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THE PRIVATE EQUITY EFFECTS ON IPO COMPANIES: AN EMPIRICAL STUDY OF THE US MARKET.

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TABLE OF CONTENTS

TABLE OF CONTENTS 3

INTRODUCTION 5

AN INTEGRATED VIEW OF THE PRIVATE EQUITY WORLD 8

1.1 Brief History of Private Equity Investments 8

1.2 A deep dive into the Private Equity world 16

1.2.1 Difference between private and public markets 16

1.2.2 Private Equity Business Model 17

1.2.3 Private Equity investment process 20

1.3 Private Equity Main Strategies 23

1.4 Private Equity Exit Strategies 26

VALUE CREATION AND PE-BACKED IPO: A LITERATURE REVIEW 30

2.1 Private Equity Value Creation Matrix 31

2.2 IPO underpricing: a common phenomenon 37

2.3 IPO underpricing in PE-backed companies 41

2.4 Post IPO Operating Performance 44

EMPIRICAL ANALYSIS OF POST-IPO OPERATING PERFORMANCE: EVIDENCE FROM THE US MARKET 47

3.1 Hypothesis statement 47

3.2 Sample, data collection and major descriptive breakdowns 49

3.2.1 Data collection and sample definition 49

3.2.2 Sample description....51
3.3 Methodology....53
3.4 Key variables....54
3.4.1 Dependent Variables....54
3.4.2 Independent Variables – model I....57
3.4.3 Independent Variables – model II....61
3.5 PE-backed companies Underpricing – hypothesis I....68
3.6 Post-IPO operating performance analysis – hypothesis 2, 3....71

CONCLUSIONS....79
REFERENCES....84
APPENDIX....89

SUMMARY....92

INTRODUCTION

"*People used to think that private equity was basically just a compensation scheme, but it is much more about making companies more efficient*" – David Rubenstein, (2013). Financial Times.

Emerged in the 70s from the dusts of the American Research and Development Corporation (ARDC), the Private Equity industry has experienced a massive evolution in both fame and size in the last decade. In fact, after a turbulent start of the new millennium as a result of the dotcom bubble and the Great Financial crisis, Private Equity firms have rebuilt their investment strategy, discovering new industries, targets and markets that were previously unexplored. These changes in the business model, in conjunction with a greater market appetite for alternative asset classes, led the wider Private Equity industry to reach an all-time high $7.3 trillion in size at the beginning of 2021 (Prequin, 2022).

Since the end of the Great Financial Crisis, PE firms have increasingly chosen the Initial Public Offering (IPO) as an Exit option for their portfolio companies. Indeed, it is possible to affirm that PE firms do not use IPO for its primary means: while the listing of a new equity is usually associated with necessities of capital raise, firm's expansion, or liquidity increase, PE firms mainly recur to IPOs for investment's liquidation purposes. Additionally, because of the presence of shareholders' lock-in periods, PE actors are usually constrained to retain some capital ownership after the IPO, thus not being able to fully exit the position at the IPO date. This leaves an open question on how PE-backed issuers perform after the listing process is complete, since PE firms' primary goal is to maximise their proceeds. It seems fair to assume that the engagement of PE firms following an IPO may result in improved outcomes on all considered time horizons, as a potential exit could occur anytime.

In reality, the listing process itself represents a first challenge for both underwriters and PE sponsors: since no observable price is available to the

market before the offering, underwriters tend to price the new issuer's stock below its true market value to allow for a smooth listing, generating greater first day returns for early investors (underpricing). The underpricing phenomenon is consolidated by both academic literature and empirical evidence, representing a significant opportunity cost for the issuer's shareholders. Since PE firms' prime interest is their investment's liquidation, it's their interest to have deals properly priced at any time, and in no case below market value, thus avoiding excessive underpricing.

By defining a sample of 397 companies whose IPO took place between 1st January 2011 and 31st December 2016 in NASDAQ and NYSE, this thesis will test the PE certification role and effects on IPO underpricing. Through the use of a robust regression, it will be found that PE-backed companies experience lower first day returns than non-PE-backed ones.

Additionally, extensive literature can be found with relation to the long-term post-IPO underperformance, and how PE-backed companies tend to dampen this phenomenon. On the contrary, fewer studies focus on the Private Equity effects on post-IPO operating performance. The further aim of this research will be to interpret how PE firms affect new issuers' operating performance 1 and 3 years after the IPO, and if so, what are the respective drivers. The regression model created using robust standard errors, combined with carefully weighted considerations give the following results in the studies sample:

1. PE-backed companies show better ΔEBITDA Margins than non-PE-backed companies 1 year after the IPO.
2. PE-backed companies tend to have a very stable EBITDA Margin and reduced sales growth in the three years following the IPO.
3. PE firms wisely choose industries where to perform IPO as Exit strategy.
4. The more underpriced a company results in its first trading day, the more it is likely to improve its operating performance three years post-IPO.

AN INTEGRATED VIEW OF THE PRIVATE EQUITY WORLD

This chapter aims to provide the reader with an integrated overview of the Private Equity (PE) world to ease the comprehension of the analysis treated in the following chapters.

Entrusting academic literature and reviewing most qualified economic papers the main features of the PE will be treated in this chapter, such as PE history, PE trends, and the main differences between Private and Public Markets.

The overview of PE firms' Business Model will be outlined as well, summarising their structure, their main clients, and their compensation/fee schema. A thorough overview of the most typical Deal structure and its evolution throughout the years will be presented.

Finally, this chapter will study the main PE strategies adopted in the current market explaining which clients and which companies are the best fit for each approach. Lastly, PE's most favourite exit strategies will be analysed in-depth to properly arrange the discussions for the following chapters.

1.1 Brief History of Private Equity Investments

Private Equity (PE) firms - as we currently know them - have been a stable presence into the financial ecosystem in the last decades of the XXth century. Some academics even trace back the first true buyout in contemporary history to JP Morgan's acquisition of Carnegie Steel Company in 1901.

In reality, due to PE's fluid definition, it results deceitful to isolate the beginning of PE investments to a particular point in time, so that the first question to be answered should really be what Private Equity is.

The Private Equity Market represents a vital source of financing to all private companies' stages, from new start-ups in need of Venture Capital financing to big established firms target of larger Buyouts (Fenn, Liang, and Prowse, 1997). The basic principle behind Private Equity investments is perfectly embodied in the broader scope of Financial Markets: catalyse the efficient allocation of funds from Surplus Spending Units (SSU) to Deficit Spending Units (DSU) (Kidwell, Brimble, Lenten, Docherty, Mazzola and Basu, 2019). In this sense, it is possible to identify Private Equity Firms as financial "intermediaries" that act as catalyser between the Limited Partners (SSUs) and the target companies (DSUs) under the exercise of a fee.

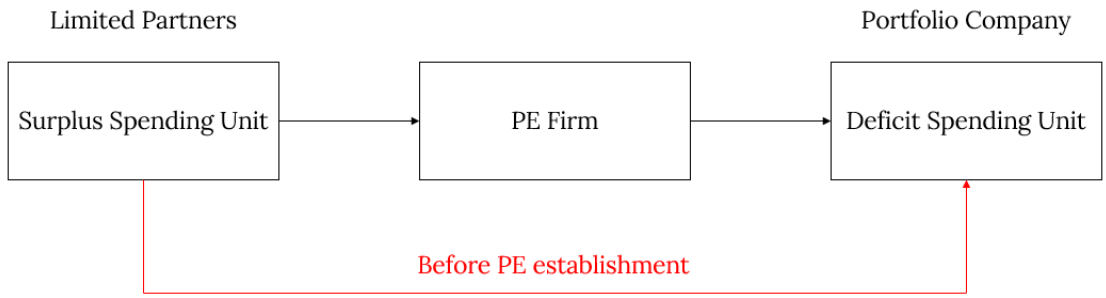

Figure 1: PE firms' role in financial markets. Own elaboration.

With this definition in mind, Private Equity firms came to substitute big investors – such as powerful bankers - that during the XIXth and the first half of XXth century made direct minority investments in private companies. The mechanism however evolved pretty rapidly: while capitalist bankers invested directly into privately held companies with their own money, bringing their skills, capital and knowledge into the business, the advent of PE firms allowed bigger investors to limit their contribution to capital only, earning (bearing) the reward (risk) of the investment made by PE firms on their behalf. What characterizes PE firms is that they are not the ones committing their own equity capital into the transaction; instead, PE firms recruit, call, and manage LP's

capital on their behalf. In synthesis, the PE business model allowed private market's investors to completely offload the managerial responsibilities to selected investment professionals under a fee compensation, creating an environment in which client's effort are reduced to the minimum and where benefits for both parties are maximised.

The typical PE activity – as we know it to these days - can trace its roots in the post-WWII Northern America scenario, more specifically in 1946 with the establishment of the American Research and Development Corporation (ARD). It is important to highlight that the PE industry found its roots mainly in Northern America throughout all of the XXth century, with Europe, Asia and the Rest of the World slowly showing up consistently into the market only in the XXIst century. According to Liles (1977), the formation of ARD was necessary and thoroughly desired by the US Congress to address the shortage of long-term financing to Small and Medium-Sized Enterprises (SMEs) after WWII. The two major goals of ARD were to model a private market that attracted institutional investors and that could have been able to provide both capital and expertise to SMEs. It is possible to say that ARD paralleled the post-war venture investments of big industrial families such as the Rockfellers and Paysons (Liles, 1977).

Despite recording an average 15.8% IRR in its twenty-five years of activity, the impact of ARD on the Private market was overall modest, with overall Asset Under Management (AUM) inferior to $10 mil on aggregate (Liles, 1977). [1]

In 1958 with the born of publicly traded Small Business Investment Companies (SBICs), Private markets' activity started to increase dramatically. SBICs are private companies licensed by the Small Business Administration (SBA) - still active to these days - which sponsor SMEs operations through equity and debt financing. SBICs are typically regarded for representing a feasible alternative to Venture Capital financing (SBA, 2021).

[1] This information already gives insights about the lucrative nature of Private markets. The Dow Jones Industrial Average for the same timespan averaged in fact 12.8% return only.

SBICs formation turned out to be a great success in its early stages: more than 690 SBICs licences were released by the SBA in the first 5 years since their establishment and these firms came to manage close to half a billion dollars by 1965 (Liles, 1977). Unfortunately, SBICs suffered from a number of problems as well, such as the inclination to support companies with debt financing rather than equity (thus, with capability to deliver interest payments, hence limiting the spectrum to only profitable companies), and the inability to attract investment managers of the highest calibre as well as institutional investors. In fact, under the Investment Company Act of 1940 investment managers of publicly traded venture firms – including SBICs – were not eligible to receive any kind of performance-linked remuneration as well as stock options, thus limiting their compensation to an ordinary salary. This Act paved the way for a significant discrepancy in compensation package among investment managers and General Partners – who benefited directly from the performance of the deals – resulting in a scarce presence of high-calibre investment professionals in the industry. (Liles, 1977).

The listed issues plus a series of Governmental scandals happened during the 70's contributed to a steep fall in SBICs activities, which by 1977 reduced to only 276 operating companies (Liles, 1977).

As a result, until the late 70's PE investments were mainly carried out by wealthy families, financial institutions and SBICs through the mechanism just described, creating a series of inefficiencies - e.g., investments undergone by wealthy families were very "industry focused", and used to take place in the same industry in which those families had grown their expertise and reputation in (Fenn, Liang, and Prowse, 1997).

By contrast, thanks to the dramatic changes in the financial landscape, the majority of investments made in private markets during the 80's has been undertaken by investment professionals on behalf of the same investors who used to directly allocate resources into private companies until the 70's. By using

a Limited Partnership Vehicle – in which institutional investors take the role of Limited Partners (LPs) and the Investment Managers take the role of General Partners (GPs) - PE firms were allowed to pool capital more easily and the private markets became more accessible to a larger audience of financial players (Fenn, Liang, and Prowse, 1997).

The switch to the Limited Partnership structure was one of the main drivers of growth for the PE industry in the 80's, which resulted in a 27% CAGR (37.23x Multiple) of total Asset Under Management (AUM) in the period between 1980-1995. As visible in Figure 2, in fact, the key source of funds for the growing PE deals during the 80's was majorly represented by Limited Partnerships – incremental AUM from $2 Billion in 1980 to $143 Billion in 1995.

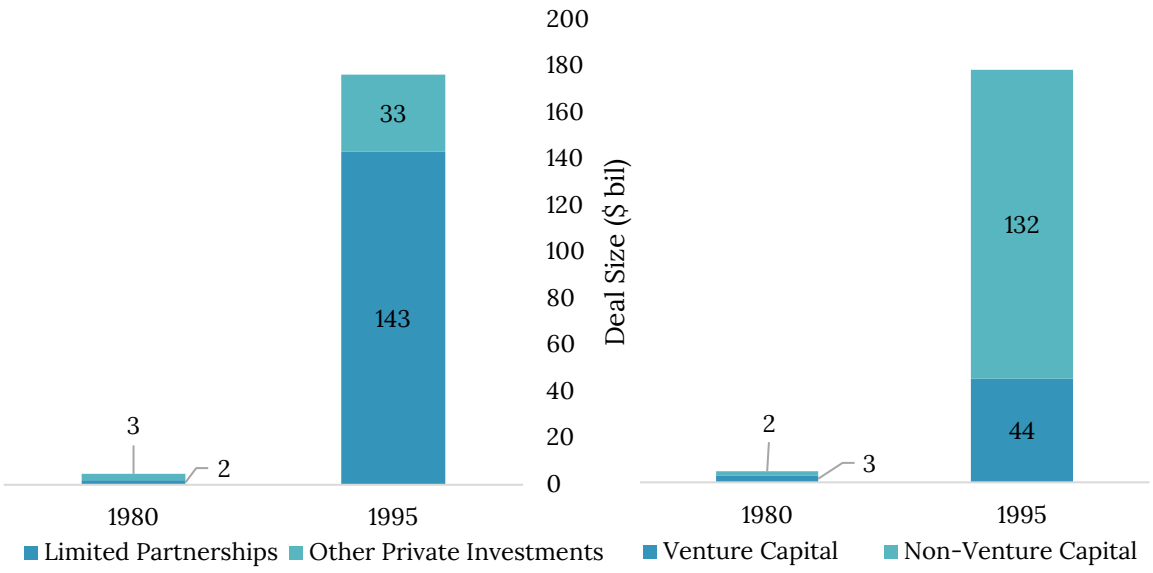

Figure 2: PE Deal Size by source of funds and investment type. Source: The Private Equity Analyst (1997)

Another valuable insight from Figure 2 is the evolution of Deal types throughout those 15 years: the expansion of private markets benefited indeed both start-up companies and well-established firms. According to Fenn, Liang, and Prowse. (1997), this conspicuous increase in non-venture deals was mainly due to three factors:

1. The abundance of profitable investment opportunities within that asset class.
2. The increasing presence in the PE space of large institutional investors, reluctant to track their investments in smaller deals (Venture Capital).
3. Based on the new LPs profile, GPs had to adapt their risk-reward schema – Venture Deals in fact, are famous for their high-risk profile.

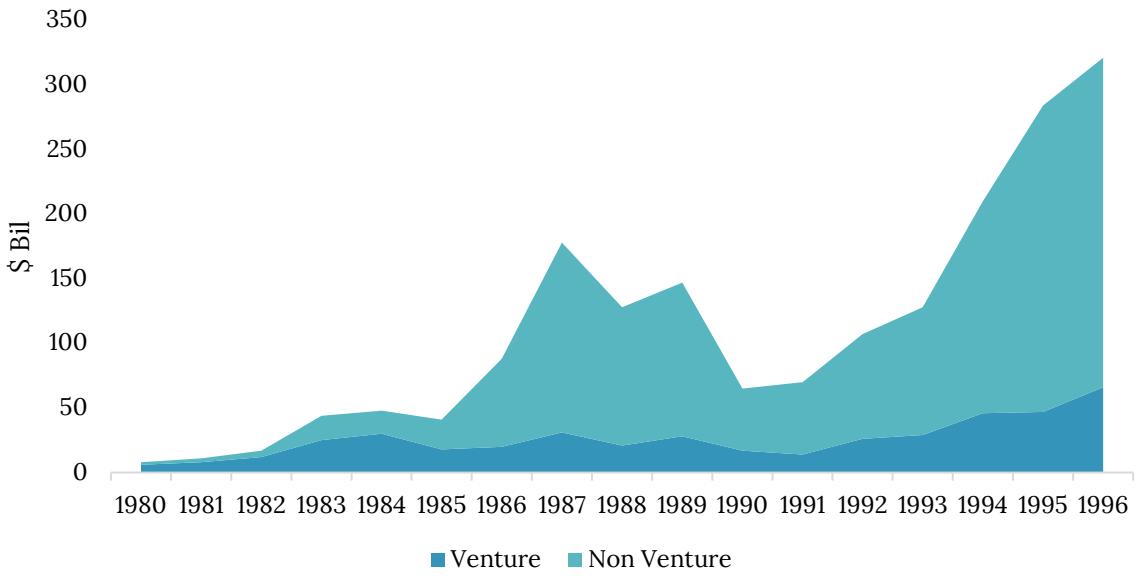

Figure 3: Deal Size by Investment Strategy (1980-1996). Source: *The Private Equity Analyst* (1997).

It is clear by now that most of the investments done in the private market before the '80s targeted small start-ups with immense upside potential rather than large companies with stable predictable cash flows. It is possible to observe a shift in these investment preferences – refer to Figure 2 and Figure 3 for further insights – from the 1980's due to a change in composition of the client base of PE firms. According to Fenn, Liang, and Prowse. (1997), private markets started to get the attention of institutional investors after registering close to 20% returns even in bearish market conditions. The market entry of institutional investors determined a natural increase in capital commitments, and many market participants suggested that when investment size increases is much easier – and convenient – to extend the size of the individual deals rather than multiply the number of investments to be made (Fenn, Liang, and Prowse, 1997).

That is exactly the behaviour observed in the private market during the '80s which resulted in the beginning of the Buyout era.

According to Kaplan, Stromberg. (2009) and as visible in Figure 3 and Figure 4, it is possible to identify two major waves in the PE market. The first wave can be traced back between middle and late 80's thanks to the explosion of the Leveraged Buyouts (LBOs)[2], and the second one leading to the dotcom bubble: with the advent of institutional investors, as previously discussed, PE firms had all of a sudden easily accessible and ready-to-use capital commitments from asset managers, which in turn favoured investments in bigger, more stable, and established firms.[3]

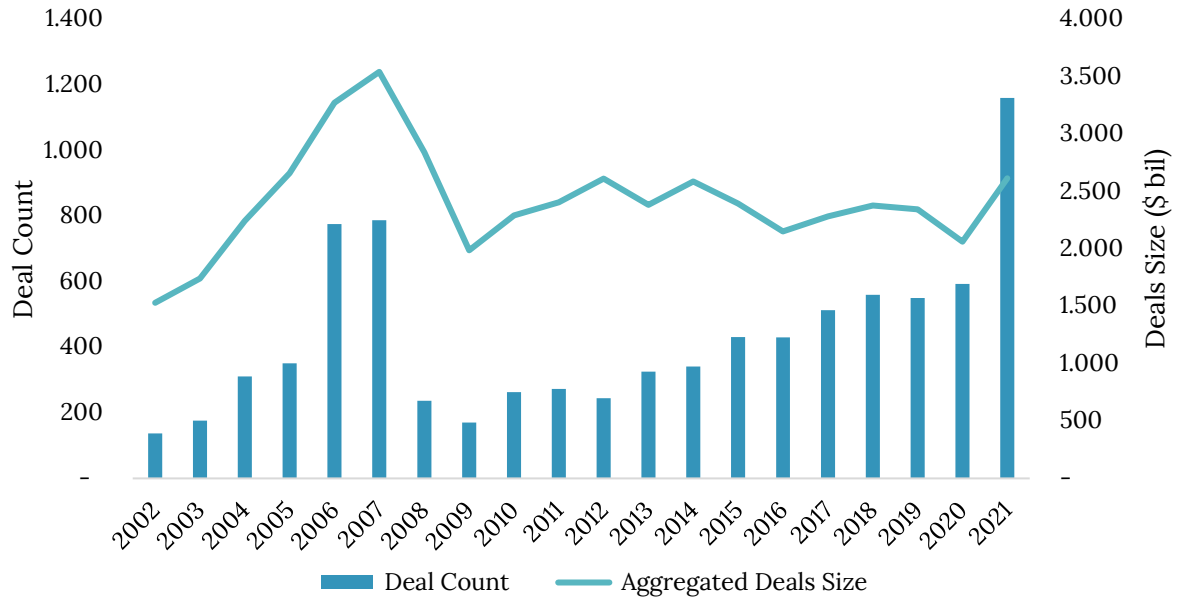

Figure 4: Deal Count and Deal Size per Investment Year (2002-2021). Source: Ernst&Young (2022).

On aggregate, between 1979 and 1989 more than 2.000 LBOs took place with combined deal value exceeding $250 billion (Opler and Titman, 1993). The first LBOs' wave peak can be identified in the acquisition by Private Equity firm Kohlberg, Kravis & Roberts of company RJR Nabisco for $25 billion, double the size of the largest LBO ever carried out to that date (Jensen, 1989).

[2] Leveraged Buyouts will be thoroughly discussed in chapter 1.3.
[3] It is worth to remember that, still in the 80's, private market's activity was majorly a Northern American phenomenon.

However, the bankruptcy of a number of LBO targets as well as the general turbulence in the financial markets contributed to the decrease in LBOs activities which in turn contributed to the collapse of the junk-bond market that lasted until the beginning of the 90's (Kester, Luehrman. 1995), and this led LBOs to disappear for almost 10 years.

After the fall of the junk bond market, the PE industry registered a steady rise both in numbers and geographical reach – only omitting the dotcom bubble of 2000/2001 – reaching its peak in the biennium 2006/2007. The second wave of PE expansion recreated some of the features observed in the first one such as large deals and the revitalization of LBOs. One of the main differences, conversely, lied in the different geographical distribution of the two waves: while the first wave was almost entirely focused on Northern American territory, the second wave recorded a strong presence in Europe and a growing incidence of the Asian market as well (Hurduzeu G., Popescu MF. 2015).

Following the Global Financial Crisis, a general trust in the private market has been displayed, and PE firms are experiencing new rise in investments, which culminated in 2021 as record breaker for number of deals and capital committed.

1.2 A deep dive into the Private Equity world

To properly understand the essence of the PE world – as well as the business model that shapes its key players - it is necessary to do a preliminary evaluation on the general characteristics of the private market and the core differences observable against the public market.

1.2.1 Difference between private and public markets

Firstly, private companies do not have any type of obligation to publicly disclose performance numbers, leverage, strategy, or anything related to ownership structure and financial statements. Public listed companies, on the contrary, are subject to a number of regulations that require special transparency for financial statements, ownership structure, dividends, governance and much more. This regulatory difference is easily explainable by the difference in the investor base among the two markets: due to the prominent minimum investment amount required to enter into a transaction, only professional investors (or very wealthy individuals) can invest in the private market. Since investment professionals undergo thorough Due Diligence processes before allocating equity capital into a target company and retail investors only represents 2-3% of the market's investor base (EY, 2022), meticulous public transparency obligations may result in an overwhelming – and futile – task for private companies.

Another fundamental difference between private and public markets lies in the degree of liquidity of these asset classes. While public market stocks are highly liquid, committed capital allocated into the private market tend to be "locked-in" by General Partners up until the partial – or complete – liquidation of the fund vehicle. This characteristic is yet again explainable by the investor base of the two markets and can also clarify the different investment's time horizon among the two asset classes. To give some context, the average holding period for buyout deals has increased from 4.1 years in 2008 to 5.8 years in 2014 (Strumillo, Ciantelle, 2015) and the median life span of a PE reached 13.2 years in

2015 (Bollen, 2015). By definition, PE firms' clients – mainly asset managers, pension funds or very wealthy individuals – have an extended investment horizon thanks to their long-term investment goals which well combines with the average investment tenure in the private market.

	PUBLIC MARKET	PRIVATE MARKET
Information Transparency	High	Low
Liquidity	High	Low
Investment Horizon	Variable	Long-term

Table 1: Main differences among private market and public market. Own elaboration.

1.2.2 Private Equity Business Model

Since the advent of institutional investors into the private markets, PE funds usually organized themselves as limited partnerships formed and managed by professional investment firms (Fenn, Liang, and Prowse, 1997). These funds are investments vehicles that allow investors to pool their capital and invest in different target companies increasing the benefit of diversification and market reach. Arguably, one of the greatest advantages of the limited partnership is that avoids double income taxation. Corporate level taxes on income, in fact, do not apply. (Petro, Martin, Cendrowski, Wadecki. 2012).

Within the structure of the fund – organised as a Limited Partnership - is it possible to identify two main economic players: General Partners and Limited Partners.

General Partners (GPs) are direct associates of the PE firm, in charge of the investment's decision-making process and direct supervisors of portfolio company's performance. The GP's degree of independence (in terms of new investments, capital calls, distributions…) is regulated in the Limited Partnership Agreement (LPA), signed by both parties.

Limited Partners (LPs) are investors committing and providing capital to the fund vehicle which will be managed by the GPs. The main players who act as LPs in a Limited Partnership are pension funds, wealthy individuals, corporations, institutions, banks (Prowse, 1998), (Petro, Martin, Cendrowski, Wadecki. 2012). The moment the LPA has been signed, LPs must keep the agreed *committed capital* readily disposable – hence, liquid – to satisfy a possible GP's *capital call.* Capital calls are performed when GPs have identified a potential investment opportunity and need liquidity to close the deal. The committed capital is usually drawn down by the GPs throughout the first years of the fund's life, thus not requiring LPs to provide a lump-sum payment at the beginning of investment activities. This flexibility allows GPs to maximize the *Internal Rate of Return* as drawing capital only when needed minimizes the time element of IRR calculation (Petro, Martin, Cendrowski, Wadecki. 2012). Once the called capital reaches the fund vehicle, GPs will invest the drawn amount in target companies.

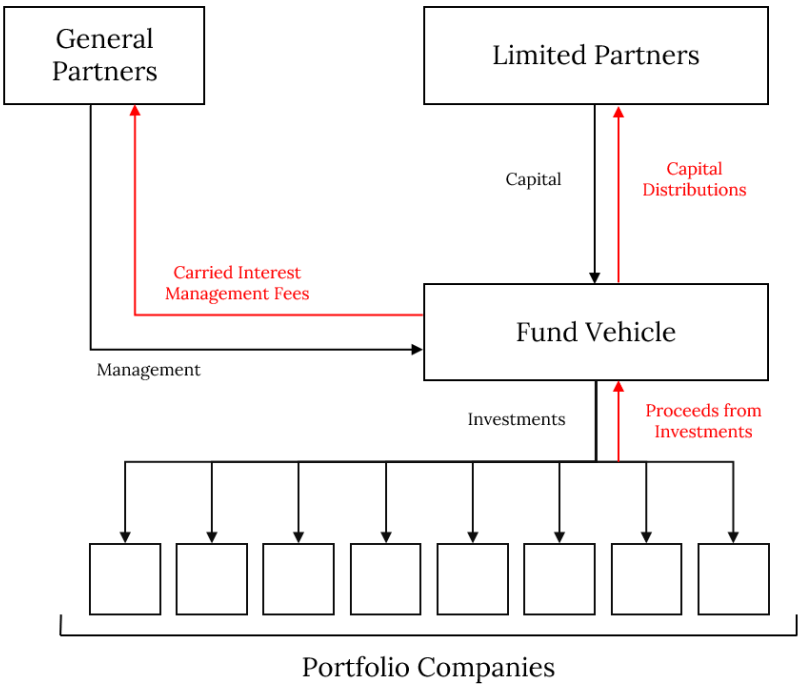

Figure 5: Private Equity Limited Partnership's structure. Own elaboration.

In this scenario, General Partners income mainly consists of *management fees* and *carried interest*. Management fees intend to compensate GPs for the effort in scanning the market for potential investment opportunity, making the deal

selection, and managing the portfolio companies throughout the duration of the fund. They consist of fixed annual payments calculated on the total AUM, usually amounting to 2% (Metrick, Yasuda. 2010). According to many market participants, management fees have been in steady decline for the last 10 years and LPs are recently pressing for a variable – decreasing – fee structure due to the natural decrement in GPs' direct management activities after 4/5 years from any given fund's Vintage Year. *Carried Interest*, on the contrary, represent a variable compensation for the GPs and is often regarded as an incentive for Investment Managers to align their compensation to the fund results. Carried Interest, in its basic essence, represents a performance fee – usually 20% (Metrick, Yasuda. 2010) – which applies only in case fund's returns are higher than a certain agreed amount, also known as the *hurdle rate*. In those cases, GPs will benefit the *carried interest* agreed percentage to apply on the extra-returns generated for LPs.

Although LPs' returns are directly linked to the fund performance, professional practice has identified two main distribution models used by PE firms. In particular, earnings from US PE firms are usually split among GPs and LPs on a "deal by deal" basis, commonly referred to as *American waterfall distribution model* (Petro, Martin, Cendrowski, Wadecki. 2012). This distribution model permits GPs to receive *carried interest* sooner, thus allowing them to create new *follow-on-funds* faster. By contrast, the *European waterfall distribution model* encompasses distributions to LPs only once the fund has been liquidated. In the last years, this approach has grown in popularity among US investors, and has been preferred and suggested by the Institutional Limited Partner Association (ILPA) as form of compensation to be included in the LPA as well (Petro, Martin, Cendrowski, Wadecki. 2012).

1.2.3 Private Equity investment process

According to Vild, Zeisberger (2014), the PE investment process can be summarized in seven key steps: (I) Fundraising, (II) Deal Sourcing, (III) Due Diligence, (IV) Valuation, (V) Transaction, (VI) Value Creation, (VII) Exit.

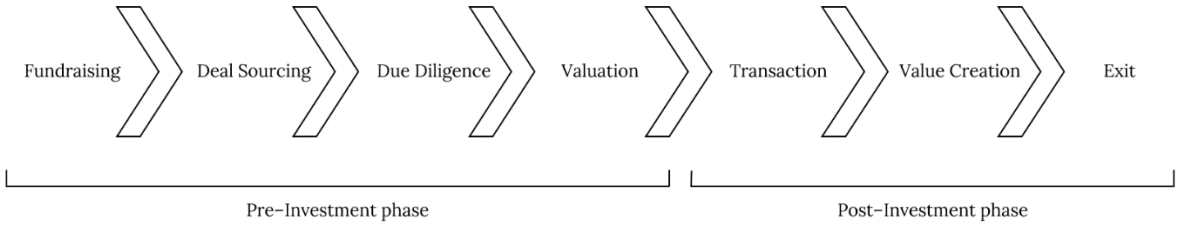

Figure 6: Typical Private Equity Roadmap. Source: Vild, Zeisberger (2014).

The Fundraising process is arguably the most sensitive step in the PE roadmap. In this step, PE firms engage potential investors and determine the fund's geographical and strategical focus. The latter is especially true for Venture funds, as they usually tend to be very industry specific (Petro, Martin, Cendrowski, Wadecki. 2012). Moreover, PE firms usually employ *placement agents* to approach influential investors and reinforce the information-spread that usually travels in the market by word of mouth. On aggregate, it is estimated that the fundraising phase can take up to 24 months to be completed (Petro, Martin, Cendrowski, Wadecki. 2012).

Once the fundraising process is over, GPs will be focused on scanning the market for profitable investment opportunities. Through a powerful network composed of investment bankers, industry specialists, advisors and lawyers, GPs

will have a better understanding of the market they want to invest in and will identify target companies.[4]

After a particular target company has been identified in the Deal Sourcing step, GPs perform thorough Due Diligence (DD) on the company. The most important goal of the DD process for the PE firm is to have a perfect understanding of the macro and micro variables affecting the target's operation, such as latest industry trends, country regulation, financial stability, ability to generate cash flows, current leverage. Since GPs cannot always have a pervasive understanding of every industry, they rely heavily on external advisors to help them with the decision making.

If the Due Diligence process shows possibilities of generating future returns, the PE firm will start the Valuation process and enter into negotiations with the target company's ownership and management to concretize the transaction. GPs can use a large set of valuation models to address the complication deriving from the private nature of the companies, the most used being; Comparable Company Analysis, Discounted Cash Flow, VC Method, First Chicago Method (Corporate Finance Institute, 2019). However, due to the extensive use of debt as a value-enhancing strategy in PE investments, GPs usually perform valuations entrusting a Leverage Buyout (LBO) Model with Terminal Value derived by an exit EBITDA multiple rather than applying the Gordon Model (Vild, Zeisberger 2014). Moreover, some market participants argue that the "traditional" valuation methods following CAPM could be misleading for private companies especially in terms of beta estimations (Petersen, Plenborg, Scholer. 2006).

Once the target company gets acquired by the Fund Vehicle, GPs will focus on cash flow management due to the (usually high) portion of debt used to finance the acquisition. The PE firm may decide to keep the company culture and management until the company's value keep increasing and its cash flow

[4] Often times, investment bankers will approach GPs with ready pitches for them to invest in a particular company.

generating ability does not fall. To support these objectives, PE firms may use mechanisms such as management stock incentive plans to align managers' interest with the fund's long-term target IRR. By contrast, GPs will not hesitate to thoroughly intervene with new governance and management structure if those goals are forecasted not to be fulfilled.

Finally, after the portfolio company registers some incremental Value, the GPs will start looking for a possible exit strategy, mainly a Private Settlement (secondary sale) or IPO[5]. It is fair to say that PE firms' ultimate goal is to "buy, improve, and sell" any company in which they invest in, and the holding period - and consequently, the exit timing – differ across distinct strategies. According to Per Stamberg (2007), the median Holding Period for an LBO deal is about 9 years. Once the Fund Vehicle exits the Deal and cashes-in the proceeds from investments, it will distribute the earnings to the LPs according to the distribution model defined in the LPA.

[5] Different Exit possibilities will be presented in chapter 1.4.

1.3 Private Equity Main Strategies

PE strategies are often directly linked to target companies' size and maturity. According to Petro, Martin, Cendrowski, Wadecki. (2012), there are four main categories of Private Equity Investments: Angel Investing, Early and Later Stage Venture Capital, Buyout.

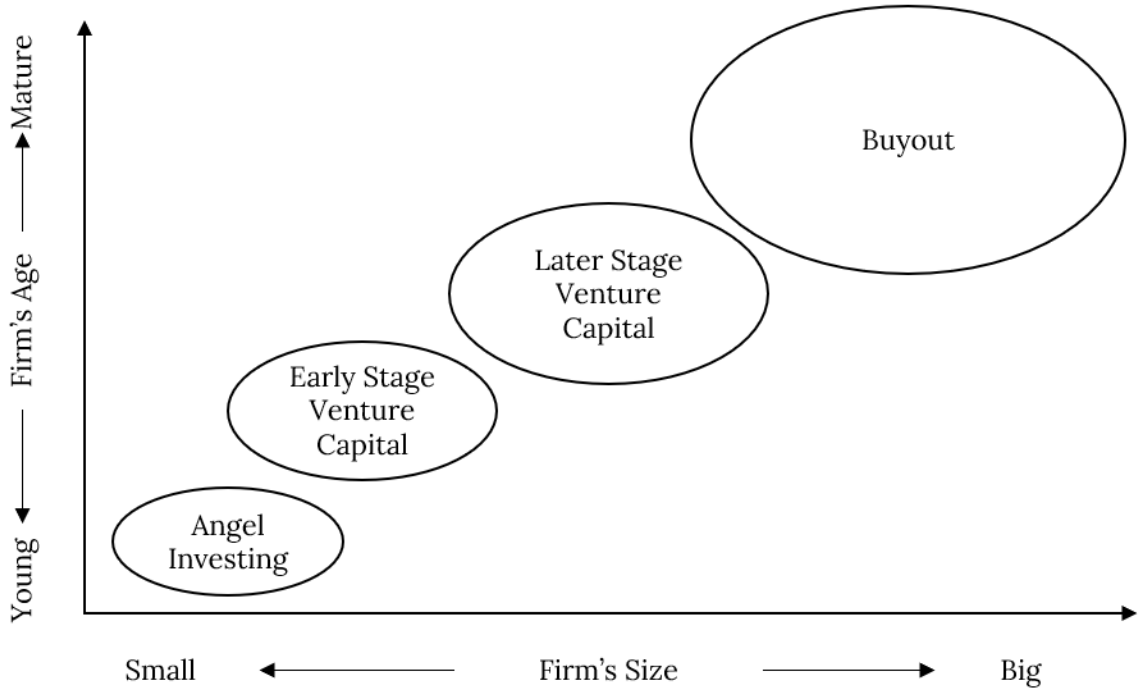

Figure 7: Private Equity Investments by target company's size and age. Source: Petro, Martin, Cendrowski, Wadecki. (2012).

A) *Angel Investing*

Economic actors who provide equity to new, young start-ups are usually referred to as Business Angels (BAs). BAs oftentimes are former investment professionals/entrepreneurs who are willing to invest their own capital into new innovative projects which they have no original connection with (Trenca, Croce, Ughetto. 2018). In the vast economic literature, the capital provided by BAs is often referred as "seed" equity, representative of the initial stage of the company's lifecycle (Wetzel, 1983), (Lindsay, 2004).

According to Aernoudt, (2005), entrepreneurs should match the real risk involved with the right type of financing. Considering what just said, debt is rarely used in young start-ups – as it supposes regular interest payments in a non-revenue generating entity - and the role of BAs is regarded as the best option for a first round of financing. BA's capital is often regarded to as "smart money" as it encompasses capital, managerial skills, and because BAs' network could enable and accelerate future financing rounds (Aernoudt, 2005), (Trenca, Croce, Ughetto. 2018).

Although known principally as a US market, BAs presence in Europe is growing year by year led by investments in Fintech (18%), Software (13%) and Health (10%) in 2020. The annual contributions have increased, on average, 6.7% in the last 10 years reaching close to 8 billion in 2020 (EBAN, 2021).

B) *Venture Capital*

As greatly discussed in chapter 1.1, Venture Capital investments were the first and original type of investments that started the PE world in the second half of the XXth Century. Venture Capitalists invest in young promising firms with a lot of upside potential, hence why industries like Software, Pharma and Healthcare are currently preferred for their disruptive nature (NVCA. 2022). In a Venture Capital Limited Partnership, Venture Capitalists are GPs and manage and control the fund's activity (Gompers, Lerner, 1999).

VC-backed companies typically present full business plans and prototypes of marketable products. In most cases, those companies use VC fundings to arrange and open manufacturing facilities and build some inventory. As in Angel Investing, Early-Stage VC-backed companies are usually at loss for a long time before turning profitable, making Early-Stage VC a long-term commitment as well as an extremely illiquid investment (Petro, Martin, Cendrowski, Wadecki. 2012).

Firms that reach a stage in which they have a fully developed and ready-to-sell product may seek additional capital for expansion purposes. In these cases, Later-Stage VC is required. Firms accessing Later-Stage VC can usually show a track record of timid profitability but need financing to expand their operations and fulfil their growth appetite (Petro, Martin, Cendrowski, Wadecki. 2012).

A peculiarity of VC funding is that it often happens in stages. VC investors may require the portfolio company to reach a particular milestone before another capital injection to mitigate their downside risk. Moreover, *staged capital* allows entrepreneurs not to surrender vast equity ownership upfront, allowing the business to grow steadily without too much pressure exercised by GPs. (Petro, Martin, Cendrowski, Wadecki. 2012), (Gompers, Lerner, 1999).

C) *Buyout*

Opposite to the early-stage investments, Buyout deals are performed on big, established firms that have often experienced a reduction in earnings in the last accounting years, turning them into a cheap target (Petro, Martin, Cendrowski, Wadecki. 2012). Since Buyout Deals can reach companies that are worth billions of dollars (hence requiring an exceptional fundraising activity if wanting to establish a diversified portfolio mainly composed of equity investments), during the 80's PE firms started the practice of using an extended portion of debt to diversify more easily their portfolio (Kaplan, Stromberg. 2009).

Target companies could be either public or private – the former being referred to as *public-to-private* deal. The ideal target for an LBO is usually fully mature companies with a steady and predictable stream of cash flows. Due to the high levels of leverage involved (usually 60 to 70% of the total financing), GPs look for companies that have little to no debt showing up in their balance sheet, so that the incremental liabilities will be repaid by the cash flows generated during the holding period. Moreover, according to Joern, Fischa, Vismarac, Andres. (2019),

LBO investors, opposite to VC investors, tend to give lower importance to revenue growth prospects but greater importance to profitability, as they seek to lower their total risk (lower individual risk is also required due to the overall increase in total risk of the operation with the introduction of debt). It is shown in the research of Kaplan, Stromberg. (2009) that Buyout funds do not actively screen the management of target companies during the Due Diligence process, as they are more prone to replace it during the holding period.

1.4 Private Equity Exit Strategies

After investing in a company and once the Value Creation phase is over, GPs will have to liquidate their investment to cash-in the profits from the operation. After 3-4 years from the Investment Year, GPs will have to make evaluations on which Exit Route is better to adapt to maximise their return and LP's returns. According to Povaly (2006), PE firms have usually three main exit option from a Deal: sell to strategic buyers (Trade Sale), sell to other PE firms (Secondary Buyout), or listing the stock on the capital markets (IPO).

Figure 8: Global Buyout Exit Value by Channel. Source: Bain, (2022).

However, the recently developed phenomenon of Special Purpose Acquisition Companies (SPACs) presented a valuable exit alternative for portfolio companies. As shown in Figure 8, in fact, IPOs and SPACs exits increased dramatically in the biennium 2020 and 2021. This net increase can find its roots in the better-than-expected recovery from the Global Pandemic, and also by the cost of debt being close to zero (Bain&Company, 2022). The empirical evidence just shown indicates that today SPACs represent an additional Exit route for PE deals. Finally, we can observe that strategic acquisitions are the most used exit option by Buyout fund managers (almost half of all exits), followed by secondary buyouts, SPACs, and IPOs.

A) *Trade Sale*

It has been shown that the sale of portfolio companies to strategic buyers represents the best profit opportunity for a PE investor; the buyer, in fact, is likely to offer the highest price among the possible exit options for the asset. Strategic buyers are usually big corporations or Holdings that are trying to reinforce their competitive position in a particular industry. The main drivers of such an acquisition are usually market expansion desire, diversification, organic growth, use of patents or synergies (Povaly, 2006). The strategic value embedded in the transaction allows GPs to ask for higher price and to have a strong position in negotiations as well.

A common rule among all the exit options is that timing and price are an inverse function of number of buyers. With this regard, a Trade Sale - since most of the cases see only one or two potential buyers – is expected to happen relatively quicker compared to all other exit options. (Baker, Filbeck, Kiymaz, 2015).

B) *Secondary Sale*

A Secondary Sale happens when a sponsor (PE firm) decides to sell one of its assets to another sponsor, and that is why this type of transaction is also known as *sponsor-to-sponsor*. One rationale for this exit strategy is that the PE firms and the portfolio company's management could believe that some unlocked potential has not been fully displayed during the holding period. On the other hand, PE firms might desire to quickly sell an asset that has already generated great returns for the fund and has potential to grow with further fundings. In this scenario, strategic buyers are not the most fit to put in place *buy-and-build* strategies. Other sponsors, conversely, may get interested to enter into the transaction. (Baker, Filbeck, Kiymaz, 2015).

One additional benefit deriving from Secondary Sales is often the flexibility embedded in the transaction. The seller may have in fact the possibility of partially liquidating the investment and keep a stake in the company to maximize long-term growth. Since partial realization reduces the time component in the IRR calculations (as cash flows are collected earlier) it is believed that secondary sale increases are used by fund managers to boost their performance indexes.

C) *Initial Public Offering*

Initial Public Offering (IPO) is the process that gets company's shares listed on the stock exchange for the first time in its history. Due to the nature of the stock market, only the biggest deals done in the private sector can really consider IPO as an exit rout; SME and start-ups in fact, do not often have the prerequisites to get listed.

IPOs have been a stable, but minor, exit rout since the first LBO waive in the 1980's. In favourable market conditions, some researchers grade the IPO as exit rout capable of generating the greatest return. (Baker, Filbeck, Kiymaz, 2015).

IPOs present numerous downside risks for fund managers, namely the high transaction cost, stringent regulatory requirements from the Security Exchange Commission (SEC) and the possible undervaluation of the company's stock on the first trading days. Furthermore, if GPs are willing to fully exit from an investment, IPO may not be the best option. A full exit in fact would trigger panic and lack of confidence from the market, leading to a greater probability of undervaluation. Financial sponsors may even be subject to a *lock-up period* after the IPO, restricting their ability to liquidate their position for a certain amount of time.

D) Special Purpose Acquisition Companies (SPACs)

SPACs have emerged as a valid and frequent alternative to traditional IPOs in the recent economic history. SPACs are special companies that undergo the IPO process to raise the capital needed to finance a future acquisition. Once the IPO has been completed, the company has, on average, two years to screen the private market for a merge opportunity, hence bringing the target company into the stock market (Klausner, Ohlrogge, Ruan, 2022).

Despite the high volatility, the number of shell companies totalled 575 as of December 2021. To this day, SPACs have privileged growth or venture targets rather than larger companies found in buyout vehicles. According to Bain&Company, (2022), a market return analysis shows that companies IPOed via SPAC are underperforming the S&P500 in the short-medium term.

VALUE CREATION AND PE-BACKED IPO: A LITERATURE REVIEW

Having completed a general introduction to the Private Equity world allowed us to gather significant understanding over PE history and dynamics. The aim of the following chapter is to perform a literature review of the main academic papers related to the scope of the thesis.

Firstly, Private Equity Value Creation models will be analysed to grant well rounded understanding about PE main value drivers. Distinction between indirect value drivers and direct value drivers will be carried out. Once defined the key value drivers for PE firms, we will have sufficient understanding over the whole PE process, and this will allow for a better pick of variables in the empirical analysis run in Chapter 3.

Later, academic overview on IPO underpricing will be summarized. The IPO process is explained in detail to allow greater understanding of the power dynamics happening within the operation. Those dynamics, as shown in literature, play a key role in the underpricing's magnitude. Although academic literature finds significant levels of underpricing throughout all of the recent financial history, it shows that typically PE backed companies have lower degree of underpricing with comparison to non-PE backed companies. This hypothesis will be tested in the next chapter.

Finally, this chapter will go through the literature about post IPO operating performance. Although the meagre interest shown in this topic from academics, moderate evidence suggests that companies tend to worsen their operating performance in the medium-long term after the IPO. This hypothesis will be tested in the next chapter in the PE backed companies' space.

2.1 Private Equity Value Creation Matrix

According to Jensen (1989), the PE Business Model creates economic value for the portfolio company mainly through governance, financial, and operational engineering. To most scholars, these strategies represent the main and tangible drivers of growth.

Firstly, PE firms profusely use management incentives. One of the principal goals of PE firms is, in fact, reduce agency problems that may arise in the growth phase of portfolio companies. Agency theory defines the existence of conflicting interests within a company arising from the diverging goals of firm's owners and managers (Fama, 1980). More generally, agency theory is verified when "*one or more persons (principal(s)) engage another person (the agent) to perform some service on their behalf, which involves deleting some decision-making authority to the agent*" (Jensen, Meckling, 1976). To limit agency risk, it is common that the management team of a portfolio company would get stocks and options to "secure" their services to the good of the company (and by reflex, the owners' one). Kaplan and Stromberg (2009) moreover, found out that on a sample of 43 Buyouts from 1996 to 2004, the median CEO received only 5.4% equity upside versus the aggregated 15% of the management team. Although stock and options-based compensation have been mostly renowned and developed in the public markets, management ownership and incentives are, on average, greater in LBOs than in public companies (Kaplan, Stromberg, 2009). However, in a typical LBO transaction, agency costs are reduced thanks to the extensive use of leverage. In fact, by performing the acquisition through vast debt financing, the target company benefits for sure from the increased financial possibilities, but it is often observed a reduction of "excess cash flow" - according to Loos (2006), excess cash flow is defined as the residual cash from investments required to fund all firms' projects and strategies discounted at the proper cost of capital. The reduction of excess cash flow originated from the increased interest payments limits the extents to which the company's managers can dispose of such cash flow. In essence, Loos (2006) believes that the higher

leverage brought by PE firms into portfolio companies reduces the "agency costs of free cash flow", thus leading to value creation. On the contrary, Kaplan, Stromberg (2009) argue that if leverage is too high value creation could be negatively affected by the fixed interest payments, because the lack of flexibility would likely increase the chances of financial distress.

Governance engineering refers to how PE firms actively manage position in the Board of Directors (BOD) of target companies. According to Kaplan, Stromberg (2009), PE investors keep board activity much more functional in comparison with public companies' boards. Furthermore, according to Acharya and Kehoe, (2008), PE-backed companies' BODs are on average less numerous than comparable public companies and meet more often. Moreover, based on empirical research on public equities from Yermack, (1996) it is shown that smaller BODs are more efficient than larger ones.
To testify PE firms' activity on the governance side, Acharya and Kehoe (2008) found out that around 30% of poorly performing companies' management gets replaced within 100 days from the investment date. The proportion increases to two-thirds if the time horizon is shifted to the investment duration.

Finally, operational engineering refers to the value adding strategies put in place by PE firms fruitfully exploiting industry expertise from their human capital (Kaplan, Stromberg, 2009). It is no secret that in recent times PE firms turned much more industry focused, allowing them to maximize the value creation thanks to their expertise in precise industries. On the contrary, largely diversified firms are expected to perform poorly against the focused ones in investments done in the same sector. Within these boundaries, operational efficiencies are to be found in having people that run a portfolio company operating in a certain sector with operational background and expertise in that particular industry (Acharya, Kehoe, 2008).

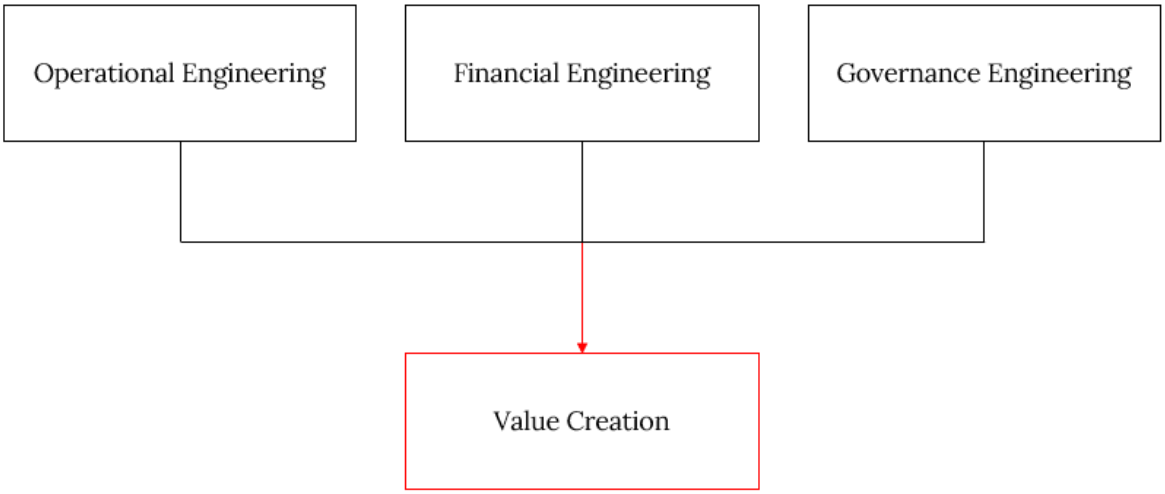

Figure 9: Private Equity Value Creation Matrix. Personal Elaboration.

Although the represented model has vast recognition among scholars and professionals, there are many other interpretations to how the value creation in a PE investment is generated. In fact, even if the variables involved are overall steady in each interpretation, the synergies and the interaction among them change ever so slightly.

According to Loos (2006), the drivers of value creation in a PE investment can be mainly classified as direct value drivers and indirect value drivers. Direct value drivers are easily recognizable as they have an immediate and tangible effect on the cash flows of the portfolio company. Indirect value drivers, by contrast, do not have a quantifiable financial consideration as they often arise in the last segments of the investment (post-investment phase as defined in 1.2.3).

According to this denomination, academics found out that direct value drivers account – on average – for two thirds of the total value creation, whereas the last third is realized in negotiations and transaction phase (Butler, 2001). In this sense, the split proposed by Loos does not provide new answers to the value creation question, but it is useful to understand the dynamics of all the value drivers already treated in the previous literature.

A) *Direct Value Drivers*

As previously mentioned, direct value drivers have tangible repercussions on the business itself, mainly in terms of cost-cutting measures, revenue growth, more efficient use of financing and leverage management. In essence, direct value drivers boost the portfolio company performance through an increase in cash flows, directly augmenting the firm's value.

Jensen (1989) suggest that the main value driver in a buyout transaction is represented by the organizational changes in the portfolio company. These changes will then be reflected in greater operational efficiencies and investment decision making skills. As discusses in the previous pages, agency control mechanisms will drive the management to generate higher cash flow and a greater operating performance (Palepu, 1990). Generally, many academics agree that buyout transactions get executed in companies with great cash flow generating potential (Kaplan, Stromberg, 2009; Jensen, 1989; Loos, 2006). Other studies suggest that buyouts are direct drivers of increased operational performance: Jensen (1989) observes that Buyout transaction generates an increase in operating margin from 10 to 20%, and a decrease in capital expenditure (industry neutral). These findings are confirmed in Smith (1990) as well. According to Muscarella, Vetsuypens, (1989), these notable operational improvements are much owed to the new way in which the company is managed and organized. By contrast, Baker, Wruck, (1989) argue that the manifested increase in performance in any target company would have verified anyhow even without the Buyout transaction happening. Moreover, they argue that much of the value generation comes from the information asymmetry about the firm's performance, which typical leads to an undervalued acquisition. Finally, it is shared academic opinion that PE firms generate value for the portfolio company thanks to a reduction in overhead costs. When a fund vehicle takes over a particular company, in fact, corporate functions are immediately turned leaner. This is achieved by building a better control system and by establishing a healthier communication system (Loos, 2006).

Another crucial strategy through which PE firms increase operational cash flow is the improvement in the asset utilization, as described in Loss, (2006). PE firms would start to tighten control on corporate spending to get substantial increase in operating cash flow. Holthausen, Larcker (1996) found out that post-buyout companies' have smaller amount of working capital than their industry peers. These findings are consistent with Esterwood, Seth (1989), who argue that better working capital management has a tremendous effect on receivables and inventory reduction. Portfolio Companies' management in fact, would try to accelerate the collection of receivables, to reduce the inventory holding period and to increase the average payables payment times in order to increase the amount of ready-to-use cash to finance their expansion.

If the increase in operational efficiency is nowadays a consolidated observed phenomenon studying PE firms' investments, the same could be said for efficacy increase and revenue growth. Revenue growth is indeed one of the core value drivers that management seeks to achieve, especially in VC deals. This growth factor has naturally different weights in buyout and venture deals. As already explained in chapter 1.3, a buyout specialized PE firm targets mature companies, usually profitable, with little to no debt. Since these companies are already profitable, the management is primarily focused on liquidity management, implementing cost cutting measures to generate operational efficiency and perform cash flow management. Moreover, in the post-investment phase, traditional valuation method such as DCF and APV can easily apply thanks to the cash flow generating ability. For VC deals, on the other hand, these valuation methods are usually not applicable since, oftentimes, the portfolio company is not profitable yet. VC specialized PE firms usually rely massively on multiple expansion as value driver (especially Revenue multiple, given that EBITDA multiple may not be useful in unprofitable companies). Therefore, the importance of revenue growth is arguably more decisive in VC deals rather than in buyout deals. Studying a sample of 502 VC deals over the 1993-2003 period, Armstrong, Davila, Foster (2006) conclude that revenue growth are key value

drivers both in pre-IPO and post-IPO periods. This result is consistent with the intent of VC funding, oftentimes used to allow portfolio companies to get operational and report their first revenues. Under a buyout perspective however, revenue growth is equally important especially when thinking about an imminent exit: to maximize the stock price for an IPO or a trade sale, a track record of strong growth is always desirable to have an edge on negotiations (Butler, 2001). Finally, according to According to Loos (2006), the last direct value driver employed by PE firms is represented by financial engineering.[6]

B) *Indirect Value Drivers*

As previously mentioned, around of 1/3 of the value generated by a buyout transaction is to be found in indirect value drivers. These drivers do not directly affect operational performance but help to amplify the value generated by direct drivers (Loos, 2006).

The first indirect value driver is to be found in management and employee's benefit plans. Oftentimes, managers fail to do the right thing just because their interest is not directly correlated with the performance of the company they are actively managing (Palepu, 1990). One could argue that the lack of penalties for "misbehaving" could represent another factor of misconduct. In addition to the already discussed equity ownership, it was found that PE firms enhance the pay-to-perform mechanisms throughout the portfolio company, covering all employee levels (Jensen, 1989). PE firms could in fact introduce employee share ownership plans to maximize motivation and reach corporate goals.

Other indirect value drivers mentioned by Loos (2006) are information asymmetries, and acquisition and negotiation skills. Specifically, it is important to understand how PE firms can generate extra value in the negotiation phase thanks to negotiation skills and information asymmetries. In particular, it was shown by Butler (1991) that PE firms consistently buy cheaper than strategic

[6] Since financial engineering topic was profusely treated in this chapter, its repetition will be omitted.

buyers. The reason is to be found in the overestimation of synergies from strategic buyers and to the development of negotiation skills from PE firms. Finally, PE firm's solid financial network could be viewed as value driver.

To summarize, the discussed value drivers will be tested in the next chapter to understand if the PE process is able to generate positive returns for the business even after their exit.

2.2 IPO underpricing: a common phenomenon

The phenomenon of IPO underpricing has been common and recurring throughout the whole history of financial markets. The core cause of this occurrence traces its roots back to the pricing's complexity of goods and services. In particular, suppliers and consumers have different perception of the value of these goods and services mainly due to information asymmetries, that, as we have just seen, represent an indirect value driver for PE firms. To properly understand the relevance of IPO underpricing, why it happens, and what leads to its creation, a brief overview on the IPO process will be treated.

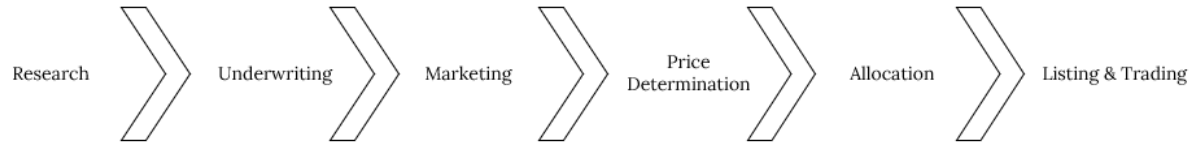

Figure 10: IPO Process. Source: Katti, Phani (2016).

- Research: After deciding to get listed on the stock exchange, the company usually appoints a sponsor, or underwriter, to facilitate the IPO process. The research department in investment banks are triggered to undergo thorough due diligence process. In this process, the underwriter collects

fruitful insights on the macroeconomic condition, IPO cyclicality, time to market, and look for industry specific as well as company specific information to gain a knowledge advantage.

- Underwriting: This phase mainly consists of the preparation of draft documents which will have to be later submitted to regulatory authorities for approval. The due diligence work in the research phase helps and catalyse the preparation of all needed documentation. Finally, this phase also confirms the level of commitment taken by the bank (total commitment, best effort basis, all or none agreement, syndication).
- Marketing: The third phase of IPO process involves marketing of the whole operation. Investment bankers will organize roadshows in different geographical locations to spread awareness to investors. This moment is crucial as Investment Bankers start to think about possible pricing, analysing the public's reaction and opinions on the new-born stock.
- Price Determination: Once roadshows are completed, investment bankers will start to collect bids from all the investors' segments recording price and quantity claimed. Finally, based on this demand, the sponsor and the company's management agree to a final offering price.
- Allocation: After the price determination, the investment bankers will start to allocate the demanded shares to the prospected investors at the determined cut-off price.
- Listing and trading: Finally, once the shares are allocated properly, the newly issued securities will be listed on the stock exchanged.

From the described process, it is clear that investment bankers – which are the ultimate price makers - develop a great understanding of the corporate business model and its upward potential, the vast macroeconomic conditions as well as the general response from the public. All the information gained throughout the IPO process result in massive information asymmetries, leading to typical underpricing in the first trading days.

Underpricing is defined as the “issue of securities below their market value” and it is characterized by the generation of excess returns to shareholders at the end of the first trading day (Brealey, Myers, Allen and Mohanty, 2012).

Only in the late 1960s did academics start to pay attention to the underpricing issue in IPOs. Reilly and Hatfield (1969), analyzed 53 new equity offerings dated 1963-1965. They studied the underpricing by looking at the difference between IPO price and first Friday post-IPO price and concluded that more than 50% of newly issued stocks outperformed the market in the short term. The study was repeated with one month post IPO, and one year post IPO stock prices showing consistent results. The limitation of this study however – pointed out by the authors themselves - is that it was not cyclicality neutral. The bullish IPO market verified during the late 60s could have for sure impacted the study’s results. Reilly and Hetfield seminal work also tried to give some answers to the root causes of the observed underpricing. In particular, they argued that underpricing could occur either because of the inability of the underwriter to properly price the stock or because underpricing brings direct benefits to the transaction’s sponsor, effectively incentivizing its use. Investment banks, in fact, could put in place an underpricing strategy to ensure greater first day returns and minimize their risk exposure. Moreover, if the sponsorship does not happen at a best effort basis, greater stock underpricing is directly correlated with greater upward potential in the short term, hence leading the underwriter to extra returns. In addition, the issuer firm could benefit from the underpricing as well: it is rare in fact that all the financing required gets fulfilled with one single round of offering, hence abnormal short-term performance could lead investors to follow up on their investment when needed (Reilly, Hatfield, 1969).

Many studies followed the seminal work of Reilly and Hatfield trying to explain the root causes of IPO underpricing and validating its assumptions. Ibbotson, Sindelar and Ritter (1994) analysed post IPO returns on a sample of US IPOs dated between 1960 and 1992, finding average short-term returns between 10 and 15%. A further empirical analysis conducted in Rhee, (2002), suggests that

short term underpricing and long-term underperformance dominated the IPO markets between 1990 and 2001. In particular, the results of his analysis pointed out that the average first day return for US IPOs happened between 1990-2001 reached 24.19%.

The vast majority of academic literature seems to point to information asymmetries as primary source of IPO underpricing. Furthermore, literature points out that these asymmetries can have birth at two different levels: Baron (1982) addresses information asymmetry between issuer and underwriter, while Rock (1986) differs between informed investor and uninformed investors.

Baron (1982) assumes that the investment bank, following the thorough IPO process described above, gains significant information advantage over the issuing company. The underwriters then could leverage this information advantage to maximize underpricing and minimize their marketing and share allocation efforts. Arguably, in PE-backed IPOs this type of information asymmetry is sensibly reduced, as PE firms gain significant knowledge over the business itself and they are sharp negotiators.

In Rock's view, the informed investors incur expenses to learn more about the company's intrinsic worth, whilst the uninformed investors do not do so and just purchase shares of any new market issue. Furthermore, he suggests that there is a type of adverse selection known as the *winner's curse*. To make up for this kind of adverse selection and avoid uneducated investors from leaving the IPO market, underpricing is required (Rock, 1986).

2.3 IPO underpricing in PE-backed companies

As mentioned in the previous paragraph, information asymmetry is the most accredited driver of IPO underpricing in the academic literature and usually underwriters have an edge on issuance share price thanks to the collected knowledge. Underwriters may in fact exploit underpricing to obtain full subscription (or sometimes oversubscription) and provide their recurrent clients (IPO investors) with initial positive returns, inducing them to participate in following equity offerings. On the other hand, if underpricing is maximized the underwriter may undermine customer relationships with the issuer. (Bergström, Nilsson and Wahlberg, 2006).

When Private Equity firms are involved in the equity offering the dynamics between issuer and underwriter change dramatically. Both of the parties involved in fact are heavily informed on market conditions and have as main goal to maximize their profit from the offering. Evidence suggests that investment banks and PE firms have developed the ability of focusing their offerings in "hot issue periods". Assuming that certain investors are more knowledgeable than other parties suggests that there are at least two types of investors: those who are knowledgeable and those who are not. Investors that are knowledgeable refrain from placing bids on IPOs that are overpriced, whereas uninformed investors do so (Rock, 1986; Bergström, Nilsson and Wahlberg, 2006). Given that underwriters may choose to allot shares to knowledgeable investors, it would seem that shares in an IPO are initially distributed to informed investors. Consequently, less knowledgeable investors only receive a tiny portion of the shares in appealing IPOs while receiving all the shares in overpriced IPOs. (Bergström, Nilsson and Wahlberg, 2006). This adverse selection indicates that occasionally early returns will be negative for less experienced investors. Due to the informational advantage held by well-educated investors (PE firms), underpricing in this situation may be seen as compensation for the risk that less informed investors must assume. This theory reflects indeed the widespread belief that top tier businesses tend to underprice their stock in an IPO context

to ensure following fundings, while bottom tier businesses tend to properly price their IPOs. (Welch, 1989; Grinblatt, Hwang, 1989).

Due to increased visibility and given openness prior to the IPO, information in private equity-backed IPOs is probably more evenly distributed across investors, which is expected to decrease the problem of adverse selection. Greater levels of publicly available information may also result from fund investors' monitoring of private equity firms during the investment term - the time frame in which private equity firms invest in their portfolio companies. The enhanced information dissemination in private equity-backed IPOs likely reduces the ex-ante uncertainty about the underlying value of the issuing business and narrows the informational gap between investors.

Another explanatory variable of IPO underpricing in PE backed companies is represented by the PE firm's certification role: Megginson and Weiss (1991) proposed the *venture capital certification theory*, which states that PE/VC funds serve as certifying agents to the issuing businesses. These funds risk losing their reputation since they routinely introduce businesses to the market. Additionally, they contend that corporations with PE/VC backing get esteemed IPO sponsors, which could lead to reduced underpricing. Chahine (2006), who asserts that PE/VC-backed IPOs in the UK are often less underpriced than non-PE/VC-backed IPOs, emphasizes the significance of the certification function. Similar to the *venture capital certification theory* proposed by Megginson and Weiss, Lin and Smith (1995), argued that PE backed IPOs experience reduced underpricing when the PE sponsor has greater reputation. They contend that since PE firms are viewed as insiders, the market would interpret a significant stock sale during the IPO as a warning. In reality, a total sale of the portfolio company's equity would lead outsiders to see the new share issuance as being expensive because PE/VC investors typically retain some of their ownership after the IPO as well. According to their empirical investigations, PE/VCs are aware that keeping their ownership after the IPO demonstrates to underwriters and the market that they are not acting opportunistically.

Studying a sample of more than one thousand IPOs between 1994 and 2004, Bergström, Nilsson and Wahlberg, (2006) confirmed their hypothesis that PE-backed IPOs register less underpricing in comparison with non-PE-backed IPOs because of the less ex-ante uncertainty about the issuer value. PE-backed IPOs registered an underpricing of 9.33% in contrast with 12.87% of non-PE-backed IPOs. The results presented are overall consistent across different sizes, years, and industries.

The work of Bruton, Chahine, & Filatotchev, (2009) provides further insights about PE-backed IPOs, especially about early-stage investments specialized firms. In particular, the conclusion of their analysis is that Business Angels' ownership represents a more powerful signal to the market about the equity quality than VC's presence. The proposed model in fact, signals a negative relationship between business angel ownership and underpricing (p = 5%), and an insignificant relationship with venture capitalists' presence.

In conclusion, there is vast consensus in the academic literature that IPO underpricing is a common phenomenon in the market and find its roots in a number of different factors, namely agency theory, mispricing, sponsor reputation and forward-looking strategical pricing. It is shown by empirical evidence that PE backed companies IPOs result in less underpriced valuations then non-PE backed peers.

2.4 Post IPO Operating Performance

Once a company successfully completes its IPO, both empirical evidence and academic literature shows the existence of long run underperformance. The seminal work of Ritter (1991) is one of the first to document the post IPO long-run underperformance phenomenon. By studying a sample of 1526 IPOs between 1975-1984, Ritter shows that long term returns – adjusted for first day's underpricing – are negative. In particular, he found out that average three year holding period return after the IPOs stands at 34.47% against the 61.86% of a comparable control market sample.

Although many studies followings Ritter's work confirmed the post-IPO long run underperformance phenomenon, very few focused on the post-IPO operating performance. The first academic study in this regard is the one pursued by Jain and Kimi (1994). They investigate the change in operating performance of 682 Northern American companies following their IPO dated 1976-1988. The results of the analysis reflect their hypothesis: significant drop in operating performance is found 3 and 6 years after the IPO both before and after industry adjustment. They also argue that this drop in efficiency is not related to a decreased effectiveness: most of the situations analysed in fact show positive revenue growth, increased capital expenditure but lower operating performance. It would seem that the observed drop in efficiency is not directly related to a decline in business activity. Interestingly, they also test the relationship between underpricing and operating performance, under the model of Welch, (1989); Grinblatt, Hwang, (1989). The model tested follows the theory that top tier businesses would tend to underprice more their stock in an IPO operation. By splitting the sample in half according to the median underpricing, they observed no significant relationship between underpricing and operating performance decline.

Jain and Kimi (1994) provide further evidence with regard to the management ownership effect on post IPO operating performance. They show that the

management ownership retention is positively related to an increase in operating performance. It is also shown that managers accurately time their issue to follow increased efficiencies. In fact, investors could be overoptimistic looking at the performance numbers at the time of the IPO, and managers could take advantage of this situation issuing overvalued equity. Following this overoptimism hypothesis, Jain and Kimi (1994) reaffirm a typical drop in operating performance.

By studying a sample of 254 Malaysian IPO companies between 1990-2000, Zaluki, (2009) provides moderate evidence that the average IPO company underperform control market benchmark in the three years after the listing. Moreover, she provides strong evidence of long run operating performance decline following the IPO. Her findings also support the theory that the IPO managers' handling of earnings at the time of going public is to blame for the decline in operating performance following the IPO.

Pereira, Sousa (2017) find similar results to Zaluki's paper, studying four different operating performance indicators in 555 European IPOs between 1995 and 2006. The indicators used to assess the long term operating underperformance are: ΔEBITDA/Assets, ΔEBITDAMargin, Δ(Operating CF)/Assets, Δ(Operating CF)/Revenue. The results of the analysis are consistent and significant among the four different variables, suggesting that each of the four approaches could be justified to study the difference in operating performance post-IPO.

Many academics suggest that agency theory could be a driver of decline in operating performance post IPO. It is shared opinion that key agency issues outlined in Jensen and Meckling (1976) are driven to the furthest extent after the private (owner) manager sensitively reduce its equity stake and its controlling abilities are suddenly hit from the IPO process. Mikkelson, Partch and Shah (1997) find that operating performance declines are highest for US enterprises that had the largest fall in managers' equity stake. Jain and Kini (1994) discovered

a similar favourable association between operating performance and managerial ownership retention.

Coakley, Hadass, and Wood (2007) study the post issue operating performance on a sample of 316 venture-backed and 274 non-venture-backed IPOs on the London Stock Exchange between 1985 and 2003. Their findings are overall consistent with previous academic literature, as they find significant operating performance drop 5 years after the pre-IPO year. They point out however that the results of the analysis are not robust, as polluted by the remarkable underperformance observed in venture investments in the dotcom bubble. Interestingly, their analysis concludes that the operational performance gap between VC backed, and non-VC backed IPO are not overall significant except for few years. They also find negative correlation between board representation and long run performance, thus signaling presence of adverse selection. Finally, they find strong evidence of Megginson and Weiss (1991)'s *venture capital certification theory*.

From the presented academic literature, it seems that companies tend to worsen their operating performance in the medium-term after the IPO. This hypothesis will be tested in the next chapter with regards to PE backed IPOs and non-PE- backed IPOs.

EMPIRICAL ANALYSIS OF POST-IPO OPERATING PERFORMANCE: EVIDENCE FROM THE US MARKET

3.1 Hypothesis statement

Following the literature presented in the previous chapter, this thesis wants to shed light on the impact caused by Private Equity on the widespread accepted phenomena of IPO underpricing and operating performance decline in the short and medium term.

Many theories have been proposed to analyse the effect of PE firms' sponsorship on IPOs, most of which have been discussed in the previous chapter. The most preponderant theory in this matter is the "*venture capital certification theory*" by Megginson & Weiss (1991) which affirms that the presence of venture capitalist (or, in broader terms, private equity investors) in the issuers' equity at the IPO date represents a certification of success of the issuer's stock. The foundation of these theory resides in the fact that, as economic agents, venture capitalists would not invest in bottom tier companies, but would look up to invest in the best cash flow generating business activities on the market. Additionally, it is worth noting that the IPO represents the moment in which the PE firms liquidate their investment, hence the desire to sell to at the highest achievable price. Moreover, given the consolidated IPO underpricing phenomenon, if the PE's portfolio company was not in the best conditions for sale (see chapter 1.4 for references), the PE firm would have arguably decided for a Trade Sale to maximize (minimize) its returns (losses). Finally, thanks to their powerful ties with investment bankers, PE-backed IPOs not only would benefit from the sponsor reputation, but from the underwriter's one as well. This certification theory will be developed further in the chapter.

For the reasons just illustrated, it is reasonable to believe that PE-backed IPOs would show less underpricing in comparison to non-PE-backed ones.

Hypothesis 1: PE-backed IPOs show less underpricing than non-sponsored ones.

Additionally, Cao (2008) has demonstrated that PE firms only completely exit their investment rarely, either due to contractual lock-up clauses that prevent them from doing so or because they would exit the investment at a later time under more favourable terms. It seems fair to assume that the engagement of PE firms following an IPO may result in improved outcomes on all considered time horizons, as a potential exit could occur anytime. Somehow the theory just presented follows closely the observation reported from Jain, Kimi (1994) which states a positive relationship between management ownership retention and post IPO operating performance increase. Different temporal horizons will be taken into consideration to assess the robustness of this theory.

Hypothesis 2: PE-backed companies show less deterioration in post-IPO operating performance than non-PE-backed ones.

Finally, this paper will test the theory that top-tier businesses tend generate greater first day returns at the IPO date. (Welch, 1989; Grinblatt, Hwang, 1989), whether they are PE-backed or not. Studying the academic literature, this interesting phenomenon surfaced as additional point of research that might have been tested with the selected dataset.

Hypothesis 3: Companies that record more underpricing at the IPO date show less deterioration in post-IPO operating performance.

3.2 Sample, data collection and major descriptive breakdowns

3.2.1 Data collection and sample definition

Since this paper will examine the three years post-IPO operating performance of PE's portfolio companies - and in order not to have polluted results by COVID crisis or by the Great Financial Crisis (GFC) – only IPOs that took place between 2011 and 2016 will be considered. The decision not to enlarge the sample adding IPOs happened before the GFC years is dictated by the findings of Coakley, Hadass, and Wood (2007): in their paper they find that the observed decline in operating performance is mainly driven by the dramatic underperformance of companies in the dotcom bubble. Their research indicates that companies, otherwise, find stable performance in the other years. This led me to the decision of conducting the analysis in "crisis free" years, not having to factor in the systemic downfall component.

Almost all of the data used in this thesis was downloaded from the Refinitiv platform, while other data sources were used to increase the sample numerosity. During the course of the research, it has happened in fact that some key data was missing from the Refinitiv database or needed a cross validation. The here treated sample is the result of this cross validation and data augmentation among different databases.

The deals were sourced from the Refinitiv database following the listed steps:

1. Log into the Refinitiv Platform and go in the "Screener" section.
2. Select the Universe "Deals" from the asset class "Equity".
3. Exclusive selection of the Issue Type: "IPO" in order to avoid seasoned equity offerings.
4. Transaction Status is set to "Live" to avoid rumoured or not completed deals.
5. The Issuer's Stock Exchange is set to be amongst New York Stock Exchange (NYSE) or NASDAQ.

6. The issue date is set between 2011 and 2016.

Following the export from Refinitiv, some manual adjustments were performed on the dataset, namely:

7. Removing from the dataset all Funds IPOs.
8. Removing from the dataset all specialized Acquisition Corporations.
9. Removing from the dataset purely Insurance/Banking firms due to the insignificance of EBITDA calculation.

A cross validation was performed for all the "outliers' values" with the Orbis database company by company. This step was time consuming but allowed the sample to be refined to its best shape. It is embedded in the researchers' spirit to pursue the explanations of observable phenomena through the use of the most accurate data available in the market, should even the data collection process last more than the analysis itself.

Additionally, to certify Refinitiv's data for first day returns for the whole sample, IPO data from IPOscoop.com was used. IPOscoop.com collects, merges, and provides a wide set of information regarding most of the IPOs taken place in the United States from the year 2000.

Refinitiv database provides information on whether the IPO company was Private Equity backed at the time of the IPO. Consequently, the data field "Private Equity Backed IPO Issue Flag" was selected to allow an easy sample breakdown.

3.2.2 Sample description

The final dataset resulting from the steps illustrated above is composed of 397 companies that IPOed between 01/01/2011 and 31/12/2016 in Nasdaq and NYSE Stock Exchanges, 132 of which were PE-backed at the IPO's time.

Table 2 provides key insights on the industry distribution of new IPO companies across the 3 portfolios. Given that this sample is not representative of all the PE investments (since we are only considering a small fraction of all PE activity), it is possible to appreciate the exit selection criteria of Private Equity investors. It is curious to notice that in some sectors (Basic Materials, Consumer Cyclicals, and Industrials) PE-Backed IPOs were more than non-PE-backed IPOs. The fact that the majority of the companies that have gone public in those industries were PE-backed represents a clear sign of PE interest, exit knowledge and potentially signalling great industry expertise.

	ALL IPOs		**PE-BACKED**		**NON-PE-BACKED**	
	n	**%**	**n**	**%**	**n**	**%**
Basic Materials	14	4%	8	6%	6	2%
Consumer Cyclicals	59	15%	34	26%	25	9%
Consumer Non-Cyclicals	8	2%	4	3%	4	2%
Energy	25	6%	11	8%	14	5%
Financials	35	9%	12	9%	23	9%
Healthcare	96	24%	11	8%	85	32%
Industrials	38	10%	20	15%	18	7%
Real Estate	25	6%	8	6%	17	6%
Technology	89	22%	21	16%	68	26%
Utilities	8	2%	2	2%	6	2%
Total	**397**	**100%**	**131**	**100%**	**266**	**100%**

Table 2: Dataset Breakdown by Industry (TRBC)

Moreover, as visible in Figure 11, some industries record a tiny percentage of PE-backed IPOs. As already mentioned in chapter 1, the IPO is usually regarded as last Exit resort for a PE firm. In fact, it would be approximative to state – only based on Figure 11 - that Private Equity firms are not active in USA in the Healthcare or in the Technology space, as the numbers reported only show a tiny fraction of total PE activity. In fact, according to the Bain Global Private Equity Report (2022), Technology and Healthcare represents respectively the first and the third industry in the PE space by deal count. In essence, it would be wrong to take IPO deal count as a proxy of PE industry activity.

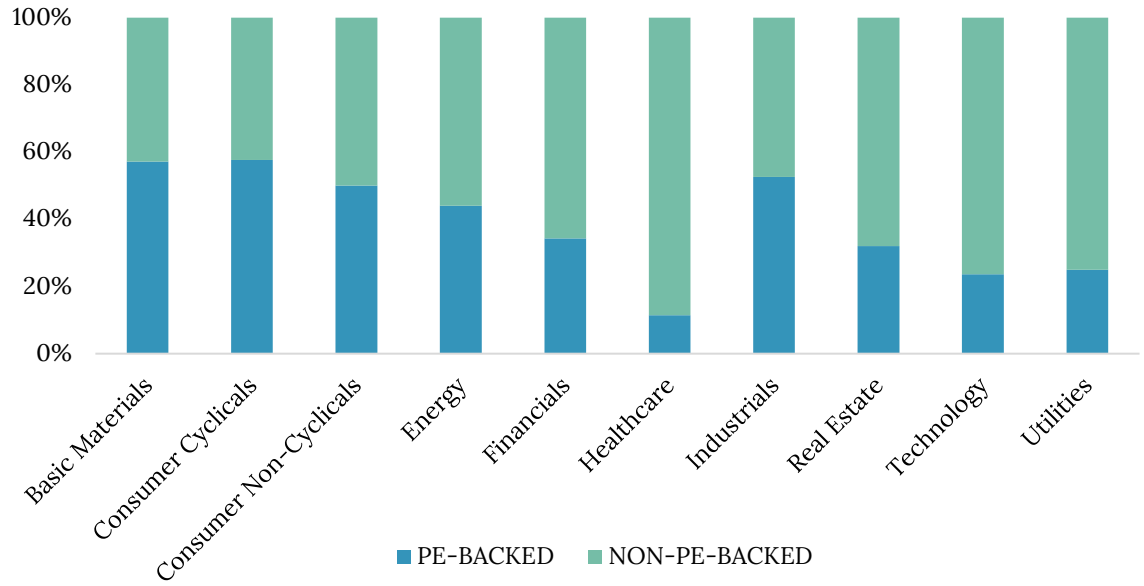

Figure 11: Dataset breakdown by Industry (TRBC) and % of PE-backed-companies

Table 3 provides the dataset's breakdown by IPO year. It is possible to appreciate the phenomenon of IPO seasonality; the number of IPOs in fact is modest in the years following the GFC (2011-2012), to then grow exponentially in the years two following years, reaching 117 IPO companies in 2014. 2014 represents the years as well in which PE firms' focus their exits, with 34% of all PE-backed IPOs registered in that year. After this observed peak in IPO activity, the number of IPOs experiences a drop in 2015 and 2016, registering less than 30 IPOs in 2016.

	ALL IPOs		PE-BACKED		NON-PE-BACKED	
	n	**%**	**n**	**%**	**n**	**%**
2011	40	10%	8	6%	32	12%
2012	54	14%	23	18%	31	12%
2013	86	22%	26	20%	60	23%
2014	117	29%	44	34%	73	27%
2015	71	18%	21	16%	50	19%
2016	29	7%	9	7%	20	8%
Total	**397**	**100%**	**131**	**100%**	**266**	**100%**

Table 3: Dataset breakdown by IPO year

3.3 Methodology

To test the formulated hypotheses, robust regression models will be used in conjunction with Welch's t-test to look for statistical significance.

To answer the first research question, the Dependent variable is set to be the first day returns with respect to the original offer price (underpricing). The model will shed light on the PE's influence on first day returns.

For the second and third hypothesis validation, the dependent variable of the model is set to be the $\Delta EBITDA\ Margin_i$ between the i^{th} year after the IPO and the IPO date. Through the presence of the dummy variable "PE", the PE firm's effects on IPO companies' operating performance improvements will be studied.

Finally, to assess the soundness of the models, Variance Inflation Factors (VIF) will be calculated to be sure of the absence of multicollinearity among the variables.

3.4 Key variables

Through the development of this thesis two different regression models have been built. The first one is intended to measure the PE effects on underpricing; hence it will test hypothesis 1. The second one is intended to measure the PE effects on short/medium term operating performance after the IPO, and it is built to answer both hypotheses 2 and 3. The following paragraph will explore the key variables of each model, their academic historical background and expected effects on the dependent variables.

3.4.1 Dependent Variables

A) *Underpricing – model I*

To validate the first hypothesis, underpricing is set to be the dependent variable of the model. Underpricing is defined as "*the percentage first day returns, measured from the offer price to the first trading day closing market price*". (Ritter, 1991). To translate in formulas what said in words:

$$Underpricing = \frac{P_{CP} - P_o}{P_o}$$

Where P_{CP} is the close price in the first trading day, and P_o is the offer price.

Despite the existence of other formulas and definitions to represent the underpricing phenomenon (such as the Market Adjusted Initial Returns – MAIR), this thesis will test the first hypothesis with Ritter's formulation.

B) *ΔEBITDA Margin – model II*

To test the second hypothesis, the ΔEBITDA Margin will be used as dependent variable defined as follows:

$$\Delta EBITDAMargin_{(0;i)} = EBITDAMargin_i - EBITDAMargin_0$$

Where:

$$EBITDAMargin_i = \frac{EBITDA_i}{Revenue_i}$$

$$EBITDAMargin_0 = \frac{EBITDA_0}{Revenue_0}$$

and i is set to 3 years to test medium-term effects on operating performance.

The ΔEBITDA Margin will be used as a proxy of efficiencies for three main reasons:

1. Previous studies - Zaluki (2007), Cao, Jerry (2011), Pereira, Sousa (2017) – have used this variable to conduct analyses on the post-IPO operating performance.
2. Private Equity firms attributes great importance to the pricing multiples of their portfolio companies. Oftentimes, as already mentioned in chapter one, multiple analysis is more entrusted than classic analytical valuation approaches. The two main multiples taken into consideration by PE firms are EV/REV and EV/EBITDA. Since PE firms' prime goal is to sell at the highest possible price and given that oftentimes the pricing multiples take massive weight in the portfolio company's valuation's calculation, the ΔEBITDA Margin represents the best proxy for the scope of this paper.
3. EBITDA stands for Earnings Before Interest, Taxes, Depreciation and Amortization. Comparing EBITDA Margins of two different companies means effectively comparing the raw operational returns net of any fixed assets-related metrics, hence of any particular industry effect.

		Count	Mean	Median	Minimum	Maximum	Std. Deviation
Underpricing	PE=1	**131**	0,153	0,085	-0,1875	1,1967	0,2346
	PE=0	**266**	0,1857	0,1	-0,2307	1,4875	0,2968
PE	PE=1	**131**	1	1	1	1	0
	PE=0	**266**	0	0	0	0	0
logProceeds	PE=1	**131**	2,4074	2,3129	1,2729	4,3985	0,4819
	PE=0	**266**	2,0737	2,0459	0,6021	4,2043	0,4122
UPREVISED	PE=1	**131**	0,7481	1	0	1	0,4358
	PE=0	**266**	0,7105	1	0	1	0,4544
Shares%	PE=1	**131**	0,2501	0,2222	0,0145	0,8699	0,1514
	PE=0	**266**	0,2729	0,2309	0,0244	1	0,1851
IBscore	PE=1	**131**	8,5887	9,001	5,001	9,001	0,5996
	PE=0	**266**	7,6626	8,501	-9	9,001	3,385

Table 4: Descriptive Statistics of model I's variables.

3.4.2 Independent Variables – model I

A) *Private Equity Backed* (PE) – *model I, II*

This is the key independent variable for Hypotheses 1 and 2 built to test Megginson and Weiss (1991)'s venture capital certification theory. *PE* is a dummy variable that takes values of 1 when the IPO company was PE-backed at the time of the IPO, 0 otherwise (so, in essence, when the IPO represents the exit strategy designed by the PE firm in a portfolio company). The data for this variable was downloaded directly from the Refinitiv platform through the column "Private Equity Backed IPO Issue Flag".

Many studies trying to explain PE-related effects on public companies use this dummy variable, including (Megginson and Weiss, 1991), (Jain and Kini, 1994), (Coakley, Hadass, Wood, 2007), and it is expected that PE-backed IPOs register less underpricing and greater operating performance improvements than non-PE-backed ones.

B) *Size* (*logProceeds*)

Proceeds are taken as a proxy of IPO company's size, and are calculated as follows:

$$Proceeds = SharesOffered * Offerprice$$

It is possible to find a vast consensus in the academic literature that bigger IPOs create major positive sentiment in the investor base, due to the inferior perceived risk. As visible in Figure 12 and Table 4, PE-backed IPOs tend to be larger than non-PE-backed ones; 82% of all non-PE-backed IPOs have had proceeds for less than 250 $M, against only 53% of PE-backed peers. From a business perspective, this is not surprising at all; LBOs target are usually big, established firms, so it would make sense that for such big corporations an IPO

exit should be considered. To limit the influence of outliers (such as Alibaba IPO in 2014), the logarithm of Proceeds has been used.

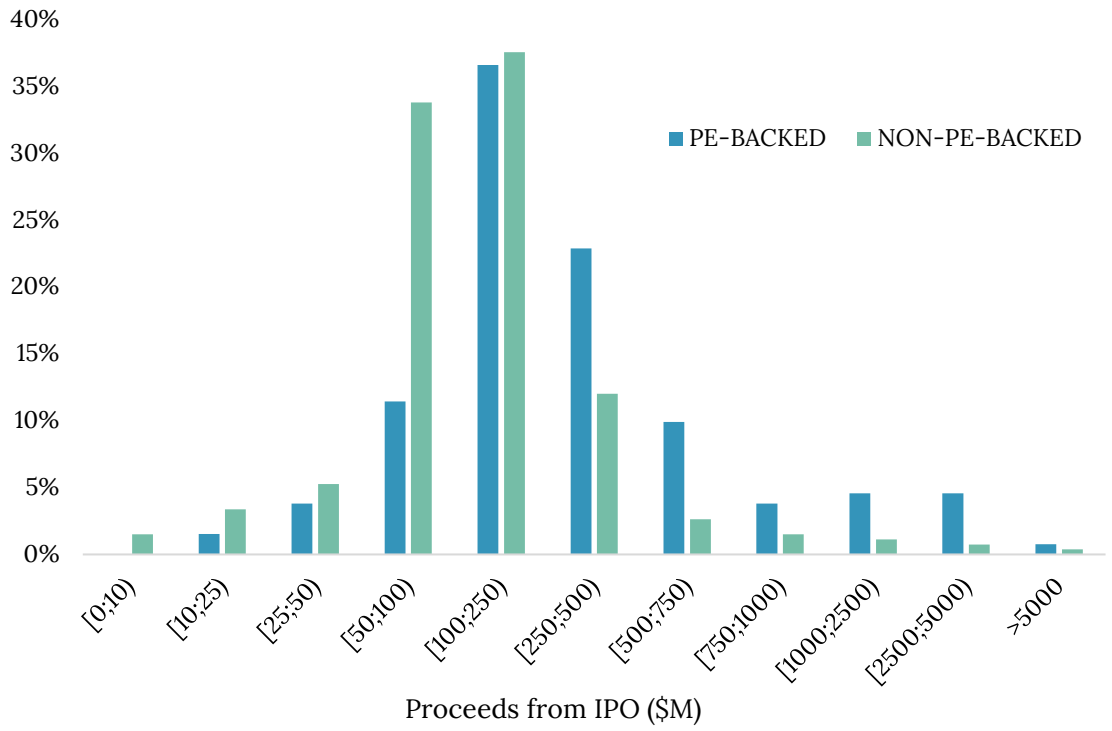

Figure 12: Dataset frequency distribution by Proceeds amount.

C) *Price revisions (UPREVISED)*

According to Benveniste and Spindt (1989), the phenomenon of underpricing could be justified by the discovery of new information in the bookbuilding stage. To compensate investors for the information shared, the sponsor could adjust the price to guarantee greater returns. Hanley (1993) has been among the first to document the so called "partial adjustment phenomenon". In her paper, she observed that IPOs tend to experience larger underpricing when the price has been upwardly revised from the original offer price.

To control for this phenomenon, in the regression model will be present a dummy variable (UPREV) that takes values of 1 when the price has been up revised from the offer price, 0 otherwise. It is expected that issues priced above the original offer price would register more underpricing.

D) Ownership concentration (Shares%) – model I, II

It is common ground in the academic literature that the more dispersed the ownership, the worse the direct control mechanisms and hence the performance are. To test this, the variable *Shares%* is introduced as control variable in the model. The values of the variable have been directly downloaded by the Refinitiv platform, and are calculated as:

$$Shares\% = \frac{Shares\ Offered}{Total\ Outstanding\ Shares}$$

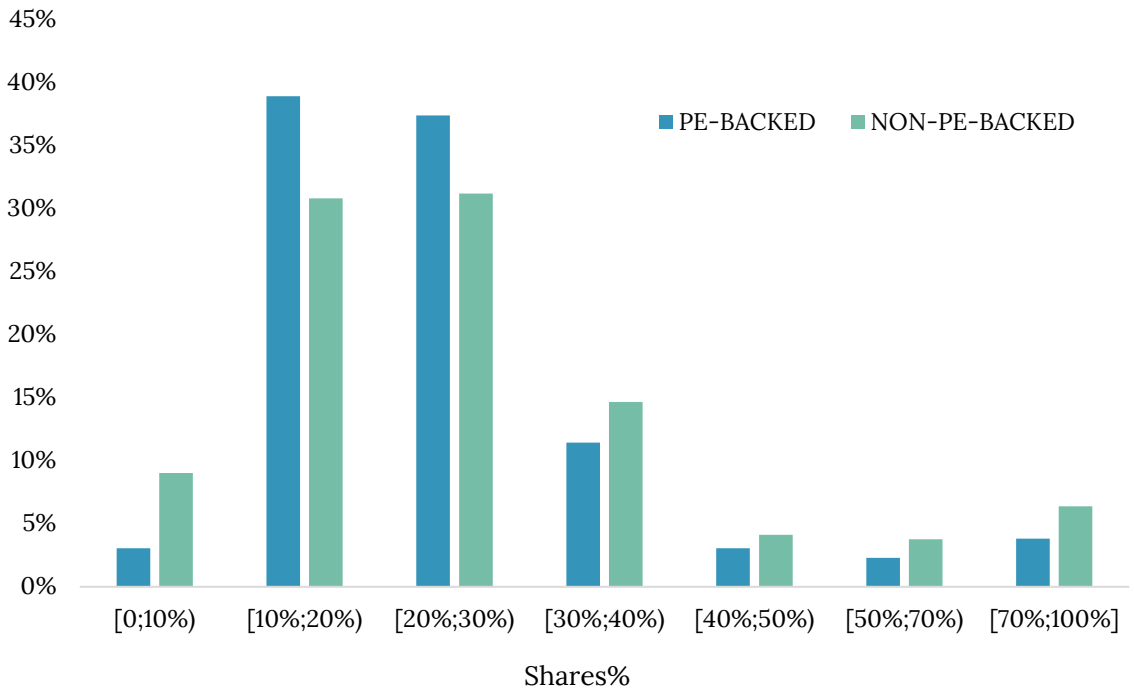

Figure 13: Dataset frequency distribution by Shares%

The insight from Figure 13 is that close to 80% of PE-Backed companies tend to offer between 10% and 30% of their outstanding shares to the market, signalling a weak control loss. On the contrary, 29% of non-PE-backed companies offered more than 30% of their shares in their IPO – against 21% of PE-backed companies. It is possible to say then that non-PE-backed companies tend to offer a greater percentage of shares when performing an IPO, thus experiencing a greater control loss against PE-backed companies.

E) *Underwriter prestige (IBscore) – model I, II*

The lead underwriter's prestige represents a factor to be considered when a company's equity gets traded for the first time. As emerges from Carter and Manaster, (1990), less risky companies tend to hire more prestigious underwriters, which could grant a more successful IPO through sharing of confidence and trust in the investor base. Despite the many proxies for the computation of underwriter's prestige, this thesis will follow the approach explained on the website of Professor Jay Ritter, through which each underwriter gets a score ranging from -9[7] to 9, with 9 signalling the ones with most prestige.[8]

As discussed in the previous chapters, PE firms maintain tight bonds with industry leaders Investment Bank. This is indeed reflected in the studied sample, as visible in Table 4 and in Figure 14. PE-backed companies' lead underwriter has an average score of 8.59, against the 7.66 non-PE-backed ones.

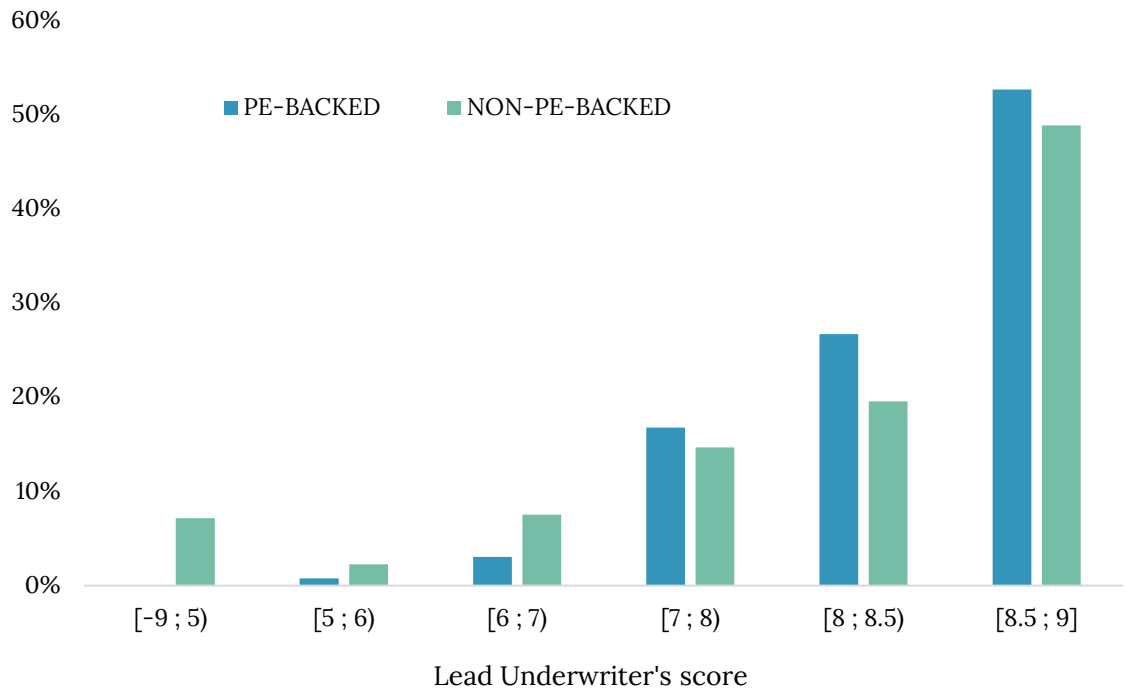

Figure 14: Dataset frequency distribution by Lead Underwriter's score

[7] Only in case there is no available data for that underwriter in that particular time window.
[8] The table used for the data determination is available at: https://site.warrington.ufl.edu/ritter/ipo-data/

3.4.3 Independent Variables – model II

A) *PE - ibidem*

B) *Ownership concentration – ibidem*

C) *Underwriter prestige - ibidem*

D) *Underpricing (BUnderpricing)*

This variable has been created to count in the effects that underpricing registered in the first trading day might have on the dependent variable. Jain and Kimi (1994) found no significant relationship between underpricing and decline in operating performance by splitting their dataset into two subsamples, with the threshold being the median underpricing. A similar approach was used to build this variable: *BUnderpricing* will have value of 1 if the company's underpricing has been greater than the median of the sample, 0 otherwise. Although following Jain and Kimi (1994) methodology, we expect different results: according to Welch, (1989); Grinblatt, Hwang, (1989), businesses who experience greater first day returns are, *ceteris paribus*, better performers than low underpricers. Hence, we expect a positive correlation between *BUnderpricing* and *ΔEBITDA Margin.*

F) *EBITDA Margin sign inversion control (EMnegative, EMupturn, EMdownturn)*

Despite its easy calculation, studying the delta EBITDA Margin could result in unexpected challenges. The straightforward case (and more common, with 59% frequency in the dataset) is depicted when both the EBITDA Margins reported ($year_0$ and $year_i$) are positive, and the delta can be easily calculated.

It is worth to recall that the theoretical EBITDA Margin range is $(-\infty; 1]$, as a company could suffer unlimited losses while generating infinitesimal revenue but can never register operating profits larger than revenue by definition. With

		Count	Mean	Median	Min	Max	Std. dev.
△EBITDA Margin (3)	PE=1	**131**	0,0027	0,012	-1	1	0,2538
	PE=0	**266**	-0,0327	0,023	-1	1	0,5642
PE	PE=1	**131**	1	1	1	1	0
	PE=0	**266**	0	0	0	0	0
BUnderpricing	PE=1	**131**	0,4733	0	0	1	0,5012
	PE=0	**266**	0,5113	1	0	1	0,5008
EMupturn	PE=1	**131**	0,0611	0	0	1	0,2404
	PE=0	**266**	0,0827	0	0	1	0,276
EMdownturn	PE=1	**131**	0,0076	0	0	1	0,0874
	PE=0	**266**	0,0789	0	0	1	0,2702
EMnegative	PE=1	**131**	0,0382	0	0	1	0,1923
	PE=0	**266**	0,3947	0	0	1	0,4897
REVCAGR (3)	PE=1	**131**	0,1805	0,1487	-0,4368	1,2063	0,2435
	PE=0	**266**	0,4135	0,2673	-0,8217	5,5152	0,6976
logTotAss	PE=1	**131**	2,9868	3,0833	0,3617	5,1659	0,766
	PE=0	**266**	2,115	2,0191	0,1139	4,6572	0,7082
△TotAss (3)	PE=1	**131**	1,3413	0,6863	-0,6933	1,6247	2,2792
	PE=0	**266**	4,8351	2,2723	-0,9116	1,1868	1,0289
***Leverage* (3)**	PE=1	**131**	0,357	0,3756	-0,6461	4,2659	0,5249
	PE=0	**266**	-0,0894	-0,12	-0,9612	2,5023	0,5531
Shares%	PE=1	**131**	0,2501	0,2222	0,0145	0,8699	0,1514
	PE=0	**266**	0,2729	0,2309	0,0244	1	0,1851
IBscore	PE=1	**131**	8,5887	9	5,001	9	0,5996
	PE=0	**266**	7,6621	8,501	-9	9	3,3849
IndExpertise	PE=1	**131**	0,4733	0	0	1	0,5012
	PE=0	**266**	0,1842	0	0	1	0,3884

Table 5: model II's variables descriptive statistics

this concept in mind, $\Delta EBITDA\ Margin$ can easily lose significance when there is a sign inversion between $year_0$ and $year_i$, or when both the numbers are negative. As it will be later explained in chapter 3.6, the loss of significance will be taken care of by putting a limit to the tails of the distribution, while three dummy variables are created to account for the reported corner cases.

- *EMnegative* will have values of 1 if both of the reported EBITDA Margin are negative, 0 otherwise.
- *EMdownturn* will have values of 1 if $EBITDAMargin_0$ is positive and EBITDA $Margin_i$ is negative, 0 otherwise. It is expected a negative relationship with the dependent variable.
- *EMupturn* will have values of 1 if $EBITDAMargin_0$ is negative and EBITDA $Margin_i$ is positive, 0 otherwise. It is expected a positive relationship with the dependent variable.

G) *Firm's Growth* ($REVCAGR_i$ - $\Delta TotAssets_i$)

Revenue Growth is calculated using the Compound Annual Growth Rate formula. In particular:

$$REVCAGR_{(t_0,i)} = \sqrt[(i-t_0)]{\frac{REV_i}{REV_{t_0}}} - 1$$

Where i is the reporting date of the company after 1 and 3 years, and t_0 is the IPO date.

As mentioned in the previous chapters, PE firms highly rely on Multiples to price their portfolio companies. Hence the belief that Revenue and EBITDA growth should go hand in hand in order to maximise the exit proceeds. Additionally, revenue growth is a good proxy of general firm growth, could lead to the generation of economies of scale.

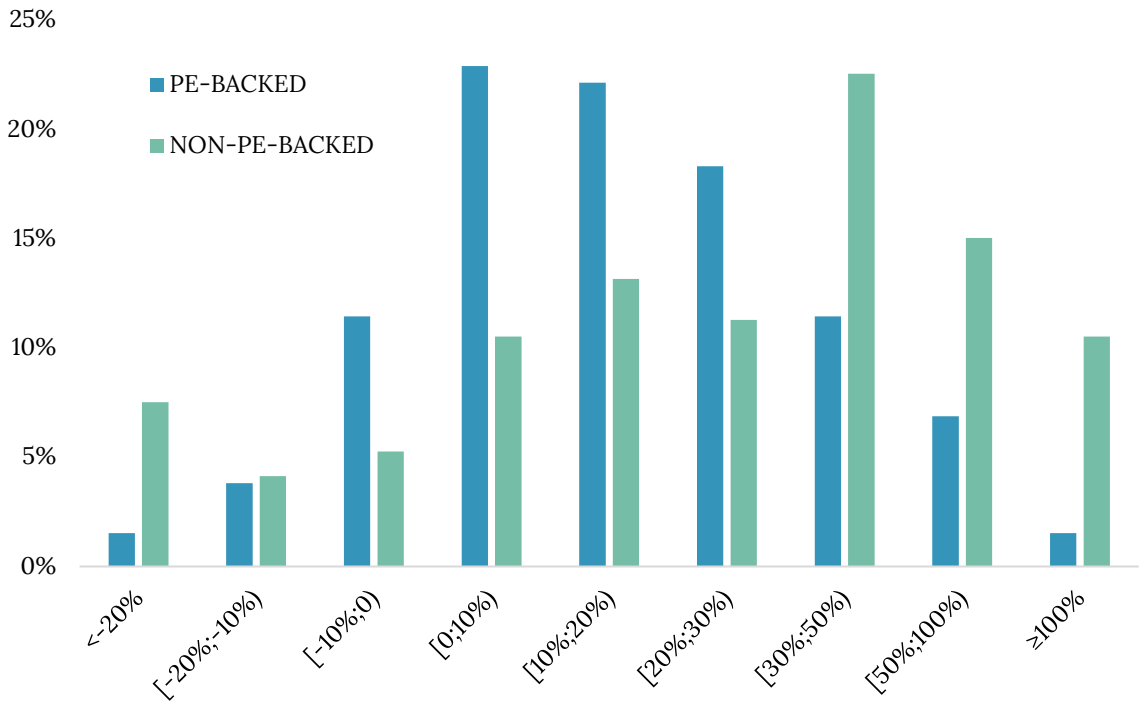

Figure 15: Dataset frequency distribution by Revenue CAGR (3)

As visible from Figure 15 and Table 4, PE-backed companies register, on average, less revenue growth compared to non-PE-backed companies (average of 18.05% against 41.35%). Intuitively, this might be surprising. However, when careful thought is put into the observation it makes perfect sense: PE firms plan and time their exit with accuracy to maximize their returns, hence when the growth plan is fully achieved. It would be surprising to notice a staggering high Revenue Growth post sale, as it would contradict PE firm's Exit plans.

Moreover, as a further proxy of firm's growth, $\Delta TotAssets_i$ (between the i^{th} year and the IPO date), is included to assess the influence of Capital Expenditures on operating performance.

H) *Size* ($logTotAssets_{t0}$)

Many studies that intended to measure the effect of companies' size on profitability found positive correlation between the two variables. Through the achievement of scale's economies, the size of a company plays a vital role in the competitive landscape through a cost reduction's race. Doğan (2013) presents

empirical evidence from a set of 200 Turkish companies listed on the Istanbul Stock Exchange that size and profitability are often strictly correlated.

To account for these phenomena the variable *Total Assets* was included in the model. The values of this variable have been directly downloaded from Refinitiv and give an absolute reference to companies' size at the IPO date.

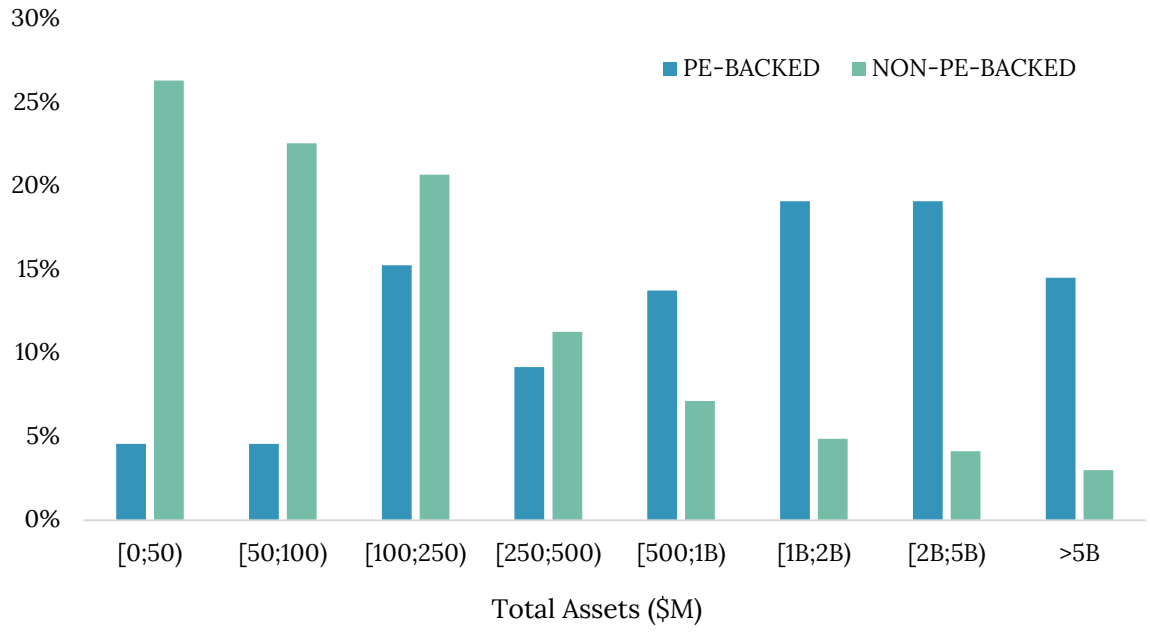

Figure 16: Dataset breakdown by Total Assets at the IPO date.

As shown in Figure 16, PE-backed companies are on average much larger than non-sponsored peers when they perform the IPO. Indeed, this chart is almost mirroring the Revenue CAGR chart: since smaller companies have greater growth potential, and the non-PE-backed sample is on average smaller in size than PE-backed one, it makes sense that PE-backed companies struggle to generate growth after the listing: they have already fulfilled their expansion plans.

I) *Leverage* (*Leverage*$_i$)

The Leverage variable is computed as:

$$Leverage = \frac{Net\ Debt}{Total\ Assets}$$

From the previous chapters we have been able to understand how PE firms employ leverage as a value generator. Consistently with this view, Figure 17 shows the sample frequency distribution by Leverage. It is observable that high leverage is a feature of PE-backed companies, with an average of 31%. It is totally expected, especially having studied the size of PE-backed IPOs. Deals this large in fact, often require additional funding than just Equity to be fulfilled, hence why PE firms choose Leveraged Buyouts. Once the LBO is completed, the financial situation of the company will be rehabilitated only in the long-term, making it reasonable to observe such high degree of financial leverage one year after the IPO.

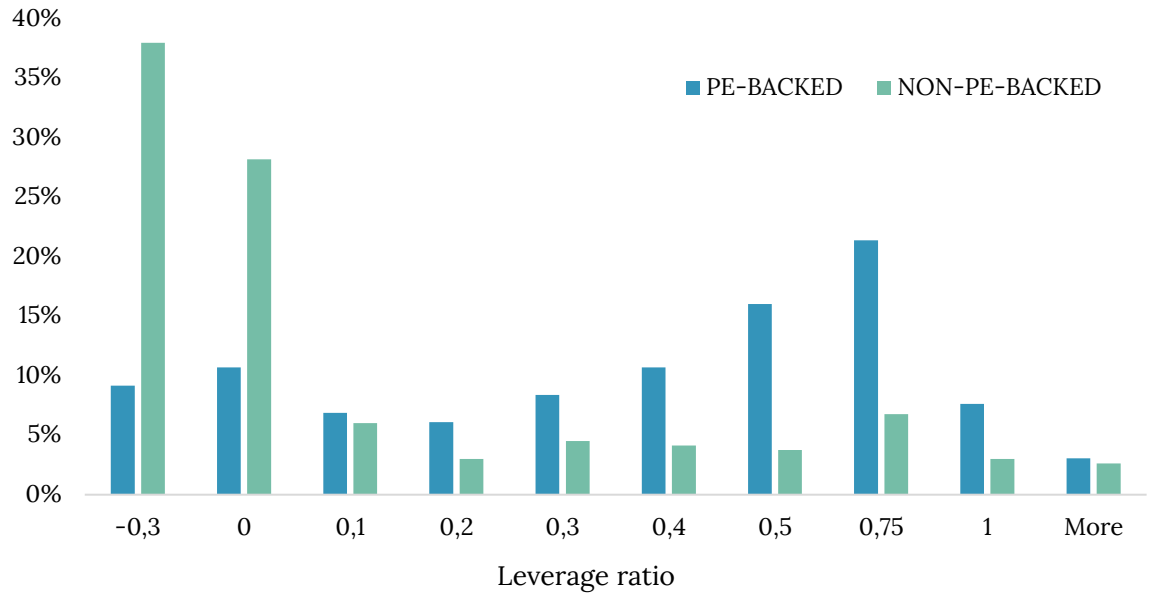

Figure 17: Dataset breakdown by Leverage 1 year after the IPO date

On the contrary, it is easy to spot a tendency from non-PE-backed companies to present themselves to the market with less debt than PE-backed ones. Almost 70% of the sample has in fact negative Lev. ratio. This discrepancy is probably due to the fact that when presenting itself to the market, a company needs to

be financially solid for a successful IPO. With the PE certification, this requirement may not be needed

Industry Expertise (IndustryExpertise)

Finally, the last variable employed in the model is related to the industry of each IPO company. Since PE investors do not casually choose their target companies and especially, they do not accidentally pick the Exit strategy, control for some industries is required. In particular, *IndustryExpertise* is built as a dummy variable that takes values of 1 if the PE-backed IPOs that took place in a particular industry are greater than their non-sponsored peers, 0 otherwise. Based on the illustrated logic and referencing to Table 2, companies which operates either in Basic Materials, Consumer Cyclicals and Industrials will register values of 1 for this variable.

The business insight we want to explain and control for is the following: since PE firms are big participants in certain spaces (more IPOs than the market), and since we have analysed the value generation matrix and a direct PE value driver is operational efficiency, one could expect *IndustryExpertise* to be positively correlated with increasing ΔEBITDA Margin. Additionally, PE firms plan to exit at the best timing possible during the life of the deal. Having gained market knowledge throughout the course of the years, PE firms might know that the best growth/timing to exit is achievable after the IPO for certain industries.

3.5 PE-backed companies Underpricing – hypothesis I.

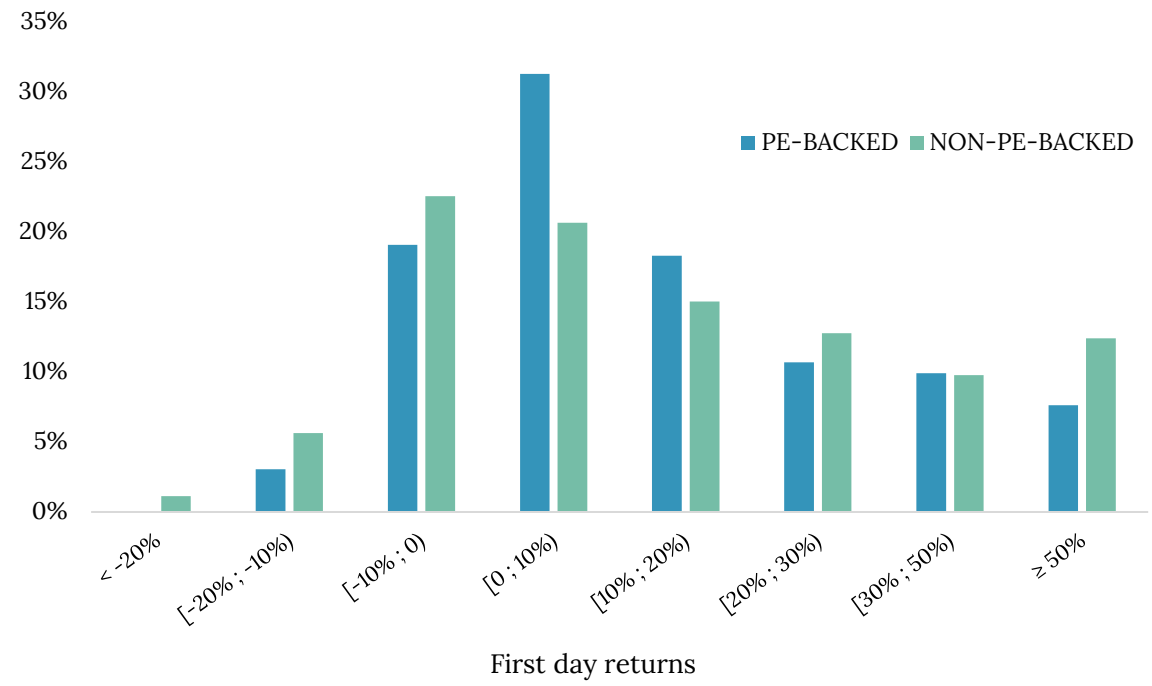

Figure 18: Dataset frequency distribution by first day returns.

Figure 18 presents the frequency distribution of the dataset by first day returns. It is possible to appreciate how PE-backed companies tend to have a much narrower oscillation range in the first trading day, as also confirmed in Table 4 by a reduced range and smaller standard deviation in the PE-backed sample. Moreover, average and median in the PE-backed sample are lower than in the non-sponsored one.

To test for statistically significant difference in mean in the two samples, a Welch adjusted version of the t-test is performed, as variances cannot be assumed to be the same across the two samples. The results are displayed in Table 5. As visible from the Table, Welch's t-test is not enough to assume that PE-backed companies register less Underpricing than non-sponsored ones, as the p-value is greater than any normally accepted confidence level.

Underpricing		
	PE-backed	***non-PE-backed***
Mean	15,30%	18,57%
Variance	5,50%	8,81%
Observations	131	266
Hypothesized Mean Difference	-	
P(T<=t) two-tail	0,23	n.s.
t Critical two-tail	1,97	

Table 6: t-test on Underpricing with Welch's approximation.

The mere fact that the mean difference in the two samples is not statistically significant, does not necessarily imply that, controlling some variables, a significant difference could be detected: having described thoroughly the independent variables in the previous paragraphs, the regression model equation is presented:

$$Underpricing = \beta_0 + \beta_1 PE + \beta_2 logProceeds + \beta_3 UPREV + \beta_4 SharesOffered\% + \beta_5 IBscore + industry\ controls$$

To validate the variable's choice, correlation matrix is shown in the appendix (AppendixTable1) where no value greater than 0.5 is shown among the variables.

Variables	**VIF**	**1/VIF**
logProceeds	1,2100	0,8262
IBscore	1,1600	0,8610
PE	1,1400	0,8771
UPREVISED	1,1100	0,8992
Shares%	1,0700	0,9371
Mean VIF	**1,14**	

Table 7: Variance Inflation Factors for all model I's variables

Table 6 shows the Variance Inflation factors for model I's variable. According to Hair et al. (1998), the upper threshold that should not be surpassed for VIF is equal to 10. Since no variable present values greater than 1.3, and in the correlation matrix no combination gives birth to values greater than 0.5, we can state that the model's variables do not suffer from multicollinearity.

The regression has been performed through the Stata software using robust standard errors. The results of the regression analysis are presented in Table 8.

Underpricing	**Coefficient**	**Rob. S.E.**	**t**	**p value**	**[95% conf,**	**interval]**
PE	-0,0603**	0,0273	-2,2100	0,0280	-0,1140	-0,0066
logProceeds	0,0076	0,0268	0,2800	0,7770	-0,0452	0,0604
UPREVISED	0,2624***	0,0196	13,3600	0,0000	0,2238	0,3010
Shares%	-0,1096	0,0761	-1,4400	0,1510	-0,2592	0,0400
IBscore	0,0041	0,0027	1,5100	0,1330	-0,0013	0,0095
_cons	-0,0691	0,0609	-1,1300	0,2570	-0,1888	0,5069
Number of obs.	**397**					
F-statistic	**19,31*** **					
R-squared	**0,2896**					

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

Table 8: Robust regression model I's results

By looking at Table 8, it is possible to notice that the coefficient of the *PE* variable is negative and statistically significant at the 0.05 level, thus confirming Hypothesis 1. On the contrary, *logProceeds*' coefficient is not significant, leaving the question on size unanswered.

The price revision's coefficient, as expected, is positive and significant at the 0.01 level, confirming that companies that have had their offer price up revised in the bookbuilding phase register greater underpricing than companies that do not upwardly revise their price.

The number of shares offered to the market presents a negative coefficient, but not statistically significant (p-value = 0.151), therefore there is not enough evidence to state that, as suggested in the literature, larger IPOs (in terms of % of shares offered) are usually more underpriced. On the contrary, since the coefficient is negative, we would expect more undepricing to be associated with smaller shares offerings.

Finally, the underwriter's score has positive coefficient, but the p-value is greater than any accepted confidence level. Hence there is no statistical evidence to assess that IPOs run by prestigious sponsors are less underpriced for their certification role.

The R-squared is equal to 0.2896, which indicates that the independent variables account for 28.96% of the variance of the dependent variable (Underpricing). Furthermore, the regression model is much more accurate than an intercept-only model with an F-statistic of 19.31 and significance at the 1% level.

3.6 Post-IPO operating performance analysis – hypothesis 2, 3.

Following the approach of Zaluki (2007), Cao, Jerry (2011), Pereira, Sousa (2017) ΔEBITDA Margin is taken as a proxy for operational efficiency. Despite its calculation being relatively straightforward, the results of such operations could be easily misguiding: As EBITDA Margin has an upper limit of 1, but since theoretically it has no lower bound, results of the calculation can give birth to numbers that - business sense wise – are not significant.

Figure 19 presents the distribution of ΔEBITDAMargin (3).

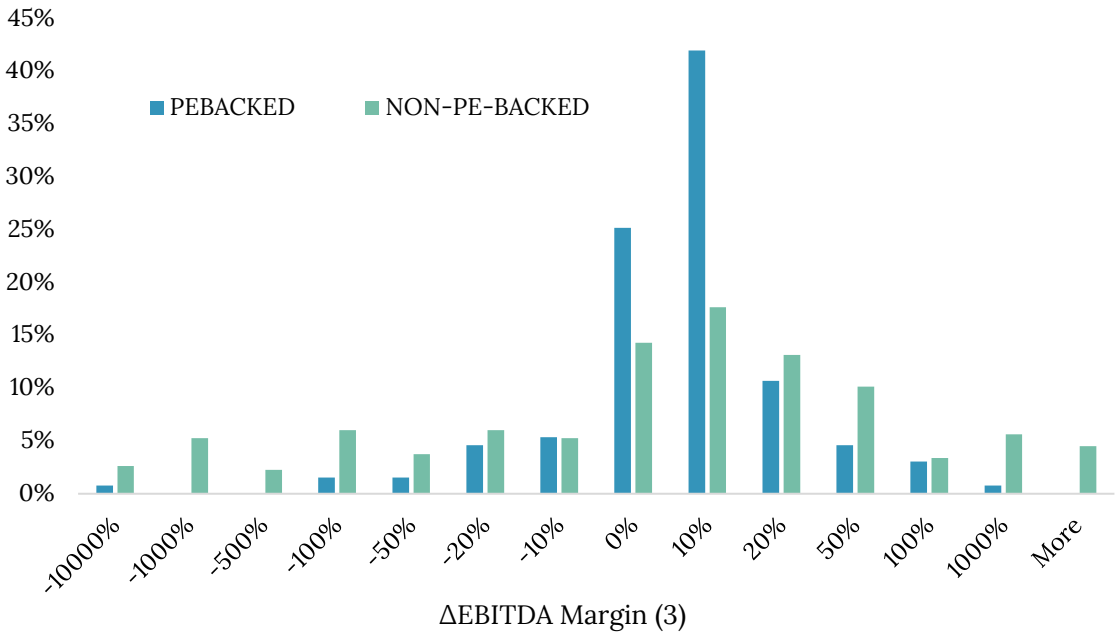

Figure 19: Dataset frequency distribution by ΔEBITDA Margin (3)

As shown in Figure 19, more than 25% of non-PE-backed deals present a variation in EBITDA Margin for more than 100% - in absolute value - three years post-IPO. It is possible to conclude that the dependent variable shows greater volatility in the non-PE-backed subsample.

As explained in chapter 3.3.1, since the variable *ΔEBITDA Margin (3)* is formulated as a simple difference, such numbers could mathematically be justified, but business-wise find poor background. Therefore, the decision of approximating every datapoint that was larger than 1 to 1 and lesser than -1 to -1 was taken. In fact, should *ΔEBITDA Margin (3)* be greater than 100%, it would for sure be a situation of EBITDA turnaround, and should it be lesser than -100% the company would necessarily be in a situation of downturn or negative EBITDA Margin. [9]

[9] That effect is already considered in the variable EMupturn, EMdownturn and EMnegative. Chapter 3.3.3 for reference.

This small sample modification will allow us to have a better financial understanding of the mean of the sample as well, thus bettering t-test calculation's results.

It is possible to do an immediate consideration: all the outliers in the left tail of the distribution are active players in the Pharma, Healthcare, or Software space. All these industries are highly volatile – especially Pharma companies that are undergoing breakthrough R&D projects – and their nature could justify such steep jumps in performance.

To validate a significant mean difference between operational improvements by PE backing status, Welch's approximation of the t-test will be used[10].

ΔEBITDA *Margin (1 year)*		
	PE-BACKED	**NON-PE-BACKED**
Mean	0,61%*	-5,87%*
Variance	5,70%	26,85%
Observations	131	266
Hypothesized Mean Difference	-	
p-value	0,0891	
t Critical two-tail	1,97	

Table 9: t-test on ΔEBITDA Margin with Welch's approximation

Table 9 shows significant ΔEBITDAMargin mean difference between PE-backed companies and non-PE-backed ones 1 year after the IPO. In particular, PE-backed companies show a stable metric, with little to no average Δ and reduced variance. On the contrary, non-PE-backed companies' sample experience a high variance, and a negative average Δ. This test is enough to conclude that, PE-

[10] Given the fact that, based on the descriptive statistics, the variance is not the same

backed companies have better operational performance 1 year after the IPO than non-PE-backed ones.

ΔEBITDA *Margin* (3 *years*)		
	PE-BACKED	**NON-PE-BACKED**
Mean	0,27%	-3,27%
Variance	6,44%	31,83%
Observations	131	266
Hypothesized Mean Difference	-	
p-value	0,39	n.s.
t Critical two-tail	1,97	

Table 10: t-test on ΔEBITDA Margin with Welch's approximation

Looking at Table 10 it is possible to see that even three years after the IPO, PE-backed companies tend to record better performance improvements than non-PE-backed ones. Indeed, the phenomenon of medium-term operating underperformance for non-PE-backed companies is verified, with an average ΔEBITDA Margin of -3.27% in absolute values.

Despite what just said, the p-value is greater than any confidence level normally assumed valid, therefore by this test it is not possible to affirm that the mean difference between the two samples is statistically significant. So far Hypothesis 2 is partially validated.

By following model I's approach, the regression model equation for ΔEBITDA Margin (3 years) is presented:

$$\Delta EBITDAMargin_{(0,i)} = \beta_0 + \beta_1 PE + \beta_2 BUnderpricing + \beta_3 EMnegative + \beta_4 EMupturn + \beta_5 EMdownturn + \beta_6 REVCAGR_{(0,i)} + \beta_7 logTotAssets_0 + \beta_8 Leverage_i + \beta_9 Shares\% + \beta_{10} \Delta TotAssets_{(0,i)} + \beta_{11} IBscore + \beta_{12} IndustryExpertise + constant$$

As the correlation matrix (AppendixTable3) shows no values greater than 0.6 among the variables and the VIF Table do not display any collinearity issue, it is possible to affirm that the model does not suffer from multicollinearity.

Variables	**VIF**	**1/VIF**
logTotAss	2,0200	0,4947
EMnegative	1,9400	0,5163
REVCAGR (3)	1,5900	0,6273
PE	1,5500	0,6437
Leverage (3)	1,5300	0,6536
ΔTOTASSETS (3)	1,4700	0,6814
EMupturn	1,2700	0,7891
EMdownturn	1,2000	0,8319
IBscore	1,1900	0,8390
Shares%	1,1800	0,8461
IndustryExpertise	1,1600	0,8632
BUnderpricing	1,1200	0,8951
Mean VIF	**1,44**	

Table 11: Variance Inflation Factors for model II's variables

Finally, the regression results are presented in Table 12.

As shown, the variable PE has negative coefficient but is not statistically significant (as p-value = 0.274), hence it is not possible to validate Hypothesis 2.

On the contrary, BU*nderpricing* has positive coefficient and significative at the 10% confidence level, thus confirming Hypothesis 3 that more underpriced companies tend to have better operational improvements after the IPO, confirming the theories of Welch (1989); Grinblatt, Hwang, (1989).

Not surprisingly, EM*downturn* and EM*upturn* have respectively negative and positive coefficients, both significant at the 0.01 level. EM*negative*, on the contrary, had inconclusive results as not statistically significant.

ΔEBITDA MARGIN (3)	Coefficient	Robust S.E.	t	p value	[95% conf.	interval]
PE	-0,0374	0,0341	-1,1000	0,2740	-0,1045	0,0297
BUnderpricing	0,0673*	0,0391	1,7200	0,0860	-0,0096	0,1443
EMnegative	-0,0162	0,0586	-0,2800	0,7820	-0,1314	0,0990
EMdownturn	-0,4707***	0,1096	-4,2900	0,0000	-0,6861	0,2552
EMupturn	0,3393***	0,0682	4,9700	0,0000	0,2051	0,4735
REVCAGR (3)	0,4629***	0,0811	5,7100	0,0000	0,3034	0,6224
logTOTASSETS	0,0564*	0,0321	1,7600	0,0800	-0,0067	0,1196
Leverage (3)	0,0538	0,0516	1,0400	0,2980	-0,0477	0,1552
Shares%	-0,2131*	0,1088	-1,9600	0,0510	-0,4270	0,0008
ΔTOTASSETS (3)	-0,0122***	0,0028	-4,3100	0,0000	-0,0178	0,0066
IBscore	0,0105*	0,0057	1,8500	0,0650	-0,0007	0,0217
IndustryExpertise	0,072**	0,0323	2,2300	0,0260	0,0086	0,1354
constant	-0,3344***	0,1069	-3,1300	0,0020	-0,5445	0,1243
Number of obs.	**397**					
F-statistic	**17,14*** **					
R-squared	**0,4123**					

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

***Significant at the 0,05 level*

**Significant at the 0,01 level*

Table 12: Robust Regression model results

The increase in size, taken as a factor with *REVCAGR (3)* and *ΔTOTASSETS (3)* surprisingly shows different results: since these two variables present the highest correlation among all the variables (0.5462), one would expect that they could have the same impact on any company's operational performance. On the contrary, these two variables show contradicting effects on *ΔEBITDA MARGIN (3)*. For instance, *REVCAGR (3)* has positive coefficient, significant at the 0.01 level, while *ΔTOTASSETS (3)* has a negative coefficient, equally significant at the 0.01 level.

logTOTASSETS has positive coefficient and significant at the 0.1 level 1 (p-value 0.08), thus implying that bigger companies at the IPO date tend to have better operational performance 3 years after the IPO.

Although being a value driver for PE-backed companies, *Leverage (3)* coefficient is not statistically significant for this regression. This could be partially explained by the multiple interpretations and uses of debt in a company: if it's true that PE-backed companies exploit debt to increase their valuation multiples, many other companies (ordinarily run by common shareholders) could see leverage as an injection of higher risk in the business, maybe even a signal of financial distress.

An interesting result is provided by the coefficient of *Shares%*. As described in the previous paragraphs, this variable is used as a proxy of ownership concentration and dilution. Being the coefficient negative and significant at the 0.1 level it is possible to affirm that the lack of core control created by a larger share issue, and thus through a subsequent ownership dilution, negatively affects IPO companies operating performance in the medium term.

The underwriter reputation shows significant positive coefficient at the 0.1 level (p-value=0.065). It is possible to conclude that companies that have more prestigious underwriters tend to have a slightly better operating performance in the three years after the IPO.

Finally, the variable *IndustryExpertise* shows positive coefficients and is significant at the 0.05 level (p-value = 0.026). This result is indicative of the Exit's selection criteria by PE firms: knowing which industries have better operational improvements capabilities after being listed, PE firms may tend to select IPO as exit strategy for those particular industries, preferring it to a classic private sale.

The R-squared is equal to 0.4123, which indicates that the independent variables account for 41.23% of the variance of the dependent variable (ΔEBITDA Margin).

CONCLUSIONS

This thesis has investigated the impact of Private Equity firms on one of the most decisive moments in a company life, its Initial Public Offering. The geographical focus of this research could not be set elsewhere than in the United States, both for its stock market activity and for its Private Equity industry maturity. The work has developed from a general analysis of the Private Equity industry, passing through the description of some IPO phenomena and the related literature findings, to the determination and quantification of those phenomena.

Firstly, after analysing a sample of 397 IPO companies, of which 131 PE-backed, the first research question was positively accepted: from the performed regression model, it appears that PE-backed companies experience inferior first day returns than non-PE-backed firms. This is most likely due the certification role provided by PE firms as described in Megginson and Weiss (1991). The interpretation of model I's result does indeed fit previous literature publications: PE firms serve as certifying agents of the issuing business, and they do it by risking their own reputation, since they introduce new businesses into the market every year. Moreover, investors and underwriters can be more easily convinced to buy the new issuer's stock if the PE firm does not sell the vast majority of its stake in the portfolio company – which is extremely rare and confirmed in the analysed sample.

Second, PE-backed companies' operating performance improvements 1 and 3-years post-IPO was tested. The results provide evidence that, after 1 year from the IPO, PE-backed companies show minor operational performance improvements, while non-PE-backed firms show a decrease in such metrics. Model II's results are, however, inconclusive with regards to the effect of Private Equity on the 3 years post-IPO ΔEBITDA Margin, so that Hypothesis 2 is only partially verified.

Analysing model II's coefficient it is possible to gain some key insights on post IPO operating performance in the selected sample:

- Companies that exhibit greater first day returns – independently if they are PE-backed or not - are more likely to see their operating performance improved 3 years after the IPO date, thus confirming Hypothesis 3.

	PE-BACKED	NON-PE-BACKED	**Average ΔEM**
Less Underpricing	1,03%	-9,04%	**-5,55%**
More Underpricing	-0,57%	2,25%	**1,37%**
Average ΔEM	**0,27%**	**-3,27%**	**-2,10%**

Table 13: Average ΔEBITDA Margin by backing type and underpricing

Table 13 shows that, in the studied sample, companies that experience inferior first day returns[11] show a greater deterioration in EBITDA margin three years after the IPO. Within the less underpriced companies subsample, the result seems to be driven by the non-PE-backed companies, with average ΔEBITDA Margin of -9.04%, while PE-backed companies seem neutral to this phenomenon.

- Highly reputable underwriters tend to sponsor companies with better operational improvements capabilities.
- The percentage of shares (thus core control) sold to the market is negatively associated with the 3-year operating performance improvements. Indeed, by rapidly expanding their operations and having to entrust third parties (agents) to run the business, IPO companies could incur in massive organizational costs, reducing the operating performance.

[11] The sample has been split in two subsamples with equal numerosity, with median underpricing as threshold, as for the definition of the variable *BUnderpricing*

- Finally, Private Equity firms focus their IPOs on industries in which they know they can have the best returns through the maximization of portfolio companies' margins and pricing multiples.

Some final considerations regarding Hypothesis 2; PE firms consider IPO just as one of the available Exit options, factoring in one major drawback: the inability to fully liquidate the investment in one tranche. If then PE firms have to keep on as shareholders in the issuer's listed equity, their unrealized value is floating alongside the market valuation.

Additionally, in the studied sample, the average and median ΔEBITDA Margin$_{(0,3)}$ are close to zero for PE-backed companies, and the standard deviation of the data points is much reduced than the observed one in non-sponsored peers. A possible interpretation of the stable ΔEBITDA Margin could reside in the portfolio company's growth cycle. Indeed, IPO represents an exit route for PE firms, so it would be reasonable to assume that PE-backed companies have already fulfilled their growth plans leading to the IPO.

	PE-BACKED	NON-PE-BACKED
Lower Quartile	9%	-61%
Median	16%	2%
Upper Quartile	29%	22%

Table 14: EBITDA Margins at the IPO date by backing status.

This evidence is also confirmed by Table 14, which shows that PE-backed companies have significantly better EBITDA Margins at the IPO date in the analysed sample. Moreover, PE-backed companies are much larger than non-sponsored ones both in terms of Revenue and Assets at the time of the IPO, as shown in Table 15.

	Average ($M)		Median ($M)	
	PE-BACKED	NON-PE-BACKED	PE-BACKED	NON-PE-BACKED
Revenue	2065,47	275,77	643,20	78,65
Tot Assets	4243,42	661,78	1211,30	104,50

Table 15: Statistics for Revenue and Total Assets by backing type at the IPO date.

Additionally, it is possible to verify from Table 5 that once listed, PE-backed companies experience a modest Revenue and Assets' growth, unlike the non-sponsored ones, which show superior growth factors. This phenomenon is indeed expected, as smaller companies tend to have greater upside growth potential, while bigger companies will find more obstacles that prohibit such scalability.

In conclusion, PE-backed companies do not show significant improvement in operating performance after being listed, but register a steady EBITDA Margin metric in the three years post-IPO. This comes as a result of the completion of their value creation plans heading to the IPO, verified by greater EBITDA Margins and size at the IPO date, and reduced growth in the 3 years following the IPO. Moreover, they are careful and thoughtful in maintaining the pre-IPO margins, so that combined with a modest revenue growth – *ceteris paribus* – the portfolio company could undergo a smoother liquidation phase of the residual investment in the years following the IPO.

- *Suggestion for future research*

As suggestion for future research, further analysis could be conducted on the influence of underpricing's degree on the operating performance. Indeed, this paper found a positive correlation between underpricing and ΔEBITDA Margin, with greater deterioration appearing in the non-PE-backed sample. It could be appealing to broaden the sample size, either accounting for greater years' range or different stock exchanges to properly document this phenomenon.

Finally, this paper found no significant relationship between PE backing type and post-IPO EBITDA Margin improvements. It could be wise to replicate the analysis for all the operating performance indicators suggested by Pereira, Sousa (2017) – and especially the cash flow-based indicators - and studying possible differences in results across PE-backed companies and non-PE-backed ones.

REFERENCES

1. Acharya, V., Kehoe, C. (2008). *Corporate Governance and Value Creation Evidence from Private Equity.* The Review of Financial Studies.
2. Aernoudt, R. (2005). *Executive forum: seven ways to stimulate business angels' investments.* Venture Capital.
3. Armstrong, C., Davila, A. & Foster, G. (2006). *Venture-backed Private Equity Valuation and Financial Statement Information.* Review of Accounting Studies.
4. Bain&Company. (2022). *Global Private Equity Report 2022.* Bain website.
5. Baker, G.P., Wruck, K.H. (1989). *Organizational changes and value creation in leveraged buyouts: The case of the O.M. Scott & Sons Company.* The Journal of Financial Economics.
6. Baker, H. K., Filbeck, G., & Kiymaz, H. (2015). *Private equity: opportunities and risks.* Oxford University Press.
7. Baron, D.P. (1982). *A model of the demand for investment bank advising and distribution services for new issues.* Journal of Finance.
8. Benveniste, L. M., and Spindt (1989). *How investment bankers determine the offer price and allocation of new issues.* Journal of Financial Economics.
9. Bergström, C., Nilsson D., Wahlberg, D. (2006). *Underpricing and Long-Run Performance Patterns of European Private-Equity-Backed and Non-Private-Equity-Backed IPOs.* The Journal of Private Equity.
10. Bollen, J. (2015). *Average private equity fund life span exceeds 13 years.*
11. Brealey, R. A., Myers, S. C., Allen, F., & Mohanty, P. (2012). *Principles of corporate finance.* Tata McGraw-Hill Education.
12. Bruton, G. D., Chahine, S., & Filatotchev, I. (2009). *Founders, Private Equity Investors, and Underpricing in Entrepreneurial IPOs.* Entrepreneurship Theory and Practice.
13. Butler, P.A. (2001). *The Alchemy of LBOs.* McKinsey Quarterly.
14. Cao, J. (2008). *What role does private equity play when leveraged buyouts go public?* SSRN Electronic Journal.

15. Cao, J., Jerry X. (2011). *IPO Timing, Buyout Sponsors' Exit Strategies, and Firm Performance of RLBOs.* Journal of Financial and Quantitative Analysis.
16. Chachine, S. (2006). *The Impact of Founders Ownership, Social Capital, and Investors on IPO Stock market Performance*. Academy of Management Journal.
17. Corporate Finance Institute. (2019). *Private Company Valuation.*
18. Coakley, J., Hadass, L. and Wood, A. (2007). *Post-IPO Operating Performance, Venture Capital, and the Bubble Years.* Journal of Business Finance & Accounting.
19. Doğan, M. (2013). *Does Firm Size Affect the Firm Profitability? Evidence from Turkey.* Research Journal of Finance and Accounting.
20. EBAN. (2021). *European Early-Stage Market Statistics 2020.*
21. Ernst & Young. (2022a). *Private Equity Pulse: Five takeaways from 1Q 2022*. EY website.
22. Ernst & Young. (2022b). *The future of Private Equity: embracing the "retail revolution"?* EY website.
23. Esterwood, J., Seth, A. (1989). *The Impact of Leveraged Buyouts on Strategic Direction.* California Management Review.
24. Fama, E. (1980). *Agency Problems and the Theory of the Firm.* Journal of Political Economy.
25. Fenn, G.W., Liang, N. and Prowse, S. (1997). *The Private Equity Market: An Overview. Financial Markets, Institutions & Instruments.*
26. Grinblatt, M., Hwang, C.Y. (1989). *Signalling and the Pricing of New Issues.* The Journal of Finance.
27. Gompers, P., Lerner, J. (1999). *An analysis of compensation in the U.S. venture capital partnership.* Journal of Financial Economics.
28. . Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (1998). *Multivariate data.* Upper Saddle River.
29. Hanley, K. (1993). *The Underpricing of initial public offerings and the partial adjustment phenomenon.* Journal of Financial Economics.

30. Holthausen, R., Larcker, D. (1996). *The financial performance of reverse leveraged buyouts*. Journal of Financial Economics.
31. Hurduzeu, G., Popescu, MF. (2015). *The History of Junk Bonds and Leveraged Buyouts.* Procedia Economics and Finance.
32. Ibbotson, G., Sindelar, J. L., Ritter, J. R. (1994). *The market's problems with the pricing of initial public offerings.* Journal of applied corporate finance.
33. Jain, B. and Kimi, O. (1994). *The Post-Issue Operating Performance of IPO Firms',* Journal of Finance.
34. Jensen, M., Meckling, W. (1976). *Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure.* Journal of Financial Economics.
35. Jensen, M. (1989) *Active investors, LBOs and the privatization of bankruptcy.* Journal of Applied Corporate Finance.
36. Kaplan, Steven N., and Per Stromberg. (2009). *Leveraged Buyouts and Private Equity.* Journal of Economic Perspectives.
37. Katti, S., B.V. Phani. (2016). *Underpricing of Initial Public Offerings: A Literature Review.* Universal Journal of Accounting and Finance.
38. Kester, W.C., Luehrman T.A. (1995) *Rehabilitating the Leveraged Buyout: A Look at Clayton, Dubilier and Rice*. Harvard Business Review.
39. Klausner M., Ohlrogge M., Ruan E. (2022). *A sober look at SPACs*. Working Paper Series in Finance.
40. Kidwell, Brimble, Lenten, Docherty, Mazzola and Basu. (2019). *Financial Markets, Institutions and Money (4th Ed).* Wiley.
41. Liles, Patrick R. (1977). *Sustaining the Venture Capital Firm.* Mimeo, Harvard University Management Analysis Centre.
42. Lindsay, N.J. (2004). *Do business angels have an entrepreneurial orientation?* Venture Capital.
43. Loos, N. (2006). *Value Creation in Leveraged Buyouts: Analysis of Factors Driving Private Equity Investment Performance.* Springer Science & Business Media.
44. Megginson, W.L. and Weiss, K.A. (1991). *Venture Capitalist Certification in Initial Public Offerings.* The Journal of Finance.

45. Metrick, A., Yasuda, A. (2010). *The economics of private equity funds.* The Review of Financial Studies.
46. Mikkelson, W., M. Partch and K. Shah (1997), *Ownership and Operating Performance of Companies that Go Public.* Journal of Financial Economics.
47. Muscarella, C.J., Vetsuypens, M.R. (1990). *Efficiency and Organizational Structure: A Study of Reverse LBOs.* The Journal of Finance.
48. National Venture Capital Association. (2022). *Yearbook.*
49. Opler T., Titman S. (1993) *The Determinants of Leveraged Buyout Activity: Free Cash Flow vs. Financial Distress Costs.* The Journal of Finance.
50. Palepu, K. (1990). *Consequences of leverage buyout.* Journal of Financial Economics.
51. Pereira, T., Sousa, M. (2017). *Is there still a Berlin Wall in the post-issue operating performance of European IPOs?* International Journal of Finance and Economics.
52. Petersen C., Plenborg T., Scholer F. (2006). *Issues in Valuation of Privately Held Firms.* The Journal of Private Equity.
53. Petro L., Martin J., Cendrowski H., Wadecki A. (2012). *Private Equity: History, Governance, and Operations*. John Wiley & Sons.
54. Povaly, S. (2006*). Private Equity Exits: An Analysis of Divestment Process Management in Relation to Leveraged Buyouts*. St. Gallen University.
55. Prowse S. (1998). *The Economics of the Private Equity Market.* Federal Reserve Bank of Dallas.
56. Rhee, G. (2002). *A review of the new issue puzzles.* Fourth OECD Round Table on Capital Market Reform in Asia.
57. Reilly, F., Hatfield, K. (1969). *Investor experience with new stock.* Financial Analysts Journal.
58. Ritter, J.R. (1991). *The Long-Run Performance of initial Public Offerings.* The Journal of Finance.
59. Smith, A. (1990). *Corporate Ownership Structure and Performance: The Case of Management Buyouts.* Journal of Financial Economics.
60. Strumillo A., Ciantelle L. (2015). *Buyout Holding Periods.* Prequin.

61. Trenca F., Croce A., Ughetto E. (2018). *Business Angels research in entrepreneurial finance: a literature review and a research agenda.* Journal of Economic Surveys.
62. USA Small Business Administration. (2021). *Apply to be an SBIC.*
63. Vild J., Zeisberger C. (2014). *Strategic Buyers vs. Private Equity Buyers in an Investment Process*
64. Welch, I. (1989). *Seasoned Offerings, Imitation Costs, and the Underpricing of Initial Public Offerings.* The Journal of Finance.
65. Wetzel Jr. (1983). *Angels and informal risk capital*. Sloan Management Review.
66. Zaluki, A.N. (2009). *Post-IPO Operating Performance and Earnings Management.* International Business Research.

APPENDIX

	ALL IPOs	PE-BACKED	NON-PE-BACKED
Basic Materials	8,35%	8,33%	8,38%
Consumer Cyclicals	29,09%	31,58%	25,71%
Consumer Non-Cyclicals	17,13%	28,19%	6,07%
Energy	5,72%	3,61%	7,38%
Financials	6,82%	7,44%	6,50%
Healthcare	16,76%	5,88%	18,17%
Industrials	13,31%	6,04%	21,40%
Real Estate	3,31%	4,87%	2,57%
Technology	25,69%	17,39%	28,25%
Utilities	13,47%	16,21%	12,56%
Grand Total	**17,49%**	**15,30%**	**18,57%**

AppendixTable 1: Mean Underpricing by industry

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Underpricing	1,000															
PE	-0,055	1,000														
logProceeds	0,048	0,339	1,000													
UPREVISED	0,476	0,039	0,145	1,000												
Shares%	-0,225	-0,061	-0,006	-0,206	1,000											
IBscore	0,172	0,154	0,269	0,254	-0,168	1,000										
Industry1	-0,063	0,098	0,065	-0,034	0,062	0,048	1,000									
Industry2	0,175	0,219	0,102	0,116	-0,128	0,030	-0,080	1,000								
Industry3	-0,002	0,052	0,035	0,049	0,012	-0,189	-0,027	-0,060	1,000							
Industry4	-0,110	0,061	0,159	-0,025	0,152	0,036	-0,050	-0,108	-0,037	1,000						
Industry5	-0,120	0,009	-0,033	-0,026	0,054	-0,105	-0,059	-0,130	-0,045	-0,081	1,000					
Industry6	-0,015	-0,259	-0,297	-0,018	-0,012	-0,002	-0,108	-0,236	-0,081	-0,146	-0,176	1,000				
Industry7	-0,049	0,136	0,049	-0,086	-0,008	0,068	-0,062	-0,136	-0,047	-0,084	-0,101	-0,184	1,000			
Industry8	-0,132	-0,005	0,121	-0,141	0,389	-0,166	-0,050	-0,108	-0,037	-0,067	-0,081	-0,146	-0,084	1,000		
Industry9	0,159	-0,107	-0,028	0,090	-0,269	0,109	-0,103	-0,225	-0,077	-0,139	-0,167	-0,304	-0,175	-0,139	1,000	
Industry10	-0,021	-0,024	0,089	0,009	0,038	0,027	-0,027	-0,060	-0,021	-0,037	-0,045	-0,081	-0,047	-0,037	-0,077	1,000

AppendixTable 2: Correlation Matrix for model I's variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
ΔEBITDA Margin (3)	1.000												
PE	0,0344	1,0000											
BUnderpricing	0,0716	-0,0357	1,0000										
EMupturn	0,3411	-0,0385	0,0388	1,0000									
EMdownturn	-0,2735	-0,1466	0,0667	-0,0693	1,0000								
EMnegative	-0,0678	-0,3746	0,0691	-0,1770	-0,1500	1,0000							
REVCAGR (3)	0,4953	-0,1836	-0,0108	0,3277	-0,0726	0,0263	1,0000						
logTotAss	0,0761	0,4916	-0,0771	-0,1230	-0,0883	-0,5304	-0,1732	1,0000					
Leverage (3)	0,0734	0,3608	-0,1435	-0,0408	-0,1732	-0,3891	-0,1101	0,4419	1,0000				
Shares%	-0,0860	-0,0614	-0,2159	-0,0299	-0,0589	-0,1046	0,0107	-0,0733	0,2032	1,0000			
ΔTotAsset	0,1121	-0,1896	-0,0006	0,1901	-0,0419	0,0304	0,5462	-0,1883	-0,1242	0,0078	1,0000		
IBscore	0,0650	0,1544	0,2322	0,0101	0,0145	0,0421	-0,0539	0,1439	-0,1384	-0,1684	-0,0091	1,0000	
IndExpertise	0,0323	0,3029	0,0184	-0,0082	-0,0528	-0,2101	-0,1669	0,1804	0,1792	-0,0819	-0,0751	0,0878	1,0000

AppendixTable 3: Correlation Matrix for model II's variables.

SUMMARY

The Private Equity industry has experienced a massive evolution in both fame and size in the last decade. Key changes in its business model, in conjunction with a greater market appetite for alternative asset classes, led the wider Private Equity industry to reach an all-time high $7.3 trillion in size at the beginning of 2021 (Prequin, 2022).

Since the end of the Great Financial Crisis, PE firms have increasingly chosen the Initial Public Offering (IPO) as an Exit option for their portfolio companies. Because of the presence of shareholders' lock-in periods – through which PE actors must retain some capital ownership after the IPO – PE firms are unable to fully liquidate the investment. This leaves an open question on how PE-backed issuers perform after the listing process is complete, since PE firms' primary goal is to maximise their proceeds. Additionally, PE firms should be willing to reduce the phenomenon of underpricing as well: it's PE firms' interest to have deals properly priced at any time, and in no case below market value, thus avoiding excessive underpricing.

The further aim of this research will be to interpret how PE firms affect new issuers' operating performance 1 and 3 years after the IPO, and if so, what are the respective drivers.

By defining a sample of 397 companies whose IPO took place between 1st January 2011 and 31st December 2016 in NASDAQ and NYSE and using regression models with robust standard errors, this thesis will verify that, in the studied sample:

- PE-backed firms suffer less underpricing than non-sponsored one.
- PE-backed companies show better ΔEBITDA Margins than non-PE-backed companies 1 year after the IPO, and stable metrics after 3 years.
- The more underpriced a company results in its first trading day, the more it is likely to improve its operating performance three years post-IPO.

AN INTEGRATED VIEW OF THE PRIVATE EQUITY WORLD

This chapter aims to provide the reader with an integrated overview of the Private Equity (PE) world to ease the comprehension of the analysis treated in the following chapters.

1.1 Brief History of Private Equity Investments

Private Equity activity can trace its roots in the post-WWII Northern America scenario, with the establishment of the American Research and Development Corporation (ARD). However, it is only in 1958 with the born of publicly traded Small Business Investment Companies (SBICs), that Private markets' activity started to increase dramatically, reaching half a billion $ AUM by 1965.

The 1980's find the consolidation of the Limited Partnership as PE organizational structure. If most of the investments done in the private market before the '80s targeted small start-ups, the 1980's represent the buyout era, where big established firms were targeted by PE actors mainly to satisfy the financial needs of their new clients: institutional investors. On aggregate, between 1979 and 1989 more than 2.000 LBOs took place with combined deal value exceeding $250 billion (Opler and Titman, 1993). However, the bankruptcy of a number of LBO targets and turbulence in the financial markets contributed to the decrease in LBOs activities for almost 10 years.

After the fall of the junk bond market, the PE industry registered a steady rise both in numbers and geographical reach – only omitting the dotcom bubble of 2000/2001 – reaching its peak in the biennium 2006/2007 led by a geographic expansion. Following the Global Financial Crisis, a general trust in the private market has been displayed, and PE firms are experiencing new rise in investments, which culminated in 2021 as record breaker for number of deals and capital committed.

1.2 A deep dive into the Private Equity world

Many differences can be observed between private and public companies, mainly in their information transparency, liquidity, investors, and investment horizon. Private markets are less transparent and less liquid than public markets; stricter selection criteria apply to be an investor in the space, and longer investment time horizon is required.

Since the 1980's, PE funds usually organized themselves as limited partnerships formed and managed by professional investment firms (Fenn, Liang, and Prowse, 1997). These funds are investments vehicles that allow investors to pool their capital and invest in different target companies increasing the benefit of diversification and market reach. It is possible to identify two main economic players: General Partners (members of PE firms and direct supervisors of portfolio companies' performance) and Limited Partners (investors committing and providing capital to the fund vehicle which will be managed by the GPs).

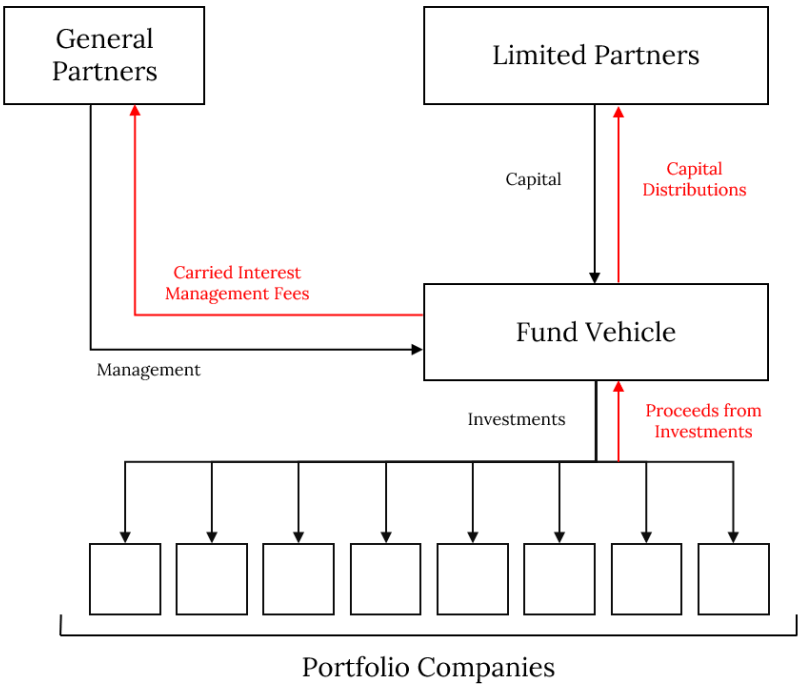

Figure 1: Private Equity Limited Partnership's structure. Own elaboration.

In this scenario, General Partners income mainly consists of *management fees* (fixed compensation) and *carried interest* (variable compensation).

According to Vild, Zeisberger (2014), the PE investment process can be summarized in seven key steps: (I) Fundraising, (II) Deal Sourcing, (III) Due Diligence, (IV) Valuation, (V) Transaction, (VI) Value Creation, (VII) Exit.

1.3 Private Equity Main Strategies

PE strategies are often directly linked to target companies' size and maturity. According to Petro, Martin, Cendrowski, Wadecki. (2012), there are four main categories of Private Equity Investments: Angel Investing, Early and Later Stage Venture Capital, Buyout.

Economic actors who provide equity to new, young start-ups are usually referred to as Business Angels (BAs). Venture Capitalists invest in young promising firms with a lot of upside potential, hence why industries like Software, Pharma and Healthcare are currently preferred for their disruptive nature (NVCA. 2022). Opposite to the early-stage investments, Buyout deals are performed on big, established firms that have often experienced a reduction in earnings in the last accounting years, turning them into a cheap target (Petro, Martin, Cendrowski, Wadecki. 2012). Since Buyout Deals can be worth billions of dollars, large portion of debt is used to finance these operations.

1.4 Private Equity Exit Strategies

After investing in a company and once the Value Creation phase is over, GPs will have to liquidate their investment to cash-in the profits from the operation. After 3-4 years from the Investment Year, GPs will have to make evaluations on which Exit Route is better to adapt to maximise their return and LP's returns. According to Povaly (2006), PE firms have usually three main exit option from a Deal: sell to strategic buyers (Trade Sale), sell to other PE firms (Secondary Buyout), or listing the stock on the capital markets (IPO).

VALUE CREATION AND PE-BACKED IPO: A LITERATURE REVIEW

Having completed a general introduction to the Private Equity world allowed us to gather significant understanding over PE history and dynamics. The aim of the following chapter is to perform a literature review of the main academic papers related to the scope of the thesis.

2.1 Private Equity Value Creation Matrix

According to Jensen (1989), the PE Business Model creates economic value for the portfolio company mainly through governance, financial, and operational engineering. To most scholars, these strategies represent the main and tangible drivers of growth.

Loos (2006) argues that drivers of value creation in a PE investment can be mainly classified as direct value drivers and indirect value drivers. Direct value drivers are easily recognizable as they have an immediate and tangible effect on the cash flows of the portfolio company – such as revenue growth, cost-cutting measures, agency control mechanisms. Indirect value drivers, by contrast, do not have a quantifiable financial consideration as they often arise in the last segments of the investment – the biggest being information asymmetries. The discussed value drivers will be tested in the next chapter to understand if the PE process is able to generate positive returns for the business even after their exit.

2.2 IPO underpricing: a common phenomenon

Underpricing is defined as the phenomenon of newly issued shared priced below their market value, and it is characterized by the generation of excess returns at the end of the first trading day (Brealey, Myers, Allen and Mohanty, 2012).

Because of IPO's process, investment bankers develop a great understanding of the corporate business model and its upward potential, the vast macroeconomic

conditions as well as the general response from the public. All the information gained throughout the IPO process result in massive information asymmetries, leading to typical underpricing in the first trading days.

Only in the late 1960s did academics start to pay attention to the underpricing issue in IPOs. A conspicuous number of research confirm the underpricing phenomenon, trying to gain different interpretation from it. The vast majority of academic literature seems to point to information asymmetries as primary source of IPO underpricing. Furthermore, literature points out that these asymmetries can have birth at two different levels: Baron (1982) addresses information asymmetry between issuer and underwriter, while Rock (1986) differs between informed investor and uninformed investors.

2.3 IPO underpricing in PE-backed companies

As mentioned in the previous paragraph, information asymmetry is the most accredited driver of IPO underpricing in the academic literature and usually underwriters have an edge on issuance share price thanks to the collected knowledge. Underwriters may in fact exploit underpricing to obtain full subscription (or sometimes oversubscription) and provide their recurrent clients (IPO investors) with initial positive returns, inducing them to participate in following equity offerings. On the other hand, if underpricing is maximized the underwriter may undermine customer relationships with the issuer. (Bergström, Nilsson and Wahlberg, 2006).

When Private Equity firms are involved in the equity offering the dynamics between issuer and underwriter change dramatically. Both of the parties involved in fact are heavily informed on market conditions and have as main goal to maximize their profit from the offering. One explanatory variable of IPO underpricing in PE backed companies is represented by the PE firm's certification role: Megginson and Weiss (1991) proposed the *venture capital certification theory*, which states that PE/VC funds serve as certifying agents to the issuing businesses. These funds risk losing their reputation since they

routinely introduce businesses to the market. Additionally, they contend that corporations with PE/VC backing get esteemed IPO sponsors, which could lead to reduced underpricing. Reduced underpricing is indeed found in empirical studies, such as Chahine (2006); Bergström, Nilsson and Wahlberg, (2006); Bruton, Chahine, & Filatotchev, (2009). In conclusion, there is vast consensus in the academic literature that IPO underpricing is a common phenomenon in the market and find its roots in a number of different factors, namely agency theory, mispricing, sponsor reputation and forward-looking strategical pricing. It is shown by empirical evidence that PE backed companies IPOs result in less underpriced valuations then non-PE backed peers.

2.4 Post IPO Operating Performance

Once a company successfully completes its IPO, both empirical evidence and academic literature shows the existence of long run underperformance, but fewer focus on post-IPO operating performance. The first academic study in this regard is the one pursued by Jain and Kimi (1994) on a North American sample, that finds significant drop in operating performance 3 and 6 years after the IPO. Zaluki, (2009) confirms this evidence on the Malaysian market.

Pereira, Sousa (2017) study four different indicators used to assess the long term operating underperformance: ΔEBITDA/Assets, ΔEBITDAMargin, Δ(Operating CF)/Assets, Δ(Operating CF)/Revenue. The results of the analysis are consistent and significant among the four different variables, suggesting that each of the four approaches could be justified to study the difference in operating performance post-IPO. Coakley, Hadass, and Wood (2007) study the post issue operating performance between VC-backed IPOs and non-VC-backed IPOs, concluding that the operational performance gap between the two groups is not overall significant except for few years.

It seems that companies tend to worsen their operating performance in the medium-term after the IPO. This hypothesis will be tested in the next chapter with regards to PE backed IPOs and non-PE- backed IPOs.

EMPIRICAL ANALYSIS OF POST-IPO OPERATING PERFORMANCE: EVIDENCE FROM THE US MARKET

3.1 Hypothesis statement

Following the literature presented in the previous chapter, this thesis wants to shed light on the impact caused by Private Equity on the widespread accepted phenomena of IPO underpricing and operating performance decline in the short and medium term. The most preponderant theory in this matter is the "*venture capital certification theory*" by Megginson & Weiss (1991) which affirms that the presence of venture capitalist (or, in broader terms, private equity investors) in the issuers' equity at the IPO date represents a certification of success of the issuer's stock. For the reasons just illustrated, it is reasonable to believe that PE-backed IPOs would show less underpricing in comparison to non-PE-backed ones.

Hypothesis 1: PE-backed IPOs show less underpricing than non-sponsored ones.

Since PE firms only completely exit their investment rarely through an IPO, it seems fair to assume that the engagement of PE firms following an IPO may result in improved outcomes on all considered time horizons, as the final liquidation of the remainder stake could happen anytime post-IPO.

Hypothesis 2: PE-backed companies show less deterioration in post-IPO operating performance than non-PE-backed ones.

Finally, this paper will test the theory that top-tier businesses tend generate greater first day returns at the IPO date. (Welch, 1989; Grinblatt, Hwang, 1989), whether they are PE-backed or not.

Hypothesis 3: Companies that record more underpricing at the IPO date show less deterioration in post-IPO operating performance.

3.2 Sample, data collection and major descriptive breakdowns

Almost all of the data used in this thesis was downloaded from the Refinitiv platform, while other data sources were used to increase the sample numerosity or to perform cross validations.

The paper studies a sample of 397 IPOs - between 2011 and 2016 - of equities listed on NASDAQ and New York Stock Exchange (NYSE).

Following the export from Refinitiv (including only realized deals), some manual adjustments were performed on the dataset, namely: (i) removing from the dataset all Funds IPOs, (ii) removing from the dataset all specialized Acquisition Corporations, (iii) removing from the dataset purely Insurance/Banking firms due to the insignificance of EBITDA calculation.

A cross validation was performed for all the "outliers' values" with the Orbis database company by company. Additionally, to certify Refinitiv's data for first day returns for the whole sample, IPO data from IPOscoop.com was used. Refinitiv database provides information on whether the IPO company was Private Equity backed at the time of the IPO. Consequently, the data field "Private Equity Backed IPO Issue Flag" was selected to allow an easy sample breakdown.

In the studied sample, it is possible to notice that in some sectors PE-Backed IPOs were more than non-PE-backed IPOs. The fact that the majority of the companies that have gone public in those industries were PE-backed represents a clear sign of PE interest, exit knowledge and potentially signalling great industry expertise. However, it would be a mistake to classify PE activity only based on IPO exits, as they represent only a tiny portion of the total activity in private markets. The number of IPOs is modest in the years following the GFC (2011-2012), to then grow exponentially in the years two following years, reaching 117 IPO companies in 2014.

3.3/3.4 Methodology and Key Variables

To test the formulated hypotheses, two robust regression models will be used in conjunction with Welch's t-test to look for statistical significance.

To answer the first research question, model I's Dependent variable is set to be the first day returns with respect to the original offer price (underpricing). The model will shed light on the PE's influence on first day returns.

$$Underpricing = \frac{1^{st} day\ closing\ price - offer\ price}{offer\ price}$$

For the second and third hypothesis validation, model II's dependent variable is set to be $\Delta EBITDA\ Margin_i$ between the ith year after the IPO and the IPO date.

$$\Delta EBITDAMargin_{(0;i)} = EBITDAMargin_i - EBITDAMargin_0$$

The ΔEBITDA Margin will be used as a proxy of efficiencies for three main reasons: (i) Previous studies have used this variable to conduct analyses on the post-IPO operating performance; (ii) the importance of EBITDA Margins and EBITDA for PE firms; (iii) compare operational returns net of any fixed assets-related metrics, hence of any particular industry effect.

Finally, to assess the soundness of the models, Variance Inflation Factors (VIF) will be calculated to be sure of the absence of multicollinearity among the variables.

3.4.2 Independent Variables - model I

A) *Private Equity Backed* (PE) – *model I, II*: This is the key independent variable for Hypotheses 1 and 2 built to test Megginson and Weiss (1991)'s venture capital certification theory. *PE* is a dummy variable that takes values of 1 when the IPO company was PE-backed at the time of the IPO, 0 otherwise.

B) *Size* (*logProceeds*): Proceeds are taken as a proxy of IPO company's size, and are calculated as follows:

$$Proceeds = SharesOffered * Offerprice$$

C) *Price revisions* (*UPREVISED*): According to Benveniste and Spindt (1989), the phenomenon of underpricing could be justified by the discovery of new information in the bookbuilding stage, leading to price revisions. To control for this phenomenon, in the regression model will be present a dummy variable (*UPREV*) that takes values of 1 when the price has been up revised from the offer price, 0 otherwise.

D) *Ownership concentration* (*Shares%*) – *model I, II*: It is common ground in the academic literature that the more dispersed the ownership, the worse the direct control mechanisms and hence the performance are. To test this, the variable *Shares%* is introduced as control variable in the model.

$$Shares\% = \frac{Shares\ Offered}{Total\ Outstanding\ Shares}$$

D)*Underwriter prestige* (*IBscore*) – *model I, II*; The lead underwriter's prestige represents a factor to be considered when a company's equity gets traded for the first time. As emerges from Carter and Manaster, (1990), less risky companies tend to hire more prestigious underwriters, which could grant a more successful IPO through sharing of confidence and trust in the investor base.

3.4.3 Independent Variables – model II

A) *PE - ibidem*

B) *Ownership concentration – ibidem*

C) *Underwriter prestige - ibidem*

D) *Underpricing* (*BUnderpricing*); This variable has been created to count in the effects that underpricing registered in the first trading day might have on the dependent variable. *BUnderpricing* will have value of 1 if the company's underpricing has been greater than the median of the sample, 0 otherwise.

E) *EBITDA Margin sign inversion control*: It is worth to recall that the theoretical EBITDA Margin range is $(-\infty; 1]$. $\Delta EBITDA\ Margin$ can easily lose

significance when there is a sign inversion between $year_0$ and $year_i$, or when both the numbers are negative. Therefore, three dummy variables are created to account for the reported corner cases.

F) *Firm's Growth* ($REVCAGR_i$ - $\Delta TotAssets_i$); Revenue Growth is calculated using the Compound Annual Growth Rate formula. As mentioned in the previous chapters, PE firms highly rely on Multiples to price their portfolio companies. Hence the belief that Revenue and EBITDA growth should go hand in hand in order to maximise the exit proceeds

Moreover, as a further proxy of firm's growth, $\Delta TotAssets_i$ (between the i^{th} year and the IPO date), is included to assess the influence of Capital Expenditures on operating performance.

G) *Size* ($logTotAssets_{t0}$): Many studies that intended to measure the effect of companies' size on profitability found positive correlation between the two variables. Through the achievement of scale's economies, the size of a company plays a vital role in the competitive landscape through a cost reduction's race.

H) *Leverage* ($Leverage_i$); Leverage is chosen as control to assess PE value creation strategy, as in the studied sample PE-backed firms present higher leverage than non-PE-backed.

$$Leverage = \frac{Net\ Debt}{Total\ Assets}$$

Industry Expertise (*IndustryExpertise*); Finally, the last variable employed in the model is related to the industry of each IPO company. Since PE investors do not casually choose their target companies and especially, they do not accidentally pick the Exit strategy, control for some industries is required. In particular, *IndustryExpertise* is built as a dummy variable that takes values of 1 if the PE-backed IPOs that took place in a particular industry are greater than their non-sponsored peers, 0 otherwise.

3.5 PE-backed companies Underpricing – hypothesis I.

To test for statistically significant difference in mean in the two samples – PE-backed and non-PE-backed - a Welch adjusted version of the t-test is performed, returning non statistically significant results. Therefore, the regression model is introduced, tested for correlation and multicollinearity.

$$Underpricing = \beta_0 + \beta_1 PE + \beta_2 logProceeds + \beta_3 UPREV + \beta_4 SharesOffered\% + \beta_5 IBscore + industry\ controls$$

Underpricing	Coefficient	Rob. S.E.	t	p value	[95% conf, interval]	
PE	-0,0603**	0,0273	-2,2100	0,0280	-0,1140	-0,0066
logProceeds	0,0076	0,0268	0,2800	0,7770	-0,0452	0,0604
UPREVISED	0,2624***	0,0196	13,3600	0,0000	0,2238	0,3010
Shares%	-0,1096	0,0761	-1,4400	0,1510	-0,2592	0,0400
IBscore	0,0041	0,0027	1,5100	0,1330	-0,0013	0,0095
_cons	-0,0691	0,0609	-1,1300	0,2570	-0,1888	0,5069
Number of obs.	**397**					
F-statistic	**19,31*** **					
R-squared	**0,2896**					

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

Table 1: Robust regression model I's results

By looking at Table 8, it is possible to notice that the coefficient of the *PE* variable is negative and statistically significant at the 0.05 level, thus confirming Hypothesis 1. The price revision's coefficient, as expected, is positive and significant at the 0.01 level, confirming that companies that have had their offer price up revised in the bookbuilding phase register greater underpricing than companies that do not upwardly revise their price. *logProceeds* and *IBscore* have positive coefficient - almost neutral – while *Shares%* seems to have negative impact on underpricing, all of them being not statistically significant.

3.6 Post-IPO operating performance analysis – hypothesis 2, 3.

As explained in chapter 3.3.1, since the variable $\Delta EBITDA\ Margin\ (3)$ is formulated as a simple difference, such numbers could mathematically be justified, but in corner cases they may lack business significance. Therefore, the decision of approximating every datapoint that was larger than 1 to 1 and lesser than -1 to -1 was taken. To validate a significant mean difference between operational improvements in the two samples, Welch's approximation of the t-test is used, resulting in significant difference for 1 year after the IPO, but not for 3 years after the IPO.

By following model I's approach, the regression model equation – tested for multicollinearity and correlation - for ΔEBITDA Margin (3 years) is presented,

$$\Delta EBITDAMargin_{(0,i)} = \beta_0 + \beta_1 PE + \beta_2 BUnderpricing + \beta_3 EMnegative + \beta_4 EMupturn + \beta_5 EMdownturn + \beta_6 REVCAGR_{(0,i)} + \beta_7 logTotAssets_0 + \beta_8 Leverage_i + \beta_9 Shares\% + \beta_{10}\Delta TotAssets_{(0,i)} + \beta_{11} IBscore + \beta_{12} IndustryExpertise + constant$$

As shown in Table 2, *PE* is not statistically significant (as p-value = 0.274), hence it is not possible to fully validate Hypothesis 2. On the contrary, *BUnderpricing* has positive coefficient and significative at the 10% confidence level, thus confirming Hypothesis 3 that more underpriced companies tend to have better operational improvements after the IPO, confirming the theories of Welch (1989); Grinblatt, Hwang, (1989). Not surprisingly, *EMdownturn* and *EMupturn* have respectively negative and positive coefficients, both significant at the 0.01 level. *Rev*CAGR seems to be the greatest driver of EBITDA Margin increase. Size at the time of the IPO, underwriter reputation and industry expertise are positively associated with EBITDA Margin expansion, as all coefficients are positive and significant. Interestingly, *Shares%* coefficient is negative and significant (probably due to agency problems), as well as ΔTOTASSETS (3), so that a slight reduction in EBITDA Margin is expected from increase Capital Expenditures.

ΔEBITDA MARGIN (3)	Coefficient	Robust S.E.	t	p value	[95% conf.	interval]
PE	-0,0374	0,0341	-1,1000	0,2740	-0,1045	0,0297
BUnderpricing	0,0673*	0,0391	1,7200	0,0860	-0,0096	0,1443
EMnegative	-0,0162	0,0586	-0,2800	0,7820	-0,1314	0,0990
EMdownturn	-0,4707***	0,1096	-4,2900	0,0000	-0,6861	0,2552
EMupturn	0,3393***	0,0682	4,9700	0,0000	0,2051	0,4735
REVCAGR (3)	0,4629***	0,0811	5,7100	0,0000	0,3034	0,6224
logTOTASSETS	0,0564*	0,0321	1,7600	0,0800	-0,0067	0,1196
Leverage (3)	0,0538	0,0516	1,0400	0,2980	-0,0477	0,1552
Shares%	-0,2131*	0,1088	-1,9600	0,0510	-0,4270	0,0008
ΔTOTASSETS (3)	-0,0122***	0,0028	-4,3100	0,0000	-0,0178	0,0066
IBscore	0,0105*	0,0057	1,8500	0,0650	-0,0007	0,0217
IndustryExpertise	0,072**	0,0323	2,2300	0,0260	0,0086	0,1354
constant	-0,3344***	0,1069	-3,1300	0,0020	-0,5445	0,1243
Number of obs.	**397**					
F-statistic	**17,14*** **					
R-squared	**0,4123**					

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

***Significant at the 0,05 level*

**Significant at the 0,01 level*

Table 2: Robust Regression model results

CONCLUSIONS

This thesis has investigated the impact of Private Equity firms on one of the most decisive moments in a company life, its Initial Public Offering. The work has developed from a general analysis of the Private Equity industry, passing through the description of some IPO phenomena and the related literature findings, to the determination and quantification of those phenomena.

Firstly, after analysing a sample of 397 IPO companies, of which 131 PE-backed, the first research question was positively accepted: from the performed regression model, it appears that PE-backed companies experience inferior first day returns than non-PE-backed firms. This is most likely due the certification role provided by PE firms as described in Megginson and Weiss (1991). Second, PE-backed companies' operating performance improvements 1 and 3-years post-IPO was tested. The results provide evidence that, 1 year after the IPO, PE-backed companies show better improvements in operating performance than non-sponsored ones. Model II's results are, however, inconclusive with regards to the effect of Private Equity on the 3 years post-IPO ΔEBITDA Margin, so that Hypothesis 2 is only partially verified. However, this thesis brought to light that, in the studied sample: (i) PE-backed companies show stable margins with low variance 3 years after the IPO; (ii) PE-backed companies have significantly better EBITDA Margins at the IPO date; (iii) PE-backed companies are larger than non-sponsored ones in terms of Revenue and Assets at the time of the IPO. (iv) PE-backed companies register modest growth post-IPO.

In conclusion, PE-backed stable post-IPO metrics come as a result of the completion of their value creation plans heading to the IPO, verified by greater EBITDA Margins and size at the IPO date, and reduced growth in the 3 years following the IPO. Moreover, PE firms are careful and thoughtful in maintaining the achieved pre-IPO margins on portfolio companies, to allow a smoother liquidation phase of the residual investment in the years following the IPO.