + \beta_6 TIME + Controls$$

Portfolio 4 (non-PE-backed IPOs):

$$BHAR36m = \beta_0 + \beta_1 UND + \beta_2 SIZE + \beta_3 Crisis + Controls$$

$$BHAR36m = \beta_0 + \beta_1 UND + \beta_2 SIZE + \beta_3 LEV + \beta_4 Crisis + \beta_5 AT + Controls$$

**Independent variables**

*Initial returns (UND).* As we have seen in the previous chapter, IPOs that are strongly underpriced (high initial returns) tend to perform poorly in the long run. We expect a negative correlation with long-term performance.

*Market capitalization (SIZE).* Market capitalization is measured at the IPO date. In the regression, the logarithm of the market capitalization is used, in order to reduce the influence of outliers. A large consensus can be found in the literature that larger IPOs have a better performance in the long run.

*Financial leverage (LEV).* Financial leverage is computed as the ratio between total debts and total assets and is measured at the end of the first year after the IPO. We expect that leverage is positively correlated to buyout-backed IPOs performance, and to have a negative or no correlation for all the other groups.

*Asset turnover.* Asset turnover is computed as the ratio between total sales and total assets and provides a measure of the efficiency of the company. Therefore, we expect that higher levels of asset turnover are associated with better aftermarket performance.

*Time to exit (TIME).* It measures the length of the fund's investment in the company and is a proxy of the fund's efforts in the restructuring (Cao, 2011). Based on Levis (2011), we expect the length of the investment to have a positive or neutral impact on performance.

*Financial crisis dummy (Crisis).* As we consider the year 2007 as a break in the financial market, the dummy variable takes a value of 1 for IPOs that occurred between 2005 and 2007, and 0 otherwise.

*PE and VC dummy.* With regard to the portfolio containing all the IPOs, we introduced in the regression two dummy variables corresponding to the sponsorship of a buyout or a VC fund. We expect both to be positively correlated with the aftermarket performance.

**Controls and model diagnostic**

Following previous literature (Levis, 2011 and Cao and Lerner, 2009), the regressions are controlled for industry fixed effects and country fixed effects. Moreover, before running the regression, the soundness of the models was tested in several ways. Therefore, first we investigated potential issues of correlation among the independent variables through the correlation matrix, in order to depict the correlation between pairs of independent variables. Then, we tested for multicollinearity analysing the values of the VIF.

## 3.3 Empirical results

*A. First-day returns*

Consistently with previous literature, we find evidence of positive initial returns across all the IPO groups (Table 1). However, both buyout and VC-backed IPOs exhibit lower underpricing – 4,69% and 4,67% compared to an average of 12,80% of non-PE-backed IPOs. These results are statistically significant. Thus, we can accept the first hypothesis that supports the existence of a "certification role" of both for buyout and VC funds.

| Underpricing | | | | |
|---|---|---|---|---|
| | n | Mean | St. dev. | t |
| **All IPOs** | 1005 | 11,18%*** | 55,23% | 6.41 |
| **Buyout-backed** | 95 | 4,69%*** | 8,21% | 5.54 |
| **VC-backed** | 106 | 4,67%*** | 10,89% | 4.42 |
| **Non-PE-Backed** | 804 | 12,80%*** | 61,43% | 5.91 |

**** Significant at the 0,01 level; ** Significant at the 0,05 level; * Significant at the 0,10 level*

*Table 1. Summary statistics and tests of underpricing for the four groups of IPOs.*

*B. Long term performance*

| Buy-and-hold abnormal returns (BHAR) | | | | |
|---|---|---|---|---|
| **Equal-weighted** | | | | |
| **Portfolio** | All IPOs | Buyout | VC | Non-PE |
| **12 months** | -8,78*** | 5,30 | -16,88*** | -9,35*** |
| | (-4,27) | (1,07) | (-3,09) | (-3,89) |
| **24 months** | -25,19*** | 7,35 | -29,14*** | -28,67*** |
| | (-8,84) | (1,12) | (-3,89) | (-7,91) |
| **36 months** | -24,48*** | 6,26 | -30,73*** | -27,37*** |
| | (-11,98) | (0,90) | (-3,49) | (-11,30) |

**** Significant at the 0,01 level; ** Significant at the 0,05 level; * Significant at the 0,10 level*

*Table 2. Equal-weighted buy-and-hold abnormal returns (benchmark: MSCI Europe Index). The skewness-adjusted version of the t-statistics (Lyon, Barber and Tsai, 1999) is in parentheses.*

Table 2 provides results of the long-run buy-and-hold abnormal returns. Results are interesting but only partially consistent with previous literature. At an aggregate level, the general hypothesis of long-term underperformance of IPOs is confirmed. Some interesting results arise when we consider the breakdown of the entire sample in three sub-portfolios. First, we can see that BHARs are positive across all the considered time horizons for the group of buyout-backed IPOs. However, these results lack statistical significance. On the contrary, VC-backed IPOs do not show this path of overperformance, but underperform the portfolio of all the IPOs. Several explanations could be given to explain this underperformance. First, one explanation could be related to timing, since nearly 50% of VC-backed IPOs took place between 2005 and 2007, which are characterized by highly negative long-term abnormal returns. Second, this underperformance might be related to the intrinsic characteristics of the deals, such as size. Indeed, VC-backed IPOs are smaller in size than their buyout-backed counterparts.

*C. Regression results*

Before presenting the results of the regressions, it is worth mentioning that no issue of correlation between independent variables and multicollinearity arose in the preliminary controls.

When we first look at Table 3, we notice the significantly positive coefficient of the Buyout dummy, denoting a positive correlation between the buyout sponsorship and the long-term (36 months) aftermarket performance. On the contrary, the coefficient of the VC dummy is negative but not significant in both regressions. Then, underpricing shows negative coefficients for the group of all the IPOs and the non-PE-backed IPOs, while coefficients are positive for buyout- and VC-backed IPOs. However, coefficients are only significant for regressions (1) and (7), supporting that high initial returns are associated with lower long-run performance. Positive coefficients (even though not significant) are related to the lower degree of underpricing of buyout- and VC-backed IPOs, having a lower impact on the long-term performance.

Market capitalization coefficients are positive and significant for all the regressions, except for buyout-backed IPOs. This is consistent with previous literature stating that larger IPOs tend to perform better in the long run. The variable concerning leverage does not support any positive or negative effect on the long-run performance for any of the portfolios except regression (4). Indeed, leverage coefficient is positive and significant for buyout-backed IPOs. This result is in contrast with Cao and Lerner (2009), but in line with Levis (2011). It confirms the idea that was stated in the previous chapters, that buyout funds use leverage to create value.

The crisis dummy shows negative coefficients in all regressions (except regressions 5 and 6), indicating that IPO activity between 2005-2007 can be associated with a lower performance. These results can be attributed to the economic downturn and macroeconomic factors. Finally, two other variables have been tested. Time-to-exit variable does not provide any evidence both for buyout and VC-backed IPOs: coefficients are negative but lack of statistical evidence. Asset turnover coefficients are positive for all portfolios (in line with the hypothesis that we stated of positive correlation), with the exception of the VC-backed IPOs (regression 6); however, they lack statistical significance.

| Portfolio | ALL IPOs | | Buyout-backed | | VC-backed | | Non-PE-backed | |
|---|---|---|---|---|---|---|---|---|
| **Time period** | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| **Underpricing** | -0,045**<br>(-2,22) | -0,015<br>(-0,79) | 0,280<br>(0,25) | 0,255<br>(0,25) | 0,492<br>(1,02) | 0,320<br>(0,63) | -0,045**<br>(-2,18) | -0,016<br>(-0,82) |
| **Market cap** | 0,071***<br>(4,11) | 0,060***<br>(3,07) | -0,048<br>(-0,63) | -0,055<br>(-0,76) | 0,113**<br>(2,00) | 0,121**<br>(2,01) | 0,075***<br>(3,92) | 0,062***<br>(2,78) |
| **Leverage** | | 0,162<br>(1,60) | | 0,608**<br>(1,97) | | -0,0002<br>(-0,00) | | 0,083<br>(0,66) |
| **Crisis dummy** | -0,134***<br>(-2,61) | -0,134**<br>(-2,47) | -0,305<br>(-1,54) | -0,334<br>(-1,66) | 0,005<br>(0,04) | 0,009<br>(0,07) | -0,147**<br>(-2,44) | -0,145**<br>(-2,29) |
| **Asset turnover** | | 0,0004<br>(1,42) | | 0,0007<br>(0,53) | | -0,0009<br>(-1,51) | | 0,0005<br>(1,45) |
| **Time to exit** | | | -0,004<br>(-0,21) | -0,022<br>(-0,87) | -0,015<br>(-0,77) | -0,012<br>(-0,59) | | |
| **Buyout dummy** | 0,192**<br>(2,16) | 0,157*<br>(1,78) | | | | | | |
| **VC dummy** | -0,056<br>(-0,72) | -0,041<br>(-0,52) | | | | | | |
| **$R^2$** | 0,0795 | 0,0844 | 0,0721 | 0,1450 | 0,1186 | 0,1292 | 0,0788 | 0,0811 |
| **N. observation** | 880 | 772 | 84 | 83 | 98 | 95 | 698 | 594 |
| **Industry and country effects** | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

**** Significant at the 0,01 level;*
*** Significant at the 0,05 level*
** Significant at the 0,10 level*

*Table 3. Regression results. The dependent variable is the three-year BHAR (with MSCI Europe Index as benchmark). On the column on the left, independent variables are reported. Two sets of independent variables are used: characteristics of the IPO (underpricing, market capitalization, crisis dummy, time to exit and PE/VC dummies) and operating characteristics at the end of the first year after the IPO (leverage and asset turnover). All regressions control for industry and country fixed effects. Numbers in parentheses are heteroskedasticity-robust t statistic as in White (1980).*

# Conclusions

The aim of this research was to shed light on the phenomenon of PE-backed IPOs in Europe in the post-crisis period. The work moved from a general analysis of the performance phenomena of IPOs on a sample of PE-backed companies, to an analysis of the determinants of such performance.

First, our study provides confirmatory evidence of the role that PE firms play in initial public offerings in reducing underpricing (Cumming, 2012). In our sample, companies backed by buyout and venture capital funds experience significantly lower first-day returns, less than the half relative to non-sponsored IPOs. Second, our results provide evidence of the phenomenon of long-term underperformance for all the IPOs. However, we do not find evidence supporting the better performance of IPO sponsored by private equity actors. While buyout-backed IPOs experience positive buy-and-hold abnormal returns but results are not significant, VC-backed IPOs exhibit a significant and severe underperformance across all the considered time horizons.

Finally, we analysed the determinants of such long-term performance, bearing in mind that results cannot be interpreted as evidence of causality. Analysing the coefficients, it is possible to highlight that: (i) IPO size is significantly associated to better aftermarket performance and much of the underperformance of VC-backed IPOs seems to be driven by smaller deals; (ii) leverage is confirmed as a performance driver of buyout deals; (iii) IPOs occurred in the period before the crisis are associated to poorer performance; (iv) buyout sponsorship is positively associated to aftermarket performance.

These results provide a basis for further reflection. Do VC-backed IPOs underperform because of bad luck or is there any flaw of the European venture capital ecosystem and fund's ability to bring startups public? Or, is this result linked to particular characteristics of the European stock markets? The marked differences in performance between buyout- and VC-backed IPOs provide food for thought and comparisons for practitioners. Industry professionals might question themselves on the possibility to signal the quality of their offerings by different means, taking a cue from buyout funds. We believe that an effective way to reflect upon this point is to jointly consider the European ecosystem for companies and the regulatory environment. Moreover, it could be interesting to include higher degrees of qualitative analysis in order to understand these differences.