

Private Equity IPOs: Long-term Performance and Drivers of Success

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Abstract

In this paper, I explore the impact Private Equity ownership has on portfolio companies post-exit. This thesis aims to add to the discussion of whether the proliferation of Private Equity in the United States is a positive development for the country. Using a proprietary dataset that compiles thousands of IPOs between the years 2000 and 2016, I look at whether there are significant differences in performance between IPOs that come from Private Equity firms and those that go public on their own. Specifically, I use empirical analysis with robust regression to estimate the effects of Private Equity ownership on four key measures of financial success: MCAP growth, Revenue Growth, EBITDA Margin, and EV / EBITDA multiple. By looking at the changes in these measures of performance across three different time windows: 3 years post-IPO, 6 years post-IPO, and 9 years post-IPO, this paper determines how Private Equity ownership affects company performance post-exit and whether those effects persist over time.

JEL Classification: G23, G24

Key Words: Private Equity, PE, Initial Public Offerings, IPOs

1. Introduction

Since the 2008 financial crisis, capital allocations to Private Equity have risen exponentially. In 2022, Private Equity dry powder, which refers to the dollar amount of unallocated assets in investors' hands, reached an all-time high of \$3.6 trillion globally (MacArthur, 2022). Furthermore, Private Equity is coming off record-setting deal activity, with around \$1 trillion invested globally in 2021 (Skornas, 2022). According to a study by Ernst & Young, in 2020, the U.S. Private Equity industry employed 11.7 million workers and accounted for 7% of the U.S. GDP. There is no question that Private Equity has become a key player in the U.S. economy. However, this growth has not come without disputes. Critics assert PE transactions that are highly levered can lead to short-term performance horizons, reductions in employment, and increased insolvency risk during times of economic downturn (Wilson et al., 2012). Furthermore, Private Equity has been publicly criticized for its exit tactics:

"I am not against Private Equity in general, but when it comes to IPOs they are in the business to get the highest price for their investors. This means there is a tendency to "alter the books to make the investment look a lot better than it is." (James Laing, Aberdeen Asset Management, in the Financial Times, 18 February 2014).

Therefore, the question is timely and relevant: is the proliferation of Private Equity a positive development for American companies? The goal of this thesis is to make an empirical investigation into the effect Private Equity has on the long-term performance of companies. Due to constraints with the availability of public data, I focus on the long-term performance of PE-backed companies exited via IPO relative to non-PE-backed IPOs (also known as standalone IPOs). Specifically, this thesis aims to answer a fundamental question: does Private Equity promote long-term growth for its portfolio companies post-IPO? To answer this question, this thesis will analyze a wide array of metrics for standalone and PE-backed IPOs, with the goal of

uncovering statistical differences between the two groups. This analysis will also provide insight into the influence company characteristics and macroeconomic factors have on company performance post-IPO.

The literature review follows in the next section. Section III describes the theoretical foundation of the paper along with the corresponding hypothesis of this thesis. Section IV describes the data: its collection process, rationale, and basic statistics. Section V covers the methods employed, specifically, the empirical model and the rationale behind it. Section VI discusses the results from the model and, finally, Section VII provides some final remarks.

2. Literature Review

This section establishes a basis for the theoretical and empirical findings up to date. The purpose of this paper is to extend, validate, or refute existing findings in the literature.

The goal of this paper is to determine the net performance of PE-Backed companies relative to standalone companies post-IPO. To date, there have been no studies looking at the long-term performance of PE-Backed companies that IPO in the United States. The research to date has instead focused on short-term quantitative metrics that look at the effectiveness of pricing of said IPOs. Beyond the realm of IPOs, there is no clear argument in the discussion of whether Private Equity leaves a long-lasting impact on the investments they exit. This is a gap in the literature that was explicitly addressed by Palepu (1990) and yet since then, there have been no notable studies to my knowledge. This thesis will make a strong contribution to the literature by providing a recent and relevant study that addresses the present validity of previous empirical studies. Furthermore, there have been limited efforts to relate the relative performance of IPOs to key metrics such as macroeconomic factors, or leverage ratios. The goal of this paper is to tie all these factors together and reach a comprehensive discussion about the performance of PE-Backed companies post-IPO. Consequently, this paper relates to a wide array of literature concerning (1) the general drivers of success or failure in PE transactions, (2) how exogenous factors can affect deal performance, (3) the specific properties of IPOs, and (4) the specific properties of PE-backed IPOs. By drawing on general literature with an increasing focus on specificity towards IPOs, this paper will manage to explain and contrast its findings relative to a broad survey of existing literature.

2.1 How Private Equity creates value for its Portfolio Companies

Prior to discussions about how PE-Backed IPOs perform relative to standalone IPOs, it is important to explore general literature looking at how Private Equity firms manage to develop and improve their portfolio companies. This thesis will contribute to this existing literature by providing evidence as to whether these changes persist after the PE sponsors exit their investment. The key topics scholars have researched around this topic include leverage, changes to management and incentives, and intrinsic resources PE firms have to enhance their portfolio companies.

2.1.1 The Importance of Leverage

Extensive literature exists around the topic of Private Equity and its revenue-generating framework. A key discussion revolves around the topic of leverage. Michael C. Jensen's (1986) Free Cash Flow hypothesis is a commonly cited source in favor of leverage in these transactions. In fact, his theories are empirically supported by other academic's studies (Kaplan, 1989). Jensen hypothesizes that by issuing debt, there is less free cash flow available for business managers to engage in wasteful activities and NPV-negative investments (Jensen, 1986). The pressure of the debt instead improves the incentive to maximize value and may lead to better operating and investment decisions (Palepu, 1990). These studies provide support for use of leverage in Private Equity transactions.

The literature also addresses concerns that these high levels of debt can be excessively risky. Some describe the payout structure of leveraged transactions as an option, where the company can either achieve strong returns or end up in a situation of bankruptcy (Haque, 2021). The greater the debt, the lower the stakes and the greater the potential returns. This can lead to excessively risky projects (Haestad, 2022). Furthermore, debt can make firms more vulnerable to

distress and reduce their flexibility around different market environments (Palepu, 1990).

Overall, according to the literature, leverage has this conflicting effect: it can increase returns for investors due to lower equity contributions and increased operational improvements, yet it can also lead to excessive risk and potential bankruptcies. Given that the data I will explore in this thesis includes company leverage ratios, it will be possible to determine the long-term effect of leverage on PE-backed companies. This is a question that the literature is yet to explore within the realm of IPOs.

2.1.2 Changes to Incentives and Operating Performance

Although leverage can indirectly lead to greater operational performance, the literature discusses that Private Equity firms also engaged in deliberate and tactical financial engineering to boost returns (Brown et al., 2020). Jensen (1989) argues part of this comes from increasing managers' equity stake in the business. On top of that, Private Equity firms have become savvy managerial experts. They have transformed the corporate leadership structure in America by replacing the role of the traditional CEO with the role of 'Active Investors'. This new decentralized decision-making system is putting value creation at the forefront of corporations' goals (Jensen, 2010). Even though these managerial incentives tend to boost the performance of Private Equity firms during their holding period, this thesis will take a long-term approach to answer this question. By looking at the performance of companies several years after being sold, it will be possible to determine if these operational improvements are sustainable and long-lasting.

2.1.3 Value-add Resources from Private Equity Firms

The final way the literature discusses how Private Equity firms can enhance their portfolio companies is through the resources and expertise they bring to the table. The most obvious

resource they can bring to a company is additional capital. This can allow portfolio companies to expand via add-on acquisitions, new projects, or labor force expansion (Wright and Robbie, 1998). Additionally, PE capital can be extremely helpful in situations of distress, where the company can inject equity and mitigate risk (Haque, 2021). Available add-on capital also need not come directly from the sponsor. PE firms also can improve financing for their portfolio companies by leveraging their relationships with banks to allow for more favorable borrowing terms and conditions (Ivashina and Kovner, 2010).

On top of providing additional capital with relative ease, Private Equity firms provide significant managerial and business expertise. The literature notes PE investors encourage entrepreneurs to pursue better projects and provide valuable monitoring and screening services (Berger and Udell, 1998; Gompers and Lerner, 2001; Chemmanur et al., 2011). PE backing also assists their investee firms in mentoring and recruiting activities (Hellmann, 2002). This role can create access to a business network, by supplying important contacts with stakeholders such as potential clients, employees, and providers. Overall, the combination of these valuable activities by the PE investor improves the capabilities of the target firm and leads to increased performance during the investment period (Davis et al., 2008; Guo et al., 2011; Bernstein et al., 2016). Even though it will be difficult to empirically account for these variables in this thesis' analysis, this literature will be a powerful resource at the time of evaluating empirical results.

2.2 Effects of Macroeconomic Conditions

The goal of this paper is to determine the unbiased effects PE-backing can have on the success of a company post-IPO. To do so, it is imperative to introduce the necessary controls for the data. Private Equity deals have crucial sensitivity to changing macroeconomic conditions and changes to the Private Equity Industry landscape. These factors can destine a deal for failure,

even if that same deal would have been a star success in a different time. Furthermore, part of the criticism towards Private Equity is that it limits flexibility for its companies during a recession or economic downturn (Palepu, 1990). This thesis will account for these key variables in its analysis and determine the extent to which macro-economic factors have an impact on PE-Backed company performance.

So far in the literature, there have been short-term inquiries into the effects macroeconomic factors have on Private Equity on a fund basis, as opposed to on the company level. This was something Steger (2017) did to find an empirical suggestion that macroeconomic conditions have a direct impact on Private Equity fund returns. Specifically, he found that a weak economy, low valuations, and interest rates at the time of investment favor positive returns. Furthermore, according to his research, returns are procyclical and show a positive relation to increasing stock market valuations over the lifetime of a fund. I seek to contribute to the literature by addressing how macroeconomic factors can affect that *company* performance, as opposed to fund performance.

2.3 General Drivers of IPO Performance

Given this paper's focus on IPOs, it is necessary to look at existing literature in the space. This may help explain the results of this paper. In the general IPO literature, a great focus has been devoted to IPO underpricing, the long-term performance of companies, and the reasons firms elect to go public.

The IPO underpricing issue is the following: firms tend to go public for less than their real value and thus exhibit outsized returns during their first year. However, in the long run, which Lougran and Ritter (2004) define to be a three year window post-IPO, companies that go public underperform the overall market. Possible explanations for this phenomenon include risk

measurement, bad luck, and fads of overoptimism (Lougran and Ritter, 2004). Other authors also contend that though underpricing is related to initial performance, it does not fully explain long term underperformance of IPOs (Hanley, 1993).

Some of the factors associated with performance include the number of revisions to the offer price, which Hanley (1993) finds to be related to underpricing. Furthermore, underwriter reputation tends to be another key factor, where IPOs associated with top-tier underwriters had significantly better long-term performance (Carter et al., 1998). According to Carter, this is because top-tier underwriters are more likely to provide higher-quality information to investors and maintain better relationships with clients. Furthermore, they note that top-tier underwriters may be better able to mitigate the adverse selection problem by selecting to work with higher-quality firms.

Finally, in terms of some of the reasons to go public, Brau and Fawcett (2006) examine CFO perspectives to understand firms' motivations. After performing a survey, they find that the biggest reason to go public is to create shares for public acquisitions, as opposed to minimizing the cost of capital (Brau and Fawcett, 2006). These papers give a broad understanding of the literature related to general IPOs. It follows naturally to look at those that explore the intersection of that with Private Equity.

2.4 Private Equity IPOs

On top of building on literature that discusses Private Equity performance on a general basis, it is important to consider what the literature has explored within the specific realm of Private Equity IPOs. This thesis will use the aforementioned literature as a basis for its analysis and will directly extend the research scholars have already made in the field of Private Equity.

Even though this thesis hopes to contribute to the overarching question of whether Private Equity has a positive and sustainable impact on the companies it invests in, it is important to address the sample bias that can arise from specifically looking at IPO exits. Exit via IPO is just one of many different routes of exit a PE firm can employ. This restriction can potentially introduce some biases to the data employed in this research. For example, Meles (2014) discusses PE IPO exits are different from other exit routes for three main reasons: (i) the IPO is a marginal exit route for PE investors; (ii) only high-quality PE-backed firms should go public; and (iii) the involvement of PE investors can be not completely terminated at the IPO time. Although these biases will not distort the findings of this study, given that they also apply to standalone IPOs, it is imperative to be aware of them. There are two areas of focus in this section: the performance of PE companies Post-IPO and PE firms' ability to time or manipulate the nature of their IPO exits.

2.4.1 PE-Backed Company Performance Post-IPO

The literature that explores company performance post-IPO is certainly the closest and most relevant literature for my thesis. Katz (2007) explores how ownership structure affects earnings quality and long-term performance by looking at firms that are PE-Backed and not PE-Backed pre and post-IPO. The paper records different metrics of performance one year, three years, and five years post-IPO and finds that PE-Backed firms generally have higher earnings quality, engage less in earnings management, and report more conservatively both before and after the IPO (Katz, 2007). It is important to note the metrics explored in Katz's paper include abnormal accruals and growth in net operating assets, which are drastically different from the ones covered in this paper. Furthermore, Katz's paper does not tie its results to extensive financial information or macroeconomic data. Nonetheless, its findings are closely tied to this thesis' research topic.

Katz (2007) also finds that majority ownership by a PE sponsor is associated with better stock price performance relative to management-owned firms. Additionally, the paper finds that large PE sponsor size is positively associated with both better long-term financial and stock price performance when a portfolio company goes public (Katz, 2007). On top of these two variables, other scholars have explored additional factors regarding the performance of PE-Backed firms post-IPO.

Meles' (2014) paper titled "Do the Effects of Private Equity Investments on Firm Performance Persist Over Time" is the closest paper to my work that I found. Studying the Italian markets, Meles finds that the length of the investment is a determining factor in post-IPO performance. That is, excessively short, or excessively long holding periods by PE firms are usually signs of distress. Meles (2014) also finds that VC-Backed firms tend to outperform other IPOs. Gompers and Lerner (2003) find a similar relationship. However, this could be a product of the fact VC companies that go public have a validated value proposition and sizeable growth prospects. Even though Meles looks at a similar question to this thesis, his paper is notably different because it looks at a fraction of the deals covered in this paper. It is also focused on a different geographical region and looks at fewer and different explanatory variables.

Another discussion of PE-backed IPOs comes from Jelic (2011), who finds that IPO exits outperformed trade sales and other exit strategies by Private Equity firms in terms of Internal Rate of Return (IRR). The paper also finds evidence that there are no significant changes in profitability post-IPO for PE-backed companies (Jelic et al. 2011). However, Jelic explicitly mentions a gap in the literature regarding the dearth of studies making this analysis relative to non-PE-backed companies. By looking at changes in multiple factors relating to size, profitability and efficiency post-IPO, this thesis will specifically address this gap.

2.4.2 IPO Market Manipulation Attempts by PE Firms

Theoretically, there are conflicting incentives when discussing the topic of market timing and manipulation by PE firms. On the one hand, PE firms may be more capable of exploiting the IPO markets relative to standalone companies. On the other hand, “fooling” public investors may be detrimental to their reputation, and, therefore, their liquidity. There are conflicting findings in this topic of the literature. Michala (2019) investigates whether PE-backed IPOs display any differences regarding timing, and information asymmetry using data for US IPOs between 1970 - 2013. The paper concludes there is no evidence to show that PE firms inflate valuations more nor that they seek to sell firms with poor prospects (“unload lemons”) compared to insiders of similar standalone companies (Michala 2019). Additionally, Michala’s paper finds that IPOs that take place in hot market periods are significantly more likely to default, but this result is not any stronger for BO or VC-backed IPOs. These results indicate that PE sponsors are not any more likely than managers of stand-alone companies to “fool” the market which agrees with the intuition that if these sponsors are caught “cheating”, they will struggle to raise money in the future (Michala, 2019).

3. Theoretical Framework

Based on the past literature, I make the following hypothesis for this paper:

Private Equity ownership does not have a significant impact on the long-term performance of its portfolio companies post-exit via IPO.

To verify this hypothesis, I will look at whether PE-backed IPOs show statistically significant differences in performance relative to standalone IPOs. The literature establishes the theoretical and empirical foundation for this hypothesis. Specifically, the literature explains the effects of leverage, operational improvements, the macroeconomic environment, and the nature of Private Equity IPOs.

In the discussions about leverage, there is a disagreement between Michael Jensen's free cash flow hypothesis, and the concerns Haque and Haestad pose about leverage. On the one hand, leverage can create the proper incentives to make a firm perform better, and it makes it harder for managers to engage in wasteful investments. On the other hand, the pressure of debt gives firms limited flexibility during times of distress and also makes it harder for firms to invest in innovation. I hypothesize that these two forces do exist but counteract each other, with the result that leverage does not increase nor decrease future performance.

Furthermore, the operational improvements Private Equity firms provide in terms of efficiency are a key consideration in this thesis. Private Equity managers bring discipline and expertise to each of their portfolio companies. Though these operational improvements may persist shortly after the Private Equity firm leaves the boardroom, there is no reason to believe these improvements will persist for many years post-exit.

In terms of the macroeconomic variables, I believe that, except for highly over-levered PE-backed firms, there should be similar effects on both groups of firms post-exit. After all, to be able to successfully sell a firm to the public, the firm must have a reasonable capital structure.

If this were not the case, no rational investor would invest in the IPO, and thus, the Private Equity firm would not be able to successfully sell the company at its target valuation.

Finally, in terms of the market-timing effects and pricing issues on IPOs, the literature establishes how not only would this not make sense for PE firms' long-term business, but it is also not seen in the data (Michala, 2019). Although authors like Meles find that *VC-backed* IPOs exhibit overperformance, this paper will account for crucial factors like company age, and industry, which could help explain those results. While accounting for these factors, I predict firms that were sold from PE portfolios should not have significant differences with respect to the control group.

4. Data

This thesis will use a hand-picked dataset that includes 634 Private Equity backed IPOs and 5523 stand-alone IPOs between the years 2000 and 2016. For each deal, the following data items are included:

Key IPO Information:

Company Name, PE Backing Status, IPO Date, Acquisition Date, Industry Classification, Year Established, Deal Size (Amount Filed), Global Number of Employees

Company Financial Data – collected annually for each year following the IPO until 10 years after they filed:

Market Capitalization, Revenue, EBITDA, EBITDA Margin, EV / EBITDA, Net Debt, Debt / Equity Ratio, PPE, Capex, Bankruptcy (Y/N)

Macroeconomic Data:

Inflation (2000 – 2016), Representative Industry Index return, PE Dry Powder at the time of purchase, Corporate Yield at the Time of Purchase, S&P 500 return, U.S. GDP Growth, Credit Spread

For the Industry Classifications, the dataset uses the Primary Industry Classification employed by the Global Industry Classification Standard (GICS), which includes Energy, Materials, Industrials, Consumer Discretionary, Consumer Staples, Health Care, Financials, Information Technology, Telecommunication Services, Utilities, and Real Estate.

4.1 Rationale

The goal of this paper is to comprehensively evaluate the long-term effect Private Equity has on its portfolio companies. Thus, it was necessary to collect data for several years post-IPO. The Key IPO information collected will be essential to establish company age and industry. The

company financial data will provide the appropriate controls in the analysis section, along with the macroeconomic data, which will account for non-company-specific factors that can have a substantial impact on outcomes. The empirical methodology section will detail how each datapoint will be used in this thesis.

4.2 Data Sources and Collection Process

The foundation of this thesis' novel contributions to the literature is the fact it uses a unique and manually curated dataset. Several different data sources have been combined to create the comprehensive dataset covered in this research. As a result, the data collection process was the most time-consuming aspect of this research. The four primary data sources employed for this research are: Preqin Pro, SDC platinum, S&P Capital IQ, and the Federal Reserve Economic data. Every data source contributed to the data in a unique way:

Preqin Pro

Preqin Pro is a data service that focuses on the private capital markets, specifically, VC, Private Equity, and Hedge Funds. It has a vast amount of data and services related to those fields.

The most important contribution Preqin Pro made was the list of names of Private Equity exits via IPO between the years 2000 and 2016. This is the foundation of the papers' research. The Preqin Pro data also contains key datapoints regarding the PE deals this paper analyzes, including date acquired, IPO date, and deal size. From this data, it is possible to extrapolate the investment duration. Additionally, Preqin Pro contributed to data relating to the net levels of dry powder for Private Equity via their industry-level data.

SDC Platinum

SDC Platinum is a collection of financial databases that provides worldwide information on mergers & acquisitions transactions, corporate restructuring, Global Public Finance, and Global New Issues.

SDC Platinum was essential to finding a control group for the thesis. This data source contributed a comprehensive list of company names that went public in the same time frame as the group of PE-backed companies. Naturally, this list is far more extensive and had around 6000 observations.

S&P Capital IQ

S&P Capital IQ is the research division of S&P Global, one of the world's largest providers of ratings, data, research, and the S&P Dow Jones Indices. The Capital IQ database provides a slew of financial data on millions of companies around the world.

The S&P Capital IQ database was essential to gathering the entirety of the Company Financial Data, described in the introduction of the data section. Furthermore, this data source contributed to key company and deal datapoints: year established and industry classification. Finally, S&P Capital IQ was essential for key macroeconomic data through the representative industry indices they provide and the general S&P 500 index data.

To gather company financial data, I used the comparable analysis feature to merge the company names gathered from Preqin Pro and SDC Platinum with the financial data from S&P Capital IQ. I created 16 different screens to collect the necessary financial data for each group of companies that went public each year. Each different screen collected every company's financial metrics for the years following their IPO year. For example, the screen for 2000 IPOs contained financial data for each company from 2001- 2010. This was a tedious and time-consuming part

of the project that involved hand-pasting every company name onto the screen, verifying each company matched, and subsequently exporting each of the screens onto one comprehensive dataset. Furthermore, the bankruptcy data, which is not available through the comparable analysis feature, was gathered by cross-referencing the entire content of the Capital IQ bankruptcy record with the list of deals I gathered from Preqin Pro and SDC Platinum.

Federal Reserve Economic Data

This government-sponsored data source was used to gather the remaining macroeconomic data including inflation, corporate yields, and U.S. GDP growth. To calculate Inflation, I gathered the CPI for all urban consumers and indexed it to the year 2000. This will allow the data to be adjusted for inflation across time.

The data collection process is a significant driver of the contributions of this thesis. The extensive manual collection process makes the research of this paper unique compared to existing literature to date.

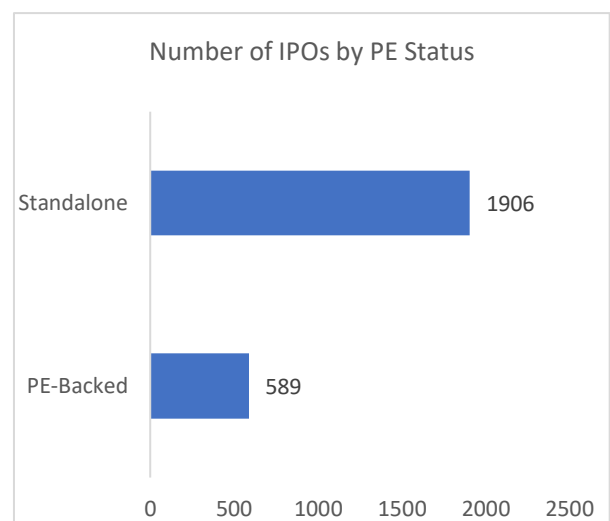
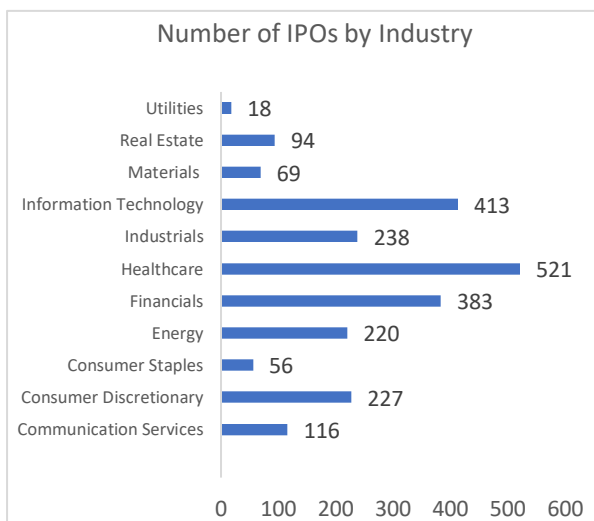
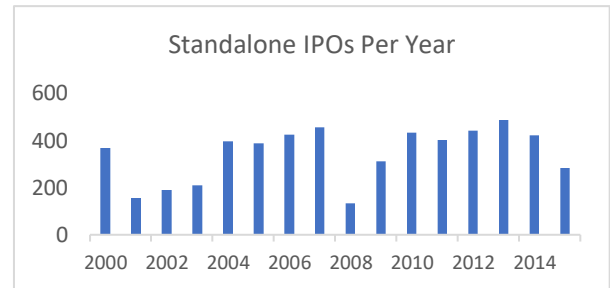
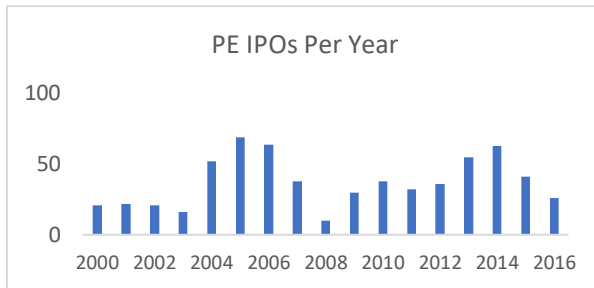
4.3 Univariate Analysis and Summary Statistics

In this section, I will go through each of the variables in the table below, discuss their summary statistics, and highlight some differences by Industry and PE-backed status. The goal of this analysis is to understand the data as best possible before any regression analysis.

	<u>Summary Statistics</u>					
	Standalone			PE-Backed		
	Number of Observations	Mean	Std. Deviation	Number of Observations	Mean	Std. Deviation
Age at Exit	1504	17.58	27.07	429	24.54	23.93
Number of Employees	1559	3222	11853.00	487	8436	27309.00
Short Term MCAP Growth	1407	0.70%	0.36	367	4.22%	0.39
Mid Term MCAP Growth	1088	2.66%	0.25	296	2.42%	0.21
Long Term MCAP Growth	608	1.35%	0.21	184	3.50%	0.19
Bankruptcy Probability	1908	0.07	0.25	594	0.10	0.30
Short Term Revenue Growth	1123	16.14%	0.46	363	10.93%	0.40
Mid Term Revenue Growth	802	14.54%	0.25	274	8.92%	0.18
Long Term Revenue Growth	507	11.54%	0.19	189	7.30%	0.12
Short Term EV / EBITDA	664	21.97x	30.13	319	12.91x	14.72
Mid Term EV / EBITDA	550	23.29x	36.38	270	14.17x	17.15
Long Term EV / EBITDA	350	17.87x	25.19	173	12.32x	11.50
Short Term EBITDA Margin	953	33.41%	0.46	354	22.00%	0.20
Mid Term EBITDA Margin	758	31.80%	0.42	290	20.93%	0.19
Long Term EBITDA Margin	452	28.30%	0.37	195	20.46%	0.18
Debt / Equity Ratio	1014	124.60%	3.84	341	204.70%	5.01

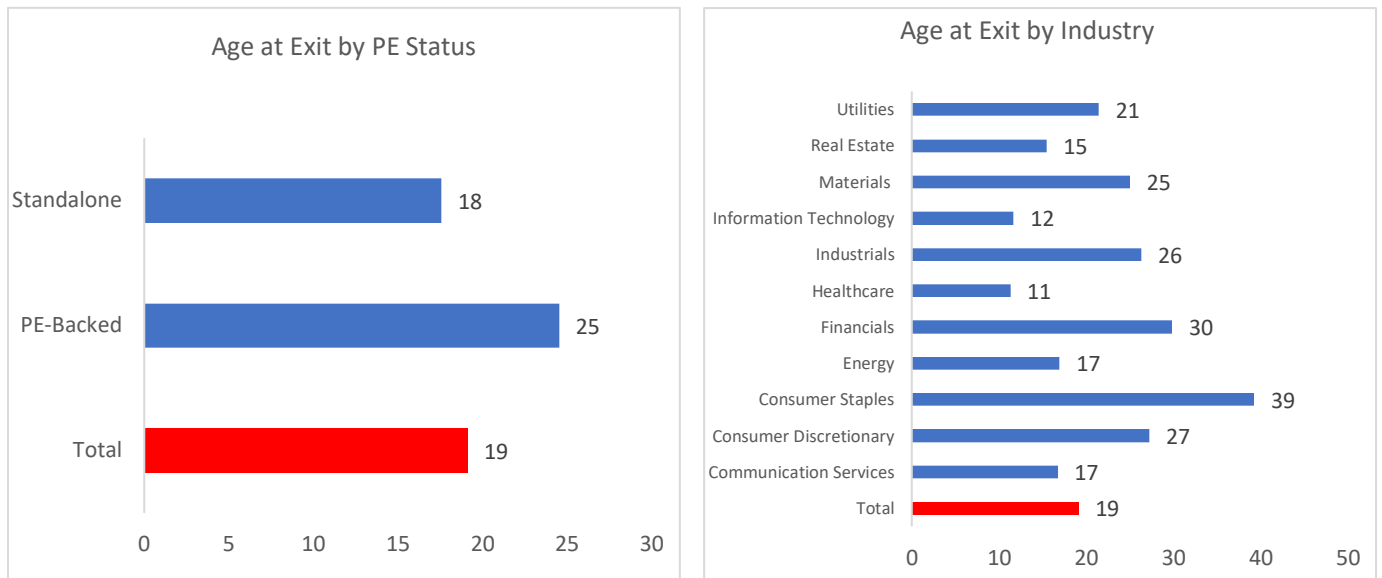
4.3.1 General Company and Deal Characteristics

Number of IPOs



One can see here that the Private Equity IPO and standalone IPO markets follow similar trends regarding yearly IPO volume. However, it appears that the PE-backed IPO market has larger swings. In terms of the composition of the data, we see most of the companies are standalone as opposed to PE-backed. A large proportion of the standalone companies are in the healthcare and IT space, with 500 and 350 companies in those respective groups. In the PE cohort, the most popular industries were consumer discretionary and industrials, with 102 and 98 companies in each respective group.

Company Age at the Time of the IPO



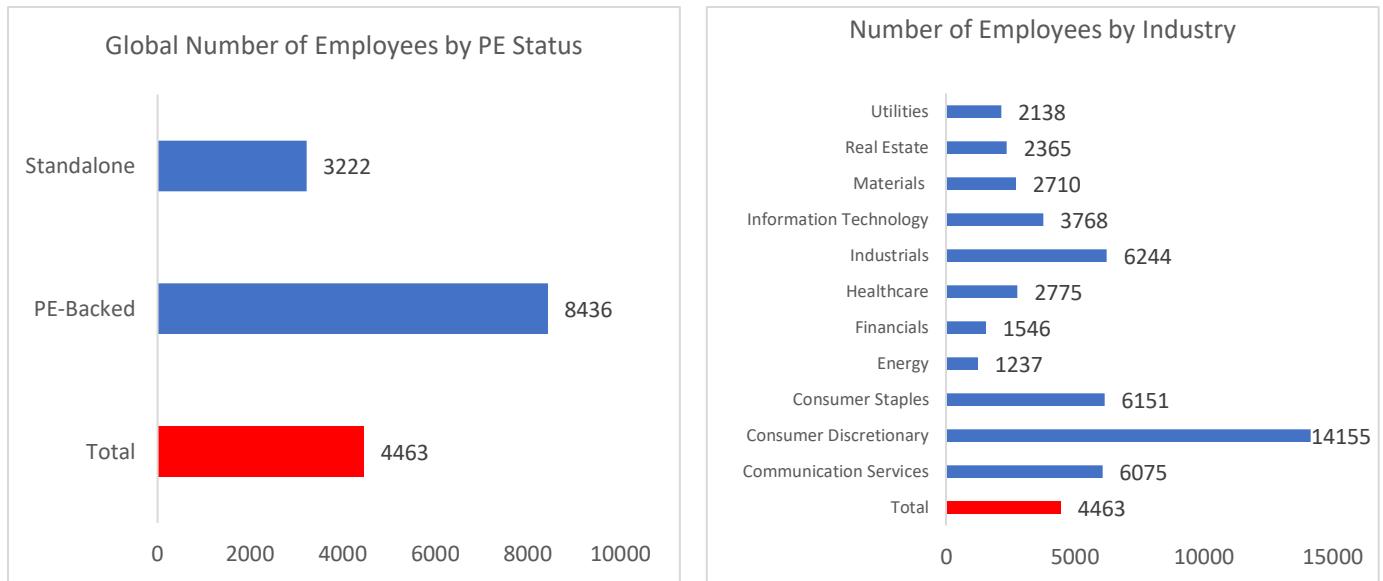
The average company age at which there was an IPO was 19.2 years. The most mature industries in the sample were consumer staples, followed by financials, and consumer discretionary. This makes sense when one considers the time it takes to establish a successful business in these industries compared to other industries such as IT or Healthcare, which represented the youngest group of companies.

In general, PE-backed companies are more mature than standalone companies in the dataset. This is due to the selection factor PE firms introduce by typically looking for established, cash-generating firms.

This analysis also reveals some insight into the types of companies PE firms tend to invest in. In certain industries, PE-backed IPOs were younger relative to standalone IPOs. This is the case in the Consumer Staples, Industrials, and Materials industries, where the company ages were 23, 20, and 19, as opposed to 47, 30, and 28 for the standalone group. However, in other industries such as Healthcare, IT, Energy, and Real Estate, standalone IPOs were far less mature

than PE-backed IPOs. In these industries, the respective PE-backed average ages were 25, 18, 22, and 40 for PE, but 10, 10, 14, and 14 for standalones.

Global Number of Employees

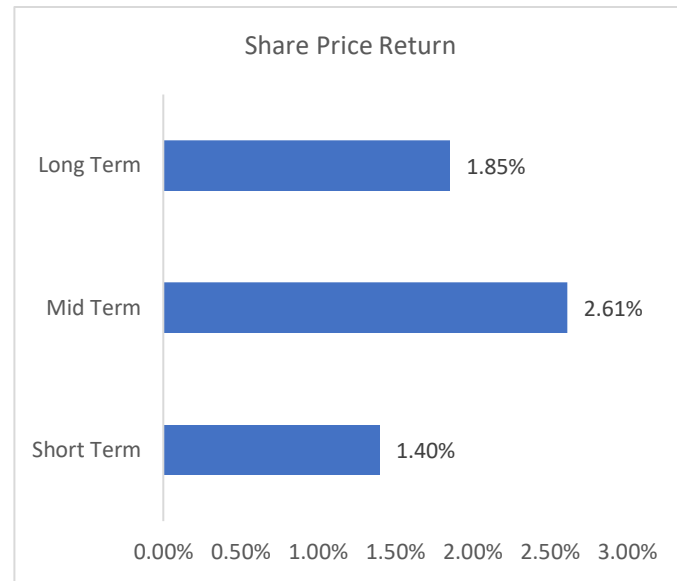
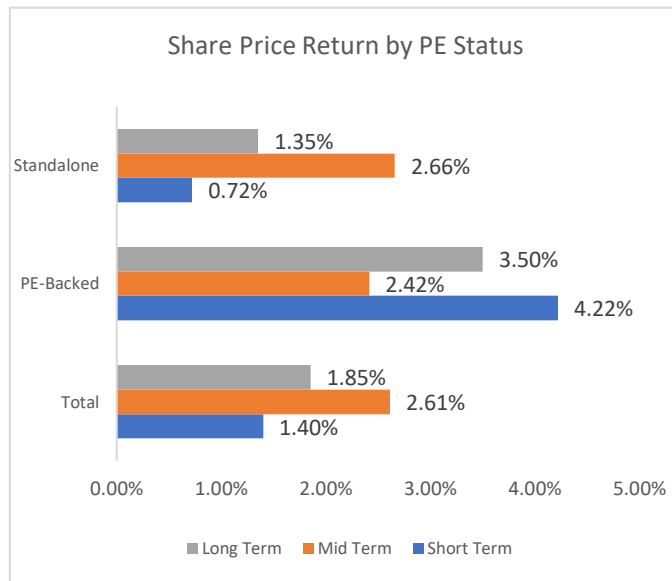


The average headcount for the companies in the dataset was 4463. This chart shows how consumer discretionary companies tend to be the largest of the group in terms of employee count. On the other hand, industries like Energy and Financials, which traditionally require fewer employees were accordingly the smallest by headcount.

These charts follow the narrative from the discussion of company age. The companies to go public via IPO from PE firms tend to be larger *and* more mature companies than the standalone companies. These intrinsic characteristics of the data are noteworthy, as they will likely be reflected in further analysis.

4.3.2 Financial Metrics

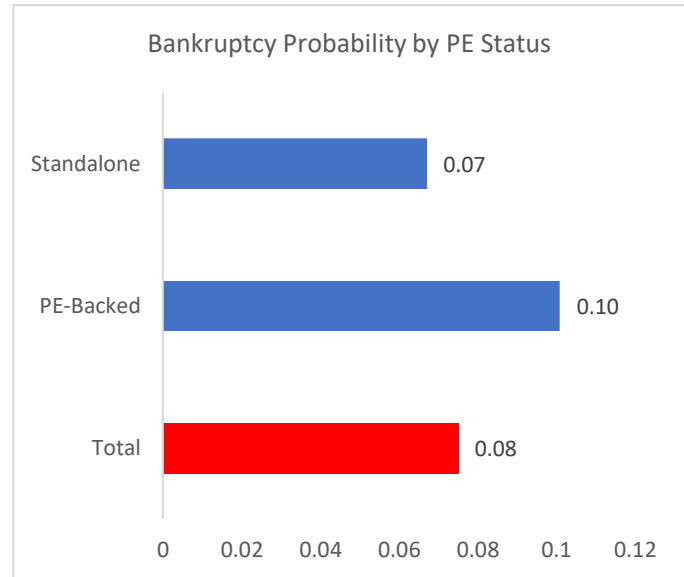
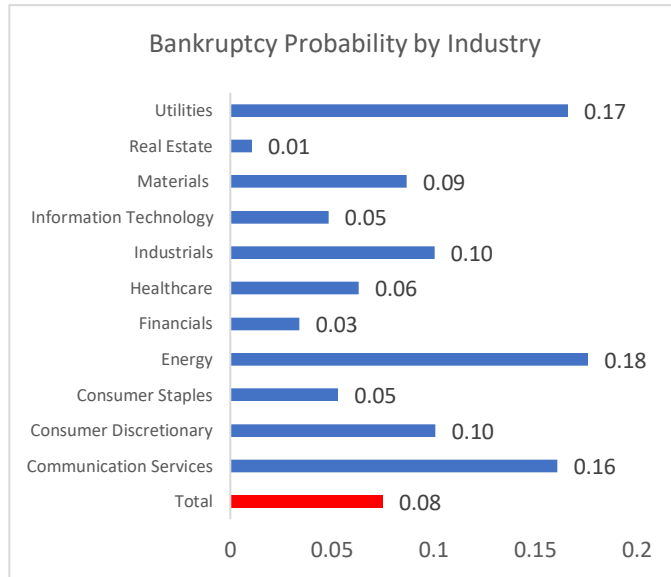
Share Price Return



These two charts show the CAGR (Compound Annual Growth Rate) of the Market Capitalization of the companies in the dataset by time window and PE status. Notably, the highest CAGR comes during the mid-term period, which is consistent with IPO underpricing and long-term performance trends discussed by Lougran and Ritter (2004).

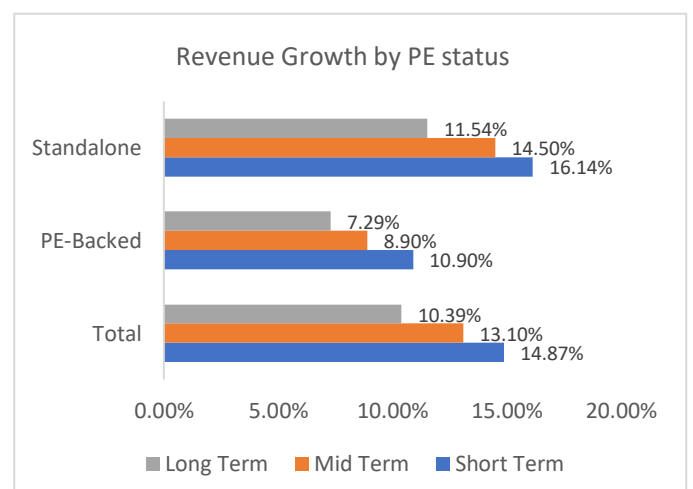
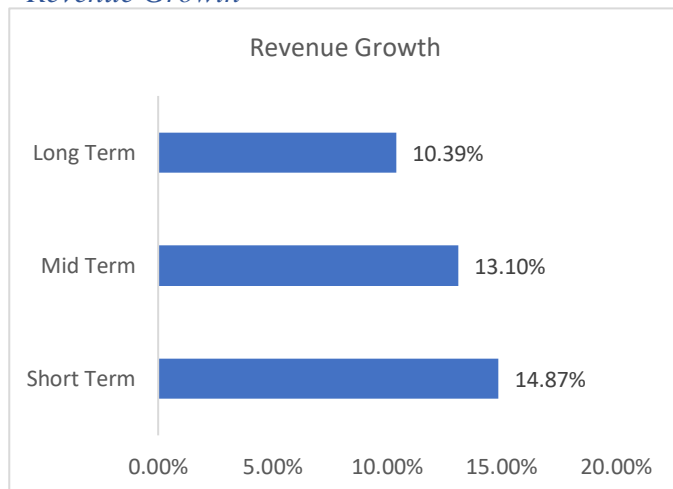
Looking at the differences between PE-backed and standalone companies, we see that PE-backed companies tend to achieve much greater growth than standalone companies in the short term. This is surprising because it may indicate that PE firms are leaving money on the table. However, it would be necessary to account for the characteristics of the companies to plausibly make that claim. In the mid-term, company returns between PE-backed companies and standalone companies is very similar. However, in the long term, once again, PE-backed companies exhibit more growth. This relationship will be explored in much more detail in the results section.

Bankruptcy Probability



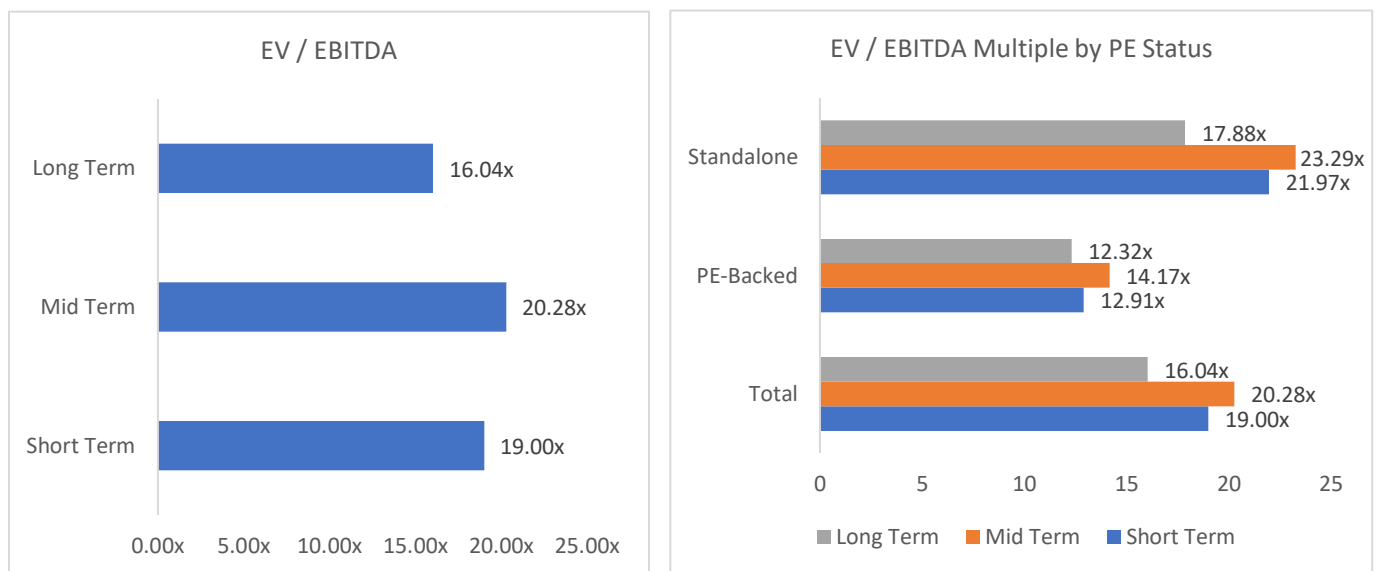
These two charts show the percentage of companies that went bankrupt according to their PE status and industry classification. Firstly, we find that PE-backed companies are significantly more likely to go bankrupt than standalone companies: PE-backed companies have a 10 percent incidence as opposed to a 7 percent incidence for the standalones. This makes sense considering the high leverage PE-backed companies often have on their balance sheets. In terms of industry, we can see Bankruptcy is most likely in the Utilities, Energy, and Communication Services sectors. Meanwhile, sectors like Real Estate, Financials, or Consumer Staples have much lower rates.

Revenue Growth



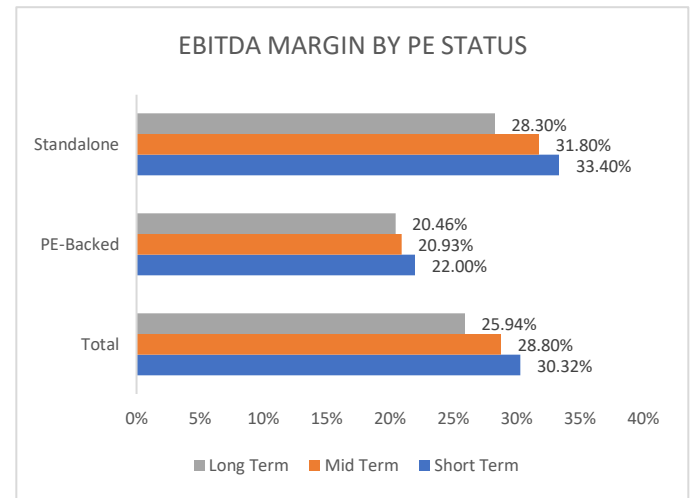
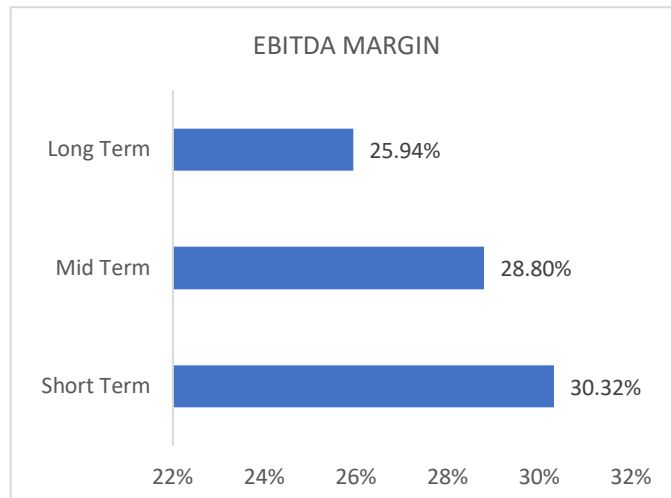
These figures show the CAGR in growth rates by time window and PE status. The time window chart shows how companies achieve significant levels of annualized growth shortly after the IPO, yet they are not able to sustain those levels in the long term. Comparing standalone companies to PE-backed companies by revenue growth, we can see standalone companies achieve greater growth in all three time windows. However, when looking at the differences in company age and size between the PE and Standalone groups, one can understand how this could be a product of the composition of the dataset.

EV/EBITDA



Looking at the EV/EBITDA multiples, we can see companies achieve higher relative valuations in the mid-term compared to the short-term. However, in the long term we see relative valuations decrease again. The differences in PE status show a consistent trend with the data explored so far. PE-backed companies tend to be more mature. This results in higher general levels of EBITDA as well as lower organic growth potential for the PE-backed companies. These two differences push the EV/EBITDA multiples to be lower for the PE-backed group.

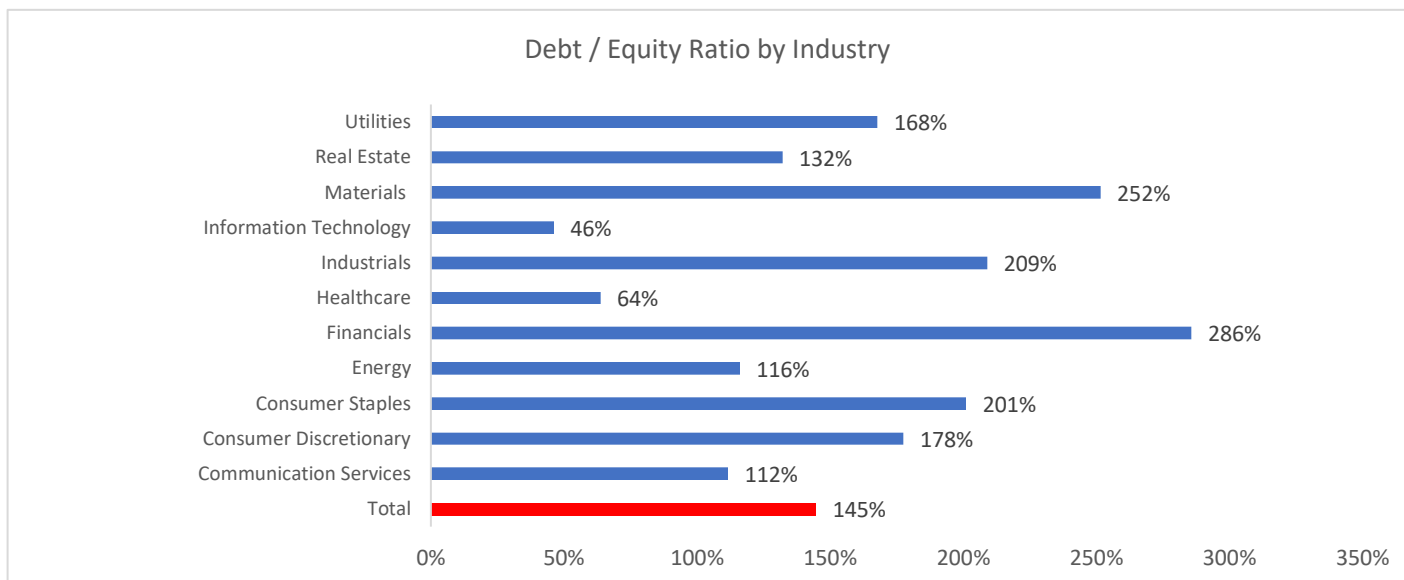
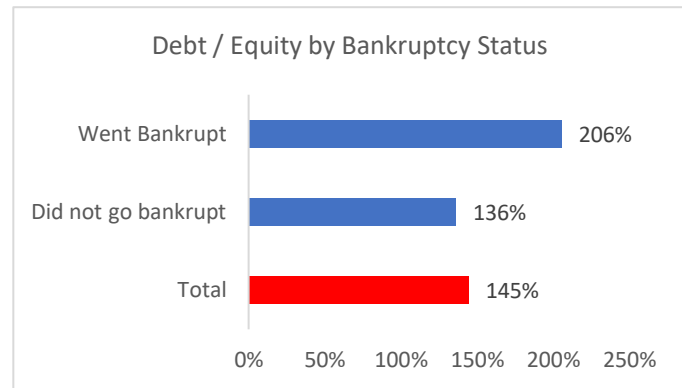
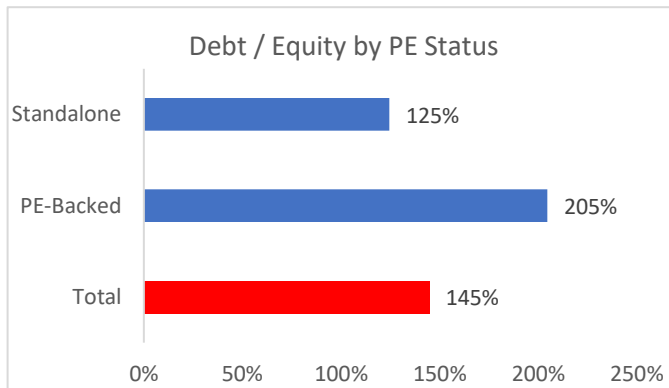
EBITDA Margin



Notably, the chart on the left shows how company efficiency tends to decrease in the years post-IPO. This is a very insightful trend that might help explain the results in the literature that claim companies that go public underperform in the long term (Lougran and Ritter, 2004). It also supports the findings by Jelic (2011), who found no significant changes in profitability for PE firms post-IPO. As one can see in the chart on the right, the profitability changes significantly more in the standalone group compared to the PE-backed group. Perhaps, after business owners cash out through the IPO, there are fewer incentives to run an efficient business.

In terms of the difference in margins by PE status, we see another surprising trend. The EBITDA margins of PE-backed companies are notably lower than those of standalone companies. To make any further conclusions about this, however, it is necessary to look at those results with respect to the companies' industry classification. This trend will be further investigated in the results section.

Debt / Equity Ratio



From this chart, we can see how PE-backed companies manage to offload their targets with substantially more debt than standalone companies. This provides a noteworthy understanding of the ways PE firms manage to generate returns, as this chart implies that they do not fully restore their portfolio companies' capital structure to normal levels. Furthermore, we can see that Debt / Equity ratio is positively correlated with the probability of bankruptcy. This makes sense: the more debt you have, the more likely it is you won't be able to pay it off. In terms of industry, we also see some drastic differences. On the one hand industries like financials, materials, or industrials have very high levels of leverage. This is due to the fact these businesses tend to be stable and manage to weather macroeconomic fluctuations effectively. On the other hand,

companies in the IT or Healthcare space tend to have much lower levels of leverage. This ties in with the fact these companies tend to be less mature and therefore have not established creditworthiness.

5. Methods

To study the long-term performance of PE-backed companies post-IPO, I will analyze several company metrics related to performance. Furthermore, I will look at three different time windows to be able to compare the long-term results with mid- and short-term results. In this paper, the long, mid, and short-term windows represent 9,6, and 3 years post-IPO. I picked these three time windows because they cover the span of data I collected and are also evenly distributed. This allows for meaningful analysis over a period of time, as opposed to a singular snapshot.

5.1 Model Specification

This section will specify the regression equation used for this paper and explain the reasoning behind it.

Before running any regressions, any dollar value will be standardized to account for inflation. This is due to the broad time span of the data, and the fact it is common practice to do so in the literature (Daigle, 2022). Along with these adjustments and univariate analysis, the empirical methodology of this paper will revolve around one fundamental regression, which will be analyzed using robust regression:

$$Perf_i = \beta_0 + \beta_1 PE + \beta_2 M + \beta_3 I + \varepsilon$$

- Perf represents the different performance measures analyzed in this thesis. There are four variables in this vector: MCAP growth, Revenue Growth, EBITDA Margin, and EV / EBITDA multiple. Each of these metrics will be considered at 3 different time windows: short-term at 3 years post IPO, mid-term at 6 years post IPO, and long-term at 9 years post IPO.

- PE is a dummy variable representing whether, or not, an observation represents a company that was IPO'd by a Private Equity firm.
- M is a vector representing the control variables and macroeconomic factors that will be accounted for in the analysis. These factors include GDP growth, Industry Benchmark returns, Debt/Equity ratio, age of the company at the time of IPO, corporate yield, and other relevant control variables.
- I represents a vector for different interaction terms included in the model. These variables will account for correlations among the variables and ensure appropriate model specification.

With this econometric equation, it will be possible to answer the fundamental research question thoroughly.

5.2 Regression Technique

Originally, I planned to use a panel as the regression technique for the thesis. However, this would have required that every datapoint contain every single financial metric for years 1-10 post-IPO. Excluding the datapoints that didn't have some intermediate terms severely decreased the sample size, which would have made the results far less reliable. Therefore, I decided to look at growth metrics as opposed to a panel for the metrics I was hoping to analyze over time. OLS is the first regression technique I considered for this thesis. However, before settling on this, it was necessary to look at the influence of outliers and heteroskedasticity.

To test this, I plotted the residuals of each regression with the predicted values. I also plotted the residuals against Cook's Distance and leverage. These findings indicated that the data not only included severe outliers but was also heteroskedastic. On top of this, there was also the potential issue of omitted variable bias.

Upon further analysis, I decided that these outliers are not a result of data entry errors, nor are they from a different population than the rest of the data. Having no compelling reason to exclude these datapoints from the regression, along with the heteroskedasticity problem and omitted variable bias, I decided to employ robust regression over OLS in this paper.¹

Robust regression is more appropriate than OLS because the outliers and tail distributions of the observations where the normal distribution assumption is violated are better addressed. Since this technique is conducted as iterated re-weighted least squares, it can also handle heterogeneity of variance to a degree. Comparing the residual plots from the Robust regression to those of OLS confirmed that the issues of heteroskedasticity and outliers had been remedied. Please contact the author for further data requests on these plots.

5.3 Variable Rationale

This section will explain why each variable was selected for the model and specify which models it will affect. Furthermore, it will touch on the predicted coefficient for each independent variable.

5.3.1 Dependent Variables

Variable	Rationale
MCAP Growth	MCAP growth is a reliable measure of company performance because it incorporates the perceptions of investors regarding performance in its pricing. Using the growth statistic is more meaningful because it allows for firms that are originally of different sizes to be compared like to like.
Revenue Growth	Revenue growth will serve as a measure of non-market-based company performance. Again, using the growth statistic will allow for comparisons of firms that are of different sizes.

¹ The specific type of Robust regression employed is the standard rreg command provided by the STATA software. This regression technique iteratively uses Huber weighting followed by bi-weighting. With the Huber-weighting, the cases with large absolute residuals are given a smaller weight. With biweighting, all cases with a non-zero residual get down-weighted to some degree. As a result, the biggest outliers are dropped, and those with large

EV / EBITDA Multiple	The EV / EBITDA multiple will allow for metrics of company's relative valuation changes over time. A key source of value for Private Equity firms is multiple expansion, so it will be meaningful to see how these multiples change over time after companies are sold to the public.
EBITDA Margin (%)	The EBITDA margin is a measure of the profitability of a firm. This metric measures a company's efficiency in turning revenue into profit. Similar to the multiple metrics, Private Equity firms try to boost EBITDA margins to generate returns. Thus, it will be meaningful to explore how this metric changes after firms sell companies via IPO.

5.3.2 Control Variables and Macroeconomic Factors

Variable	Rationale
Private Equity (Y/N)	<p>This is the key variable of this thesis. Looking at the influence of this variable in each regression will allow me to quantify how much private equity ownership affects different performance metrics. Its statistical significance will be a key consideration.</p> <p>Earlier in the paper, I hypothesize that this variable will have no effect. Thus, I expect magnitudes close to zero and no statistical significance. In the short term, there may be significance, but I certainly do not expect this in the long term.</p>
Debt / Equity (%) at Year of IPO	<p>Debt / Equity will be used to explore the effects of leverage at the time of IPO on performance. Using this ratio, as opposed to a gross measure of debt will allow for comparisons between firms of different sizes.</p> <p>I have no clear prediction of the sign of this variable. This is due to the conflicting effects of Micahel Jensen's Free Cash flow hypothesis and the contrasting opinions of other scholars.</p>
Age at the time of IPO	<p>This variable will account for differences that can arise due to age. Companies at different stages of the company cycle have different performance characteristics and this variable will account for that.</p> <p>I expect company age to have a positive influence on MCAP and Revenue growth. This is because younger firms have significantly more time to grow. I expect this to also have a positive effect on the EV/EBITDA multiple because higher growth prospects tend to yield higher relative valuations. However, I expect the sign to be negative for EBITDA margin, because young firms tend to have more difficulties establishing profits.</p>
Revenue at the time of IPO	This variable looks at the differences in company size. As opposed to asset base or employee count, revenue at the time of IPO will be

	<p>an appropriate measure of size among companies of different industries.</p> <p>Companies of different sizes will have different characteristics on performance metrics. Therefore, it is important to include this control variable.</p> <p>This variable is included as a log given the large raw values of PPE compared to the dependent variables. The log values presented a much better fit in all the regressions.</p> <p>I expect initial revenue to have a negative impact on MCAP and revenue growth. That is because the bigger a firm is, the less margin it has to grow. I expect it to have a positive effect on EBITDA Margin because larger firms tend to benefit from economies of scale. I cannot predict the effect it will have on the EV / EBITDA multiple.</p>
BankruptcyYN	<p>This is a dummy variable that indicates whether or not the company experienced Bankruptcy. The goal of this variable is to control for financial distress that can affect the company performance.</p> <p>I expect this variable to have a significantly negative effect on all four performance variables.</p>
Property Plant and Equipment	<p>Asset base can allow Private Equity firms to enjoy favorable terms on loans. Therefore, it is relevant to account for these potential advantages some firms may have with respect to others.</p> <p>This variable is included as a log given the large raw values of PPE compared to the dependent variables. The log values presented a much better fit in all the regressions.</p> <p>The PPE variable could go either way for the Revenue Growth and MCAP growth statistics. It could be that size has a negative effect on returns. However, it could also be that having tangible assets has a positive effect.</p>
Industry Market Return	<p>This is a key variable as it accounts for the divergent performance different industries may have depending on exogenous factors such as technological developments or government policies. By accounting for this variable, it will be possible to look at company's performance relative to their respective industry performance.</p> <p>I expect this variable to be significant and have a small and potentially negative sign. This is due to the literature that addresses how IPOs tend to underperform the rest of the market in the long term.</p>

Industry EV / EBITDA	<p>This variable will only be used for the regressions that look at EV / EBITDA multiples. This will account for some of the clear differences in valuation one can find across industries.</p> <p>I have no clear prediction for this variable—there should be relatively even amounts of companies that are over the Industry EV / EBITDA and companies that are under. Thus, I predict this variable to be significant, though with a small magnitude.</p>
Industry EBITDA Margin (%)	<p>Like the Industry EV/EBITDA variable, this variable will account for inherent differences in margins that arise across different industries. It will only be included in the EBITDA margin regression. I again predict this variable will have a small magnitude but cannot indicate its sign.</p>
GDP Growth	<p>This variable will account for the overall economic health of the country during the period of the IPO. The Economic health of the country will naturally affect businesses, which is why it is important to account for it. I predict this variable to be positive for all four regressions.</p>
Credit Spread	<p>This variable will control for the differences in the credit markets of the country. These differences will have a big impact on Private Equity owned firms due to leverage in transactions. Furthermore, credit spreads are an indicator of the overall economic conditions of the country. Since high credit spreads indicate higher market risk, I predict this variable will have a negative sign.</p>

5.3.3 Interaction Terms

To ensure appropriate model specification, it is important to look at the correlations among the co-variates. Please find specific correlation matrices in the Appendix.

From these correlation matrices, we find two groups of variables that are significantly correlated: company size variables and market conditions variables. Any variables that present a correlation greater than 0.3 across the three time windows are considered to be significantly correlated.

In terms of the company size variables, we find that Number of Employees, Capex, PPE, and Revenue at the time of IPO are all mutually correlated. Of these variables, Capex and PPE are employed to indicate the size of physical tangible assets. This is a meaningful metric for this thesis because a large physical asset base can allow Private Equity firms to have favorable terms

on debt. On the other hand, Number of Employees and Revenue at the time of IPO measure pure company size—regardless of the asset base.

Given these differences, it is appropriate to pick one out of each of these pairs. I decide to pick PPE because it gives a more direct picture of a company's physical assets. Furthermore, I pick Revenue at the time of IPO because the nature of a company has a big impact on the number of employees it requires. For example, a company in the Consumer Business will require far more employees than, say, an innovative tech company. Nonetheless, these companies may still produce similar revenues and thus be of a similar size.

Considering these two variables for size, it is appropriate to include an interaction term to account for endogeneity. This variable does improve the specification of the model and is accordingly included in the regressions.

In terms of the market conditions variables, I found a similar situation. The stock market return and industry market return variables are general indicators of the Equity market performance. On the other hand, the Corporate Yield and Credit Spread variables are indicators of the Credit Market performance. Since the Industry Market variable is more closely tied to the companies we study than the general stock market variable, we pick the Industry Return variable to represent equity returns during the period. Likewise, the Credit Spread variable shows the health of corporate credit *relative* to the risk-free rate. This variable, again, is a more appropriate measure than the corporate yield, which does not account for the risk-free rate environment.

These two variables, namely Credit Spread and Industry market return, are significantly correlated across the three windows so I include an interaction term to account for endogeneity. \

6. Results

This section will analyze the results of the robust regressions described in the methods section. Before diving into these, it is important to note that using robust regression over OLS results in a different test for goodness of fit. For this model, it is not appropriate to report r squared as the metric for fit because the iteration process that reaches convergence produces pseudo values for the dependent variable. Consequently, the F-test statistic is used to assess the goodness of fit for the robust regression model. For this test, the null hypothesis is that all the coefficients are equal to zero. Larger F statistics suggest a better fit.

6.1 MCAP Growth

MCAP Growth			
	Short Term	Mid Term	Long Term
Private Equity (Y/N)	0.016 (0.023)	-0.005 (0.02)	-0.018 (0.062)
Debt/ Equity Ratio at Year of IPO	-0.004* (0.002)	-0.003 (0.002)	-0.021** (0.01)
Company age at Year of IPO	0.000 (0)	-0.001 (0)	0.000 (0.001)
Bankruptcy (Y/N)	-0.188*** (0.033)	-0.185*** (0.03)	-0.255** (0.1)
Industry Return	0.486*** (0.126)	-0.095 (0.083)	-0.772*** (0.254)
GDP Growth	2.962* (1.625)	1.940 (1.755)	13.822 (10.168)
Credit Spread	-0.05*** (0.019)	-0.008 (0.018)	-0.369*** (0.058)
ln(PPE)	0.035*** (0.011)	0.044*** (0.01)	0.133*** (0.033)
ln(Revenue at Time of IPO)	0.029*** (0.009)	0.033*** (0.008)	0.053** (0.026)
PPE and Revenue Interaction	-0.004** (0.002)	-0.006*** (0.002)	-0.016*** (0.005)
Credit Spread and Industry Return Interaction	0.000 (0)	0.000 (0)	0.000 (0)
_cons	-0.124 (0.085)	-0.196*** (0.075)	0.685** (0.303)
Observations	1014	798	491
F- Statistic	18.29	8.81	8.86
Prob > F	0.000	0.000	0.000

Standard Errors in Parenthesis

*** p<0.01, ** p<0.05, * p<0.1

From these results, it is clear that Private Equity status does not have a measurable impact on Market Capitalization growth. Not only is the coefficient of the PEYN variable small, but it also is not statistically significant across any of the time windows. This is an important result because it shows that there are no pricing disparities between PE-backed and standalone IPOs in the short term. Furthermore, it shows that, from a market perspective, standalone and PE-backed companies don't have significant differences in performance. I believe this to be the consequence of two important ideas. One, as the literature suggests, Private Equity firms have no incentive to engage in opportunistic pricing when selling their companies via IPO (Michala, 2019). Furthermore, by accounting for a large number of controls in this analysis, I managed to overcome the selection bias that arises from Private Equity firms selecting a specific type of company. These results are consistent with the paper's hypothesis.

In terms of goodness of fit, we can see that the model is strongest in the short-term window. This is likely because the number of observations is lower for the longer time windows.² Alternatively, it could be because during this shorter period, firms that go public still share common characteristics. However, as the time window gets wider, these firms have more time to experience changes, which may cause the model's goodness of fit to decrease. For the three time windows, the F-statistics show the results can be interpreted as reasonable as opposed to being the result of mere chance.

Leverage is another noteworthy result of this regression. We can see the Debt/Equity (%) statistic does have a significant effect on MCAP growth in the Short Term and Long Term windows. In the short term, we see that a 1-point increase in Debt/Equity ratio yields a 0.4% decrease in short growth. In the long term, we see that a one-point increase results in a 2.1%

² You can find the summary statistics table in Section 4.3

decrease in MCAP growth. These variables are small in magnitude, as predicted. However, the negative sign shows how the difficulties that arise from leverage can be stronger than its benefits.

Another notable result is the predictive power of the Bankruptcy statistic. Going through bankruptcy results in 18, 18, and 26 percent reductions in market capitalization growth across the short-, mid-, and long-term windows respectively. This is not surprising, since a bankruptcy often wipes out a company's equity value.

Furthermore, there is a strong statistical significance of the industry return variable in the short- and long-term. This can be explained by the fact that firms of different industries have different sensitivities to changes in their industry market environments.

Finally, the two size statistics employed in this regression, namely PPE and Revenue had statistically significant effects on company MCAP growth. These effects became larger as the time window was increased. However, their magnitudes are very small. A 1% increase in PPE yields a 0.1% increase in Market Cap growth across the 9-year window. Similarly, a 1% increase in Revenue at the time of IPO yields a 0.05% increase in Market Capitalization growth.

6.2 Revenue Growth

	Revenue Growth		
	Short Term	Mid Term	Long Term
Private Equity (Y/N)	-0.011 (0.012)	-0.024** (0.012)	-0.018 (0.062)
Debt/ Equity Ratio at Year of IPO	-0.002** (0.001)	-0.001 (0.002)	-0.021** (0.01)
Company age at Year of IPO	0.000 (0)	0** (0)	0.000 (0.001)
Bankruptcy (Y/N)	-0.05*** (0.017)	-0.059*** (0.019)	-0.255** (0.1)
Industry Return	0.000 (0.067)	-0.173*** (0.052)	-0.772*** (0.254)
GDP Growth	2.556*** (0.853)	2.764** (1.069)	13.822 (10.168)
Credit Spread	-0.014 (0.01)	0.019* (0.011)	-0.369*** (0.058)
ln(PPE)	0.024*** (0.006)	0.013* (0.007)	0.133*** (0.033)
ln(Revenue at Time of IPO)	0.000 (0.005)	-0.015** (0.006)	0.053** (0.026)
PPE and Revenue Interaction	-0.004*** (0.001)	-0.001 (0.001)	-0.016*** (0.005)
Credit Spread and Industry Return Interaction	0.000 (0)	0* (0)	0.000 (0)
_cons	0.095 (0.044)	0.089* (0.048)	0.685** (0.303)
Observations	959	712	477
F- Statistic	9.74	8.83	5.68
Prob > F	0.000	0.000	0.000

Standard Errors in Parenthesis

*** p<0.01, ** p<0.05, * p<0.1

The Private Equity statistic is only a significant predictor of revenue growth at the six-year mark. However, the fact that it is not significant at the short-term nor the long-term mark does not present a clear picture. It could be that there are differences between standalone and PE-backed firms' ability to grow past the short-term window, but that these differences dissipate by the nine-year mark. Something important to note, despite lack of clear statistical significance, is the negative sign on the PEYN statistic across all windows. This implies that to some extent, companies that were owned by PE firms are unable to grow post-IPO revenues at the same rate as standalone companies. This could be a result of the fact PE ownership pushes these companies to their limit and thus made it hard for them to expand even further. However, since the results are not statistically significant, one can't arrive at this conclusion. This insignificant result supports this paper's hypothesis, which predicts there are no long-term differences between firms that IPO from PE firms compared to standalone IPOs.

In terms of goodness of fit, we see the model is best specified in the short term and has decreasing fit as we expand the time horizon. This is likely due to the same reasons outlined in the MCAP growth results. It is important to note that this model overall has a lower level of fit compared to the MCAP model. In a way, this may be because the revenue growth statistic is not market-based, and may be subject to much bigger fluctuations. For the three time windows, the F-statistics show the results can be interpreted as reasonable as opposed to mere chance.

Some other interesting results include how leverage limits PE-backed firms' ability to grow revenues in the short-term and long-term but does not have a statistically significant effect in the mid-term window windows. Perhaps it might be the case that in the short term, debt/equity ratio is significant, but doesn't have a notable influence on revenue growth, as indicated by the small

coefficient. However, as the time window increases, the weight of the debt obligations takes its toll and starts to influence performance.

Furthermore, the Bankruptcy statistic is a clear predictor of decreases in revenue growth. As one could expect, financial distress can be a result of difficulties with the operating side of a business, which is what we see in this relationship. Going through bankruptcy results in a 5, 5.9, and 25.0 percent decrease in revenue growth across the short, mid, and long-term windows. The big jump in the long-term window is likely the result of the timing of bankruptcies relative to the timing of an IPO.

Finally, looking at the company size statistics, one can see that size generally has a positive effect on revenue growth. This is a surprising effect, as it goes against the idea that smaller companies have more room to grow. Perhaps, it may be the case that more established companies have the infrastructure and network capabilities of achieving generally bigger growth.

6.3 EBITDA Margin (%)

	EBITDA Margin		
	Short Term	Mid Term	Long Term
Private Equity (Y/N)	0.027** (0.012)	0.007 (0.013)	0.024 (0.017)
Debt/ Equity Ratio at Year of IPO	0.000 (0.001)	0.001 (0.001)	-0.001 (0.003)
Company age at Year of IPO	0.000 (0)	0.000 (0)	0.000 (0)
Bankruptcy (Y/N)	-0.008 (0.017)	-0.005 (0.019)	-0.053** (0.024)
Industry Return	-0.119* (0.069)	-0.089 (0.058)	-0.129* (0.07)
GDP Growth	0.605 (0.879)	-1.091 (1.209)	-1.837 (3.088)
Credit Spread	-0.002 (0.011)	-0.017 (0.012)	-0.041** (0.017)
ln(PPE)	0.082*** (0.009)	0.079*** (0.01)	0.059*** (0.013)
Industry EBITDA Margin	0.002** (0.001)	0.001 (0.001)	0.002** (0.001)
ln(Revenue at Time of IPO)	-0.029*** (0.009)	-0.029*** (0.01)	-0.034*** (0.012)
PPE and Revenue Interaction	-0.005*** (0.001)	*** ()	-0.002 (0.002)
Credit Spread and Industry Return Interaction	0.000 (0)	0.000 ()	0* (0)
Constant	0.061 (0.061)	0.136** (0.067)	0.110 (0.11)
Observations	676	525	345
F- Statistic	24.83	18.63	9.43
Prob > F	0.000	0.000	0.000
Standard Errors in Parenthesis			
*** p<0.01, ** p<0.05, * p<0.1			

In the short term, we can see that PE ownership has a positive and statistically significant effect on EBITDA margin. This relationship makes sense considering that PE firms tend to achieve returns through improvements in operational efficiency. Although the coefficient remains positive throughout the mid- and long-term windows, it is not statistically significant for these longer windows. This result agrees with the many scholars who point out that PE firms achieve returns by increasing the efficiency of their portfolio businesses. However, consistent with this thesis' hypothesis, we observe that the influence of PE ownership on firms' operational efficiency dissipates over time.

In terms of goodness of fit, this model presents the strongest fit across all three regressions, as indicated by the F-statistics. This shows how the trends in this regression are strong and the selected variables appropriately predict a company's EBITDA margin. In the same trend as the MCAP and Revenue growth models, we can also observe that the fit decreases as the time window is increased.

Some other notable results include the fact that the Industry EBITDA margin is a statistically significant predictor of a company's EBITDA margin across the short- and long-term windows. This shows that Industry differences do play a role in determining the operational efficiency of a company. However, the size of the effect is very low.

Other statistically significant predictor of EBITDA margin were the size statistics, including PPE and Revenue. However, the direction of these variables' influence was different. Asset-heavy businesses that have high PPE tend to have higher EBITDA margins. On the other hand, larger businesses by revenue tend to have lower EBITDA margins. Despite these signs, the actual size of the coefficients is very low. Thus, even though there is a statistically significant relationship, it is not the case that differences in size push EBITDA margins firmly in a certain

direction. It is also important to note that the magnitude of these variables' coefficients is very close to zero.

6.4 EV/EBITDA

	EV / EBITDA		
	Short Term	Mid Term	Long Term
Private Equity (Y/N)	-1.4*** (0.53)	-0.124 (0.614)	-0.382 (0.713)
Debt/ Equity Ratio at Year of IPO	-0.004 (0.049)	-0.041 (0.066)	0.049 (0.218)
Company age at Year of IPO	-0.02** (0.008)	-0.012 (0.01)	-0.009 (0.012)
Bankruptcy (Y/N)	-2.928*** (0.87)	-3.169*** (1.012)	-2.714** (1.252)
Industry Return	-5.368 (3.277)	0.428 (2.88)	-5.901* (3.266)
GDP Growth	31.499 (42.35)	30.193 (60.81)	-123.730 (130.576)
Credit Spread	-2.453*** (0.497)	-1.411** (0.608)	-3.239*** (0.787)
ln(PPE)	0.446 (0.5)	-0.259 (0.549)	-0.636 (0.662)
Industry EV/EBITDA Margin	0.449*** (0.088)	0.116 (0.105)	0.356*** (0.13)
ln(Revenue at Time of IPO)	-1.355*** (0.518)	-0.377 (0.567)	-0.635 (0.665)
PPE and Revenue Interaction	0.032 (0.079)	0.000 (0.087)	0.091 (0.105)
Credit Spread and Industry Return Interaction	0.001 (0.001)	0.000 (0.001)	0.001 (0.001)
Constant	18.123*** (3.536)	17.304*** (3.912)	21.362*** (5.352)
Observations	561	450	298
F- Statistic	10.52	3.32	2.48
Prob > F	0.000	0.000	0.004

Standard Errors in Parenthesis

*** p<0.01, ** p<0.05, * p<0.1

The PEYN variable is statistically significant in the short term. This indicates that Private Equity ownership has an impact on firms' relative valuations right after going public, but that impact fades over time. In the short term, Private Equity ownership accounted for a 1.4-point decrease in EV / EBITDA multiple. This negative relationship is rather surprising given that PE firms try to boost their multiples over the acquisition period. However, the self-selection factor that can arise from Private Equity firms looking for targets that are undervalued relative to their market could explain this negative relationship. Furthermore, this result strongly supports the conclusion that PE firms do not engage in price manipulation—instead, it appears that they often leave money on the table (Michala, 2019). This might be the result of the fact that PE firms *have* to sell their portfolio companies after a given period to generate returns. It could also be a result of the fact the PE firms who sell companies via IPO still hold a larger number of shares after the initial public offering. This might incentivize the PE firm to continue selling shares in the years directly following the IPO, which could make valuations lower (Meles, 2014). Looking at the mid and long-term windows, the PEYN variable continues to be negative though it is not statistically significant. This is, again, consistent with the hypothesis that PE ownership doesn't have a long-term impact on its companies post-exit.

In terms of goodness fit, we see a reasonable metric for the short-term regression, but very low F-statistics for the mid and long-term windows. This is particularly true for the long-term regression, where the F-statistic shows the highest probability of being a result of chance out of all 12 regressions. These metrics show that relative valuations can be harder to predict compared to the other dependent variables. It could also be the case that there are omitted variables that would help explain the relationship. Likewise, it could result from the fact every

variable I chose was included due to its economic significance, as opposed to statistical significance.

Some other notable results include how the Industry EV/EBITDA multiple is significant at the short- and long-term marks. A one-point increase in Industry EV/EBITDA yields a 0.45-point increase in the short term and a 0.36 increase in the long term. This shows that industry classification does have a notable influence on the multiples of firms that go public. This result is to be expected given that firms are often evaluated using comparable analysis, and it is not surprising that firms' target valuations line up with those of similar firms.

Finally, the Bankruptcy statistic was significant across all three-time windows. Going through bankruptcy resulted in a 2.9, 3.1, and 2.7 decreases in EV / EBITDA multiple across the short, mid and long-term windows. This is not a surprising result given that financial distress leads to significantly lower valuations for firms.

6.5 Summary

To summarize, the results from the robust regression indicate this paper's hypothesis holds. According to this data, Private Equity IPOs do not show long-term differences in performance relative to standalone IPOs. In the MCAP growth regression, we found no significance in the PE dummy variable. In the Revenue regression, we found the PE variable to be significant at the 5% level for the mid-term window, but insignificant in the short or mid-term windows. Finally, in the EBITDA Margin and EV EBITDA regression, we saw a significant effect of the PE variable in the short term, but also noted that the relationship faded for the mid- and long-term windows. Another result we saw across all four regressions is the decrease in the goodness of fit of the model as the time horizon was expanded. This is likely due to a decrease in the number of observations as the time horizon became larger. However, it could also show that

firms that go public share common characteristics in the short term that fade away as the time window post-IPO becomes wider.

The biggest limitation of these results was the goodness of fit of some of the models, particularly the long-term window models and the EV / EBITDA model. This is likely due to a low number of observations. However, as discussed for the EV / EBITDA model, this could have also been a result of omitted variable bias. Although I did the best I could to include all relevant variables in this analysis, it could be that some relevant variables were not included.

Alternatively, the weak fit could be due to the inherent unpredictability of financial data.

Finally, in terms of future research, there is much more to be explored in this paper's proprietary dataset. Some key variables that had to be omitted from this analysis include the PE dry powder variables or investment duration, which the literature identifies as key factors of PE deal performance. These variables had to be omitted because they only exist for PE datapoints and were therefore perfectly correlated with the PEYN variable. However, it could be fruitful to perform an analysis that exclusively looks at PE-backed companies and determines the significance of these variables. This would extend the work of Meles (2014), and the overall literature that discusses the cyclicity of Private Equity. Furthermore, another novel analysis this paper's dataset could explore is using Bankruptcy as a dependent variable. This would allow for insight into the drivers of bankruptcy and the impact PE ownership may have on that. Lastly, even though this paper took a comprehensive approach to the analysis, there is enough data to break down the analysis by industry and company age. This would allow for comparative analysis of the drivers of performance across industries and company stages. All in all, this is just one of the many analyses that can be done using the dataset I collected. If any of these topics pique your interest, please contact the author.

7. Conclusion

To conclude, the goal of this paper is to add to the discussion about whether the expansion of Private Equity across the American economy is a positive phenomenon. To do so, I looked at the long-term performance of Private Equity IPOs relative to standalone IPOs and used empirical analysis with robust regression to uncover statistical differences. The biggest challenge of this paper was the data collection process, as it required merging various data sources into a unique and proprietary dataset. The empirical analysis of this data found that Private Equity IPOs do not show significant differences in performance relative to standalone IPOs.

This paper has made several contributions to the literature on Private Equity and IPOs. Notably, it extends the analysis by Meles (2014) and Gompers and Lerner (2001) to the entire universe of Private Equity Investments. Though these authors found the VC-backed companies outperformed standalone IPOs of similar age, this paper finds that general IPOs do *not* have differences in performance relative to the control group. Furthermore, this paper supports the findings by Michala (2019), who found no evidence that PE firms engaged in opportunistic pricing in ways to ‘cheat’ the markets. Since this paper did not find any differences in share price growth across the board, the findings of this paper support her conclusion. Finally, this paper supports the existing literature on the operational improvements PE firms institute in their portfolio companies. Specifically, this paper builds on the works by Brown (2020), Jensen (2010), and Jelic (2011) by showing that even though PE-backed firms show increased efficiency in the three-year window post-IPO, the operational improvements fade over time. These findings have important implications for policy discussions around the Private Equity industry.

The implications of this paper are rather nuanced. On the one hand, the data indicates that Private Equity firms do not have a negative effect on companies' long-term performance. This goes against some of the popular criticism the industry has received, particularly in the media. However, this paper also shows that Private Equity does not manage to bring sustainable improvements either. This begs important questions: can we justify the tremendous growth of this industry? PE managers clearly have been managing to turn a profit during their holding period. Why don't their 'improvements' persist over time? I leave it to the readers, policymakers, and future researchers to answer these questions.

8. References

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9. Appendix

1) Correlation Matrices

Any pair of variables with a correlation of magnitude greater than 0.3 is highlighted.

Short Term	EVEBITDA 3	EBITDA Margin 3	Revenue Growth 3	MCAP Growth 3	PEYN	DebtEquity 1	Bankruptcy YN	Global Number of Employees	Age at Exit	Stock Market Return 3
EVEBITDA 3	1									
EBITDA Margin 3	-0.062	1								
Revenue Growth 3	0.1264	0.1451	1							
MCAP Growth 3	0.1983	-0.0127	0.2153	1						
PEYN	-0.1582	-0.1256	-0.0502	0.0402	1					
DebtEquity 1	-0.0705	0.0189	-0.0546	-0.0432	0.0845	1				
Bankruptcy YN	-0.0057	0.0338	-0.011	-0.1475	0.0542	0.049	1			
Global Number of Employees	-0.0307	-0.0907	0.0081	0.0807	0.1307	0.2245	-0.0396	1		
Age at Exit	-0.0867	-0.1281	-0.0817	0.0434	0.0982	0.0261	0.0226	0.1202	1	
Stock Market Return 3	-0.0263	-0.0132	-0.0267	0.1238	0.0993	0.0443	-0.0119	0.0279	0.0887	1
Indust EVEBITDA	0.1593	-0.2136	0.0167	-0.0758	-0.0554	-0.0391	-0.1271	0.0359	0.0037	-0.1404
Industry Return 3	-0.0494	0.0804	0.0477	0.0777	-0.0128	0.06	-0.0431	0.0004	0.0678	0.5917
Industry EBITDA Margin	0.166	0.045	-0.0055	-0.1054	-0.1549	-0.0915	0.0196	-0.0576	-0.111	-0.153
GDP Growth 3	0.0386	0.0055	0.0921	0.2332	-0.0141	0.015	-0.0584	0.0366	0.0083	-0.0251
Credit Spread 3	-0.0875	-0.0316	-0.0875	-0.2062	0.0612	-0.0433	0.0572	-0.0136	0.0451	-0.0048
Corporate Yield 3	-0.012	-0.0032	-0.0051	-0.1474	-0.0349	-0.0338	0.0428	-0.033	-0.0357	-0.8037
Capex 1	-0.045	0.0076	-0.0213	0.0005	0.0873	0.0221	0.0845	0.2333	0.0686	0.0234
PPE 1	-0.0702	0.0012	-0.0411	0.0358	0.0818	0.0187	0.0404	0.3215	0.1166	0.0627
Revenue 1	-0.0707	-0.0821	-0.053	0.0061	0.0497	0.0152	-0.0172	0.4368	0.1934	0.0291
	Industry EVEBITDA	Industry Return 3	Industry EBITDA Margin	GDP Growth 3	Credit Spread 3	Corporate Yield 3	Capex 1	PPE 1	Revenue 1	
Indust EVEBITDA	1									
Industry Return 3	-0.1146	1								
Industry EBITDA Margin	0.1567	-0.2713	1							
GDP Growth 3	0.0257	0.2508	-0.0703	1						
Credit Spread 3	-0.029	-0.3134	0.0489	-0.7083	1					
Corporate Yield 3	0.07	-0.64	0.1167	-0.326	0.4712	1				
Capex 1	-0.196	-0.0387	0.0006	-0.0313	0.038	-0.0078	1			
PPE 1	-0.2109	-0.0419	0.0142	0.0062	0.0263	-0.0499	0.7598	1		
Revenue 1	-0.046	-0.005	-0.0545	-0.003	0.034	-0.0116	0.5293	0.5415	1	

Mid Term	EVEBITDA 6	EBITDA Margin 6	Revenue Growth 6	MCAP Growth 6	PEYN	DebtEquity 1	Bankruptcy YN	Global Number of Employees	Age at Exit	Stock Market Return 6
EVEBITDA 6	1									
EBITDA Margin 6	-0.086	1								
Revenue Growth 6	0.0793	0.108	1							
MCAP Growth 6	0.1389	-0.008	0.4402	1						
PEYN	-0.1342	-0.1289	-0.105	-0.0025	1					
DebtEquity 1	0.0012	-0.0043	-0.0426	-0.0315	0.0845	1				
Bankruptcy YN	-0.0371	0.0045	-0.0273	-0.2026	0.0542	0.049	1			
Global Number of Employees	-0.0645	-0.0885	0.0267	0.1119	0.1307	0.2245	-0.0396	1		
Age at Exit	-0.0965	-0.1213	-0.127	0.0149	0.0982	0.0261	0.0226	0.1202	1	
Stock Market Return 6	0.0531	0.0648	0.0528	0.1078	0.0499	0.026	-0.0353	0.0137	0.0503	1
Indust EVEBITDA 6	0.1989	-0.2749	0.0366	0.0321	-0.0554	-0.0391	-0.1271	0.0359	0.0037	-0.0832
Industry Return 6	-0.0396	0.0831	-0.0222	0.0108	0.0222	0.0686	-0.022	-0.0001	0.0929	0.5585
Industry EBITDA Margin	0.1426	0.0013	0.0209	-0.0289	-0.1549	-0.0915	0.0196	-0.0576	-0.111	-0.1025
GDP Growth 6	0.0694	0.0706	0.0612	0.0697	-0.0909	-0.0482	-0.0375	0.0303	-0.0302	0.2619
Credit Spread 6	-0.1415	-0.119	-0.0302	-0.0628	0.0637	0.0283	0.036	0.0291	0.0442	-0.4551
Corporate Yield 6	-0.0234	-0.034	0.0194	-0.0605	-0.0867	-0.0393	0.0007	-0.0087	-0.0707	-0.8317
Capex 1	-0.0526	0.0255	-0.0217	0.011	0.0873	0.0221	0.0845	0.2333	0.0686	0.0184
PPE 1	-0.0735	0.0207	-0.0601	0.0457	0.0818	0.0187	0.0404	0.3215	0.1166	0.0584
Revenue 1	-0.0657	-0.0741	-0.0714	0.0171	0.0497	0.0152	-0.0172	0.4368	0.1934	0.0139
	Industry EVEBITDA	Industry Return 6	Industry EBITDA Margin	GDP Growth 6	Credit Spread 6	Corporate Yield 6	Capex 1	PPE 1	Revenue 1	
Industry EVEBITDA	1									
Industry Return 6	-0.2043	1								
Industry EBITDA Margin	0.1567	-0.2693	1							
GDP Growth 6	0.0771	-0.0774	0.0451	1						
Credit Spread 6	-0.0566	-0.0677	-0.0844	-0.548	1					
Corporate Yield 6	0.1217	-0.5961	0.1035	0.169	0.2885	1				
Capex 1	-0.196	-0.0386	0.0006	0.0109	0.0007	-0.0338	1			
PPE 1	-0.2109	-0.0533	0.0142	0.0394	-0.0223	-0.0598	0.7598	1		
Revenue 1	-0.046	0.0039	-0.0545	0.016	0.0109	-0.0257	0.5293	0.5415	1	

Long Term	EVEBITDA 9	EBITDA Margin 9	Revenue Growth 9	MCAP Growth 9	PEYN	DebtEquity 1	Bankruptcy YN	Global Number of Employees	Age at Exit	Stock Market Return 9
EVEBITDA 9	1									
EBITDA Margin 9	-0.032	1								
Revenue Growth 9	0.2375	0.0488	1							
MCAP Growth 9	0.3336	0.056	0.4801	1						
PEYN	-0.12	-0.1078	-0.109	0.0367	1					
DebtEquity 1	-0.0514	-0.0356	-0.0726	-0.0455	0.0845	1				
Bankruptcy YN	-0.0472	0.0214	-0.0583	-0.1266	0.0542	0.049	1			
Global Number of Employees	0.0187	-0.0923	0.0981	0.1842	0.1307	0.2245	-0.0396	1		
Age at Exit	-0.0783	-0.1026	-0.1241	0.01	0.0982	0.0261	0.0226	0.1202	1	
Stock Market Return 9	0.1977	-0.0336	-0.0386	0.1221	0.0993	0.0443	-0.0119	0.0279	0.0887	1
Indust EVEBITDA	0.1969	-0.2019	0.0651	0.0414	-0.0554	-0.0391	-0.1271	0.0359	0.0037	-0.1404
Industry Return 9	0.0143	-0.0253	-0.0427	-0.0171	0.0222	0.0686	-0.022	-0.0001	0.0929	0.6354
Industry EBITDA Margin	0.1297	0.0345	0.0502	0.0267	-0.1549	-0.0915	0.0196	-0.0576	-0.111	-0.153
GDP Growth 9	0.0415	-0.0446	0.0132	0.0957	-0.0432	-0.0365	0.0136	0.0617	0.0121	-0.099
Credit Spread 9	-0.1477	0.0552	0.0353	-0.1915	-0.1411	-0.0556	0.0069	-0.0444	-0.1135	-0.867
Corporate Yield 9	-0.1607	0.0382	0.0461	-0.1553	-0.1189	-0.0754	-0.0003	-0.0337	-0.0959	-0.8735
Capex 1	-0.0566	0.0608	-0.0309	0.0341	0.0873	0.0221	0.0845	0.2333	0.0686	0.0234
PPE 1	-0.0623	0.0428	-0.0565	0.0628	0.0818	0.0187	0.0404	0.3215	0.1166	0.0627
Revenue 1	-0.0447	-0.0738	-0.0706	-0.0003	0.0497	0.0152	-0.0172	0.4368	0.1934	0.0291
	Industry EVEBITDA	Industry Return 9	Industry EBITDA Margin	GDP Growth 9	Credit Spread 9	Corporate Yield 9	Capex 1	PPE 1	Revenue 1	
Indust EVEBITDA	1									
Industry Return 9	-0.2043	1								
Industry EBITDA Margin	0.1567	-0.2693	1							
GDP Growth 9	0.0028	-0.1088	-0.0113	1						
Credit Spread 9	0.1818	-0.558	0.2112	0.0347	1					
Corporate Yield 9	0.1789	-0.5532	0.1936	0.1489	0.9262	1				
Capex 1	-0.196	-0.0386	0.0006	0.0141	-0.0064	-0.0113	1			
PPE 1	-0.2109	-0.0533	0.0142	0.0363	-0.0605	-0.0481	0.7598	1		
Revenue 1	-0.046	0.0039	-0.0545	0.0433	-0.033	-0.0218	0.5293	0.5415	1	