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Master's Thesis

TOWARD A NEW ERA FOR THE BARBARIANS?

A Study of Performance and Value Creation in Private Equity-Backed Initial Public Offerings

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LIST OF ABBREVIATIONS

App.: Appendix

ATO: Asset Turnover

BHAR: Buy-and-Hold Abnormal Returns

BHR: Buy-and-Hold Returns

CEO: Chief Executive Officer

CFO: Chief Financial Officer

EBITDA: Earnings before Interest, Taxes, Depreciation, and Amortization

FCF: Free Cash Flow

GP: General Partner

HR: Human Resources

ICA: Index of Competitive Advantage

IPO: Initial Public Offering

IRR: Internal Rate of Return

LBO: Leveraged Buyout

LLC: Limited Liability Corporation

LP: Limited Partner

NPV: Net Present Value

OLS: Ordinary Least Squares

OP: Operating Partner

OTC: Over-the-Counter

PBO: Primary Buyout

PE: Private Equity

REIT: Real Estate Investment Trusts

RLBO: Reverse Leveraged Buyout

ROA: Return on Assets

RQ: Research Question

R&D: Research and Development

SBO: Secondary Buyout

S&P: Standard & Poor's

UK: The United Kingdom

US: The United States of America

VC: Venture Capital

VRIN: Valuable, Rare, Inimitable, and Non-substitutable

ABSTRACT

Using a sample of 318 private equity-backed (PE-backed) IPOs, listed for flotation on US stock exchanges between 1997 and 2014, this study presents a tripartite analysis of the value creation mechanisms employed by the sponsors and ensuing performance implications, utilizing the portfolio firm as the unit of analysis. Firstly, we examine the aftermarket and operating performance for the three years following the listing, adopting a matched control group of non-backed firms to reduce selection bias. Secondly, we perform a comparative analysis of the use of various value creation levers for firms acquired prior to versus after the financial crisis with particular emphasis on the gravitation toward increased use of operational engineering. Finally, we estimate a multiple regression model, relying on OLS methodology, to examine which operational mechanisms are associated with portfolio firm performance, and inquire into the contingencies which may moderate the main effects.

By computing Buy-and-Hold Abnormal Returns, we detect signs of superior performance for PE-backed IPOs relative to both the market and non-backed peers. In terms of operating performance, we find that PE-backed IPOs enjoy greater efficiency while exhibiting weak to no signs of superior profitability, posing a puzzle. The performance largely appears robust to the financial crisis with some signs that PE-backing counteracts the documented negative impact of the latter on IPO firm profitability. While we find that conventional governance levers of control and monitoring seem to sustain their relevance after the crisis, we find evidence in favor of a shift in the prototypical PE model toward heavier reliance on mechanisms aimed at operational and strategic improvements, particularly the injection of industry expertise and use of add-on investments. Confirming the difficulty in drawing generalizations as to which factors contribute to portfolio firm performance, we find that the impact of operational mechanisms is circumscribed by several contingencies and furthermore differs across performance measures. Particularly, while sponsor specialization seems especially conducive to firm efficiency in secondary buyouts, the market appears to penalize this combination. Moreover, we find that industry expertise appears of greater importance for firms acquired after the crisis, cementing the need for sponsors to move above and beyond mere financial and governance engineering.

Hence, we contribute to existing literature by updating the body of knowledge on PE-backed IPO performance from a contemporary perspective while providing a novel, systematic inquiry into the change in the archetypical approach to value creation employed by PE. Finally, we shed new light upon the prevalence and importance of sponsor resource heterogeneity, which we believe will constitute an imperative determinant and driver of performance at the portfolio firm level going forward.

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1. INTRODUCTION

Ever since the first wave of leveraged buyouts (LBOs) swept through the global economy in the 1980s, the private equity (PE) industry has continued to roar with impressive prowess (Kaplan & Strömberg, 2009). From the combined value of all LBO deals falling short of $20 bn in 1985, the impressive growth in the industry has resulted in accumulated LBO deal value surpassing $800 bn in 2006, at the very pinnacle of the second buyout wave (Kaplan & Strömberg, 2009). Even as the financial crisis of 2008 sent shockwaves of financial fragility through the global capital markets, the PE industry has managed to rebound with noteworthy pace, illustrated in the consistent increase in capital committed to buyouts funds from 2011 to reaching a record high in 2017 (Bain, 2018).

Given the tremendous influence of PE on the economy, accelerated by the growing globalization of the industry, several scholars have sought to demystify the realm of these large, secretive firms. As such, much work has been conducted both in terms of the societal impact and policy implications of buyout activity as well as the performance of PE funds and portfolio firms, respectively (Gompers, Kaplan, & Mukarlyamov, 2016). Across time and geographies, a growing body of literature has documented impressive performance of PE compared to relevant benchmarks, as will be briefly outlined in the following.

At the fund level, Harris, Jenkinson, & Kaplan (2014) find average outperformance over and above the S&P 500 based on computation of public-market-equivalent measures of approximately 20% over the fund's life, with Robinson & Sensoy (2011) echoing these findings in reporting average outperformance of buyout funds of 18%. Further, Kaplan & Schoar (2005) extend upon these results by studying the performance persistence of PE funds, noting that fund returns are positively correlated with the performance of the sponsor's previous fund, thus carefully hinting at the importance of reputation for sustaining performance.

Scholars adopting the portfolio firm as the unit of analysis have likewise praised PE for facilitating greater efficiency and value creation, analyzing a broad range of metrics. In terms of employment effects both Bacon, Wright, & Meuleman (2013) as well as Olsson & Tåg (2017) find that PE sponsors are apt in adjusting HR practices as to ensure productivity gains without significant net job losses. Thompson, Wright, & Robbie (1992) provide evidence of PE ownership enhancing innovation, supported by Zahra (1995) finding that buyouts result in greater effectiveness in R&D expenditure. Hence, plenty of literature seems to support the net positive effects of PE ownership on the firms

which they acquire, even if these are brought about in a process of creative destruction and wealth redistribution (Olsson & Tåg, 2017).

In terms of measuring overall portfolio firm performance, one area that has attracted considerable interest from a scholarly perspective is that of PE-backed IPOs. The impetus for this attention seems grounded in both empirical and methodological considerations. Firstly, PE has and continues to drive a substantial proportion of IPO activity, accounting for an impressive 53% and 42% of all new US listings in 2005 and 2006 (Cao, 2013). Also, the PE sponsors are generally found to retain meaningful presence and exert active ownership in the period after the listing (Levis, 2011). Secondly, an inherent intricacy facing scholars inquiring into PE-backed firm performance, particularly in the US, is the difficulty in sourcing data given the private status of the acquired firms. Examining IPO firms thus mitigates this challenge, allowing for the examination of post-issue stock returns, commonly defined as 'aftermarket performance' (Levis, 2011), as well as accounting performance. Several scholars adopting such research design have documented apparent outperformance of PE-backed IPOs, largely persisting over time periods and benchmarks applied, both in terms of operating and aftermarket performance (Cao, 2012; Chou, Gombola, & Liu, 2006; Holthausen & Larcker, 1996).

Despite the evidence speaking in favor of the value-generating role of PE, several points of criticism have permeated both academic research and public sentiment. Such skepticism is often attributed to the seminal research conducted by Shleifer & Summers (1988) who critique hostile takeovers as simply spurring a redistribution of wealth. Capturing the scrutiny flourishing in society, in a famous quote, former Danish Prime Minister Poul Nyrup Rasmussen directed a profound criticism of the predatory nature of PE at the very advent of the financial crisis:

> The big private equity funds have proven to be a menace to healthy companies, to workers' rights […] Typically, they take over companies with borrowed money - often more than 80% of the price. These "leveraged buy-outs" leave the company saddled with debt and interest payments, its workers are laid off, and its assets are sold. A once profitable and healthy company is milked for short-term profits, benefiting neither workers nor the real economy (Rasmussen, 2008).

Evidently, the criticism rests on the assumption that the sponsors predominantly rely on prototypical financial engineering mechanisms to reap value, even if expropriating other stakeholders, pronounced short-termism, and opportunistic exploitation of market conditions and timing (Cao, 2013). Interestingly, borne out of the build-up in dry powder as well as heightened competition for target firms, and

further accelerated by the reduction in debt availability in the wake of the financial crisis, recent times have seen sponsors forced to rethink their approach to value creation (Braun, Jenkinson, & Stoff, 2017; Døskeland & Strömberg, 2018). Particularly, evidence points to PE approaching an era of operational engineering, concerned with enabling and instilling direct strategic or operational changes in the target firm, and often hailed as capturing a more long-term, genuine approach to value creation (Bernstein & Sheen, 2016; Hammer, Knauer, Plfücke, & Schwetzler, 2017).

Owing to this apparent gravitation away from the conventional PE operating model with its reliance on financial and governance mechanisms, as first cemented in Jensen's seminal praise (1986; 1989), academic attention has shifted toward constructing a granular understanding of the very actions employed by the PE sponsors rather than their effects. In a notable mention, Gompers et al. (2016) survey 79 PE firms on their adopted practices, confirming the perceived importance of driving operational improvements in more recent times. While several advancements have thus been made in terms of comprehending the changing nature of PE firms' approach to value creation and active ownership, much remains to be said. To contribute to existing literature, we thus propose the two following research questions:

RQ1: Do PE-backed IPOs, listed on the US stock exchanges in the period 1997 to 2014, exhibit superior aftermarket and operating performance?

RQ2: Has the use of operational engineering levers of value creation by the PE sponsor become more prominent after the financial crisis and which of these levers, if any, are associated with the performance of the PE-backed IPO firm?

Hence, our contributions to existing literature remain threefold. Firstly, we update the body of knowledge on the performance of PE-backed IPOs in the US by including more recent years and adopting a time frame sufficiently long to partition the analysis into subsets, allowing for inquiry into any potential shifts in performance over time. Secondly, we provide, to the very best of our knowledge, the first systematic examination of whether the operating model of PE sponsors has indeed shifted toward operational engineering, with the point of demarcation being the financial crisis beginning 2008, constituting a watershed event for the global capital markets and simultaneously marking the end of the second buyout wave (Bernstein, Lerner, & Mezzanotti, 2018; Davidoff, 2012; Rizzi, 2009). Finally, we marry the two aforementioned analyses by modelling the associations between six selected operational levers of value creation, based on an extensive synthesis of literature and empirical work, and the aftermarket as well as operating performance of the PE-backed IPO firm.

For the same reasons just mentioned, our study differs drastically from the previous work of our bachelor's thesis. Particularly, the latter focused solely on the aftermarket performance of US PE-backed IPOs listed after the crisis, and excluded operating performance considerations altogether. Also, we solely tested performance vis-à-vis the market, whereas we in this study introduce a non-backed control group to reduce selection bias. Moreover, in our bachelor's thesis, we examined a very broad range of explanatory variables, encompassing PE sponsor, listing, and portfolio firm characteristics, in seeking to explain performance differences. In this paper, we delimit our hypotheses very selectively to focus exclusively on operational levers of value creation and examine contingencies which may render some of these particularly conducive to performance. Finally, we include a whole new perspective through a comparative analysis of how the PE sponsors' use of value creation levers has changed after the financial crisis. We continue to rely on the seminal frameworks on PE value creation per Kaplan & Strömberg (2009), among other, yet increase the degree of granularity with regards to the theoretical axioms of capital structure and agency theory. In addition, we invoke new theoretical aspects given our emphasis on operational engineering, including but not limited to, thoughts originating within the fields of knowledge management, network theory, and firm resource heterogeneity, the latter being at the core of the strategic management literature.

The remainder of the paper proceeds as follows. Firstly, we introduce the theory upon which the study is based, followed by a presentation of the relevant empirical work on the topic of PE value creation and active ownership. Synthesizing these two sections, we construct a range of hypotheses to be tested and subsequently introduce the approach to constructing the overall sample. Next, we elaborate on the methodology employed in terms of computing both performance measures as well as operationalizing the pertinent levers of value creation, constituting our explanatory variables, and introduce the cross-sectional regression model. The 9th section of the paper presents the results from our analyses, including comparisons to previous literature and reflections on potential explanations for the observed patterns. These are finally summarized and extended upon in the discussion of the results, leading to suggested implications for both future research and practitioners within the field.

2. INTRODUCTION TO PRIVATE EQUITY

Before delving into the theoretical implications of PE ownership and empirical work conducted by scholars on the topic, we first seek to establish a thorough comprehension of the very concept and nature of PE. As such, this part serves as an introduction to the asset class that PE comprises, and thus provides the foundation for the forthcoming literature and empirical review.

The section will include a brief discussion on the definition of PE as well as the functioning of the model employed by the sponsor firms. Furthermore, a brief description of the historical development of the industry will be presented, concluding with a description of the PE industry in the US, since the latter constitutes the geographical context for the study.

2.1. DEFINING PRIVATE EQUITY

Overall, the concept of PE lacks a strict categorical definition and is subject to varying interpretations. As put forth by Gilligan & Wright (2014, p. 15), the term is relatively loose and is applied both when describing the overall asset class of "*not quoted equity*", encompassing both stage venture, growth capital investments, as well as the acquisitions of mature firms in so-called 'buyouts'. Other definitions do exist such as Weidig & Mathonet's (2004), describing how PE firms provide equity capital to companies not presently listed on a stock exchange. Finally, an even broader definition is provided by Bance (2004, p. 2), simply describing PE as *"investing in securities through a negotiated process".*

Building upon the notion of target firm maturity, Loos (2005) presents a continuum of various stages, being instrumental in seeking to distinguish between the various types of PE involvement. Categorizing the investments from seed capital for young companies to regular buyouts of mature firms, it is evident that venture capital (VC) is more so concerned with the former while traditional PE firms are focused on the latter. As such, the stage of the acquired firm's life cycle is crucial when discussing PE (Levis, 2011), and particularly when discerning potential differences between the nature of the sponsors' involvement.

Not only the age of the portfolio company remains relevant for the discussion. Several characteristics are stressed by scholars as being crucial when discussing the investments conducted by PE firms. Extending upon the seminal work by Jensen (1989), Kaplan & Strömberg (2009), among other, stress the combination of concentrated ownership stakes by managers in the portfolio companies, the lean and efficient structure as well as the introduction of high-powered incentives to reduce agency problems. Other quintessential elements of the PE operating model include the significant use of debt financing combined with a limited holding period of the portfolio companies by the PE firms (Kaplan & Strömberg, 2009; Spliid, 2007). In essence, the typical buyout is one where the sponsor acquires majority control of a mature, underperforming target with positive cash flows (Jensen, 1986), allowing them to inject significant amounts of financial leverage and exert active ownership (Gilligan & Wright, 2014; Kaplan & Strömberg, 2009).

On the contrary, VC firms target investments in emerging firms and typically refrain from acquiring majority stakes (Kaplan & Strömberg, 2009). The targets often exhibit significant but uncertain growth potential and suffer from large, negative cash flows due to substantial upfront investments (Gilligan & Wright, 2014). As such, this paper applies the discussed criteria when drawing distinctions between VC and PE investments with only the latter being included in this study. Particularly, we will use the term 'PE' to describe the prototypical buyout industry and sponsors, centered on the acquisition and ownership of mature, established firms.

2.2. THE PRIVATE EQUITY MODEL

Typically, the PE firm is structured as a partnership or a limited liability corporation (LLC) in which capital is raised through a fund structure (Kaplan & Strömberg, 2009). In these, principal investors include pension funds, endowment funds, banks or fund-of-funds who invest alongside the PE managers. Often referred to as *"investment clubs"*, a PE fund (Gilligan & Wright, 2014, p. 38) thus consists of two entities: Limited Partners (LPs) and General Partners (GPs). The former is commonly comprised by the external investors, whereas the latter are the fund managers (Gilligan & Wright, 2014). Lastly, debt providers such as banks are included in this part of this process due to the need for the sponsor firm to undertake debt to facilitate the acquisition of the target (Andersen, 2015). In terms of the dynamics, the role of the GPs becomes one of the typical 'agent', expected to provide the expertise and knowledge required to ensure a maximization of the investment by the LPs, constituting the 'principals', by actively managing the portfolio of companies (Spliid, 2007).

The business model of PE, as explained by Andersen (2015), is based on sequential stages commencing with initial fundraising, leading to the establishment of the PE fund. Subsequently, the fund identifies and invest in portfolio companies where substantial restructurings are implemented, defined as the 'investment stage'. The last stage is characterized by a divestment or exit of sorts to return profits to the GP and LP, respectively, per the predefined allocation scheme, commonly known as the 'distribution waterfall' (Andersen, 2015). The life of the fund typically spans 10 years with the possibility of an extension for up to three additional years, pending contractual negotiations between the GP and LP (Kaplan & Strömberg, 2009). Consequently, a fund is structured as a "'closed-end" investment vehicle, implying that investors are unable to withdraw any committed capital until the termination or closure of the fund (Kaplan & Strömberg, 2009).

Delving further into the profit allocation scheme, the GP requires compensation for the expenses incurred during the fund's lifetime. These payments are often referred to as 'fees' and are separated into a fixed and variable component (Kaplan & Strömberg, 2009). Firstly, the fixed management fee typically constitutes a percentage of the committed capital on an annual basis (Andersen, 2015; Metrick & Yasuda, 2010). In the PE industry, this management fee has traditionally and continues to stand at a relatively stationary, homogenous level of 2% across sponsor firms. (Døskeland & Strömberg, 2018). Secondly, the variable component constitutes 'carried interest' (Kaplan & Strömberg, 2009), and embodies a means to achieve incentive alignment. Particularly, to further incentivize PE fund managers to strive for profit maximization in the acquired firms, 20% of the return on the capital invested is paid to the GPs after a hurdle rate of usually around 8% p.a. has been realized by the LPs on top of recoupment of committed capital (Andersen, 2015; Gilligan & Wright, 2014).

2.3. THE DIVESTMENT PROCESS

Given the nature of PE, the exit stage remains a quintessential milestone which must necessarily be reached to return the capital invested by LPs (Døskeland & Strömberg, 2018). While some of the fund returns can be partially credited to dividends paid out during the private period, the bulk of capital gains accrues from the exit (Gompers et al., 2016).

Due to the focus of this paper, exits in the form on IPOs inevitably remain of particular interest. Nevertheless, other avenues do exist as is evident from the data gathered by Kaplan & Strömberg (2009), with the three most common types being those of IPOs, secondary buyouts (SBOs), and strategic acquisitions/trade sales (Folus & Boutron, 2015; Kaplan & Strömberg, 2009; Povaly, 2006). Interestingly, the aforementioned authors document that the proportion of IPO exits exhibit some cyclicality while the use of SBOs, denoting the sale to financial buyers, has largely seen steady increases (Preqin, 2019; Strömberg, 2008). The most common exit type, and the one that has enjoyed greatest most consistency over time, is the sale to strategic buyers, comprising 38% of exits for the reported period of 1970-2007 (Kaplan & Strömberg, 2009).

As a final note, PE investments can, as with any other firm, exit rather involuntarily via bankruptcy. Interestingly, even though significant amounts of debt have been applied historically, Kaplan & Strömberg (2009) find that only 6% of the LBOs in their dataset resulted in bankruptcy. The annual default rate of LBOs can be shown to be lower than that of the average default rate for US corporate

bond issuers being 1.2% and 1.6% respectively, as explained by Hamilton, Praveen, Sharon, & Richard (2006). One potential explanation for the lower default rate of PE-owned firms can be found in what Jensen (1989; 2010) coins the 'privatization of bankruptcy', capturing the heightened incentive for creditors to salvage the troubled company given the substantial amount of debt they have provided. We will elaborate further on this concept in the theoretical background.

3. THE HISTORY OF PRIVATE EQUITY

3.1. EMERGENCE OF THE INDUSTRY

The emergence of what we know as the 'PE industry' today can be traced back to the 1970s and 1980s with the existence of two distinct types: VC and development capital (Gilligan & Wright, 2014). While the former traditionally invested in firms in the early stages of their lifecycles, the latter focused on the expansion of already established firms (Gilligan & Wright, 2014). In the late 1980s, the availability of cheap debt coupled with organizational innovation led to the emergence of a new type of institution; the prototypical PE or buyout firm. Since its advent, the PE industry has endured various busts and booms (Kaplan & Strömberg, 2009), exhibiting a highly cyclical pattern which is epitomized in buyout waves.

Facilitated by cheap bond financing, the first buyout wave reached its peak in 1988 with the infamous buyout of RJR Nabisco by KKR (Kaplan & Strömberg, 2009; Washington Post, 1989). This particular transaction has since come to be regarded as synonymous with the greed of PE firms; a narrative which found further uptake in the takeover of Federated Department Stores by Robert Campeau in 1988, in which leverage exceeded 90% (Cendrowski, Petro, Martin, & Wadecki, 2012). The readily available financing that allowed for such substantial use of debt was facilitated in part by the establishment of the junk bond market in the 1970s and 1980s (Rizzi, 2009).

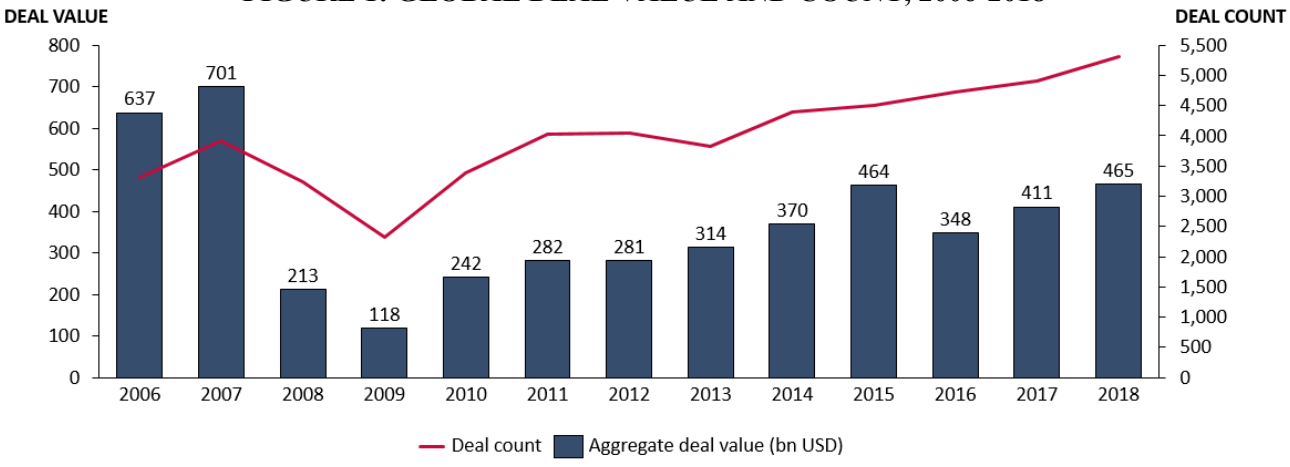
The PE industry took the seminal ideas and concepts provided by Jensen (1989) regarding the disciplining effects of debt and concentrated ownership to new and unchartered heights. As such, the industry quickly became known and renowned for generating value primarily through the use of financial engineering, often criticized for not generating any genuine, long-term value in the portfolio firms (Gilligan & Wright, 2014). The first wave of buyouts ended in the late 80s due to the recession in 1989-1991, marked by the collapse of the junk bond market (Rizzi, 2009).

In the 2000s, the public-to-private buyout activity once again started to accelerate. As a consequence of prolonged economic growth and the addition of low inflation through the 1990s (Gilligan & Wright, 2014), the world saw a second PE boom in the mid-2000s (Kaplan & Strömberg, 2009). Driven by large buyouts from 2003 to 2007, the PE industry raised still larger funds and executed deals whose values far exceeded those witnessed previously (Gilligan & Wright, 2014). Furthermore, PE firms now truly started subjecting their operating model, which had traditionally relied on leverage as its primus motor, to innovation and began experimenting with other levers of value creation (Kaplan & Strömberg, 2009).

However, in 2008, the subprime mortgage crisis was fully ablaze and with the collapse of Lehman Brothers on 15th of September 2008, the financial markets were thrown into turmoil, with its ramifications likewise exerting pressure on the PE industry (Gilligan & Wright, 2014; Rizzi, 2009). Banks were now required to retain cash rather than lend it, resulting in the collapse of heavily-levered deals, while completed deals encountered insolvency at a significantly higher rate. In sum, the financial crisis brought the roar of the second buyout wave to an abrupt halt (Gilligan & Wright, 2014)

Subsequent to these sudden culminations of the two previous buyout waves, a natural question pertains to how the PE industry has fared since. Following a severe setback in the period immediately following the crisis (Gilligan & Wright, 2014), the number of executed deals has increased significantly ever since. As shown in the figure below, both deal count and volume has steadily increased, to the extent that some scholars and practitioners have even claimed the advent of a third buyout wave, commencing carefully around 2010 (Gilligan & Wright, 2014).

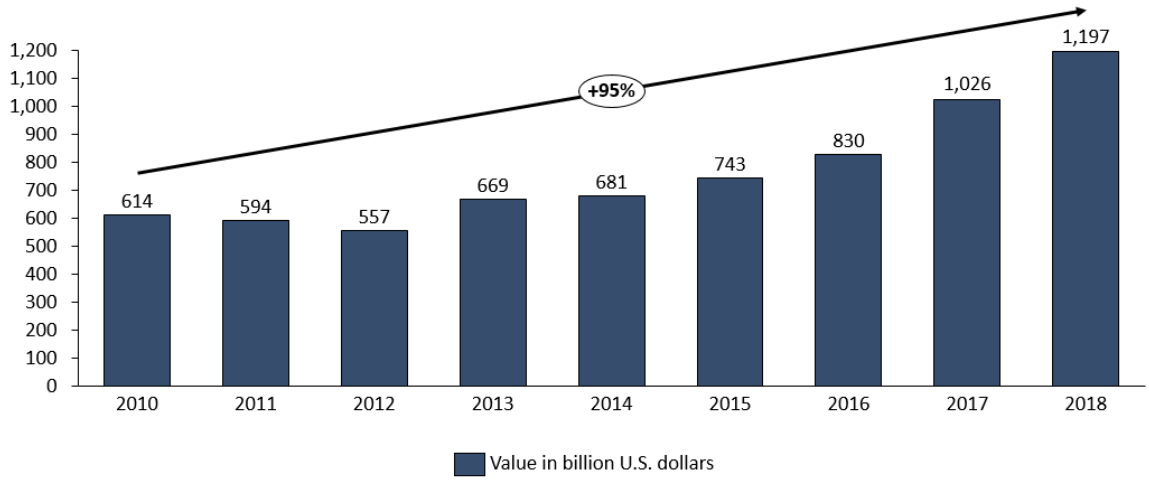
FIGURE 1: GLOBAL DEAL VALUE AND COUNT, 2006-2018



According to Mergermarket (2018), $528 billion was invested in buyouts in 2017, comprising the

highest level since the crisis. This development has, once again, been facilitated by low interest rates, resulting in cheap financing, and strong economic growth. A consequence of these macro environmental movements is the accumulation of a large amount in dry powder in the PE firms, reaching unprecedented levels and giving rise to fierce competition amongst PE in deploying capital (Mergermarket, 2018; Pitchbook, 2018b). This is evident from the figure below.

FIGURE 2: GLOBAL AMOUNT OF DRY-POWDER, 2010-2018



Furthermore, this third buyout wave is by many scholars and professionals perceived as a new era for for PE (Gompers et al., 2016; Grant Thornton, 2016; Rizzi, 2009). As mentioned previously, in the earlier waves, leverage has been recognized as the main driver of PE fund returns (Berg & Gottschalg, 2005). However, various macroeconomic events, in particular the crisis in 2008, debt covenants and new regulation for taxation of interest payments has pushed debt levels down to around 50-60% (Andersen, 2015; Cleary Gottlieb, 2018). Combined with the increased competition for target firms (Bain, 2018), PE firms have found themselves forced to adjust their approach to value creation by utilizing other levers at their disposal to ensure survival. Indeed, it is this very development in the nature of PE involvement which forms the impetus for this study.

3.2. THE PRIVATE EQUITY INDUSTRY FROM A US PERSPECTIVE

Before elucidating the theoretical background, the following section provides a brief description of the US PE industry, due to the latter forming the geographical context for the study.

As described previously, the emergence of the PE industry, in its contemporary interpretation, occurred in the 1970s and 1980s. However, one of the first recognized “buyouts” can be traced back to the early 1900s US with the acquisition of Carnegie Steel Company by J.P. Morgan in 1901 (Ayers,

Gould, Oshinsky, & Soderlund, 2011). As such, the concept of buyouts in the US dates far back in time together, although the actual sophistication of the organizational model did not occur until several decades later.

Redirecting focus to the acquisition type constituting a focal point of this study – namely the LBO, scholars fail to reach definite consensus on which transaction categorically embodies the first genuine LBO (Cendrowski et al., 2012). Nevertheless, it is acknowledged that its occurrence has seen a rapid increase since the early 1980s (Kaplan & Strömberg, 2009; Loos, 2005; Strömberg, 2008), with the US reporting the highest activity. Lending credence to this observation, from 1970-2007, the US has accounted for 45.1% of all LBOs conducted, and in terms of enterprise value has accounted for 49.7% in the same period (Strömberg, 2008).

In more recent times, North America[1] has accounted for roughly 51% in the period 2006-2018, compared to Europe standing at 34% and Asia at 9% of global deal volume – once again cementing the dominance of the American market. Though not strictly comparable, the aforementioned concentration of buyouts in North America is relatively similar to that documented by Strömberg (2008), examining the period 1970-2007. The importance of the US market thus seems rather consistent over time, even as the PE industry has expanded into new, emerging markets.

TABLE 3.1: NUMBER OF BUYOUTS FOR EACH CONTINENT FROM 2006-2018
DATA IS SOURCED FROM PREQIN (2019)

Continent	Number of Deals	% of Total
Africa	1,277	2.4%
Asia	4,927	9.2%
Australasia	1,090	2.0%
Europe	18,091	33.7%
North America	27,525	51.2%
South America	8,35	1.6%

In terms of funds raised, we notice an increase in value and also cyclicality. Scrutinizing appendix 2 (App.), it is evident that the industry has undergone a significant development since 1985, with the value of raised fund capital reaching its peak in 2007, before the detrimental impact of the financial

[1] North America includes: United States, Canada, Bermuda, Cayman Islands and US Virgin Islands.

crisis hit the industry. After 2010, fundraising has once again picked up and been steadily increasing ever since (App. 2).

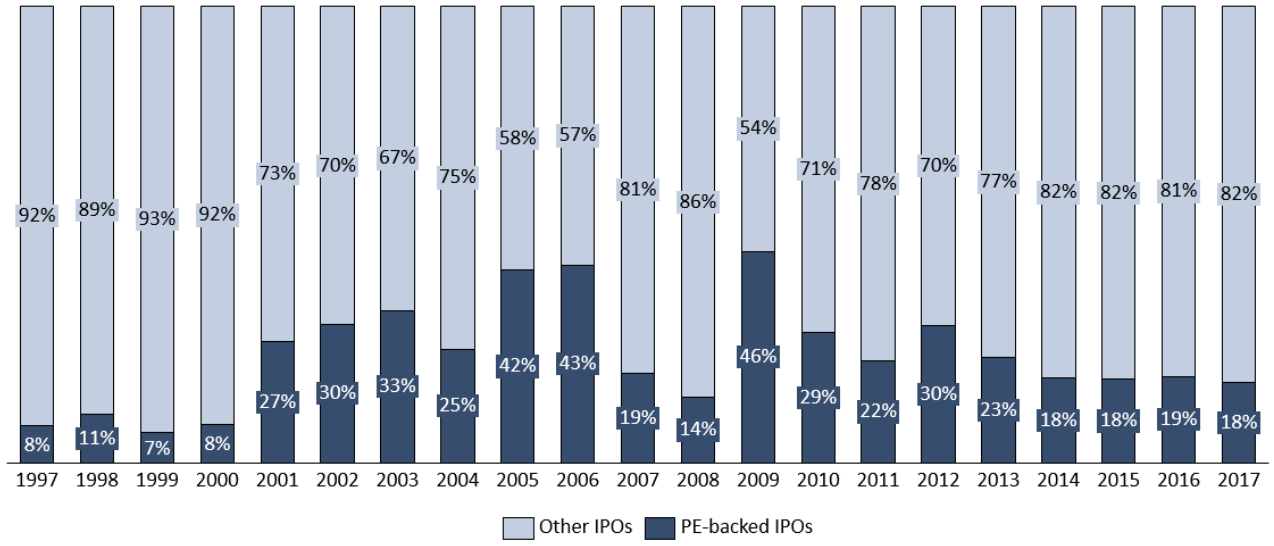
If we examine the current PE industry in terms of number of funds currently operated, it once again becomes apparent that the US accounts for the vast majority with 39.73% of all global funds being raised in this particular geographical market. If we narrow scope as to include only funds strictly belonging to the *buyout* segment, the picture becomes even clearer, with the US being accountable for 54.98%.

TABLE 3.2: NUMBER OF FUNDS CURRENTLY BEING RAISED GLOBALLY AND IN THE UNITED STATES. DATA IS SOURCED FROM PREQIN (2019)

North America	Number of Funds	Aggregate Target Size ($ Billions)	Average Size ($ Millions)
Private Equity Funds	1,578	420	266
Buyout	221	201	911
Private Equity Funds (% of World Total)	39.73%	46.15%	
Buyout (% of World Total)	54.98%	57.59%	

Finally, and of particular relevance to this study given our focus on PE-backed IPOs, it is apparent that the industry has and continuous to drive a substantial proportion of IPO activity in the US, albeit prone to the inherent cyclicality, as evident from the figure below (Ritter, 2018).

FIGURE 3: PE-BACKED IPOS IN THE US AS % OF GRAND TOTAL



Hence, we believe that the documented pattern supports the relevance of delimiting the study to the US market, since the inquiry into any changes to the archetypical PE model for value creation is

preconditioned on the very existence of such archetype. With the US constituting the most mature and sophisticated market for the PE industry, we thus find that this geography constitutes the most fruitful and instrumental setting in seeking to inform the discussion.

4. THEORETICAL BACKGROUND

With the establishment of a fundamental understanding of the PE model and industry, the upcoming section examines the theoretical underpinnings pertaining to the efforts instigated by the sponsor firm with the aim of unleashing value. Such synthesis simultaneously contributes to the foundation, together with the subsequent empirical review, for the development of the hypotheses in section 6.

While several frameworks on the topic of PE value creation have been proposed, we primarily rely on those conceptualized by Kaplan & Strömberg (2009), Gompers et al. (2016), and Berg & Gottschalg (2005). More specifically, the taxonomy consists of three value creation drivers; financial, governance, and operational engineering. These will be covered in the initial part of the theoretical background while the additional drives recognized by Berg & Gottschalg (2005), will be described and discussed subsequently as we believe these contribute pertinent insight.

4.1. FINANCIAL ENGINEERING

Financial engineering has since the inception of modern PE been recognized as one of the most applied and trusted tools in the quest for unleashing value (Berg & Gottschalg, 2005), constituting a fundamental conduit in the restructuring process and contributing to enhancing financial performance (Kaplan & Strömberg, 2009). More specifically, value gains are reaped through capital restructuring and capital structure optimization, combined with the reduction in corporate taxes facilitated by the debt interest shield (Berg & Gottschalg, 2005). We will elaborate further on each of these mechanisms in the following.

4.1.1. Capital Structure Optimization

As heavily documented in the body of work on PE, debt has been a key factor in driving returns at the fund level. Now, an argument could be put forth that the concept of levering up firms can easily be imitated by non-PE owners (Berg & Gottschalg, 2005). However, merely replicating the efforts aimed at optimizing capital structure remains, in and by itself, insufficient due to several reasons.

Firstly, as explained by Anders (1992), PE firms enjoy vast knowledge and experience regarding the functioning of capital markets. Through networks of both strong and weak ties (Borgatti & Halgin, 2011) with various actors in the financial markets, buyout firms are able to negotiate superior terms on loan agreements or obtain better support in the due diligence phase (Berg & Gottschalg, 2005; Spliid, 2014). Particularly, as explained by Cotter & Peck (2001), given that PE firms are often seen as being *"repeat players"* in the debt capital markets (Cotter & Peck, 2001 p. 103) and are branded as being reliable borrowers, creditors are more likely to extend them favorable terms. The latter is supported by noting that PE firms seek to maintain their reputational capital and advantageous network position, which ensures adherence to financial obligations (Borgatti & Halgin, 2011; Tykvová & Borell, 2012). Summarizing, PE firms may be regarded as possessing an advantage in the pre-investment stage vis-à-vis alternative acquirers.

Theoretically, the presence of a substantial amount of leverage in the capital structure results in increased costs of financial distress due to heightened risk of bankruptcy (Brealey, Myers, & Allen, 2016; Sudarsanam, Wright, & Huang, 2011). Nevertheless, Tykvová & Borell (2012) suggest that PE sponsors, given their solid financial expertise, are more capable at managing firms with higher debt levels and turning around problematic financial situations. Adding to this theoretical line of thought, Jensen (2010), through his conceptualization of the *privatization of bankruptcy*, argues that the high debt-to-value ratio in LBOs incentivizes creditors to negotiate for a solution due to the large potential losses incurred, should the portfolio firm default on its debt. This implies that corrective actions are taken earlier in the insolvency stage, leading to a lower default rate for PE-owned firms. As put by Jensen (2010, p. 84): *"LBOs frequently get in trouble, but they seldom enter formal bankruptcy".*

4.1.2. Utilization of Interest Tax Shield

Departing from the discussion of capital structure, this section delves into the marginal effect of leverage on corporate taxes, being the very driver of value. As such, it seems prudent to, albeit briefly, revisit the seminal work of Modigliani & Miller (1958). In their paper, they introduce various propositions, the most famed inevitably resting with the conclusion that firm value, theoretically, ought to be insensitive to capital structure. Under a strict range of idealized assumptions, among other the absence of corporate taxation, it is argued that the intrinsic value of an all-equity-financed firm and a firm with a combined debt-equity capital structure should not differ (Modigliani & Miller, 1958). Put differently, the weighted average cost of capital (WACC) should remain unaffected by leverage (Brealey et al., 2016).

Unsurprisingly, when departing from the theoretical realm, these assumptions rarely, if ever, hold. As such, in 1963, the authors revisited the propositions, this time allowing for the inclusion of corporate taxes (Modigliani & Miller, 1963). In a vastly different conclusion, they recognize the value accruing from the tax deductibility of interest payments. As explained by Brealey et al. (2016), intrinsic firm value is now affected by leverage, given that the present value of the interest tax shield has to be added to arrive at an accurate, representative valuation. Another way to model the effect of leverage is seen through the ensuing reduction in the WACC, implying a net positive effect on firm valuation, all else being equal (Berg & Gottschalg, 2005).

Per the logic above, the highest value of a company would be achieved by applying as much debt as possible. However, one implication serves to augment this conclusion, namely the concept of *financial distress* (Brealey et al., 2016). This non-linearity between leverage and firm value arises out of the interplay between increased levels of debt and the riskiness of the firm, leading to the possibility that financial obligations cannot be satisfied. Consequently, creditors may demand a higher interest rate as compensation, and the overall health and competitiveness of the firm might likewise be negatively affected (Palepu, 1990). As a result, an optimal ratio between equity and debt exists that allows for maximization of firm value (Jensen, 1986) with the optimality condition persisting exactly at the point where the marginal costs of financial distress start to exceed the marginal value added through the interest tax shield (Brealey et al., 2016; Gompers et al., 2016).

In the PE boom of the 1980s, it was exactly the possibility to capitalize on such interest tax shield which facilitated the advent of and accelerated the growth in the PE industry (Kaplan & Strömberg, 2009). While financial engineering inevitably constitutes an imperative component of the PE operating model, its contribution to value is preconditioned on the contemporaneous use of effective governance mechanisms, the antecedents of which are to be found in the theoretical realm of agency theory (Baker & Smith, 1998; Berg & Gottschalg, 2005). These will be elaborated on in the following.

4.2. GOVERNANCE ENGINEERING

Acting as the next overarching lever of value creation, this section covers governance engineering. While those of financial and operational engineering are perceived as having a direct impact on the portfolio firm, value generated by their governance counterpart is largely seen as indirect in nature, constituting a secondary rather than a primary lever (Berg & Gottschalg, 2005; Kaplan & Strömberg, 2009). More specifically, these efforts are concerned with reducing the agency costs arising out of

the free cash flow (FCF) problem and thus target enhanced incentive alignment through mechanisms of monitoring and control (Berg & Gottschalg, 2005).

4.2.1. Reducing the Free Cash Flow Problem

Being one of the most prominent and seminal cornerstones in PE literature, the solution to the FCF problem has long been associated almost exclusively with PE ownership (Kaplan & Strömberg, 2009). In short, this problem arises due to misalignment between the shareholders of the corporation and the managers responsible for day-to-day operations. Here, the former act as the principals while the latter embody the agents (Jensen, 1986; 1989; Jensen & Meckling, 1976).

The fundamental conflict flows from the inherent desire to maximize one's individual utility, potentially leading the agent to pursue actions which may deviate from the interest of the principal (Jensen & Meckling, 1976). To benefit from specialization and division of labor, constituting the very foundation for the corporate organizational form, some decision-making authority must inevitably be delegated by the principal to the agent, with certain governance mechanisms circumscribing the relation to reduce the likelihood and severity of the agent's self-interested actions (Hendrikse, 2003; Jensen & Meckling, 1976). In order to attain this goal, the principal can either ensure that the agent is incentivized to pursue the interest of the principal or, alternatively, monitor the agent to engage in sanctioning action if misconduct is detected. Jensen & Meckling (1976) coined these costs, together with any residual loss, agency costs.

Building upon the initial groundwork and research conducted together with Meckling in 1976 on the aforementioned, Jensen introduced his seminal conceptualization of the FCF problem in 1986. In here, he explains how managers may pursue interests which are not only misaligned but directly value and utility destroying for the owners. In mature, established firms, where significant amounts of FCF is generated (Andersen, 2015), there might be funds in excess of what is required to invest in projects with positive NPVs (Brealey et al., 2016; Jensen, 1986). Hence, managers might, at their discretion, undertake projects aligned with their own private incentives due to the funds being readily available and residing internally in the firm (Jensen, 1986; Jensen & Meckling, 1976). Examples include those of empire building or increasing monetary compensation over and above what appears reasonable (Berg & Gottschalg, 2005; Grossman & Hart, 1982; Kaplan & Strömberg, 2009). One solution to this problem, as explained by Jensen (1986), is to instigate disciplining mechanisms forcing the managers

to pay out these surplus funds to the owners. Pending such return of capital, the principals are then at liberty to invest in projects that generate a satisfactory return (Jensen, 1986).

As alluded to, while reducing the excess FCF remains imperative, the modus for paying it out to owners remains of equal importance. Distributions in the form of dividends do not represent a long-term promise to continue such payout and can easily be reversed, thus serving only as a soft commitment (Brealey et al., 2016; Jensen, 1986). Debt, in contrast, serves as a hard-disciplining mechanism and an efficiency-enhancing tool by enforcing mandatory interest payments that must be met to avoid bankruptcy, the latter incurring high personal cost for managers (Cotter & Peck, 2001; Grossman & Hart, 1982; Jensen, 1989; Rappaport, 1990). Theoretically, network and social capital aspects such as reputational damage and loss of power may also discourage managerial misconduct and constitute an incentive in themselves (Adler & Kwon, 2002; Berg & Gottschalg, 2005; Loos, 2005).

Furthermore, due to the reliance on debt from credit and financial institutions, some governance and monitoring is indirectly outsourced to these stakeholders (Berg & Gottschalg, 2005) who have an incentive to ensure recoupment of recurring debt payments (Thompson et al., 1992). As discussed by Palepu (1990), one problem arising out of substantial leverage, pertains to the risk that managerial sentiment becomes tainted by short-termism, potentially impairing the long-term competitiveness and health of the firm. Rappaport (1990) echoes this by noting that financial flexibility is required to compete in the modern market place and that this endeavor is inhibited by high levels of debt (Loos, 2005). Also, due to the high undiversified risk characterizing the managers' private wealth, they could, in effect, pick short-term oriented low-risk, low-NPV projects (Holthausen & Larker, 1996). One approach, by means of which PE sponsors seek to negate this risk, is through the alteration of incentive structures, as will be elaborated on in the following.

4.2.2. Increased Incentive Alignment

A common approach to onboarding management in the quest for value-maximization rests with increasing managerial equity ownership to such a level that personal costs of not undertaking value-maximizing activities and projects are rather severe (Jensen, 1986; Kaplan & Strömberg, 2009; Loos, 2005; Renneboog & Vansteenkiste, 2017). Due to substantial leverage levels, the slice left for equity owners is rather humble, implying that a relatively high fraction of total equity can be allocated to managers without necessitating large monetary investments (Jensen, 2010). Indeed, PE firms often require managers in the newly acquired companies to purchase significant ownership stakes (Kaplan

& Strömberg, 2009; Muscarella & Vetsuypens, 1990). The combination of the stated mechanisms thus ensure that managers have strong high-powered incentives (Hendrikse, 2003), reducing shirking and inefficiencies (Kaplan & Strömberg, 2009; Renneboog & Vansteenkiste, 2017; Smith, 1990).

This greater managerial commitment, theory stipulates, ought to ensure sounder decision-making, in turn leading to higher levels of performance (Loos, 2005; Phan & Hill, 1995). This form of co-investing (Muscarella & Vetsuypens, 1990) ties the personal wealth of managers to underlying firm value, enabling them to benefit from performance while suffering if the company underperforms, thus discouraging value-destroying actions (Smith, 1990). Contrasting this, managers in public corporations often receive executive compensation in the form of stock options, which invites them to take part in any potential upside but shields them from downside risk (Hall & Murphy, 2002). Additionally, due to the theoretically-grounded relationship between option value and volatility (Bodie, Kane, & Marcus, 2014), managers may be encouraged to undertake excessive risks due to their limited or non-existent downside (Cohen, Hall, & Viceira, 2000). PE firms seek to mitigate such problems by relying on a "carrot" and "stick" mechanism, as coined by Berg & Gottschalg (2005), often permeating several managerial and hierarchical layers in the organization (Baker, Jensen, & Murphy, 1998).

4.2.3. Monitoring and Controlling Mechanisms

Ideally, while the alignment of incentives should, in an idealized world, ensure commitment by the managers to guard the interests of the shareholders, having these structures in place are generally not regarded as sufficient conditions in and by themselves. Particularly, due to a multitude of confounding factors, for example cognitive biases, private incentives and the like, the principal may find it necessary to engage in monitoring of the agent (Thomsen & Conyon, 2012).

Commonly, the sponsor firms and creditors occupy board positions as to exert such monitoring and control over management (Andersen, 2015; Berg & Gottschalg, 2005; Jensen, 1989; Thomsen & Conyon, 2012). Besides being active on the board, Anders (1992) and Jensen (2010) argue that PE firms are involved in the composition of the top management team as well as the overall business and corporate strategy of the portfolio companies. While not necessarily unique to the PE model, the sponsors thus capture a vivid example of active owners (Cotter & Peck, 2001; Thomsen & Conyon, 2012). The facilitator for this active ownership is the majority ownership stake often acquired by PE firms, which at once encourages and empowers the sponsors to, for example, instigate changes to the board composition (Gilligan & Wright, 2014; Kaplan & Strömberg, 2009). As such, the marginal cost

of monitoring is significantly lower for a majority owner, compared to the situation prevailing in publicly owned companies with dispersed ownership structures (Thomsen & Conyon, 2012). Furthermore, given that the sponsors occupy board seats at the portfolio companies, they are endowed with access to some of the private information only possessed by the incumbent management, facilitating better oversight, monitoring, and decision-making (Kaplan & Strömberg, 2009; Palepu, 1990).

4.3. OPERATIONAL ENGINEERING

While the use of the two preceding levers have been quintessential to the PE operating model since its very inception, recent times have witnessed accelerating interest into the realm of operational engineering, albeit still remaining a relatively immature topic (Kaplan & Strömberg, 2009). As its name implies, this lever is strictly more concerned with instilling direct operational and/or strategic improvements in the portfolio firm by emphasizing optimization of revenues, cash flows, operating margins, working capital flows etc. (Berg & Gottschalg, 2005). Given the breadth of the topic, we structurally derive inspiration from Berg & Gottschalg's (2005) framework, although we include several additional theoretical perspectives to advance and nuance the discussion.

4.3.1. Increasing Margins and Reducing Costs

Buyouts are often regarded as synonymous with efforts to aggressively reduce the fixed and variable cost base of the target and, indeed, this perception seems neither without reason nor without warrant. Subsequent to the acquisition, significant change is frequently set in motion by the PE owner, resulting in increased operating margins, driven, at least in part, by a decrease in costs (Muscarella & Vetsuypen, 1990; Wright, Hoskisson, & Busenitz, 2001). Furthermore, as explained by Kaplan (1989b), greater discipline is applied to elements such as corporate spending as to further induce cost savings and maximize value. Lending concrete testimony, Muscarella & Vetsuypen (1990) find that the initiation of cost cutting programs are frequently cited by sponsors as a key focus area together with reductions in production costs and improved inventory control.

Returning to the general skepticism surrounding the cost-focus of PE firms, the latter are oftentimes accused of predatorily pursuing costs reduction, particularly in areas promoting short term performance, even if detrimental to the company in the longer term (Amess, Stiebale, & Wright, 2016; Loos, 2005). One area that has attracted considerable attention is that of research and development (R&D). However, contrary to the concerns voiced by critics, some scholars do find evidence suggesting otherwise. Lichtenberg & Siegel (1990) find that firms that underwent an LBO exhibited similar

increases in R&D intensity compared to the average firm that was not acquired by PE. Additionally, Opler (1992), as described by Renneboog & Vansteenkiste (2017), echoes this notion by reporting no notable decreases in R&D spending post-buyout.

4.3.2. Optimization of Current Asset Allocation

Aside from the renowned cost cutting, PE firms have also been found to target improved efficiency of existing assets and resources, leading to overall higher asset turnover (ATO). This is achieved in several ways. One common tool is that of operational consolidation, achieved either by enhancing efficiency of retained assets while divesting those that are otherwise superfluous to the core operations of the company, and thus not marginally contributive to value (Bull, 1989; Berg & Gottschalg, 2005; Easterwood, Seth, & Singer, 1989). Also, decreases in selected items, particularly capital expenditures, is often pursued by the sponsor, and, as described by Holthausen & Larcker (1996), does not necessarily imply performance deterioration due to the aforementioned increase in efficiency.

Another area which allows for unleashing of latent value from an operational standpoint pertains to working capital, with sponsors seeking to reduce inventory levels and further tighten control over accounts receivable (Long & Ravenscraft, 1993a). Moreover, more favorable terms with suppliers, for example to extend the collection period for accounts payables, are often negotiated by PE firms (Loos, 2005), with such extension generating value from a time value of money perspective (Brealey et al., 2016). These efficiency gains result in higher levels of cash flows that can be used to for more productive purposes such as paying down debt, executing value-adding acquisitions etc. (Kravis, 1989; Berg & Gottschalg, 2005).

While sponsor firms are thus expected to introduce operational measures that increase efficiency (Anders, 1992; Easterwood et al., 1989; Holthausen & Larcker, 1996), scholars agree that a careful balance must be maintained. Given that the portfolio companies should, ideally, be acquired to perform from an operational and financial standpoint, instead of simply being stripped of their assets to, for example, benefit from elimination of potential conglomerate discounts (Berger & Ofek, 1995; Burch, Nanda & Narayanan, 2000; Gilligan & Wright, 2014), the sponsors should adhere to changes only as long as the overall competitiveness of the company is not adversely affected (Easterwood et al., 1989). After all, as explained by Kravis (1989), the overarching objective ought to be value generation rather than pursuit of short-sighted objectives (Loos, 2005).

4.3.3. Enhancing Managerial Efficiency

As explained by Anders (1992), the operational improvements attained by PE firms in the companies they acquire often occur in conjunction with replacement of incumbent management (Andersen, 2015; Gilligan & Wright, 2014; Martin & McConnell, 1991). The latter is a result of target underperformance often flowing from inefficient management, owing among other things to the generic principal-agent problem and cognitive traps (Berg & Gottschalg, 2005; Warner, Watts, & Wruck, 1988). Indeed, as explained by Martin & McConnell (1991), poorly performing companies, which suffer from managerial inefficiencies, are often prime target for takeovers; a dynamic exactly embodied in the PE operating model (Kaplan & Strömberg, 2009).

Berg & Gottschalg (2005) further theorize on the underlying reasons for such managerial inefficiencies. Of note, they highlight that large corporations might have non-core business units that have received insufficient attention over time. Furthermore, resources may not have been readily available to pursue innovative endeavors or could have been hindered by an organizational climate infrugal to entrepreneurial activities. Particularly, conservatism borne out of core rigidities may be present with less calculated risk-taking and proactivity (Miller & Friesen, 1984). Interestingly, scholars have advanced the argument that buyouts can act as a catalyst in rekindling managerial motivation and thus spur strategic and operational innovation to negate these organizational rigidities and myopia (Beaver, 2001; Lerner, Strömberg, & Sørensen, 2011; Wright et al., 2001, Bruining, Verwaal, & Wright, 2013).

4.3.4. Devoting Attention to Strategic Objectives

Besides targeting internal efficiencies through operational improvements, PE firms devote attention to strategic dimensions by seeking to rationalize the business and corporate strategies pursued by the acquired firms (Berg & Gottschalg, 2005). Particularly, the sponsor firms instill such modifications with the aim of refocusing current strategic objectives of the company and examining avenues for future growth, both at the top and bottom line, the latter, for example, in the form of entering new markets, altering the product mix, reorganizing distribution channels etc. (Berg & Gottschalg, 2005; Muscarella & Vetsuypen, 1990).

To execute on the aforementioned, sponsor firms rigorously evaluate the activities undertaken by the portfolio firm, both before and after the buyout (Phan & Hill, 1995). As such, activities deemed non-

core to the business might be divested as to both refocus resources to genuinely cash generating objectives and simultaneously reduce the complexity of the firm (Phan & Hill, 1995; Seth & Easterwood, 1993; Zenger, 2013). Framed differently, focus is shifted toward areas that are ripe with sources of recurring revenues and profits, generally regarded as superior to income sources that are more transitory in nature (Petersen, Plenborg, & Kinserdal, 2017). Consequently, corporate scope is often reduced substantially, cross-subsidies previously awarded to underperforming product lines are terminated, and the sponsor outsources functions which are peripheral to the business model (Loos, 2005; Rao, Nam, & Chaudhury, 1996; Wiersema & Liebeskind, 1995). The impetus behind all the aforementioned actions rests with the potential to enhance firm competitiveness to sustain competitive advantage vis-à-vis rivals (Baker & Smith, 1998).

Secondly, besides the improvement to existing processes, PE owners are in a unique position to aid the companies in defining, pursuing, and achieving new strategic objectives (Berg & Gottschalg, 2005; Loos, 2005). The latter can be facilitated through both internal and external growth strategies (Berg & Gottschalg, 2005; Hammer et al., 2017). As explained by Butler (2001), a condition for a successful buyout rests with growth in the private period as the traditional efficiency enhancements, corporate downsizing etc. are not necessarily sufficient in and by themselves (Wright et al., 2001). Much literature on corporate restructuring and refocusing primarily centers around that of organic growth, emphasizing the core activities of the firm. Naturally, growth can likewise be achieved inorganically, as explained by Butler (2001) and Hammer et al. (2017) with portfolio companies serving as a platform for further add-on investments in the private and subsequent public period, if the acquired entity is exited by means of an IPO (Easterwood et al., 1989).

A catalyst for such inorganic growth strategy is typically found in market fragmentation, encouraging industry consolidation to establish fewer, larger players (Butler, 2001; Loos, 2005; Spliid, 2007). As per traditional M&A arguments (Brealey et al., 2016; Grant, 2016), such acquisitions may unleash synergies in terms of both scale and scope, pending sound due diligence and post-merger integration. Owing to the potential to explore both cost and revenue synergies, these “buy-and-build” strategies have increased in popularity within recent years (BCG, 2016; Hammer et al., 2017). Interestingly, this strategy seems to somewhat contrast the more traditional PE modus operandi, as described by Spliid (2007), who argues that PE aims not to construct but rather dismantle industry conglomerates. Hence, the gravitation toward heavier reliance on such strategy may be found in the decommoditization of the traditional value creation levers, running in tandem with flourishing competition in the PE

industry, forcing the sponsors to pursue more unique and tailored strategies to generate the required returns (Achleitner & Figge, 2014).

4.3.5. Utilizing Knowledge: Expertise and Specialization

In addition to the direct mechanisms elaborated on in the preceding sections, Berg & Gottschalg (2005) additionally note that sponsors pursue operational and strategic improvement through positive externalities. In their framework, they recognize two additional drivers worthy of mention; the advisory role of individual PE representatives and the utilization of unique, intimate knowledge, residing at the level of the sponsor firm.

Advisory Role and Expertise

To attain a competitive advantage vis-à-vis other sponsors and competing firms, PE often rely on valuable human capital resources by involving individuals with relevant knowledge and expertise, being, in and by themselves, highly tacit and inimitable (Barney, 1991; Kaplan & Strömberg, 2009). As discussed in the section on governance engineering, affiliates of the sponsors often occupy board seats in the portfolio firms to advise on strategic and operational matters while simultaneously refraining from interfering directly with day-to-day operations (Bruining & Wright, 2002; Houlden, 1990). These seasoned PE representatives oftentimes are or have been subjected to similar industries, allowing them to accumulate valuable experience to draw upon in decision-making (Spliid, 2014).

As such, PE sponsors may transfer both knowledge gained from previous transactions as well as involve experienced former executives, commonly known as operating partners (OP) (Anders, 1992; Hite & Vetsuypens, 1989; Matthews, Bye, & Howland, 2009). Acting as a substantial positive externality (Hendrikse, 2003), the presence of knowledgeable PE representatives, in effect, implies that the portfolio firm becomes a node in a highly sophisticated and dense network (Borgatti & Halgin, 2011). By creating and exploiting the ties created, the portfolio firms can hereby benefit from intimate industry expertise and managerial talent through cross utilization, which is highly valuable and would not, presumably, be available prior to the buyout – or at the very least require time and costly resources to access (Baker & Smith, 1998; Hite & Vetsuypens, 1989).

Another benefit of occupying a node in this established network can be found in the context of the pursuit of buy-and-build strategies (Hammer et al., 2017), mentioned earlier in the section. Due to

the array of available connections in both similar and related industries, the search for add-on investments progresses with comparatively greater ease, potential targets become more accessible and due diligence easier to carry out (Baker & Smith, 1998; Berg & Gottschalg, 2005).

Superior Market Intelligence and Specialization

While several scholars, primarily based on theories originating in the knowledge management literature, emphasizes the value of the insight transferred from individual PE representatives, others have been more concerned with the knowledge contained in the nodes and networks of the PE firm itself (Borgatti & Halgin, 2011; Bygrave, 1987; 1988). While the survival of any given PE firm is inevitably preconditioned on a certain level of market intelligence and expertise in active firm ownership (Berg & Gottschalg, 2005), several scholars have directed attention to and theorized on the effect of sponsor concentration within certain industries (Cressy, Munari, & Malipiero, 2007; Lossen, 2006). The postulate centers around the hypothesis that, if a PE firm is relatively more specialized vis-à-vis peers, it is more likely to enjoy a competitive advantage, flowing from the novel repertoire of knowledge accumulated. It is thus argued that specialized PE firms ought to experience lower level of asymmetric information with regards to the target company's idiosyncratic situation and industry surrounding it.

In addition, the intimate industry knowledge accruing from specialization serves to reduce risk and uncertainty (Cressy et al., 2007). Le Nadant, Perdreau, & Bruining (2018) add to this by theorizing that industry specialization resembles a valuable strategic resource which drives performance heterogeneity at the portfolio firm level. As is evident from the discussion thus presented, the theoretical axiom underlying much of the literature on specialization finds it roots in seminal thoughts of the strategic management field, particularly Barney's (1991) notion that competitive advantage is attained by employing resources that are, in nature, valuable, rare, inimitable, and non-substitutable (VRIN). Indeed, since specialization facilitates the gradual accumulation of knowledge and learning, it may exactly allow for the development of strategic assets that are difficult to replicate by competing sponsors by virtue of their intangibility and causal ambiguity (Lippman & Rumelt, 1982).

Progressing along a different theoretical strand, namely that of portfolio diversification, Norton & Tenenbaum (1993) directs attention to the advantages stemming from being presents in a different set of industries. Specifically, by spreading capital across sectors rather than clustering in a narrow or singular set of industries, unsystematic risk is effectively reduced. The apparent lack of theoretical consensus on the impact of specialization must necessarily be resolved by entertaining considerations

regarding the level of analysis. Particularly, while diversification indeed ought to exert positive impact at the level of the PE fund, the industry expertise resulting from specialization may well prove highly valuable at the level of the acquired firm.

4.4. VALUE CAPTURE VERSUS VALUE CREATION

While the levers thus discussed are concerned with changes installed during the holding period, we finalize the theoretical understanding by briefly examining financial arbitrage, as engaged in during the pre-investment stage (Berg & Gottschalg, 2005). Being solely a result of mathematically-driven changes in the valuation of the portfolio company from buyout to divestment, this generation of value is unrelated to any underlying improvements in the financial performance of the firm, instead commonly characterized as 'buy low, sell high' (Berg & Gottschalg, 2005; Jenkinson, Morkoetter, & Wetzer, 2018). In contrast to those levers presented in the previous sections, financial arbitrage can thus be seen as a value capturing rather than value generating strategy (Bodie et al., 2014).

4.4.1. Maximizing Market Valuations

Inevitably, several underlying factors collectively determine the market valuation of any company, moreover impacted by the choice of valuation method. As such, the ideal procedure adopts several computational models and bases the final valuation on a weighted average, depending on the assessed accuracy (Fernández, 2007; Petersen et al., 2017). In practice, the methods most commonly applied are those based on present value approaches, such as a discounted cash flow analysis and relative valuation, which is primarily based on multiples from peers in the industry (Petersen et al., 2017).

Due to the nature of PE being buyout specialists, they often possess detailed and precise information pertaining to the future of public market valuation multiples, being valuable knowledge in the negation process (Berg & Gottschalg, 2005). Accordingly, this type of arbitrage is coined 'multiple riding' (Gröne, 2012), and serves as a vivid example of the difference between value capture and value generation. As is evident, superior information remains quintessential. This information asymmetry of the PE firm vis-à-vis the other actors in the process often manifests itself through two different types: Private information and superior information about the market (Berg & Gottschalg, 2005).

4.4.2. Private Information

As alluded to several times, PE firms have often been the subject of criticism from both the public sphere and private institutions (Shleifer & Summers, 1988). One noteworthy critique is that sponsors

source information from incumbent management (Kaplan & Strömberg, 2009), being a particularly pronounced tendency in MBOs. In extreme cases, a scenario could occur where managers may negotiate a lower purchase price vis-à-vis the true intrinsic firm value, and perhaps even manipulate accounting data (Hite & Vetsuypens, 1989; Löwenstein, 1985). Defined as 'managerial self-dealing', a conflict of interest thus arises, with management on the hand bound by virtue of their fiduciary duty to maximize the selling price for its current owners while, at the same time, acting as buyers due to their equity stake, being interested in acquiring the firm for the lowest possible price (Hite & Vetsuypens, 1989; Jensen, 1989).

Pertaining to all types of buyouts, some scholars additionally argue that current management may tend to favor acquisition by a PE firm due to the possibility of reaping significantly higher compensation due to the incentive schemes typically installed post-buyout (Kaplan & Strömberg, 2009). From a theoretical point of view, managers may thus be prone to manipulate earnings to further their own private interest, albeit this claim empirically seems to hold little power. Specifically, due to disclosure requirements, litigation concerns, and efficient market mechanisms, several scholars have documented that such self-dealing is the exception rather than the norm (DeAngelo, 1986; Jensen, 1989; Lee, 1992; Palepu, 1990; Singh, 1990).

4.4.3. Expert Deal-Makers

Drawing upon elements discussed in the preceding sections on the advisory role of PE and market value optimization, these firms can be seen as being in possession of an instrumental repertoire of knowledge on market timing and conditions (Berg & Gottschalg, 2005; Kaplan & Strömberg, 2009; Renneboog & Vansteenkiste, 2017). In their continuous and rigorous search for targets, PE firms capitalize on this insight, both regarding acquisition candidates and general trends in the market, while also being capable of leveraging their deeply rooted network to gain proprietary access to otherwise inaccessible transactions.

Extending on the above, PE investors may benefit from lower acquisition prices vis-à-vis other potential buyers (Anders, 1992; Alperovych, Amess, & Wright, 2013). Through leveraging their sophisticated network, PE firms are able to not only scan for and access attractive targets but also capable of identifying eventual buyers in the divestment phase, lending credence to the broker role that these institutions occupy in the market (Berg & Gottschalg, 2005; Borgatti & Halgin, 2011; Burt, 2004).

5. EMPIRICAL REVIEW

Having covered the theoretical background for the PE operating model and their approach to value creation, the following section presents selected empirical research and evidence to contextualize our comprehension of the topic. As such, this section will highlight key findings in the literature preceding this paper as to both investigate the empirical relevance of the theoretical claims thus examined, and also lay the foundation for the forthcoming hypotheses development. Structurally, we first present evidence on the aftermarket and operating performance PE-backed IPOs, which also encompass reverse leveraged buyouts (RLBOs), as well as the perceived drivers of performance. We then survey the empirical body of work on the impact of the financial crisis on performance as well as its implications for the PE operating model. The latter provides the foundation for the subsequent synthesis of evidence gathered on the heightened importance and use of various operational engineering mechanisms, which we apply particular emphasis to given the objective of this paper.

5.1. AFTERMARKET PERFORMANCE: PATTERNS AND DRIVERS

Situated strictly in the period of the first buyout wave, DeGeorge & Zeckhauser (1993) investigate a sample of 62 US RLBOs that went public between 1983 and 1987. Focused on the aftermarket performance vis-à-vis non-backed firms, the authors find returns in excess of the control group that are positive and significant for the two years following flotation. Specifically, they document average cumulative abnormal returns (CAR) of 15.22% for the two-year period, adopting information asymmetry arguments to explain this pattern.

In a similar vein, Mian & Rosenfeld (1993) examine the post-IPO performance for their sample of 85 RLBOs between 1983-1988 for three years of flotation, documenting long-term outperformance of their sample compared to the value-weighted NYSE benchmark with 24-month and 36-month excess returns of 21.96% and 21.05%, respectively. Providing an alternative explanation for this apparent outperformance, the authors find that the excess returns seem not to be driven by specific actions instigated by the PE owner, but rather remains the result of takeover activity in the period post-listing.

Running along a similar vein, both in terms of findings and research design, Holthausen & Larcker (1996) examine a sample of 90 RLBOs from 1976-1988 in the US by computing the Buy-and-Hold Abnormal Returns (BHAR), adjusted by the value-weighted NYSE market benchmark. Of note, they document significantly positive mean BHARs for the 24-month period while failing to find other significant signs of outperformance. As such, they conclude that no convincing evidence of abnormal

stock performance exists, albeit they do highlight the positive association between performance and managerial as well as PE ownership. Providing concrete empirical evidence for Jensen's seminal findings of 1989, their results thus hint at the importance of governance engineering – indeed emphasized as a principal lever of value creation during the first buyout wave in the 1980s; exactly the period examined by the authors.

Providing yet another perspective on the pattern and drivers of PE-backed aftermarket performance, Chou et al. (2006) find mixed results when investigating a sample 247 US RLBOs that went public between 1981 and 1999. Using three different market benchmarks, they document that RLBOs do outperform over the short-term but that deterioration of returns occur subsequent to the 6- and 9-months after the listing, contingent on the individual benchmark. The authors attribute the rather lackluster performance to managerial opportunism, particularly the tendency to engage in earnings manipulation, which the market seems to detect and penalize.

In a more recent study, Cao & Lerner (2009), employing a comparatively larger sample of 496 US RBLOs floated between 1980 and 2002, examine the returns up to five years subsequent to the listing. Computing BHARs, they document outperformance relative to the market during the first, fourth and fifth year with the other periods showing ambiguous results. Also, they report no long-run deterioration in returns. Examining an extensive array of potential governance-related drivers of performance, including but not limited to PE presence on the board and PE ownership stakes, the authors fail to document any significant associations. Owing to the discrepancy vis-à-vis the results reported by Holthausen & Larcker (1996), it could thus be speculated whether the importance of governance engineering, at least relative to other drivers, has diminished over time.

Extending the inquiry to other geographical settings, Levis' (2011) study, consisting of 204 UK PE-backed IPOs from 1992-2005, find that they exhibit superior performance when compared to the market. Particularly, the long-run outperformance is pronounced with market adjusted returns upwards of 30%, and positively associated with ownership by the PE sponsor and leverage. Lastly, Chamberlain & Joncheray (2017) investigate 52 RLBOs across Germany, France and the UK for the period 2001-2011, likewise documenting superior aftermarket performance even through the financial crisis between 2007 and 2009, hinting carefully at the relative resilience to financial fragility provided by PE-backing. Lending credence to the difficulty in disentangling and identifying the drivers of performance, the authors survey a broad range of potential explanatory variables such as LBO duration and reputational effects yet fail to document any statistically significant relations.

In sum, most scholars do seem to provide evidence of superior aftermarket performance of PE-backed IPOs, robust to benchmarks, time periods, and geographical context. Nevertheless, the actual drivers remain a puzzle with several potential explanations provided, encompassing a multitude of analytical levels such as investor perception, market timing, managerial actions, active ownership and the like. This ambiguity cements the relevance of inquiring further into the topic.

5.2. OPERATING PERFORMANCE: PATTERNS AND DRIVERS

Arguably, one of the first scholars to entertain thorough analysis of the performance of LBOs, Kaplan (1989b) examines the operational performance in his sample of 76 US firms, undergoing MBOs in the period 1980-1986. Computing industry-adjusted measures for the three years following the buy-out, he reports increases in EBITDA upwards of 24% as well as decreases in capital expenditures, being symptomatic of the efficiency improvements cemented so heavily in the theoretical axioms on PE. Also, he documents significant increases in EBITDA/assets and EBITDA/sales, over and above the industry median, of 21.3% and 34.8% for the three-year period.

Smith (1990) follows a similar approach in her study of 58 US MBOs that went from public-to-private in the period 1977-1986, and documents significant increases in operating cash flows for the year following the buyout. Further, providing evidence against the proverbial skepticism surrounding PE involvement, she finds that the increased operating returns are not driven by a reduction in number of employees or expenditures in R&D but rather enhanced efficiency in working capital and inventory management. These findings thus mirror those of Olsson & Tåg (2017).

Broadening the research design to encompass both LBOs and divisional buyouts, Muscarella & Vetsuypens (1990) examine a sample of 72 US firms that were acquired between 1976-1987. Across several operating measures, inter alia gross margin and operating income to sales, the sample is found to outperform their non-backed peer group. Attributing the aforementioned primarily to cost reductions instigated post-buyout, their study thus provides further support to the increased efficiency arising from the organizational structure imposed by PE ownership, which serves to align incentives between shareholders and management, among other owing to managerial equity ownership.

In their seminal study of R&D intensity, Long & Ravenscraft (1993b) document significant operating performance gains in their sample of 72 US LBOs between 1981-1987 versus non-backed peer firms. Furthermore, while R&D expenses decrease significantly post LBO, they find that this cutback does not affect operating performance in both the short term, defined as the first year after the buyout, as

well as in the long-term, capturing the three or five years following the buyout, respectively. Their study thus lends testimony to the theorized ability of PE sponsors to engage in optimization of asset allocation. In a similar vein, Holthausen & Larcker (1996) examine a sample of 90 RLBOs acquired in the period 1976-1988 in the US from the year prior to up until four years after their IPO. On an industry-adjusted basis, they document pronounced superior performance as measured in profitability and efficiency for the period immediately following the listing, albeit these signs are weakening over the longer run.

More recently, Guo, Hotchkiss, & Song (2011) investigate the performance of 94 LBOs conducted in the period 1990-2006 in the US. Testing for changes in EBITDA/sales and Net cash flow/sales over the three years following the buyout, they document little to no evidence of significant improvement for all periods, net of industry effects, with only few periods testing significantly positive. As such, the improvements to operating performance during this second buyout wave, comprising the setting for their study, could appear lower than those attained in the first buyout, the latter exemplified in the studies by Kaplan (1989b) and Smith (1990).

Finally, Acharya, Gottschalg, Hahn, & Kehoe (2013) explore a sample of 255 targets acquired between 1991-2007 and find that PE-ownership has a positive effect on operating performance on a sector-adjusted basis. Investigating the effects over the entire holding period, they document margin improvements of around 1% in EBITDA/sales, being relatively lower than the 2.4% improvement reported by Kaplan (1989b). They owe some of these improvements to HR management and more specifically skill factors possessed by the deal partners involved in the buyouts. As in the case for aftermarket performance, a solid body of evidence seems to support the expected operating improvements, per the theory on PE ownership, albeit consensus on the exact drivers of this performance remains rather weak.

5.3. PRIVATE EQUITY AND THE FINANCIAL CRISIS

Given the focus of this paper, a natural question pertains to whether the documented performance patterns of PE-owned firms appear impacted by the financial crisis. Due to the relative immaturity of the topic, empirical insight remains relatively scarce, although two papers are worthy of mentioning.

Investigating exactly the resilience of PE during the recent financial crisis, Wilson, Wright, Siegel, & Scholes (2012) examine a large sample of UK buyouts, documenting higher levels of growth and profitability together with increases in efficiency and working capital management. Comparing their

sample to both matched private and public firms, Wilson et al. (2012) find that PE-backed companies enjoy significantly higher return on assets (ROA) through the recession, thus speaking in favor of the advantages attained from PE-ownership, particularly those flowing from having owners that are actively involved, capable, and highly incentivized to aid their portfolio companies in troubled times.

Moreover, Bernstein et al. (2018) examine the financial fragility of PE-backed firms and their operating performance during the crisis in their sample of 722 firms acquired between 2001-2007. While not finding significant outperformance in terms of EBITDA margin and ROA, they do find significant increases in asset growth for PE-backed firms during the crisis. Owing to better resource utilization and a network of valuable relations, the authors do indeed show that, even during dire periods, PE-backing does not foster economic fragility but rather reduces it, lending credence to the importance of network effects per the theoretical background (Borgatti & Halgin, 2011).

Directing attention to the implications on the operating model employed by PE sponsors, Rizzi (2009) notes that the crisis necessitated drastic changes to not only fund structure and governance, but also the actions instigated at the level of the portfolio firm. Particularly, he posits that: *"The transactions will be more conservatively structured, with less reliance on financial engineering to offset overpriced acquisitions"* (p. 165) and that *"Sponsors will move beyond financial engineering to improving operations"* (p. 176). Several industry reports and practitioners echo this observed gravitation away from conventional value creation levers in the wake of the crisis. Specifically, in a recent survey shedding light upon 'the new private equity model', PwC (2015) find that 82% of PE executives cite operational improvements as a key component in the investment decision. Nevertheless, systematic, scholarly inquiry into how the approach to value creation has changed, and any performance implications of such shift, remains scarce.

Albeit refraining from entertaining comparative considerations, Gompers et al. (2016), in a contemporary study, survey 79 PE firms on the use of various value creation levers. As a vivid example of the growing need for sponsors to exert highly active ownership, the authors find that 97.2% of the surveyed firms regard operational improvements as a key return driver with only 76.1% pointing to leverage as being an important component. Going into depth with exactly which specific mechanisms are viewed as accretive to value, the most cited remain increasing revenue, changing the senior management team, and executing follow-on acquisitions. While operational engineering is evidently important for PE firms today, per the mentioned survey, drawing conclusions vis-à-vis previous periods nevertheless remains unattainable, supporting our contribution to the body of work on the topic.

5.4. SECONDARY BUYOUTS

Given the maturing of the PE industry, a significantly larger part of buyouts continues to be in the form of SBOs (Bonini, 2015; Kaplan & Strömberg, 2009; Strömberg, 2008). Recent times have thus seen heightened academic attention directed toward this topic, resulting in several empirical advancements. Particularly, as argued by Achleitner & Figge (2014), Braun et al. (2017) and Wright, Gilligan, & Amess (2009), value creation potential in SBOs ought to be limited, relative to the potential residing in primary buyouts (PBOs), due to it being exhausted by the former PE owners, assuming they have been apt in doing so.

In his study, Wang (2012) investigates a sample of 140 SBOs and 465 PBOs in the UK that were acquired between 1997-2008. Interestingly, while firms undergoing an SBO experienced increased profits on average, the specific profitability ratios of ROA and EBITDA/sales saw decreases. Also, when compared to the control group of PBOs, the SBOs generated higher cash flows but worse earnings, thus yielding ambiguous overall result as to whether all value generation potential was exhausted subsequent to the initial buyout. He does, however, find that SBOs are, on average, priced at a premium of 4.5% in his sample, being indicative of the new owners at the least assuming the ability to unleash additional value.

Similarly, Achleitner & Figge (2014) investigate 448 SBOs and 2,456 PBOs across Europe in the period 1990-2010. Examining the first year post-buyout, they provide no evidence of lower operating performance for SBOs vis-à-vis PBOs. However, they do document how the former is characterized by around 30% more leverage and priced at a premium of between 6-9%, largely echoing the findings of Wang (2011). Due to the lack of deterioration in operating performance, that is otherwise expected, Achleitner & Figge (2014) speculate as to whether the former owners disposed of the portfolio firm prematurely, posing one potential explanation, or whether there is indeed reason to believe that sponsors purchasing firms through an SBO possess a different skillset and rely on other levers of value creation than those traditionally employed (Kaplan & Strömberg, 2009).

Examining the European market, Bonini (2015) studies the two years post-buyout for a sample of 326 companies that underwent an SBO between 1999-2007. Of note, he documents that, while his sample of PBOs saw significant increases in operating performance after the buyout, the same did not hold true for SBOs. In the latter case, the performance remained stationary or saw only small, insignificant improvements. As such, the SBOs did not necessarily exhibit worse performance, but the sponsors evidently failed to unleash additional value over and above that already realized under previous PE

ownership. Bonini (2015) similarly documents that the capital structure of SBOs show higher levels of leverage than the PBOs, echoing the findings of Achleitner & Figge (2014).

Lastly, DeGeorge, Martin, & Phalippou (2016) examine a sample of 467 SBOs and 5,382 PBOs from different countries acquired in the period 1986-2007. While they do find that SBOs may be value-destroying at the fund level, provided that the acquisition is conducted close to an investment deadline which implies that the sponsor may be under time pressure, they discover an interesting venue for value creation. In particular, they document that SBOs perform better when different, albeit complementary skills, exist between the former and the new PE owner. This suggests that generating value in SBOs may be heavily contingent on specific characteristics of the new owners, such as expertise. We delve further into this notion in the next section on specialization.

As a final point worth noting, 2007/2008 marks the upper boundary on the time period examined in the large majority of the mentioned papers, coinciding with the advent of the financial crisis. To the best of our knowledge, academia is largely silent on the topic in more recent times, lending testimony to the relevance of contributing to the body of evidence – as sought attained in this paper.

5.5. SPONSOR SPECIALIZATION

In the theoretical section, it was argued that sponsors concentrating within specific industries might be able to generate superior performance due to more in-depth knowledge of the buyout process as well as the implications of industry structure and dynamics for firm competitiveness (Spliid, 2014).

Providing empirical evidence, Lossen (2006), albeit adopting the PE fund rather than the portfolio firm as the unit of analysis, investigates 2,871 investments by 100 different PE funds in the period 1979-1998. While he documents higher rates of return for funds specialized within specific finance stages, the opposite holds true for those focused on individual industries. Hence, the benefits of diversification are evidently higher in his sample vis-à-vis what is attained from being specialized. Put differently, and as concluded by Lossen (2006, p. 35): "*The benefits of additional investment opportunities in various industries appear to be higher than the costs of diversification across industries.*"

Contrasting these findings, Cressy et al. (2007) document the exact opposite on portfolio firm level in their inquiry into 122 buyouts conducted in the UK between 1995-2002. Besides reporting superior operating profitability of 4.5% for PE-backed firms relative to a matched control group, they find that some of the outperformance can be attributed to industry specialization of the PE sponsor. Specifi-

cally, the aforementioned authors find compelling evidence for their "advantages-to-industry-specialization" hypothesis by documenting, by means of cross-sectional regression analysis, that such specialization adds between 6% and 8.5% to the profitability of the average PE investment. As such, they conclude that specialization indeed constitutes valuable tool for PE sponsors in their pursuit of competitive advantage and continued survival.

More recently, Le Nadant et al. (2018) examine a sample of 217 PE-backed buyouts conducted in France between 2001-2007. Resonating with the findings of Cressy et al. (2007), the authors confirm industry specialization as a driver of operating performance. Specifically, they find average increases in profitability of 7.55% and also report increased top-line growth of 33% for companies backed by specialized PE funds vis-à-vis non-specialized peers. Furthermore, they posit that the main effect of specialization on portfolio firm performance is circumscribed by various contingencies, such as the pre-acquisition performance of the target. In addition, the authors emphasize that some industries might be more relevant for the pursuit of specialization strategies; a notion shared by Spliid (2014), stating that industries that are highly knowledge intensive serve as prime candidates.

5.6. EXPANSION STRATEGIES

The use of inorganic growth strategies, coined 'Buy-and-Build' per the theoretical background, by PE-firms continues to be a subject of great debate. Literature on general M&A is ripe with ambiguity, depicted in some scholars documenting higher firm performance post-merger (Healy, Palepu, & Ruback, 1992) and others finding the exact opposite (Gugler, Mueller, Yurtoglu & Zulehner, 2003). While no overarching consensus as to the advantages of such acquisition strategy persists, scholars do agree as to the contingencies rendering the generation of financial and strategic value possible; namely that the projected synergies are realized, and post-merger integration executed in a sound manner (Brealy et al., 2016; Grant, 2016).

Nikoskelainen & Wright (2007) examine a sample of 321 UK buyouts conducted between 1995-2004 in the UK. Performing a multiple regression on achieved IRR at the fund level, they find that acquisitions made post-buyout are associated positively with performance and even claim that this variable constitutes a main driver of realized returns. They furtherstate that add-ons are primarily utilized to exploit scale economies and achieve industry consolidation as to reduce competitive forces, singing in tune with the theoretical underpinnings on the topic as elaborated on earlier.

Investigating drivers of performance during the holding period, Valkama, Maual, Nikoskelainen, & Wright (2013) examine a sample of PE-backed firms between 1995-2004, similar to the aforementioned authors, albeit expanding the sample size to 1,503 companies. In line with the former, Valkama et al. (2013) do indeed find that add-on acquisitions executed during the holding period are conducive to performance, in particular when taking the form of divisional rather that whole-company buyouts. Once again, the results remain heavily dependent on certain contingencies of the individual portfolio firm and buyout type, cementing the difficulty in generalizing the results across the population of PE-owned firms.

Adopting the portfolio firm as the unit of analysis, thus being of comparatively greater relevance to this study, Borell & Heger (2013) examine a sample of 844 companies merged in buy-and-build transactions across Europe in the period 2000-2008. Through panel regression analysis, the authors find positive associations with profitability. Furthermore, they explain that firms that constitute platforms for further investments are required to exhibit high turnover growth while the add-ons ought to be targets with lower levels of growth for the posited relation to hold true. This condition is based on the underlying logic that the platform company may utilize low-growth firms more efficiently than if the add-on company were to remain a standalone entity (Borell & Heger, 2013).

5.7. HOLDING PERIOD

While rather intuitive, an imperative determinant of performance rests with the holding period, since it is during this stage that the sponsors unleash both governance, operational, and strategic mechanisms (Kaplan & Strömberg, 2009). Scholars have found varying evidence on the effect of the length of private ownership. In their study of 496 LBOs between 1980-2002, Cao & Lerner (2009) find that firms being held for more than the median of 37 months exhibit lower performance than those held for a shorter duration. However, they also document underperformance if firms were held less than a year, suggesting that the relation between holding period and performance may take the form of an inverse U-shaped curve.

In line with the aforementioned, Cao (2011) argues that market timing may force a premature offloading of the portfolio company, thus hinting at an adverse impact on performance. Moreover, Badunenko, Baum, & Schäefer (2010) analyze a sample of PE-backed firms in the period 2002-2007 and find supporting evidence that short durations hurt the portfolio firm, to the point where they, in fact, exhibit performance inferior to that of the non-backed control group. A potential explanation

rests with the notion that sponsors are increasingly required to deviate from conventional financial engineering mechanisms and adopt more operational and strategic measures, which inevitably takes longer time to implement (Badunenko et al., 2010).

5.8. MANAGEMENT AND BOARD

Given the need for PE sponsors to realize efficiencies rather quickly pursuant to the buyout, another mechanism found to be used frequently is that of replacing incumbent management (Gompers et al., 2016; Kaplan & Strömberg, 2009). Martin & McConnel (1991), in their study of general corporate takeovers, find that companies which experience top management turnover shortly after the acquisitions exhibit declining performance as a result. Contrasting this, in their study of 192 buyouts between 1990-2006, Guo et al. (2011) document positive associations between top management change and operating performance, measured through the generated cash flow. Interestingly, they moreover find that, if the new CEO simultaneously occupy the position as chairman of the board, this positive effect is negatively moderated, potentially due to weaker monitoring abilities of the board (Thomsen & Conyon, 2012).

Lastly, PE sponsors have been found to increasingly focus on injecting industry expertise and knowledge in the companies they acquire, often through gaining control of board seats in the acquired entity (Gompers et al., 2016; Renneboog & Vansteenkiste, 2017). Cornelli & Karakas (2008) find that having PE representatives on the board aids in subsequent restructuring and thus regard their presence as conducive to performance. Contrasting this, Cao & Lerner (2009) find no evidence that PE board presence alone is a sufficient condition for achieving better performance. As such, several scholars have emphasized the importance of not only having people present, but having the right people present, by virtue of relevant expertise. Providing concrete evidence from the deal level, Acharya et al. (2013) document a positive association with performance when the sponsor firms install industry experts in their acquired companies. Combining the above with the aforementioned findings of Le Nadant et al. (2018) and Cressy et al. (2007) on sponsor specialization, industry expertise, whether at the level of the sponsor firm or individual PE representatives, has largely been found to exert positive impact on portfolio firm performance in recent times.

6. HYPOTHESES DEVELOPMENT

With the two preceding sections having presented the theoretical impetus and literature of relevance to the study, we synthesize these in the development of a range of hypotheses, aimed at contributing

to the existing body of knowledge on the performance of PE-backed IPOs and the development in the approach to value creation employed by the sponsors.

6.1. OUTPERFORMANCE OF PE-BACKED IPOS

As is evident from the empirical review, several scholars have been concerned with documenting the performance patterns of PE-backed IPOs, spurred by the great scrutiny and skepticism often surrounding the involvement of PE firms (Bernstein & Sheen, 2016; Cao, 2013). Although some variation characterizes the findings, owing among other to differences in geographies and time periods examined, several scholars have reported that PE-backed IPOs do indeed outperform both the market and their non-backed peers in terms of aftermarket performance (Cao & Lerner, 2009; Chamberlain & Joncheray, 2017; Levis, 2011). Hence, our first hypothesis rests on the expectation that our sample of US PE-backed IPOs floated between 1997 and 2014 outperforms these two benchmarks:

H1(a): IPO firms backed by PE exhibit superior aftermarket performance compared to the market and non-backed IPO firms

While not, in and by itself, a new subject of inquiry, we hope to complement existing findings by providing an updated picture, benefitting from the notion that we can include a substantial fraction of firms acquired during more recent times. Moreover, we divide the analysis of performance into a subspecification concerned with examining whether the performance pattern for firms listed after the financial crisis differs markedly from those listed prior to it. To the very best of our knowledge, our study remains one of the first to establish such direct comparison.

In addition, we update the findings of scholars such as Muscarella & Vetsuypens (1990) and Holthausen & Larcker (1996), who both find superior profitability and efficiency in US PE-backed IPOs in the first buyout wave from 1983-1988, by hypothesizing that the stipulated outperformance per **H1(a)** pertains to operating performance as well. The exact measures of efficiency and profitability will be introduced in section 8.1. Hence, our second hypothesis becomes:

H1(b): IPO firms backed by PE exhibit superior operating performance compared to non-backed IPO firms

6.2. CHANGE IN THE APPROACH TO VALUE CREATION

Having accounted for the performance patterns of PE-backed IPOs, we delve further into the actual measures implemented by the sponsors with the aim of unleashing value. With aggressive competition for targets as well as reduction in debt availability borne out of the financial crisis exerting pressure on PE sponsors to rethink their approach to value creation and increasingly deviate from heavy reliance on the prototypical levers (Braun et al., 2017; Harris et al., 2014; Matthews et al., 2009), we propose the following hypothesis:

H2(a): The use of operational engineering levers of value creation by the PE sponsor is more pronounced for firms acquired in the period after the financial crisis

To inform the discussion, we define a range of conventional value drivers, as elaborated on in section 8.3.2. including, but not limited to, the use of leverage, board control, and managerial incentives (Achleitner & Figge, 2014; Filatotchev, 2012) to contrast against the use of operational value drivers, as will be elaborated on in the next section. Hence, we expect to observe significantly more pronounced use of the operational levers for the subsample acquired in the period after 2008. We deliberately do not hypothesize on whether the reliance on conventional levers differs between the two subsamples, since the gravitation toward the use of operational levers does not necessarily have to substitute perfectly for these (Matthews et al., 2009). We thus believe that including these conventional financial and governance mechanisms remains imperative in allowing us to extract insights on whether the gravitation toward operational engineering, if found to persist, serves as a complement or rather a substitute to the traditional PE operating model.

6.3. ASSOCIATION BETWEEN OPERATIONAL LEVERS AND PERFORMANCE

The next natural question pertains to whether the operational levers are associated with portfolio firm performance and moreover whether the findings differ for the firms acquired prior to versus after the crisis. Synthesizing the, although relatively scarce literature, and complementing this by industry reports, we define six variables to capture the operational levers of value creation. Each of the six levers will be presented below as well as the underlying rationale for the hypothesized relationship with performance. Firstly, we propose that the increased importance of operational engineering (Braun et al., 2017; Hammer et al., 2017) leads to these variables carrying a positive association with aftermarket as well as operating performance:

H3(a): The use of operational engineering levers of value creation is positively associated with aftermarket performance

H3(b): The use of operational engineering levers of value creation is positively associated with operating performance

To the best of our knowledge, this two-pronged approach which adopts both aftermarket and operating performance measures as the dependent variables remains rather unique compared to previous literature which tends to either focus on one of the two (Cao & Lerner, 2009; Levis, 2011) or refrain from commenting on why some variables appear associated with one performance measure but not the other. We believe such analysis is important. Particularly, while aftermarket performance relies on stock prices in computation, which inherently embodies the expectations of investors and thus represent a forward-looking metric, the operational performance measures rely on historical accounting data, reflecting only past performance (Petersen et al., 2017). Analyzing both may thus allow for the incorporation of reflections regarding the impact of value creation levers on investor expectations etc. We comment further upon the distinction between the two types of performance measures in section 8.1.

For now, we introduce the six levers of operational engineering which we expect to exhibit positive associations with performance and the literature supporting such expectations. In order of discussion, these are: *Holding Period, Sponsor Specialization,* use of *Buy-and-Build, Management Turnover, Board Expertise,* and the use of *Operating Partners.* The specific operationalization and data used to construct the variables are left for section 8.3.

6.3.1. Holding Period

The growing emphasis on operational and strategic improvements has been stipulated to exert pressure on the sponsor to engage more intimately with the portfolio company, in turn requiring them to have sufficient time to instigate the necessary changes (Døskeland & Strömberg, 2018). Hence, we stipulate that holding period is positively associated with performance. The impetus for the hypothesized relationship is strengthened by Cao & Lerner's (2009) finding that the so-called *quick-flip IPOs*, defined as portfolio companies which are held by the sponsor for a very limited period of time, significantly underperform relative to non-quick-flips both in terms of EBITDA/sales as well as stock price returns. As stipulated by Cao (2013), the observed inferior performance could indeed well be

correlated with the lack of sufficient time for the sponsor to prioritize genuine value-creating changes, instead relying on market timing.

6.3.2. Specialization

With the surge in scholarly interest into the impact of sponsor specialization on portfolio company performance (Achleitner & Figge, 2014), we include the industry specialization of the sponsor firm as one of the levers of operational engineering. As mentioned in the empirical review, a definite consensus on the benefits of specialization, both at the level of the portfolio company and at the PE fund level, is still absent. To highlight but a few, Brigl et al. (2008) document no positive impact of country or industry specialization of the sponsor on fund IRR with Lossen (2006) echoing this by finding evidence of positive impact of industry *diversification* on PE fund returns.

Contrasting these findings, Cressy et al. (2007) find that industry specialization of the sponsor seems to seems to drive higher profitability in the portfolio company, owing to a reduction in asymmetric information and accumulation of intimate industry knowledge accruing from such concentration. Similar results are documented by Le Nadant et al. (2018) who find positive effect of industry specialization on profitability and growth, explaining this pattern with resource-based view arguments and the importance of heterogeneity of firm resources in conferring competitive advantage. Summarizing, we hypothesize that firms backed by industry-specialized sponsors will exhibit superior performance compared to those backed by non-specialized sponsors. While Cressy et al. (2007) include stage specialization, we refrain from doing so since our approach to sample identification implies that the sponsors in our sample will, predominantly, be specialized in the 'buyout' stage. Further elaboration can be found in section 7.1.

6.3.3. Buy-and-Build

Thirdly, we include the use of *Buy-and-Build* strategies, defined as the acquisition of smaller add-on companies to a larger platform company (Spliid, 2007). Although existing literature has so far only scarcely touched upon the performance implications of this mechanism, often boiling the examination down to descriptive statistics on the number of acquisitions by the portfolio firm in the private period (Muscarella & Vetsuypens, 1990), several industry sources have documented the surge in the popularity of such inorganic growth strategies in recent times (Bain, 2019; Pitchbook, 2018a). Quantifying this phenomenon, a recent survey by Gompers et al. (2016) indeed state that 51.1% of their 79 surveyed PE firms report follow-on acquisitions as an ex-ante expected driver of value creation. Hence,

with the apparent increased importance of this lever for the PE business model (Hammer et al., 2017), we include it as our third operational engineering variable. Interestingly, as noted in a recent Pitchbook (2018a) report, the integration of businesses as required by the pursuit of Buy-and-Build strategies implies prolonged holding periods. Hence, this further supports the inclusion of the *Holding Period* variable, as discussed earlier, and strikes the increased interdependencies between the various mechanisms.

6.3.4. Management Turnover

Next, we propose a positive association between PE-instigated changes to the top management team immediately following the buyout and subsequent performance. Hence, we follow Gompers et al. (2016) who likewise classify such replacement of management as a key mechanism of operational engineering. While many nuances and contingencies inevitably serve to question whether such replacement is universally prudent (Barney, 1991; Goergen, O'Sullivan, & Wood, 2014), we find impetus for the hypothesized positive relationship in two main notions.

Firstly, departing from agency theory, Gong & Wu (2010) find that PE sponsors are apt in identifying and replacing entrenched executives, thus reducing agency costs and with it the proverbial FCF problem, as first identified by Jensen (1986). Secondly, the fields of behavioral finance and managerial cognition have long cemented that entrenched managers of mature firms are more prone to cognitive biases and inertial forces, often owing to relatively long tenure and substantial discretion over strategic decision-making, even if not always strictly value-maximizing (Jensen, 1986; 1989; Shleifer & Vishny, 1989).

Given the aforementioned, we stipulate that the replacement of executives, assuming that the sponsors are indeed able to identify and replace only entrenched managers (Gong & Wu, 2010), exhibits a positive association with performance. In such cases, the replacement of incumbent management could constitute at once a signal of imminent change and an important mechanism in reducing myopia and core rigidities within the target firm organization, thus allowing for the implementation of the desired strategic and/or operational changes as defined by the PE sponsor (Hannan & Freeman, 1984; Huff, Huff & Thomas, 1992).

6.3.5. Board Expertise

The lesser reliance on financial engineering has resulted in changes not only in terms of sponsor and fund profile but permeated all the way down to the employee selection processes of PE firms, who are increasingly targeting operational and industry specialists (ATKearney, 2019; Le Nadant et al., 2018). As noted by Bernstein & Sheen (2016), one principal counterargument to the skepticism cited by PE-opponents exactly rests with the sponsor's ability to identify and involve actors with relevant knowledge to unleash genuine, long-term value.

Indeed, the aforementioned authors find that operational improvements are facilitated by injecting managerial experience and intimate industry-know-how into the target firm through the involvement of individual PE representatives. Cementing these findings, Acharya et al. (2013) likewise report a positive association between performance at the deal level and the presence of industry experts from within the PE firm. Hence, we propose that industry expertise of the PE board representatives, given that these have a direct say in the operational and strategic orientation of the target firm, represents a valuable strategic resource in executing operational improvements (Castellaneta & Gottschalg, 2014, Gentler & Kaplan, 1996) and is therefore expected to exhibit a positive association with performance.

6.3.6. Operating Partner

We include as our final lever of operational engineering a relatively recent mechanism utilized by PE sponsors to differentiate and sustain performance in an increasingly competitive terrain; namely the involvement of an OP. While literature remains scarce, several industry sources have touched upon the subject and emphasized the key role of these people, who often carry with them deep and intimate executive experience from the relevant industry, in enhancing portfolio company value (Axial, 2015; PE Hub, 2015; Thomas H. Lee, 2012). One study which lends empirical credence to the hypothesis is that of Gompers et al. (2016) who find that OPs are, on average, engaged in the identification of potential sources of value creation in 45.3% of deals in the pre-investment stage and an even higher 51.1% of deals in the post-investment phase, being second only to the internal deal team in the list of involved actors in both cases.

Hence, the basic rationale for the hypothesized positive association with performance rests, to some extent, on the same logic presented in the above paragraph on *Board Expertise;* namely that the OPs comprise a valuable human capital resource. Nevertheless, a noticeable distinction still characterizes the two variables, namely that the OP is not strictly required to be employed at the PE firm. Also, the

OP often possesses direct management experience accrued from years of industry tenure, whereas the PE board representative could be considered an expert by virtue of him having profiled himself in a particular direction, albeit while working in the PE industry, by means of deal focus and/or board directorships. Hence, as noted by Matthews et al. (2009), the OP can assume an important mediating role in reducing internal resistance to PE ownership among incumbent management since their credibility, arising out of their direct industry experience, may foster greater trust in their abilities. From a network theoretical lens, the OP could thus be perceived as a broker between the portfolio company managers and the PE owner (Burt, 2004).

6.4. CONTINGENCIES MODERATING MAIN EFFECTS

6.4.1. Sponsor Specialization in SBOs

Finally, we return briefly to the hypothesized benefits of sponsor specialization. While our overall hypothesis predicts a positive relationship, we do find reason to believe that conditions exist which may render specialization particularly conducive to target firm performance. Particularly, we posit that sponsor firms who acquire targets that have previously undergone PE ownership are more likely to see the conventional mechanisms of value creation having been exhausted (Achleitner & Figge, 2014). Hence, it seems reasonable to expect that sponsors which are specialized within the particular industry possesses a superior repertoire of knowledge and ability to unleash unique, targeted operational improvement initiatives (Cressy et al., 2007). In the words of Le Nadant et al. (2018), these specialized firms may thus to a greater extent possess the strategic resources necessary to generate value in the SBO firm, over and above those exploited by the previous PE owner. Hence, we propose the hypothesis:

H4(a): The effect of sponsor specialization on performance is positively moderated for IPO firms acquired by the sponsor in an SBO

Indeed, the expectation that the benefit of specialization may be contingent upon other portfolio firm characteristics finds inspiration in Le Nadant et al. (2018) who note that the effect is moderated by the pre-buyout performance of the target firm. We nevertheless remain unable to repeat such analysis since the aforementioned authors survey French companies, which are required to disclose information during the private period, unlike the US companies examined in our study.

6.4.2. The Effect of the Financial Crisis

Per the logic presented in section 6.2, we propose a final hypothesis related to the moderating impact of the financial crisis on the main effects between the operational mechanisms and IPO firm performance. Particularly, given the stipulated increase in the importance of unleashing value through efforts deviating from the conventional value creation levers, we expect that:

H4(b): The effect of the operational engineering levers on performance is positively moderated for IPO firms acquired by PE after the financial crisis

As an example, we imagine a fictional scenario, centering around two IPO firms, one acquired prior to and the other acquired after the financial crisis, in which the PE sponsor instills an OP in both. Hence, we would obviously document no difference in the prevalence of this specific mechanism between the two firms. Nevertheless, it is conceivable that the actual role and impact of the OP differs, since he may possess greater mandate in the strategic decision-making for the firm acquired after the crisis given the heavier emphasis on driving operational improvement. The example is stylized, but similar logic could be extended to the other defined levers of operational engineering (Matthews et al., 2009). To clarify, using the *Holding Period* variable as a final case in point, we find reason to believe that the impact on performance ought to be greater for firms acquired post-crisis, given the increased pressure to drive improvements at the strategic and operational level of the portfolio firm, necessarily requiring sufficient time to engage in such.

7. SAMPLE IDENTIFICATION

The following section presents the approach followed in identifying the sample of PE-backed IPOs, based on inspiration from the work of multiple scholars within the field (Cao, 2013; Levis, 2011). Having accounted for the process of constructing our final sample of 318 PE-backed firms, we subsequently introduce the approach to establishing the matched control group, serving as one of our principal benchmark in the analysis of performance.

7.1. IDENTIFYING THE PE-BACKED IPO SAMPLE

Table 7.1. presents, in the order of actual execution, the various steps followed with the aim of excluding any firms not satisfying the established criteria for inclusion in the group of PE-backed IPOs. Each of the steps will be elaborated on in detail.

TABLE 7.1: SAMPLE IDENTIFICATION APPROACH

Step	Category	Exclusion	# of Firms in Sample	Source
1	IPO Type	▪ Non-PE-backed IPOs	956	▪ Thomson One ▪ Zephyr ▪ Preqin
2	Listing Characteristics	▪ Cross-border listings ▪ OTC listings ▪ Withdrawn listings	829	▪ Thomson One ▪ NASDAQ
3	Portfolio Company Characteristics	▪ REITs[1] ▪ Financial vehicles ▪ Startup firms	773	▪ Thomson One ▪ IPO prospecti
4	Sponsor Characteristics	▪ Venture capital firms ▪ Alternative asset managers	626	▪ IPO prospecti ▪ Sponsor website ▪ Preqin
5	Governance Characteristics	▪ < 50% ownership pre-IPO ▪ < 30% ownership post-IPO	526	▪ IPO prospecti
6	Data Availability	▪ Firms where ambiguity pertains to the above-mentioned ▪ Lack of sufficient stock price, accounting or explanatory data	318	▪ All of the above-mentioned ▪ Datastream ▪ COMPUSTAT

[1] Real Estate Investment Trusts

7.1.1. IPO Type

In the first step, we extract raw lists of IPOs flagged as being backed by PE from the databases Thomson One, Zephyr, and Preqin, applying the same criteria to all searches. Particularly, we require that the IPO firm was categorized as a US firm at the time of the listing, that the listing was carried out on a US stock exchange, and finally that the IPO took place in the period 1997–2014. The upper demarcation point is chosen to allow for retrieval of three years of stock price and accounting data post-IPO while the lower boundary is set to ensure that we can source sufficient data from the IPO prospecti. While the three databases, not surprisingly, return a substantial amount of duplicate firms, they each also add unique matches to the list, cementing the importance of using several sources. After removing duplicate IPO firms, we are left with a total initial sample of 956 IPO firms which are backed by a financial sponsor of some sort.

7.1.2. Listing Characteristics

While the databases effectively sort away firms listed on foreign exchanges, they fail to fully exclude some firms which cannot reasonable be deemed to be US domestic. These are thus dropped from the sample. Similarly, while the vast majority of the candidates are listed on NASDAQ or NYSE, a small percentage are floated on over-the-counter (OTC) exchanges. These are excluded from the sample.

Finally, Thomson One contains no option to effectively exclude firms whose listings were withdrawn subsequently to the filing of the IPO prospectus. Hence, we manually check these firms in the NASDAQ database to confirm that the IPO was indeed completed and abandon firms where this is not the case. After this step, the sample is reduced by 127 to 829 firms.

7.1.3. Portfolio Company Characteristics

Next, we aim to ensure that all firms in the group qualify as the prototypical PE target in terms of operations and maturity. The following steps conspire to assure this. Firstly, in line with Cao & Lerner (2009) and Ritter (2018), we exclude REITs and other alternative financial vehicles, since their performance cannot reasonably be measured in a manner comparable to the remainder of the sample firms. The exclusion is performed by means of the Thomson industry classification and supported by data from the firm prospectus whenever necessary. Secondly, we seek to exclude firms which can be characterized as 'startups'. We utilize several sources to decide upon such categorization, but it remains important to state that the process is inherently subjective and thus subject to risk of false exclusion or inclusion. Given the rigidity of the process, we remain confident in our belief that such should pertain only to a minor fraction of the total sample. This reduces the sample to 773 firms.

7.1.4. Sponsor Characteristics

Having eliminated IPOs from the sample which fail to meet the criteria at the portfolio firm-level, we turn to the level of the sponsor firm. While the lists from all three databases include only firms which have at least one sponsor represented in the ownership structure, a well-documented intricacy remaining is the inability of the databases to distinguish between VC and buyout, the latter being what we define as 'PE' sponsors. Consequently, we manually examine each sponsor by checking whether it exists in the Preqin list of 'PE fund managers'. Whenever this is the case, representing the vast majority, we are able to base the decision on information on the description, buyout activity, and fund types of each sponsor. Where the sponsor firm, for some reason, is not listed in Preqin, we check the prospectus for information and, if insufficient information is contained herein, we examine the sponsor website, provided that it still exists.

Having gathered the aforementioned information, we exclude from the sample sponsors which are exclusively or predominantly focused within the VC segment. Hence, the total list represented in the final sample encompasses both sponsors focused solely on the mature PE segment, but also firms which constitute a hybrid in terms of stage specialization, using the terminology of Cressy et al.

(2007). Indeed, many of the sponsors are engaged across the spectrum of restructurings, growth capital, and buyouts – although it is only presence in the latter that we introduce as a strict criterion for qualification. In a few cases, we encounter sponsors which, to a greater extent, resemble alternative asset managers such as hedge funds, mutual funds etc. Firms backed by such are excluded from the sample since their involvement is not directly comparable to that of PE sponsors (Kaplan & Schoar, 2005). Having completed this step, the sample is narrowed down to 626 firms.

7.1.5. Governance Characteristics

As a final step in enhancing data validity and reduce sample bias, we establish two criteria pertaining to the concentration of ownership on the PE sponsor(s). Firstly, we require that the sponsor, or sponsors if the buyout was syndicated, held a majority stake prior to the IPO. Secondly, to ensure that the sponsors maintained a meaningful presence post-IPO, and were able to exert significant influence, we follow the NASDAQ (2019) definition of a 'controlling stake' standing at 30%, and require that the sponsors hold a stake equal to or above this threshold post-IPO. As such, invoking this criterion serves as an implicit control variable, enhancing the reliability of our subsequent analyses. Particularly, we seek to secure that the sponsor firms have, by and large, similar opportunities to influence the operational and strategic direction of the portfolio firm (Gertner & Kaplan, 1996; Kaplan & Strömberg, 2009) such that our results remain unconfounded by the lack of a significant controlling stake. In terms of data sources, we benefit from the notion that all IPO firms listing on the US exchanges are required to disclose the security ownership of certain beneficial stockholders in the prospectus. We thus hand collect the data on ownership stakes from the latter. This further reduces the sample to 526 firms.

7.1.6. Data Availability

Having confirmed that all firms qualify as part of the sample, one final check eliminates the firms for which we cannot gather sufficient data per table 7.1. This further eliminates 208 firms from the sample. For a minor proportion of the firms, we were able to gather stock price data, but unable to extract reliable accounting data from COMPUSTAT. For these firms, we sought to obtain the data from other databases, namely Osiris and Thomson One, but some inevitably remained irretrievable. Consequently, the final sample of PE-backed IPOs for the analyses based on aftermarket performance measures consists of 318 firms, while the comparative figure for the analyses of operating performance stands at a slightly lower 305 firms. Since a number of the sample firms were delisted within the three-year post-IPO period which we examine, the sample size falls year-on-year as is the case in

similar studies of PE-backed IPO performance (DeGeorge & Zeckhauser, 1993; Mian & Rosenfeld, 1993; Levis, 2011). Section 9.1 examines the frequency and delisting reasons further, being an interesting inquiry in and by itself, although not constituting the main point of interest for the study.

7.2. CONSTRUCTION OF CONTROL GROUP

In the analysis of performance, we rely on the use of a control group of non-PE-backed IPOs as benchmark, following the adopted modus within the field (Brav & Gompers, 1997; Chamberlain & Joncheray, 2017; Mian & Rosenfeld, 1993). Particularly, adopting the terminology of Kothari & Warner (2006), such practice mitigates the possibility that the returns to the event firms, being the PE-backed IPO firms in this case, exceed those of the control firms due to event-induced volatility. This is exactly ensured by allowing the PE-backed group and the control group to undergo the same event, namely the IPO.

From Thomson One, we extract the list of all US firms listed between 1997 and 2014 on US exchanges, excluding those backed by one or multiple PE sponsors. This yields a raw list of 6,557 IPOs. After removing duplicates, OTC-traded stocks and restricting the group to include only firms listed on NYSE and NASDAQ, we are left with 3,320 non-PE backed IPOs whose listing characteristics match those of our group of PE-backed IPOs. For a fraction of these firms, no ISIN code could be identified, leaving it impossible to extract data from Worldscope and they were thus removed.

To reduce the inherent selection bias present in studies of PE-backed IPO performance, we construct a restricted version of the control group by employing a range of matching criteria, established in existing literature; namely industry, IPO year, and firm size as measured in total assets at the time of the IPO (Cao & Lerner, 2009; Levis, 2011). Apart from being cemented as the dominant approach empirically, our approach is supported from a theoretical perspective by Barber & Lyon (1996; 1997) who document that such matching generally leads to well-specified test statistics in event studies.

After we check for availability of stock price data in Worldscope and accounting information in COMPUSTAT, the entire control group is reduced to 1,800 non-backed firms. We match each of the 318 PE-backed IPOs to firms in the control group which satisfy the criteria listed below. Inevitably, the exercise remains a careful balance between obtaining a reasonable number of control firms and obtaining high structural similarity between the two groups.

TABLE 7.2: MATCHING CRITERIA FOR CONTROL FIRMS

Category	Measure	Criteria Employed
Timing	Year of IPO	Identical to that of PE-backed IPO firm or the year before/after
Industry	Major Industry (SIC Primary)	Identical to that of PE-backed IPO firm
Firm Size	Total Assets	Between 0.5 and 1.5 times that of PE-backed IPO firm

We prioritize exact matches on IPO year but if none such are available, we allow for 12 months of deviation following Schöber (2008), implying that candidate firms listed in the year before or after the actual year qualify as well. For industry, we match on a relatively high aggregation level, namely the major industry as reported by Thomson One, corresponding largely to the 2-digit SIC. While as much granularity as possible is naturally preferred (DeGeorge & Zeckhauser, 1993), we find that tightening this criterion leads to an insufficient number of comparable control firms. Also, we generally find support for high-aggregation matching on industry in existing literature (Jain & Kini, 1994). Finally, we match on firm size, requiring total assets of the control firm to be 0.5 to 1.5 times that of the PE-backed IPO firm, again inspired by Barber & Lyon (1996; 1997), among other.

After the matching, we are left with a control group of 415 non-backed firms. While the matched control group represents the most instrumental benchmark in analyzing performance, we deliberately include the full control group, when deemed relevant, to further triangulate the results and construct as extensive a comprehension of the performance of PE-backed IPOs as possible.

8. METHODOLOGY

8.1. DEFINING PERFORMANCE MEASURES

The following section presents the variables which are employed as measures of IPO firm performance, based on extensive review of existing literature. We introduce two categories to operationalize performance. Firstly, we examine aftermarket performance, capturing the returns to the IPO firm's stock post-listing, thus representing a measure of intrinsic firm value (Brealey et al. 2016). Secondly, we triangulate the results with an analysis of operating performance measures which serve to capture fundamental value drivers (Petersen et al., 2017). As such, the performance analysis in section 9.2., as well as the cross-sectional regression analysis in section 9.4., rely on both types of measures. To the best of our knowledge, our study represents one of the first which actively seeks to discern how PE involvement may affect various dimensions of performance differently.

8.1.1. Measures of Aftermarket Performance

In line with existing literature, we compute the Buy-and-Hold Returns (BHR), based on stock prices, to each firm on a market-adjusted basis to capture any prevalence of long-run abnormal returns in the post-IPO period (Barber & Lyon, 1997). As such, the excess return enjoyed by firm *i* over period *T* is captured in the BHAR which equals the raw returns to the IPO firm, $R_{it,}$ compounded for *T* months after the listing, minus the equivalent compounded market return over the same period, $E(R_{it})$. For the latter variable, we use the return to the S&P 500 index as our reference portfolio, in line with Cao & Lerner (2009) and Spliid (2015), among other. To entertain both shorter and longer-run considerations, we compute the BHARs for the 6, 12, 24, and 36 months following the listing, implying that *T* can assume one of these four values in the equation below:

$$BHAR_{iT} = \prod_{t=1}^{T}[1 + R_{it}] - \prod_{t=1}^{T}[1 + E(R_{it})]$$

An alternative measure, which often competes with the use of BHARs is that of Cumulative Abnormal Returns (CAR). We deliberately refrain from using this return measure for several reasons. Firstly, as documented by Barber & Lyon (1997), CARs are less instrumental in evaluating the long-run performance, instead being more suitable for testing the average abnormal return on monthly basis. Secondly, although both measures are widely adopted, extensive empirical review reveals a preference for the use of BHARs, especially as we approach recent times (Cao, 2013; Chamberlain & Joncheray, 2017; Levis, 2011;). Hence, for the purpose of this study, BHAR methodology appears to possess both superior empirical power and relevance.

By computing BHARs per the equation above, in which we subtract the market return without further adjustment, the model implicitly assumes that the returns to the IPO firm exhibit a beta of 1 with the S&P 500 (Spliid, 2015). Although unlikely to be the case, we believe that the use of benchmarking against control groups reduces the detrimental effect of such assumption violation. Furthermore, the use of control firms effectively reduces the impact of various biases present in the BHAR figure by virtue of its computational features, namely the skewness, rebalancing, and new listing bias (Barber & Lyon, 1997; Cowan & Sergeant, 2001).

We retrieve stock prices for the three years following the IPO from Worldscope via the Datastream database. To reduce the effect of the underpricing phenomenon, whose existence among IPO firms is documented convincingly by Ritter (1991), we rely on the first month closing price, adjusted for

dividends. When firms are delisted from the stock exchange, we continue to include them in the analysis up until the point of delisting and furthermore devote a section in the analysis of results to discuss the potential existence of survivorship bias (Gilbert & Strugnell, 2010).

8.1.2. Measures of Operating Performance

In order to determine which measures of operating performance carry the greatest empirical power and enhance comparability with existing literature, we engage in extensive survey of previous empirical work. For the test of outperformance, we rely on the asset turnover ratio (ATO) as a proxy for efficiency and the EBITDA margin to proxy profitability, in line with several scholars (Cao, 2012; Jain & Kini, 1994; Levis, 2011; Muscarella & Vetsuypens, 1990). These measures are computed as shown in the equations below:

$$ATO\ ratio = \frac{Sales}{Total\ assets}$$

$$EBITDA\ margin = \frac{Operating\ profit\ before\ depreciation\ and\ amortization}{Sales}$$

While several other measures could have been introduced, such as the operating cash flow-to-assets ratio and net income margin (Holthausen & Larcker, 1996), we find theoretical backing in refraining from the use of pure cash-flow based measures in Petersen et al. (2017), stipulating that such are inferior in terms of measuring shareholder value creation. Furthermore, the selected measures are directly related to underlying operations. For the cross-sectional regression in section 9.4. which examines the variables associated with performance, we introduce revenue growth for the year prior to the IPO up until each subsequent year post-listing as a dependent variable under the proposition that some of the initiatives may be aimed specifically at driving top-line growth. We nevertheless refrain from including revenue growth in the analysis of performance due to limited scope and our principal area of interest in terms of outperformance pertaining to efficiency and profitability.

In line with existing literature (Holthausen & Larcker, 1996; Jain & Kini, 2014; Levis, 2011), we adjust the ATO ratio and the EBITDA margin by the contemporaneous industry median to achieve the adjusted levels of operating performance for the year prior to the IPO, defined as T-1, up until the third year after the IPO, T+3. Thus, whenever we refer to 'ATO ratio' or 'EBITDA margin' throughout the paper, they refer to the industry-adjusted measures, unless otherwise specified. We thus follow Cao (2013), among other, who perform regressions on the industry-adjusted EBITDA margin level.

Due to the availability of accounting data, our study suffers from an intricacy similar to that discussed by Holthausen & Larcker (1996) with regards to the distinction between calendar and fiscal years. Particularly, we define Year 0 as the year in which the IPO occurs, although the listing may be executed at any given point during the year. This implies that the operating results for this particular year may, for some of the IPO firms, predominantly be based on the private period. Likewise, we adopt the notation $T+X$ to refer to the X^{th} years after the listing. In this regard, X should be interpreted strictly as the number of fiscal years following the IPO rather than calendar years.

We retrieve the sales, total assets, and EBITDA figures from COMPUSTAT for the year prior to up until three fiscal years after the IPO for each firm in the sample. Albeit cemented as a highly reliable database, we perform a random control on 5% of the sample by checking the reported accounting numbers in the original SEC Edgar filings. For the stock prices, we perform a similar check using CRSP. In both instances, we remain confident in the accuracy of the retrieved data following these controls.

8.2. STATISTICAL TESTS USED IN ANALYSIS OF PERFORMANCE

Since the BHARs represent an excess return measure, we can subject their means and medians to statistical tests for significant deviation from zero, being symptomatic of either under- or outperformance relative to the S&P 500. Nevertheless, owing to the intricacies involved in entertaining long-run event study methodology (Barber & Lyon, 1997; Cowan & Sergeant, 2001; Ritter, 1991), measures must be taken to ensure validity. Specifically, per Kothari & Warner (2006), the economic interpretation of the test for outperformance is made difficult given the presence of a joint test; that is, each test is both one to determine whether the abnormal returns are different from zero *and* a test of the assumptions underlying the very calculation of the abnormal returns as well as the test statistics.

We have sought to tailor the approach to ensure that the statistical tests for outperformance yield well-specified test statistics, reducing the probability of Type I errors, and carries a high degree of power, in turn reducing the probability of Type II errors (Kothari & Warner, 2006). As such, when testing for difference from zero of the BHARs, we utilize both parametric and non-parametric tests, being the Student's t-test for the mean and the Wilcoxon test of median, respectively. In addition, to control for selected firm characteristics, we specify an OLS regression model on the below form, which we run for the full sample of PE-backed IPO firms and the matched control group:

$$BHAR_{i,T} = a_0 + \beta_1 PE\_Dummy + \beta_2 Controls + \gamma_1 + \gamma_2 + \epsilon$$

The *PE Dummy* embodies a binary variable assuming the value of 1 if the firm is backed by PE and 0 otherwise, γ_1 and γ_2 represent year and industry fixed effects, respectively, and ϵ captures the error term. If the coefficient estimate for the *PE Dummy* is positive and significant, this is indicative of the PE-backed IPOs showing superior aftermarket performance vis-à-vis the control group, and vice versa. As for the *Controls,* we run specifications with firm size, measured as the natural logarithm to the total assets at the time of the IPO (Cao, 2013; Leslie & Oyer, 2009; Levis, 2011). Moreover, given the generally greater leverage in the capital structure of PE-owned firms (Jensen, 1989; Spliid, 2007), we run specifications with the inclusion of a leverage control variable, defined as the *Long-Term-Debt-to-Assets* ratio prevailing immediately following the offering, since the proceeds are often used to pay down debt (Spliid, 2007). We furthermore run several modified versions of the base specification to proxy how robust the findings are to varying contexts.

To summarize, the analysis of aftermarket performance follows a two-pronged approach; first a test of outperformance vis-à-vis the market and then versus the matched non-backed peer firms. As such, our method not only mirrors that of existing literature, an example being Chamberlain & Joncheray (2017), but also industry reports which adopt a similar bipartite benchmark structure when commenting on stock price performance (BVCA, 2008).

To test operating performance, we likewise base the analysis on the specified regression model, although the dependent variable is substituted for the ATO and EBITDA margin, adjusted by the industry median, respectively. Hence, we obtain the two following regression models:

$$ATO_{i,T} = a_0 + \beta_1 PE\_Dummy + \beta_2 Controls + \gamma_1 + \gamma_2 + \epsilon$$

$$EBITDA\ margin_{i,T} = a_0 + \beta_1 PE\_Dummy + \beta_2 Controls + \gamma_1 + \gamma_2 + \epsilon$$

Since we compute the level of each measure for every IPO firm in the year prior to the IPO up until the third year after the IPO, *T* can assume a value of either -1, 0, 1, 2 or 3. Again, we are interested in the sign and significance of the coefficient estimate for the *PE Dummy*, being the indication of any potential performance differences vis-à-vis the non-backed IPO firms. Where deemed relevant, we repeat the Wilcoxon test of difference from zero of the industry-adjusted median ATO ratio and EBITDA margin, with significant deviation being indicative of either better or worse performance compared to the applied industry benchmark.

For both the PE-backed IPO group and the control groups, there is a slight discrepancy between the sample sizes reported in the analysis concerned with aftermarket versus operating performance. This

is a direct result of data availability. Particularly, if the firm is delisted between the second and third year after flotation, we may be able to extract sufficient stock price data to include the firm in the 36-month analysis of aftermarket performance. Since no financial statements will have been published, we nevertheless remain unable to retrieve accounting data to use for analysis of operating performance for the same firm.

8.3. OPERATIONALIZATION OF VARIABLES

The following section elaborates on the operationalization of the conventional and operational levers of value creation, thus laying the foundation for the comparative analysis as presented in section 9.3. Furthermore, the six operational levers presented simultaneously constitute our explanatory variables for the multiple cross-sectional regression analysis per section 8.4.

When the portfolio firm was acquired by a consortium of PE sponsors, we use the data for the sponsor listed as the lead investor in Preqin and/or the prospectus. Where no explicit mention of a lead investor is made, we instead use the numbers for the sponsor with the largest ownership stake immediately prior to the listing. In the final instance, which occurs very rarely in our sample, where the sponsors hold exactly similar stakes, we use the numbers for the largest sponsor firm as measured in committed capital from the first vintage up until the IPO date.

8.3.1. Operational Levers of Value Creation

Firstly, we introduce the variables proposed to capture the operational levers of value creation. Table 8.1 presents a brief description and furthermore reports the expected sign of the coefficient estimate for the multiple cross-sectional analysis, based upon the hypotheses presented in section 6.3.

Holding Period

We measure holding period as the number of months for which the portfolio firm was held under PE ownership prior to the IPO by taking the difference between the exact IPO date, as listed in the NASDAQ database, and the date for the completion of the buyout, sourced from Preqin.

Buy-and-Build Strategies

The *Buy-and-Build* variable proxies the extent to which the sponsor firm has relied on inorganic growth initiatives. We use several checks before designating the dummy. Firstly, we examine the sponsor profile in Preqin to gather information on whether they claim reliance on such strategy. We believe that this check remains particularly important due to the difficulty in establishing causality

between PE ownership and acquisition activity in the portfolio firm. To triangulate, we furthermore check whether the portfolio firm executed any add-on acquisitions during the private period and ensure that the PE firm was listed as co-investor, based on data sourced from Preqin. Although inherently imperfect, we thus believe that our criteria enhances the probability that a causal link exists.

TABLE 8.1: EXPLANATORY VARIABLES FOR MULTIPLE REGRESSION

Variable	Type	Description	Expected Coefficient Sign
Holding Period	Numerical, continuous	The time from the completion of the buyout by the sponsor until the IPO date	+
Buy-and-Build Strategies	Dummy, [0,1]	Dummy variable assuming a value of 1 if the sponsor is listed as using "Buy-and-Build" as a main applied strategy in Preqin and the portfolio firm has executed at least one add-on acquisition in the private period	+
Sponsor Specialization	Dummy, [0,1]	Dummy variable assuming a value of 1 if the sponsor has an ICA above 1 at the time of the IPO, measuring the concentration of the PE sponsor's buyout activity within the portfolio firm's industry	+
Management Turnover	Dummy [0,1]	Dummy variable assuming a value of 1 if the sponsor has replaced top management immediately following the buyout	+
Board Expertise	Numerical, continuous	Percentage of PE board representatives with experience strictly within the industry of the portfolio firm	+
Operating Partner	Dummy [0,1]	Dummy variable assuming a value of 1 if the PE sponsor has instilled OPs on the board of the portfolio firm	+

Sponsor Specialization

To measure industry specialization, we compare the sponsor's concentration of buyouts within the industry of the portfolio firm vis-à-vis the entire PE industry. The measure we employ thus resembles the Index of Competitive Advantage (ICA), as originally conceptualized within the field of international trade and applied to the topic of PE sponsor specialization by several scholars (Archibugi & Pianta, 1994; Cressy et al., 2007; Le Nadant et al., 2018). The ICA metric yields values above 1 if the sponsor exhibits greater industry concentration in its portfolio relative to the PE industry, per the equation below:

$$ICA_{ij,t} = \frac{\frac{C_{ij,t}}{C_{j,t}}}{\frac{C_{i,t}}{C_t}}$$

We adopt the following notation:

$C_{ij,t}$ denotes the total number of buyouts completed by the sponsor firm within the industry of interest

$C_{j,t}$ denotes the total number of buyouts completed by all PE firms within the industry of interest

$C_{i,t}$ denotes the total number of buyouts completed by the sponsor firm across all industries

C_t denotes the total number of buyouts completed by all PE firms across all industries

All the numbers are computed from the year of the first buyout deal executed by the sponsor up until the year of the portfolio firm IPO. Hence, the numerator in the ICA measure comes to reflect sponsor firm *i*'s share of all buyouts completed within the particular industry, while the denominator captures sponsor firm *i*'s share of all buyout deals for the period of interest. To obtain the required data, we extract the list of all buyout deals executed by each sponsor in the sample from Preqin as well as all buyouts from the earliest available year up until 2015. We deliberately employ the historical record of buyout deals for the PE sponsor vis-à-vis the overall PE industry instead of using the portfolio composition at the time of the IPO, since the latter is likely to generate highly biased results given the tendency for sponsors to hold only few companies at a time (Spliid, 2007). By virtue of this, the sponsor could appear highly (un)specialized as a result of timing, leading to inaccurate conclusions.

Board Expertise

To proxy the extent to which the sponsor relies on installing directors with relevant industry expertise, we examine each of the PE board representatives for industry-related expertise, both in terms of direct exposure to the particular sector as well as concentration of board directorships within the industry of the portfolio firm (Bernstein & Sheen, 2016). The data is gathered from multiple sources, principally the prospectus since this often contains details on each of the directors. Where sufficient information cannot be gathered from the prospectus alone, we engage other databases such as Bloomberg.

Operating Partner

To examine the use of OPs, we introduce a dummy assuming a variable of 1 whenever the PE sponsor such profile on the board of the portfolio company. Although the exact title varies among sponsor firms, the most frequently used being ‘operating partner’, ‘senior advisor’ or ‘operating executive’,

their roles remain largely similar. These indirect PE representatives, sometimes being hired as external consultants to the GP, often constitute seasoned executives with direct experience accumulated from years of managerial tenure; a notion we indeed confirm when scrutinizing their profile in the IPO prospectus before designating the dummy (Axial, 2015; PE Hub, 2015).

Management Turnover

To examine turnover in incumbent management, we designate a dummy of 1 to portfolio firms in which the buyout sponsor initiated changes to the top management team at the time of or immediately after having acquired the portfolio firm, following the method of Guo et al. (2011). We strictly require that the executive was unaffiliated with the portfolio firm prior to the buyout, implying that in cases where he held a position with the firm prior to the buyout, but was promoted subsequently, we do not employ the dummy, in line with Mian & Rosenfeld (1993). The decision is based on information retrieved from the IPO prospectus and Bloomberg.

8.3.2. Conventional Levers of Value Creation

While our primary interest rests with the levers of operational engineering, we gather data on a range of conventional levers (Achleitner & Figge, 2014) to use in the comparative analysis of the hypothesized shift in the approach to value creation, and thus help inform **H2(a)**. These are presented below.

TABLE 8.2: CONVENTIONAL VALUE CREATION LEVERS

Variable	Type	Description
Change in PE Sponsor Ownership Stake	Numerical, continuous	The percentage point change in the ownership held by the PE sponsor(s) immediately prior to and after the offering
Change in Insider Ownership Stake	Numerical, continuous	The percentage point change in the ownership held by insiders immediately prior to and after the offering
PE Board Representation	Numerical, continuous	The fraction of the board of directors which is comprised of representatives from the PE sponsor(s)
Chairman of the Board from PE	Dummy [0,1]	Dummy variable assuming the value of 1 if the chairman of the board is affiliated with the sponsor at the time of the IPO
Variable Pay Component	Numerical, continuous	The variable pay component as a fraction of the fixed salary component
Leverage Ratio	Numerical, continuous	The long-term-debt-to-assets ratio for the year immediately prior to and after the IPO

Firstly, we compute the change in the ownership stake held by the PE sponsor prior to the IPO vis-à-vis immediately following the offering. We report the comparable figure for insiders, comprising executive management and directors of the board. In both cases, data on ownership by these two groups is readily available in the IPO prospecti. Where multiple share classes are outstanding, we consistently use the effective voting power.

Furthermore, we compute the percentage of the board which was controlled by the PE sponsor at the time of the listing. The ratio is calculated simply by counting the number of representatives who are directly employed at or affiliated with the sponsor as a fraction of the total number of directors. Again, we rely on the IPO prospectus to source this data. In addition, we note down if the chairman of the board was affiliated with the PE firm at the time of the IPO, following Cao & Lerner (2009).

To proxy the use of high-powered incentives, we compute the average ratio of variable-to-fixed pay for the portfolio firm CEO and the CFO (Spliid, 2007). Where the bonus has included non-recurring items such as retention bonuses, these have been excluded to ensure valid comparisons. For non-equity compensation bonuses, we check to ensure that they can reasonably be included as part of annual compensation. The ratio is finally calculated by taking the variable component as percentage of the fixed component. Hence, a metric above 100% indicates that variable pay exceeds the fixed salary and vice versa. Finally, to capture the proverbial use of financial engineering (Kaplan & Strömberg, 2009), we calculate the leverage ratios before and after the IPO, respectively, based on data from COMPUSTAT.

8.4. SPECIFICATION OF MULTIPLE CROSS-SECTIONAL REGRESSION MODEL

8.4.1. Introduction to Base Specification

The dependent variables, being the defined aftermarket and operating performance measures, and the explanatory variables, as were introduced in the preceding paragraph, combined form the basis for the specification of a multiple cross-sectional regression model. As such, we examine which of the six operational levers of value creation are associated with the performance of the IPO firm in the period around and after the listing by estimating the following model, relying on OLS regression methodology:

$$y_{i,T} = a_0 + \beta_1 HP_i + \beta_2 BB_i + \beta_3 MT_i + \beta_4 BE_i + \beta_5 OP_i + \beta_6 Spec_i + X_i + \gamma_1 + \gamma_2 + \epsilon$$

The dependent variable, $y_{i,T}$, thus represents a performance measure for one of the defined time periods, being BHARs in the analysis based on aftermarket performance, while embodying either revenue growth, the ATO ratio or the EBITDA margin, the two latter adjusted by the industry median, when examining the variables associated with operating performance (Holthausen & Larcker, 1996; Levis, 2011), among other. The abbreviations used for the explanatory variables for IPO firm *i* in the above are specified below, with further elaboration on each variable available in the preceding section, 8.3.1.

TABLE 8.3: ABBREVIATIONS FOR EXPLANATORY VARIABLES

HP	Holding period, as measured in number of years from the buyout up until the IPO
BB	Dummy assuming a value of 1 if the sponsor is found to use Buy-and-Build strategies
MT	Dummy assuming a value of 1 if the sponsor instilled immediate changes to the top management team after the buyout
BE	The proportion of PE board representatives which holds industry expertise
OP	Dummy assuming a value of 1 if the sponsor installed operating partners on the board
Spec	Dummy assuming a value of 1 if the ICA measure for the sponsor assumes a value above 1

Furthermore, X captures control variables, as will be described below, γ comprises year and industry fixed effects, both included to reduce the potential impact of unobserved heterogeneity in the model, while ϵ constitutes the error term of the regression.

Synthesizing findings from existing literature, we include controls for those variables which have been found to potentially impact the performance of PE-backed IPO firms, presented in the table below.

TABLE 8.4: CONTROL VARIABLES USED IN MULTIPLE REGRESSION

Variable	Type	Description
Ln (Total Assets)	Numerical, continuous	The natural logarithm to the total assets of the IPO firm, measured at the time of the listing, to control for IPO firm size
Ln (Sponsor Size)	Numerical, continuous	The natural logarithm to the capital committed to the sponsor firm from the vintage of the first fund up until the IPO year
Consortium	Dummy [0,1]	Dummy variable assuming a value of 1 if the IPO firm was acquired by a consortium of PE sponsors in the buyout

Per Leslie & Oyer (2008) we include a control for IPO firm size as measured in the natural logarithm to total assets at the time of the IPO. Moreover, inspired by Mowery, Oxley, & Silverman (1996), theorizing that the syndication of deals facilitates valuable inter-firm learning and thus enhances value

creation potential, we include a control dummy equaling 1 if the IPO firm was acquired by a consortium of PE firms. The theoretical foundation is complemented by Guo et al. (2011) who empirically document superior performance of syndication deals. Serving as a counterargument, other authors have focused on the potential for each consortium participant to engage in free-riding with coordination friction and collective action problems ensuing (Nanda & Rhodes-Kropf, 2018; Pichler & Wilhelm, 2001). Hence, while not hypothesizing on the direction of the association, given the lack of a clear consensus on the matter, we find it prudent to control for this particular factor. Finally, based on the findings of Kaplan & Schoar (2005) and Levis (2011), who investigate the impact of PE sponsor reputation as proxied by the size of the sponsor, we include the natural logarithm to the committed capital to the sponsor firm from first vintage year up until the time of the IPO as the last control variable.

8.4.2. Specifications with Interaction Terms

In addition to the base specification, we run a model introducing an interaction term between *Sponsor Specialization* and the *SBO* variable to test hypothesis **H4(a).** Hence, the regression is altered to yield:

$$y_{i,T} = a_0 + \beta_1 HP_i + \beta_2 BB_i + \beta_3 MT_i + \beta_4 BE_i + \beta_5 OP_i + \beta_6 Spec_i + \beta_7 SBO_i + \beta_8 Spec_i SBO_i + X_i + \gamma_1 + \gamma_2 + \epsilon$$

Where $Spec_i SBO_i$ captures the interaction term with SBO being a dummy equaling 1 if the IPO firm was acquired from another PE firm. Hence, the term measures whether the effect of sponsor specialization is moderated if the IPO firm has previously undergone PE ownership, hence constituting an SBO (Bernstein & Sheen, 2016). A significant coefficient estimate for the interaction term is thus indicative of the association between specialization and performance being more pronounced in SBO firms in either positive or negative direction, depending on the sign of the coefficient estimate. In a similar vein, we introduce an interaction term between a *Post-crisis Dummy*, denoted *PC*, which assumes a value of 1 if the IPO firm was acquired after the financial crisis in 2008, and selected operational levers of value creation to test hypothesis **H4(b)**. Since the explanatory variables included vary across regressions, per App. 20, we denote them *OL* below for simplicity. Hence, the interaction term $PC_i OL_i$ helps us determine whether any association between performance and the given operational levers of value creation is significantly more pronounced for firms acquired after the crisis.

$$y_{i,T} = a_0 + \beta_1 HP_i + \beta_2 BB_i + \beta_3 MT_i + \beta_4 BE_i + \beta_5 OP_i + \beta_6 Spec_i + \beta_7 PC_i + \beta_8 PC_i OL_i + X_i + \gamma_1 + \gamma_2 + \epsilon$$

8.4.3. Assumptions Underlying OLS Regression Analysis

Since we rely on OLS methodology, a number of assumptions must be satisfied to a reasonable extent for the regression model to yield unbiased coefficient estimates and allow for meaningful use of inferential statistics (Gujarati, 2011; Karafiath, 1994). To test for multicollinearity, we compute the correlations between the explanatory variables by use of the Pearson matrix and test to see whether we observe any bivariate correlations greater than 0.7, being the boundary generally applied to guide potential elimination of explanatory variables as explained by Dormann et al. (2012). As shown in App. 17, this is not the case and all six variables are thus included in the various specifications. Furthermore, as mentioned previously, we include several control variables and fixed effects to reduce unobserved heterogeneity in the model (Gujarati, 2011). Finally, we perform tests for heteroscedasticity to ensure constant variation of the error term. Generally, we find that the assumptions of the OLS regression are satisfied sufficiently to engage in inferential analysis of the coefficient estimates.

8.5. LIMITATIONS

Having presented the overall research design, the following section engages in a discussion of the limitations which must be taken into consideration in interpreting our findings.

8.5.1. Prevalence of Sample Bias

Firstly, our study focuses exclusively on the performance of and value creation mechanisms used in PE-backed firms undergoing an IPO. It is not unlikely that the findings may be context specific such that the conclusions vary if extending the sample to encompass PE-owned firms which are exited through other routes (Plagborg-Møller & Holm, 2017; Rigamonti, Cefis, Meoli, & Vismara, 2016). Hence, this compromises the generalizability of our findings. Furthermore, in constructing the sample of PE-backed IPOs, we carefully went through several steps to confirm the qualification of each firm. Nevertheless, the procedure is characterized by a substantial degree of subjectivity and we thus remain unable to fully exclude the possibility that our sample suffers from incompleteness, potentially leading to sample bias.

Moreover, in comparing the value creation mechanisms used by PE sponsors before versus after the crisis, we have to rely on a comparatively smaller sample size for the post-crisis period, since many of the firms acquired after the financial crisis have not been exited yet. If the post-crisis firms included in our study should differ in a systematic, predictable manner from other PE-backed firms which were

likewise acquired post-crisis but have not been exited yet, our results may be biased. We will nevertheless have to leave this examination to future inquiries.

8.5.2. Applied Performance Measures and Benchmarks

In the calculation of BHARs, we subtract the returns to the S&P 500, although several other benchmarks could have been used to enhance the robustness of the findings. Nevertheless, scope considerations restrict our ability to do so and multiple scholars, who do indeed triangulate with multiple market indices, continue to report largely similar results across these (Cao & Lerner, 2009; Levis, 2011). Moreover, we refrain from engaging in risk-adjustment of the returns. While it is inherently the case that different risk profiles characterize our sample of IPO firms, we seek to reduce the impact of this by adopting a matched control group as performance benchmark.

Extending on the construction of the matched control group, we follow the general consensus within the field by matching on industry and IPO firm size (DeGeorge & Zeckhauser, 1993; Kaplan, 1989a; Kothari & Warner, 2006). To further reduce the risk of misspecified test statistics, several other criteria could have been invoked. For example, Barber & Lyon (1996) suggest matching based on pre-event performance, such as ROA, to adjust for the mean reversion characterizing accounting data. Given that our study is centred around IPO firms listed on the US exchanges, we were nevertheless unable to carry out such matching procedure given the lack of accounting data availability during the period in which the firms are held private.

Moreover, in constructing the matched control group, we rely on industry matching at a high level of aggregation. Adopting a more granular industry classification, such as the four-digit SIC code, could help ensure a closer match, although inevitably compromising the size of the possible control group (Kothari & Warner, 2006). Interestingly, Barber & Lyon (1996) perform a comparative test of the explanatory power of regressions when using two-digit versus four-digit industry SIC codes, documenting no significant improvement. This supports the validity of our findings.

8.5.3. Specification of Cross-Sectional Regression

With regards to the cross-sectional multiple regression examining which operational levers of value creation are associated with performance, we have sought to include those control variables which, based on synthesis of previous work, are deemed most relevant. It is inevitable the case that several other controls could have been included. Moreover, we are principally unable to establish any causal

relationship given the intricacy caused by model endogeneity. As such, we can only comment upon the associations between the explanatory variables and IPO firm performance.

Finally, we hypothesize on and examine contingencies which may moderate the main effect between our explanatory variables and performance, depicted in the regressions including interaction terms between post-crisis dummies and selected value creation mechanisms as well as between SBOs and sponsor specialization. Given the heightened complexity and decommoditization of the PE approach to value creation (Braun et al., 2017; Døskeland & Strömberg, 2018), it is not unlikely that the key to unlocking their contribution to performance is exactly to be found in specific contingencies. Hence, further analyses could have been carried out through the inclusion of additional interaction terms. We delve deeper into this observation in section 10.1, where we entertain a discussion of the results and implications.

9. ANALYSIS OF RESULTS

The following section presents the results from the study, proceeding as follows. Firstly, we describe summary statistics of interest for the PE-backed IPOs and the control group, respectively. Having constructed a solid pre-understanding of the sample characteristics, we delve into the analysis of aftermarket and operating performance. Next, we present the analysis of the approach to value creation for firms acquired prior to versus after the financial crisis in 2008, applying particular focus to the hypothesized gravitation toward greater use of operational engineering. This finally lays the foundation for the cross-sectional multiple regression, examining which of these operational engineering mechanisms, if any, are associated with performance. Whenever we entertain inferential statistics, we consistently report statistical significance as: *** = significant at the 1% level, ** = significant at the 5% level, * = significant at the 10% level.

9.1. SAMPLE DESCRIPTION

Firstly, we compute the distribution of the 318 PE-backed IPO as well as the matched sample of 415 control firms on IPO year, as shown in the table below.

TABLE 9.1: DISTRIBUTION ON YEAR OF IPO

Year	PE-backed IPOs	Matched Control Group
1997	2.20%	3.86%
1998	1.89%	6.02%
1999	3.46%	5.54%
2000	5.03%	4.82%
2001	2.20%	2.65%
2002	2.52%	1.93%
2003	3.46%	2.41%
2004	7.55%	7.95%
2005	10.69%	9.64%
2006	10.69%	9.64%
2007	5.35%	11.33%
2008	0.63%	0.96%
2009	5.97%	1.93%
2010	5.35%	6.02%
2011	5.35%	6.99%
2012	8.18%	4.82%
2013	9.75%	8.67%
2014	9.75%	4.82%

As is evident, the activity for the PE-backed IPO sample seems to accelerate in the years leading up to the financial crisis with approximately 29% of the sample being listed between 2004-2006, corresponding well to a majority of these IPO firms being bought out during the second buyout wave (Kaplan & Strömberg, 2009). Interestingly, the subsequent decrease in activity in 2007 seems greater than for the non-backed sample, potentially being indicative of PE sponsors reacting more quickly to the signs of increased fragility in the financial system (Bernstein et al., 2018). From 2010 and onward we report a steady climb in PE-backed IPO activity, somewhat outpacing that of the non-backed control group. Our findings largely match industry reports which likewise report a similar pattern, both in terms of capital raised and number of listing executed (Pitchbook, 2017; Renaissance Capital, 2018), thus lending credence to the role of PE in driving IPO activity, particularly in the US.

The matched control group exhibits a slightly higher concentration in the early years of 1997-1999, potentially confounded by the distribution across industries within the group. Specifically, as shown below, the group of non-backed firms shows a higher concentration in the *High Technology* industry. As such, the greater number of listings in the late 1990s may well be the result of these technology firms listed just prior to the dot.com bubble. Due to these patterns, we include robustness tests in which the *High Technology* industry is excluded altogether when examining performance, as will be

explained later. Unsurprisingly, the group of PE-backed IPO firms are, to a higher extent, concentrated in relatively more mature industries such as *Industrials*, *Materials*, and *Retail*.

TABLE 9.2: DISTRIBUTION ON INDUSTRY CLASSIFICATION

Major industry	PE-Backed Group	Matched Control Group
Consumer Products and Services	13.84%	13.73%
Consumer Staples	3.46%	2.17%
Energy and Power	9.12%	13.73%
Financials	5.03%	12.53%
Healthcare	11.32%	18.55%
High Technology	12.26%	22.17%
Industrials	12.58%	4.82%
Materials	10.06%	2.17%
Media and Entertainment	3.46%	2.65%
Real Estate	0.94%	0.72%
Retail	16.04%	5.06%
Telecommunications	1.89%	1.69%

Next, we present selected summary statistics of interest, namely IPO firm size, as measured in total assets, and leverage ratios prevailing immediately following the IPO. Per Table 9.3, the group of PE-backed IPOs are generally larger in terms of total assets than the non-backed firms, corresponding well to the expectation given the prototypical focus of PE sponsors on acquiring mature firms with stable cash flows (Jensen, 1986; Kaplan & Strömberg, 2009). Notably, while the total asset mean exceed that of the non-backed firms, the medians are much closer, being indicative of our sample of PE-backed IPOs containing a few very large firms, which upward biases the arithmetic mean. This hypothesis is confirmed if scrutinizing the maximum asset figures persisting in each sample, with the PE-backed IPO figure standing at above $30.72bn compared to $9.37bn for the non-backed IPOs. Fully in line with what may be expected, the mean leverage ratio of 41.22% for the PE-backed IPOs exceeds the non-backed firms, whose comparable figure stands at 18.37% (Cao, 2013; Spliid, 2007). The reported deviations between the two groups support the importance of controlling for such firm characteristics in comparing their performance by virtue of regression analysis.

TABLE 9.3: FIRM CHARACTERISTICS

	PE-backed IPOs		Non-backed IPOs	
Statistic	**Total Assets ($ million)**	**Leverage (%)**	**Total Assets ($ million)**	**Leverage (%)**
Mean	1,833.04	41.22%	572.55	18.37%
Median	725.96	40.99%	597.65	19.43%
Min	48.82	0.00%	26.76	0.00%
Max	30,717.00	201.04%	9,371.43	112.95%

If we dive deeper into the characteristics of the PE-backed IPOs, a noteworthy insight arises as we examine the concentration across PE sponsor firms as shown in App. 5. Specifically, owing to scale economies in fundraising and the importance of maintaining a solid reputation to attract future capital from LPs (Døskeland & Strömberg, 2018), we would expect a rather small number of sponsors to be accountable for a relatively large proportion of the total buyout activity in the sample. Confirming this hypothesized pattern, we observe that 19 of the sponsors together back more than 50% of the sample. To contextualize the high degree of concentration on a few selected PE firms, the total number of sponsors represented in our sample of 318 PE-backed IPO firms equals 122, implying that approximately 16% of the sponsors are responsible for more than half of the buyouts in the sample. Interestingly, Cao (2013), in his examination of US buyouts executed in the period 1981-2006, likewise find that many of the sponsors listed in the table above are repeat players, lending testimony to the apparent sustainability of the operating model employed by these firms and the ambidextrous ability to gradually tailor their strategy for continued survival (Raisch & Birkinshaw, 2008). In addition, the pattern may well reflect the importance of sponsor reputation and return persistence, as documented by various scholars (Kaplan & Schoar, 2005; Levis, 2011).

Next, we examine the nature of the delistings occurring in the PE-backed IPO group within the three years of flotation in attempting to proxy the existence of potential survivorship bias in our sample (Gilbert & Strugnell, 2010). Table 9.4. summarizes the reasons for the delisting for those firms where we were able to extract the information. As shown in Panel A, the vast majority are taken private in acquisitions carried out by strategic buyers, followed by acquisitions by other PE firms – the latter thus exemplifying an SBO. Only 5.36%, corresponding to three firms, were delisted as a result of entering into bankruptcy. This figure approximates that of McElreath & Wiggins (1984) who inquire into the delisting reasons for 330 US firms on the NYSE, finding that 6% were delisted due to bankruptcy. Mirroring their conclusion, we thus find no reason to believe that survivorship bias should significantly influence our results.

TABLE 9.4: DISTRIBUTION ON REASON FOR DELISTING

	PANEL A: 1997-2014		PANEL B: 2007-2009	
Reason for Delisting	**Count**	**% of Grand Total**	**Count**	**% of Grand Total**
Strategic Acquisition	34	60.71%	7	53.85%
Financial Acquisition (by other PE firm)	12	21.43%	5	38.46%
Merger	6	10.71%	*N/A*	*N/A*
Bankruptcy	3	5.36%	1	7.69%
Incompliance with Listing Rules	1	1.79%	*N/A*	*N/A*
Grand Total	**56**	**100.00%**	**13**	**100.00%**

Of note, when we filter the results to depict only the firms which were delisted during the time surrounding the financial crisis, as shown in Panel B, the percentage which are acquired in financial acquisitions by other PE firms rises drastically. Particularly, out of the 12 delistings which were caused by financial acquisitions, five of these were executed in the crisis years, corresponding to 41.67%. In comparison, only 20.59% of the strategic acquisitions were executed in the same period. Although we do warrant further examination of the observed pattern, it could indeed lend credence to the role of PE sponsors in assuming control of troubled companies to turn these around (Jensen, 1986; 1989; Kaplan & Strömberg, 2009). As such, it could be worth considering inquiring into, first of all, the underlying reasons for the bankruptcy encountered by these PE-backed firms and, secondly, the approach to unleashing value anew employed by the new sponsors following the SBO.

Finally, we report some basic metrics for the PE-backed IPO group in terms of listing characteristics below. Following Levis (2011), we calculate market capitalization based on the number of shares outstanding immediately after the offering multiplied by the offer price. Gross proceeds, in turn, is given as the product of the shares issued in the offering and offer price. Worth noting, for both market capitalization and issue size, the medians lie strictly below the means, indicating that the latter are upward biased due to the presence of very large values in the sample. To contextualize the reported characteristics, Cao & Lerner (2009), for their sample of PE-backed IPO firms, document substantially lower gross proceeds of $79.06m, although their average market value remains closer to ours at $902.84m. Since the mentioned authors examine the period 1980-2002 while our study comprises more recent listings, this pattern could lend support to a trend observed by various industry actors, namely the gravitation toward larger listings (Pitchbook, 2018a; Renaissance Capital, 2018).

TABLE 9.5: LISTING CHARACTERISTICS FOR PE-BACKED IPOS

Statistic	Market Capitalization ($ million)	Shares Outstanding (Million)	Shares Offered in Issue (Million)	Offer Price ($)	Gross Proceeds ($ million)
Mean	1,123.29	63.85	16.63	16	292.95
Median	618.24	41.31	12	16	175.75
Min	96.44	8.22	1.09	7	16.28
Max	15,456.15	515.21	126.20	40	3,786.00

9.2. ANALYSIS OF PERFORMANCE

The following section presents the main findings from our inquiry into the hypothesized superior aftermarket and operating performance of PE-backed IPOs as stipulated in **H1(a)** and **H1(b)**, respectively. We first delve into our analysis of aftermarket performance, being synonymous with stock price returns, followed by an examination of our operating performance measures, being the ATO ratio and EBITDA margin. We frequently include parallels and reflections based on existing literature to contextualize our findings and emphasize how this study contributes to the existing body of knowledge on PE-backed IPO performance.

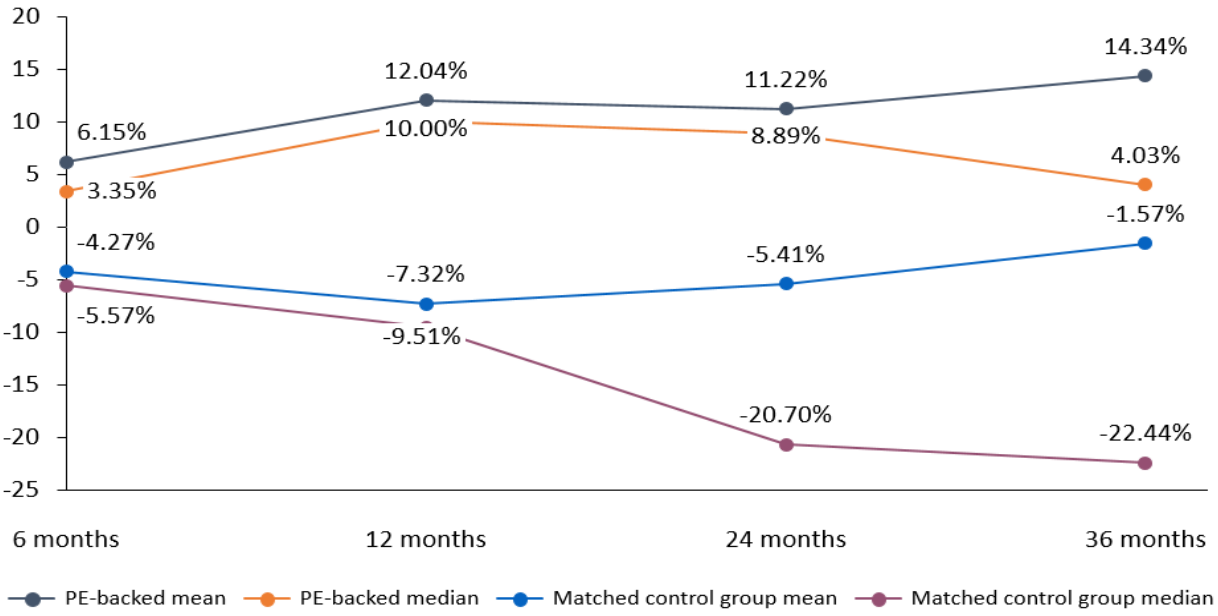
9.2.1. Analysis of Aftermarket Performance

Firstly, we report the results for the raw BHRs, unadjusted for the S&P 500 market benchmark. Figure 4 below depicts the mean and median returns over the specified time horizon for the matched control group and the PE-backed IPOs. The table containing the actual metrics can be found in App. 7. Since the BHR measure does not represent an abnormal return, but rather depicts the investor's return profile if investing in the entire sample of IPO firms (Barber & Lyon, 1996), we do not subject them to test for difference from zero.

As shown below, the BHRs exhibit a pattern in which the medians lie strictly below the means with the gap widening over the longer run, particularly for the matched control group. Hence, we observe indications of very large positive values presumably upward biasing the mean return, confirming the importance of executing non-parametric tests to determine outperformance. For all time periods, the raw returns to the PE-backed group exceed those of the non-backed firms quite substantially with some signs of gradual progression in the mean return over time. A more ambiguous picture characterizes the mean BHRs for the matched control group which exhibit signs of return deterioration of

the intermediate period, although improving slightly for the 36-month window, albeit still being negative at -1.57%.

FIGURE 4: RAW BHR FOR PE-BACKED IPOS AND MATCHED CONTROL GROUP



To test whether the PE-backed group indeed outperforms the non-backed group, the table below depicts the means and medians for the two subsamples when we adjust the raw returns by the S&P 500 market return, yielding the excess return measure, BHAR. Reported in brackets for each period are the test statistics for the Student's t-test for the mean and the Wilcoxon test of median. Both test the null hypothesis of difference from zero, with rejection of the null being symptomatic of outperformance (if positive test statistic) or underperformance (if negative test statistic) vis-à-vis the S&P 500 market benchmark.

TABLE 9.6: BHAR BASED ON S&P 500 - TEST OF MEANS AND MEDIANS

Null hypothesis: The mean/median equals zero. High test statistics reject the null.

	PE-backed IPOs			Matched Control Group		
	Mean	**Median**	**N**	**Mean**	**Median**	**N**
6 Months	10.40% (4.91)***	7.45% (6,654)***	318	-6.43% (-3.10)***	-9.45% (-12,977)***	415
12 Months	12.82% (4.50)***	10.14% (5,740)***	317	-10.77% (-4.22)***	-14.51% (-14,193)***	411
24 Months	7.12% (2.00)**	-1.12% (1,354)	311	-18.86% (-5.85)***	-26.17% (-18,704)***	409
36 Months	7.06% (1.46)	-4.35% (211)	298	-26.87% (-9.25)***	-31.31% (-18,986)***	380

For the matched control group, we observe indications of gradual aftermarket performance deterioration in the three years following the IPO when scrutinizing the development in both mean and median BHARs. As such, for the 36-month window, the matched control firms seem to underperform the S&P 500 with approximately 30% and likewise exhibit underperformance over the shorter periods. Hence, our findings largely support those documented in the seminal study on the long-run underperformance of IPOs by Loughran & Ritter (1995) and Ritter (1991), documenting underperformance of IPO firms of 27.39% vis-à-vis a matched control group of non-IPO firms over a three-year holding period.

Interestingly, we observe a vastly different pattern for the group of PE-backed IPOs which shows significant average outperformance of approximately 10% and 13% in the 6 and 12 months following the IPO. For the 24- and 36-month period, the PE-backed IPOs continue to exhibit positive excess mean returns, but their deviation from zero falls in significance for the 24-month period and vanishes for the 36-month window. Moreover, the median for these two periods turns negative, although being statistically insignificant from zero. As such, even over the longer time windows, we do observe some indications that the PE-backed control group realizes returns superior to that of the non-backed group. Particularly, while the control group shows statistically significant underperformance relative to the market benchmark across all periods at the 1% significance level, we document no significant underperformance for the group of PE-backed IPOs, even if the signs of outperformance disappears for the 24 and 36-month periods. In comparison, Brav & Gompers (1997) document a similar performance discrepancy between PE-backed and non-backed IPO firms with the latter found to significantly underperform the market. Although speculative, it could be considered, whether the apparent deterioration of performance for the PE-backed IPOs can be partially attributed to the notion that, while the PE sponsors utilize the IPO as an exit route, they are subject to a 180 days lock-up period which ensures preservation of the ownership stake in the period immediately following the IPO (Cao, 2013; Gertner & Kaplan, 1996). Further inquiry is nevertheless warranted.

To control for selected firm characteristics, we run the OLS regression model specified in section 8.2., on the full sample of PE-backed IPOs and the matched control group, yielding a total sample size of 733 in T0. The coefficient estimate of interest is that for the *PE Dummy*, with a positive and statistically significant estimate being indicative of outperformance relative to the non-backed IPO firms.

TABLE 9.7: AFTERMARKET PERFORMANCE (BHAR BASED ON S&P 500)
BASE SPECIFICATION REGRESSION

Coefficient	6 Months	12 Months	24 Months	36 Months
Intercept	0.3712 (2.22)**	0.2963 (1.36)	0.3383 (1.22)	-0.6997 (-2.22)**
PE Dummy	0.1209 (3.42)***	0.1694 (3.76)***	0.1504 (2.67)***	0.2603 (4.06)***
LN (Total Assets)	0.0062 (0.42)	0.0157 (0.84)	0.0587 (2.40)**	0.0701 (2.54)**
Year Fixed Effects?	Yes	Yes	Yes	Yes
Industry Fixed Effects?	Yes	Yes	Yes	Yes
R-Squared	0.1191	0.1310	0.1376	0.1254
Adjusted R-Squared	0.0762	0.0883	0.0948	0.0792
N	733	728	720	678

For all the four periods measured after the IPO, the OLS coefficient estimate for the *PE dummy* remains positive and significant at the 1% level, indicating that the IPO firms backed by PE indeed seem to outperform the matched control group. When we run specifications with the exclusion of fixed effects, the results remain unchanged as shown in App. 10(a). In fact, both the size and significance of the coefficient, capturing the difference between the performance of PE-backed and non-backed IPOs, increase.

Comparing our findings to those of Cao & Lerner (2009), who examine US PE-backed IPOs listed between 1980-2002, we find several similarities. Firstly, the aforementioned authors likewise find that non-backed IPO firms underperform the S&P 500, although their mean BHAR stands slightly lower at -19.91% over 36 months. For the PE-backed IPOs, they document outperformance of 15.98% over and above the S&P 500 index over the same period, exceeding our comparable 36-month mean BHAR of 7.06%. Furthermore, the authors report no deterioration in the performance of PE-backed IPOs over time, while we observe indications of such gradual reduction in BHAR over the longer runs. Interestingly, this difference could be attributed to the notion that our sample includes the period surrounding and succeeding the financial crisis in 2008. We will elaborate further on this consideration when running specifications which introduces the interaction term *PE Dummy*Post-crisis*.

Worth noting, Cao (2013) likewise documents median BHARs which lie strictly below the mean, in fact turning negative for the 24 and 36 months. This, once again, cements the relative contribution of a few well-performing firms in driving the mean BHARs upward, particularly for the longer time

windows. Finally, Levis (2011), who studies PE-backed IPOs on the UK market listed between 1992-2005, reports abnormal returns which exceed those of Cao & Lerner (2009) and our study alike, furthermore showing no apparent reduction over time. In fact, the opposite is the case, with gradual improvement in returns documented. Hence, by synthesizing these insights, there seems to be reason to believe that the performance of PE-backed IPOs may well be sensitive to geographical context.

To further the robustness of the results thus presented, we include various alterations to the base specification by bootstrapping the sample according to potentially influential contingencies, as follows in section 9.2.3. Due to scope, the majority of the actual tables are presented in the appendix. Before doing so, we first delve into the impact of the financial crisis on the reported performance patterns.

9.2.2. Aftermarket Performance – Impact of Financial Crisis

We repeat the OLS regression analysis including an interaction term between the *PE Dummy* and a *Post-crisis Dummy*, to proxy whether PE-backed IPOs appear more or less resistant to financial crises (Bernstein et al., 2018). Due to the inclusion of the *Post-crisis Dummy* assuming a value of 1 if the firm was listed after 2008, we do not include year fixed effects when running the specification.

For all four time windows, the *PE Dummy* continues to be positive and significant at the 1% level. The coefficient estimate for the *PE Dummy*Post-crisis Dummy* interaction shows no statistical significance, indicating that PE-backed IPOs do seem to sustain their superior performance, with the latter not being significantly different after the crisis. This could be symptomatic of some degree of robustness to exogenous financial shocks. Finally, while it may appear surprising that the *Post-crisis Dummy* itself is not negative and significant across all periods, given the crisis' general detrimental impact on stock returns globally (Bernstein et al., 2018), this is likely a result of the computational features of the BHAR measure. Particularly, the latter is computed by subtracting the S&P 500 index return, which likewise suffered as a result of the crisis (CRSP, 2019), presumably leading to a net neutral effect on post-crisis BHARs.

The results thus presented are confirmed if performing a t-test of difference in the mean BHARs for the PE-backed IPOs floated prior to versus after the crisis, in which we document no statistically significant difference between the two subgroups, as shown in App. 9(c).

TABLE 9.8: AFTERMARKET PERFORMANCE (BHAR BASED ON S&P 500) REGRESSION INCLUDING POST-CRISIS INTERACTION TERM

Coefficient	6 Months	12 Months	24 Months	36 Months
Intercept	0.2110 (1.46)	(-0.0319) (-0.17)	0.2301 (0.94)	-0.7645 (-2.76)***
PE Dummy	0.1396 (4.00)***	0.2008 (4.46)***	0.1942 (3.48)***	0.2989 (4.71)***
Post-crisis Dummy	0.0593 (1.76)*	0.01329 (0.31)	-0.0508 (-0.95)	-0.1009 (-1.66)*
PE Dummy*Post-crisis Dummy	-0.0491 (-0.79)	0.0761 (0.95)	0.0309 (0.31)	-0.0274 (-0.24)
LN (Total Assets)	0.0095 (0.64)	0.1986 (1.05)	0.0612 (2.55)**	0.0700 (2.57)**
Year Fixed Effects?	No	No	No	No
Industry Fixed Effects?	Yes	Yes	Yes	Yes
R-Squared	0.0810	0.0744	0.1006	0.0880
Adjusted R-Squared	0.0565	0.0495	0.0761	0.0616
N	733	728	720	678

To the best of our knowledge, few attempts have been made at directly discerning potential performance differences for PE-backed IPO firms in the wake of the crisis. One noteworthy mention is found in Chamberlain & Joncheray (2017), although these two authors examine the European market, who find that the performance of PE-backed IPOs worsens after the crisis, albeit still showing some signs of outperformance vis-à-vis the market. We do not find evidence that this seems to be the case for the US, as such would have manifested itself in a negative and significant *PE Dummy*Post-crisis Dummy* interaction term. Hence, supporting our previous proposition on the general sensitivity of PE-backed IPO performance to geographical context, it could be that the impact of the crisis indeed also varies across markets (Prasad, Puri, & Jain, 2015).

9.2.3. Robustness Tests of Aftermarket Performance

Firstly, we recompute the regressions when including leverage as a control variable and continue to with that the *PE Dummy* coefficient is positive and significant for the 12- and 36-month windows, respectively. The statistical significance vanishes for the other periods, although the sign of the coefficient remains positive as expected. We do warrant caution given the relative difficulty in sourcing reliable leverage data for a substantial fraction of the sample firms, implying that the sample size is also smaller in the specification reported below. Nevertheless, it could seem that leverage does indeed

have a moderating effect, even if the exact magnitude remains difficult to conclude upon. Interestingly, for none of the reported periods is the coefficient estimate for the leverage control variable significant.

TABLE 9.9: AFTERMARKET PERFORMANCE (BHAR BASED ON S&P 500) REGRESSION INCLUDING LEVERAGE CONTROL.

Coefficient	6 Months	12 Months	24 Months	36 Months
Intercept	0.2937 (1.79)*	0.2204 (1.03)	0.2802 (1.01)	-0.7991 (-2.58)***
PE Dummy	0.0348 (0.97)	0.0991 (2.16)**	0.0726 (1.24)	0.2167 (3.31)***
LN (Total Assets)	0.0181 (1.18)	0.0363 (1.85)*	0.0707 (2.78)***	0.0960 (3.37)***
Leverage Ratio	0.0134 (0.21)	-0.1053 (-1.26)	0.0126 (0.12)	-0.1899 (-1.60)
Year Fixed Effects?	Yes	Yes	Yes	Yes
Industry Fixed Effects?	Yes	Yes	Yes	Yes
R-Squared	0.0857	0.1130	0.1263	0.1166
Adjusted R-Squared	0.0421	0.0704	0.0838	0.0710
N	703	699	691	654

Next, we rerun the tests without the firms belonging to the *High Technology* industry. As indicated in the Sample Description, the matched group exhibits a somewhat higher concentration in this industry. Since firms in *High Technology* are presumably particularly likely to constitute startup firms, which are less comparable to our sample given the maturity criterion employed in the sample identification phase, we test to see whether the outperformance of the PE-backed IPOs disappears when eliminating this industry completely. Per App. 10(b) and 11(a), the findings from the base case remains unchanged with regards to the mean and median BHARs as well as the regression analysis.

Furthermore, given the presence of a few extreme values in both groups, which leads to the infamous skewness of the BHAR distribution (Barber & Lyon, 1997; Cowan & Sergeant, 2001), we compute the results when eliminating those values deviating by more than three standard deviations from the mean BHAR in each period, simultaneously reducing any impact of potential heteroscedascity in the data set. As is evident from App. 10(c) and 11(b), the significant outperformance for the PE-backed group, both vis-à-vis the market and the matched control group, largely persists as we bootstrap the sample to more closely resemble the normal distribution. The matched control group continues to significantly underperform the S&P across all time windows. For the PE-backed IPOs, statistically

significant positive mean and median BHARs are continue to persist for the 6- and 12-month periods. The mean and median BHARs for the 24- and 36-month period remain statistically insignificant from zero, with the exception of the 24-month mean. This further supports the overall finding that, while the PE-backed IPOs seem to outperform quite consistently over the shorter run, any outperformance over the longer run could well be attributed to a few firms performing extremely well.

Finally, we benchmark the PE-backed IPOs against the full control group of 1,800 non-PE-backed firms. In line with the results for the matched control group, we document significant underperformance at the 1% level for the full control group across all time periods, with the exception being the 6- and the 24-month mean. Interestingly, when we rerun the regression analysis, the coefficient estimate for the *PE Dummy* falls in significance, and even disappears for some of the specified time windows. Specifically, for the 24-month window, the OLS estimate carries the expected positive sign, but remains statistically insignificant as seen in Appendix 10(d). For the three other periods, the coefficient for the dummy is positive and significant, but only at the 5%, for the 6- and 12-month period, and at the 10% level for the 36-month period.

One potential explanation for the observed lower significance of the *PE Dummy* could be found in noting that the full control group shows substantially higher concentration in the years immediately leading up to the dot.com bubble, being 1997-1999 compared to the group of PE-backed IPOs (App. 12). It is thus likely that the full control group is characterized by a greater proportion of startup firms that were listed prior to the bubble and enjoyed impressive performance in the first couple of years after flotation – exactly the period we measure – until the burst of the bubble (Ritter, 2018). We do warrant further examination before any definite conclusions are drawn, nevertheless.

9.2.4. Analysis of Operating Performance

The tables below show the results from running the OLS regression model paralleling that carried out for aftermarket performance, but with the dependent variables substituted for the industry-adjusted EBITDA margin and ATO ratio for the year prior to the IPO, defined as T-1, up until three years after.

TABLE 9.10: OPERATING PERFORMANCE
BASE SPECIFICATION REGRESSION

PANEL A: ATO RATIO

Coefficient	**T-1**	**T0**	**T+1**	**T+2**	**T+3**
Intercept	0.8505 (2.21)**	0.6354 (1.83)*	0.3403 (1.04)	-0.0924 (-0.26)	-0.092 (-0.20)
PE Dummy	-0.0646 (-0.80)	0.2050 (2.82)***	0.2429 (3.60)***	0.1690 (2.44)**	0.1531 (2.03)**
LN (Total Assets)	-0.0642 (-1.84)*	-0.0397 (-1.27)	-0.0219 (-0.76)	-0.0102 (-0.34)	-0.0174 (-0.55)
Year Fixed Effects?	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects?	Yes	Yes	Yes	Yes	Yes
R-Squared	0.3443	0.3945	0.4235	0.4063	0.3700
Adjusted R-Squared	0.3146	0.3671	0.3969	0.3762	0.3343
N	718	718	703	645	579

PANEL B: EBITDA MARGIN

Coefficient	**T-1**	**T0**	**T+1**	**T+2**	**T+3**
Intercept	-0.4116 (-0.61)	-0.1686 (-1.90)*	-0.3943 (-4.59)***	-0.2291 (-1.62)	-0.4879 (-1.99)**
PE Dummy	0.0787 (0.56)	0.0287 (1.53)	0.0263 (1.48)	0.0395 (1.45)	0.0487 (1.20)
LN (Total Assets)	0.0539 (0.88)	0.0133 (1.65)*	0.0094 (1.24)	0.0111 (0.95)	0.0239 (1.39)
Year Fixed Effects?	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects?	Yes	Yes	Yes	Yes	Yes
R-Squared	0.0280	0.0684	0.0798	0.0751	0.0994
Adjusted R-Squared	0.0160	0.0262	0.0373	0.0283	0.0482
N	718	718	703	645	579

In terms of ATO, we do observe indications that the PE-backed IPOs outperform the matched control group in all periods examined, with the exception of the year prior to the IPO, with the *PE Dummy* being positive and significant for year T0 through T+3. Hence, compared to the matched control group, the PE-backed IPO firms appear to enjoy relatively greater efficiency in the post-IPO period. These findings are supported if directly comparing the industry-adjusted ATO medians, applying the Wilcoxon test of difference from zero, for the two groups, as shown in the table below.

TABLE 9.11: COMPARISON OF INDUSTRY-ADJUSTED MEDIANS

Null hypothesis: The median equals zero. High test statistics reject the null.

	PE-backed IPOs Medians			Matched Control Group Medians		
	ATO Ratio	**EBITDA Margin**	**N**	**ATO Ratio**	**EBITDA Margin**	**N**
T-1	-0.0913 (-1,877)	-3.17% (-9,643)***	305	-0.0348 (1,977)	-10.64% (21,510)***	413
T0	-0.0492 (-794)	-1.80% (-5,998)**	305	-0.1972 (-17,603)***	-6.48% (-15,276)***	413
T+1	-0.0490 (-174)	-2.21% (-4,397)***	290	-0.1398 (-16,447)***	-8.06% (-16,360)***	413
T+2	-0.0248 (-60)	-1.64% (-4,262)***	275	-0.0954 (-10,509)***	-7.35% (-12,931)***	370
T+3	-0.0267 (-277)	-2.00% (-4,596)***	254	-0.1479 (-8,750)***	-6.19% (-8,631)***	325

While the matched control group consistently exhibits ATO ratios significantly below the industry benchmark, the PE-backed IPOs show no signs of underperformance vis-à-vis the industry medians. More specifically, for none of the periods can we reject the null hypothesis of the median being zero, indicating that the PE-backed IPOs, at least to a greater extent, seem to match the performance of the relevant industry benchmark. These findings parallel those of Levis (2011), who document an ATO ratio for his PE-backed IPO subsample which significantly exceeds that of the non-backed control group, both on a raw-unadjusted level as well as when adjusting by the industry median.

A vastly more ambiguous picture is noted if scrutinizing the results from the EBITDA margin regression. Across all periods, the sign of the PE dummy coefficient is positive as expected, although not significant. We find these results surprising, given the relatively solid body of evidence documenting the superior performance of PE-backed firms on this exact measure of operating performance, singing fully in tune with the prototypical emphasis on profitability employed by PE sponsors (Gertner & Kaplan, 1998; Jensen, 1986; Spliid, 2007). Particularly, scholars have reported profitability measures consistently exceeding those of non-backed peers and industry alike in the years following the listing (Cao, 2013; Holthausen & Larcker, 1996; Levis, 2011), largely showing persistence across time periods and geographies. We seek to uncover potential explanations for this result when running robustness tests on the operating performance measures.

To triangulate the results, we first rerun the regression excluding fixed effects altogether. As is evident from App. 15(a), the results from the regression on ATO without fixed effects largely parallels the

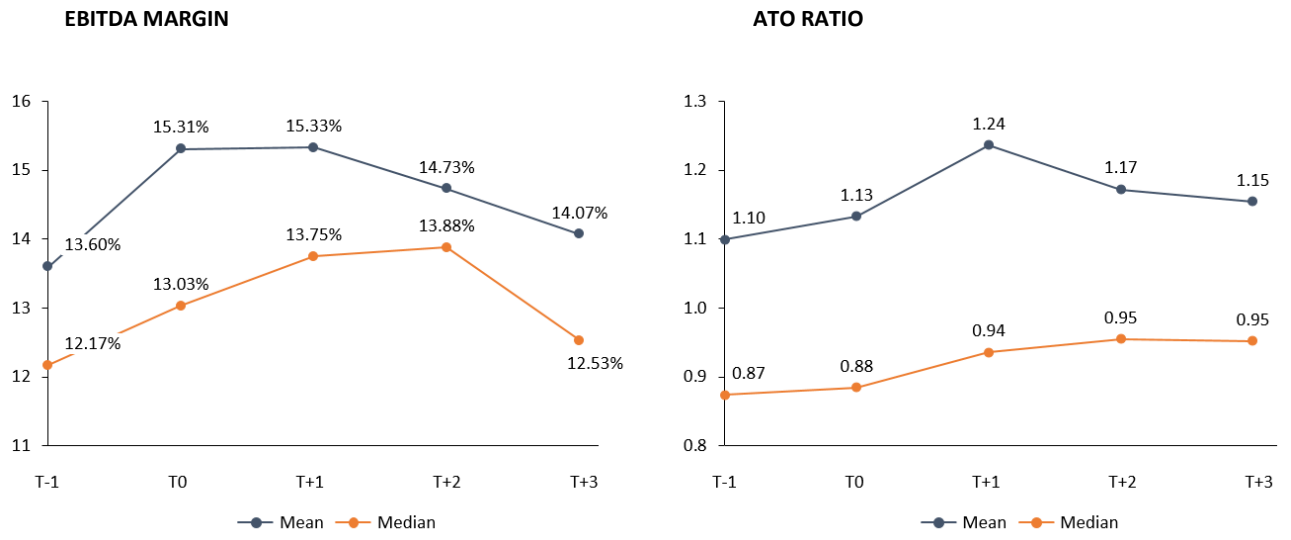
base specification. In terms of profitability, the *PE Dummy* coefficient now exhibits significance at the 10% level for T+1 and T+2. Since we regress on the industry-adjusted operating measures, we moreover run specifications which include year fixed effects, but no industry fixed effects, to proxy whether this makes a marked difference. As shown in App. 15(b), this is not the case and we obtain results in line with those thus presented. As in the specification excluding all fixed effects, the signs of superior profitability for the PE-backed IPOs becomes stronger relative to the base case, with the coefficient estimates for the PE dummy being significant for T+1 and T+2.

The signs of superior profitability, even if weak, that seems to characterize the years immediately after the listing is supported if directly comparing the median industry-adjusted EBITDA margins for the PE-backed IPO group and the matched control group per Table 9.11. While groups largely underperform the applied industry EBITDA margin benchmarks, the underperformance of the matched control group seems larger in magnitude for all of the measured periods. It is likely the manifestation of this pattern which leads to the slight outperformance of the PE-backed IPO group in the regression. Given the weak significance and ambiguity, we nevertheless continue to advice caution in drawing overly deterministic conclusions. Also, as is the case for the analysis of aftermarket performance, the results are highly sensitive to the benchmark applied and may thus command further triangulation.

When we compute the development in the raw, unadjusted operating performance measures for the PE-backed IPOs, we find that both the mean and median appear somewhat persistent over time as depicted in Figure 5. If anything, the ATO ratio seems to exhibit a slight increase over time, rising from a mean of 1.10 in the year prior to the IPO to 1.15 three years after the IPO. These results thus contradict the seminal findings of DeGeorge & Zeckhauser (1993) who document deterioration in operating performance of PE-backed IPOs following the listing. Particularly, the authors find that the performance peaks just prior to the listing only to decrease gradually hereafter.

In interpreting the apparent differences vis-à-vis these authors, it should be noted that the paper referred to investigates the period 1983–1987, just at the very inception of first buyout wave (Kaplan & Strömberg, 2009). It may well be expected that the pattern indeed has changed over time, potentially coinciding with a difference in the extent to which the sponsors maintain a meaningful presence in the post-IPO period. Furthermore, Levis (2011) seems to find a slight reduction in the industry-adjusted EBITDA margin, falling from 15.0% in T-1 to 14.3% in T+3 in his inquiry into UK-based PE-backed IPOs. Combining these insights with our findings reveals the sensitivity of the conclusions not only to time periods, but also to geographies, as was the case for aftermarket performance.

FIGURE 5: UNADJUSTED OPERATING PERFORMANCE FOR PE-BACKED IPOS



Supporting the aforementioned, when we benchmark our findings against those of Cao (2013), whose research design to a greater extent resembles ours by focusing on US RLBOs listed from 1981-2006, we find a roughly similar pattern in terms of profitability. Particularly, he documents unadjusted EBITDA margins for his sample of RLBOs of 13.20%, 16.25%, 15.72% and 12.79% from T-1 up until T+2, largely corresponding to the figures prevailing in our study. This supports our confidence in the reliability of the data. Furthermore, when adjusting by the industry median, Cao (2013) too finds evidence contradicting DeGeorge & Zeckhauser (1993) with no apparent deterioration in performance. He thus finds industry-adjusted median EBITDA margins of 0.27%, 1.86%, 1.35%, and 0.96% from T-1 to T+2, all showing no significant difference from zero, being indicative of the group exhibiting no signs of superior profitability compared to the industry.

9.2.5. Operating Performance – Impact of Financial Crisis

As in section 9.2.2., we run specifications to test whether the documented operating performance seems to have changed in the wake of the financial crisis. Again we exclude year fixed effects due to the inclusion of the *Post-crisis Dummy*. As shown in Panel A in Table 9.12, depicting the results from the regression on the ATO ratio, we continue to find that the *PE Dummy* coefficient is positive and significant for T0 through T+3. The interaction term *PE Dummy*Post-crisis Dummy* is negative for all periods, albeit insignificant, and we thus observe no indications that the financial crisis exerts a moderating effect on the ATO ratio of PE-backed IPOs. Particularly, as for aftermarket performance, the superior efficiency seems robust to the crisis.

TABLE 9.12: OPERATING PEFORMANCE
REGRESSION WITH POST-CRISIS INTERACTION TERM

PANEL A: ATO RATIO

Coefficient	**T-1**	**T0**	**T+1**	**T+2**	**T+3**
Intercept	0.7956 (2.36)**	0.5534 (1.82)*	0.3796 (1.30)	-0.0284 (-0.09)	0.0538 (0.13)
PE Dummy	-0.0491 (-0.61)	0.2296 (3.17)***	0.2471 (3.67)***	0.1781 (2.58)**	0.1560 (2.11)**
Post-crisis Dummy	0.0289 (0.38)	0.0240 (0.35)	-0.0108 (-0.17)	-0.0660 (-1.01)	-0.0791 (-1.12)
PE Dummy*Post-crisis Dummy	-0.1507 (-1.06)	-0.1741 (-1.36)	-0.1497 (-1.27)	-0.1273 (-1.05)	-0.0838 (-0.64)
LN (Total Assets)	-0.05213 (-1.50)	-0.0252 (-0.81)	-0.0083 (-0.29)	0.0050 (0.17)	-0.0070 (-0.22)
Year Fixed Effects?	No	No	No	No	No
Industry Fixed Effects?	Yes	Yes	Yes	Yes	Yes
R-Squared	0.3077	0.3584	0.3825	0.3618	0.3335
Adjusted R-Squared	0.2919	0.3438	0.3681	0.3455	0.3145
N	718	718	703	645	579

PANEL B: EBITDA MARGIN

Coefficient	**T-1**	**T0**	**T+1**	**T+2**	**T+3**
Intercept	-0.3356 (-0.58)	-0.1335 (-1.73)*	-0.2963 (-3.98)***	-0.0749 (-0.59)	-0.1369 (-0.60)
PE Dummy	0.0979 (0.71)	0.0241 (1.31)	0.0290 (1.69)*	0.0425 (1.68)*	0.0546 (1.39)
Post-crisis Dummy	-0.1776 (-1.35)	-0.0093 (-0.53)	-0.0409 (-2.51)**	-0.0535 (-2.12)**	-0.1343 (-3.58)***
PE Dummy*Post-crisis Dummy	0.2295 (0.95)	-0.0147 (-0.45)	0.0493 (1.66)*	0.0709 (1.66)*	0.1743 (2.52)**
LN (Total Assets)	-0.0417 (0.70)	-0.0134 (1.70)*	0.0063 (0.86)	0.0055 (0.49)	0.0166 (1.00)
Year Fixed Effects?	No	No	No	No	No
Industry Fixed Effects?	Yes	Yes	Yes	Yes	Yes
R-Squared	0.0177	0.0325	0.0690	0.0470	0.0846
Adjusted R-Squared	0.0048	0.0103	0.0473	0.0224	0.0584
N	718	718	703	645	579

A somewhat different patterns seems to persist in the EBITDA margin regression. Worth noting, the coefficient estimate for the *Post-crisis Dummy* is negative and significant for the three years following the listing. Hence, it could seem that the crisis exerts a negative exogenous shock to IPO firm profitability, fully in line with Prasad et al. (2015). Interestingly, the interaction term *PE Dummy*Post-crisis Dummy* is positive and significant for all three years after the listing, implying that PE-backing seems to have a positive moderating effect on profitability for firms listed post-crisis. While we warrant further examination, this finding could potentially hint at the role of PE sponsors in reducing the detrimental impact of increased macroenvironmental fragility and turbulence, in line with the findings of Bernstein et al. (2018).

9.2.5. Robustness Tests of Operating Performance

To further the validity of the findings, the next section presents a range of robustness tests, largely following the structure laid out in section 9.2.3. Firstly, when we rerun the base specification, but now also introduce leverage as a control variable, we report no noteworthy change for either performance measure (App. 15(c)). Also, across both measures and all time periods, the coefficient estimate for the *Leverage Ratio* itself remains statistically insignificant. When we run the specification with only year fixed, but no industry fixed effects, the results remain similar to those thus presented as shown in App. 15(d).

App. 15(e) presents the results from running the specification where we exclude firms in the *High Technology* industry. Interestingly, the signs of outperformance are sustained for the ATO ratio and, in fact, strengthened for the EBITDA margin. For the latter, the PE dummy coefficient is now positive and significant at the 10% level for the year of and immediately after the IPO. This notion could potentially indicate that the insignificance of the PE dummy in the base specification could be driven by the comparatively higher concentration of firms in the high technology industry for the matched control group; an industry characterized exactly by high profit margins (CRSP, 2019).

As a final check, we repeat the analysis including the full control group and report no significant deviations from the main findings (App. 15(f)). The statistical significance of the *PE Dummy* for the regression on ATO increases quite substantially, being significant at the 1% level for T0, T+1 and T+2. In terms of profitability, we continue to find meagre to no signs of outperformance relative to the non-backed firms, although the sign of the *PE Dummy* coefficient remains positive as expected. Only in the very year of the IPO is the coefficient significant at the 10% level, supporting our main

conclusion that, while the PE-backed IPOs seem to outperform non-PE-backed firms in terms of efficiency, the indications of superior profitability are less evident.

9.2.5. Sub-conclusion for Analysis of Performance

To summarize briefly on the analysis of performance, we do overall find quite convincing evidence of superior aftermarket performance for the PE-backed IPOs relative to the market and the matched control group in the period immediately following the listing, being the 6- and 12-month windows, lending support to hypothesis **H1(a)**. Over the 24- and 36-month periods, the evidence is less robust and could be attributed to a few firms performing well. While continuing to outperform in the post-crisis period, the performance is not markedly different, showing in the lack of significance of the *PE Dummy*Post-crisis* interaction term. In terms of operating performance, the PE-backed IPOs do seem to enjoy higher efficiency measured in ATO, being robust to several tests, albeit also not showing more pronounced outperformance in the post-crisis period. For profitability, measured in the EBITDA margin, we document ambiguous results with no apparent outperformance. Interestingly, it nevertheless seems that PE-backing has a positive moderating effect on profitability post-crisis in the three years following flotation with a positive, significant *PE Dummy*Post-crisis* interaction term for T+1, T+2 and T+3. Overall, in terms of efficiency, **H1(b)** is supported, although the same does not pertain to profitability.

9.3. COMPARATIVE ANAYSIS OF APPROACH TO VALUE CREATION

While the preceding section sought to shed light upon the performance of IPOs backed by PE in the period after the listing, the following analysis delves deeper into the very mechanisms of value creation employed by the sponsor in the private period to test hypothesis **H2(a).** To explore the dynamic and potential differences arising over time from as many relevant angles as possible, the analysis adopts a tripartite structure.

Firstly, we examine the basic characteristics of the sample, being the prevalence of SBOs, syndicated buyouts, and sponsor size. While these variables are not, in and by themselves, of primary interest for the study, they still contribute an important understanding of the nature of PE. Secondly, we examine the more conventional levers of value creation as cemented in existing literature and frequently subjected to empirical inquiry (Cao, 2012; Filatotchev, 2012; Kaplan & Strömberg, 2009). These predominantly apply emphasis to the role of financial and governance engineering. Finally, we introduce the analysis of the use of operational levers, concerned with enabling concrete changes at the

operational and/or strategic level of the portfolio company, constituting the main point of interest for the paper. It is exactly these variables which will be subject to even greater scrutiny in section 9.4. where we compute cross-sectional regression analysis to test the association with performance.

For each of the three analytical dimensions, we report the mean, if the variable is numerical continuous, or proportion, if the variable is a binary dummy, for the relevant measure both for the full sample of 318 PE-backed IPOs as well as for the two subsamples; one comprising the firms acquired prior to the financial crisis, the other comprising those acquired after the crisis in 2008. As such, we seek to examine whether the approach to value creation has changed over this period. However, we do warrant great caution given that a substantial portion of the firms acquired after the crisis have presumably not been exited yet by the sponsor firm. As such, our post-crisis sample may be slightly biased given the relatively small sample size of 47 firms. Still, we believe the analysis contributes an important first attempt to inquire into the changing nature of value creation in more recent times and may hopefully provide inspiration for future research into the topic.

For each of the variables, we include the test statistic for significant difference in the mean/proportions between the pre- and post-crisis subsamples. We report the P-value for Fisher's Exact Test to examine whether the proportions differ between the subsamples, while relying on t-tests for the arithmetic means. No test statistics for Fisher's Exact Test are reported since these are not defined. To triangulate the latter, we also conduct Chi-Squared tests for independence, although these are left for App. 16. Nevertheless, the tests serve the same purpose, namely to determine whether we observe statistically significant differences between the use of each mechanism between the two subsamples, being indicative of a potential shift in the operating model of PE sponsors over time.

9.3.1. Basic Characteristics

As depicted in Table 9.13, the pre- and post-crisis groups differ significantly on three out of the four basic characteristics, the only exception being the *Consortium* variable. In all three cases, the deviation seems to be aligned with what may be expected. Particularly, the proportion of SBOs increases drastically for the post-crisis subsample, rising from 13.97% to constituting more than one third. Given the growth and industry trends described earlier (Bain, 2018), it is hardly surprising that we observe a rise in buyouts of firms which have previously undergone PE ownership.

TABLE 9.13: BASIC CHARACTERISTICS

Null hypothesis = No difference between the subsamples

Type	Variable	Full Sample	Pre-crisis Subsample	Post-crisis Subsample	Test Statistic	P-Value
Proportion	SBO	16.98%	13.97%	34.78%	*N/A*	0.0012***
Proportion	Consortium	30.50%	31.62%	23.91%	*N/A*	0.3867
Mean	Sponsor size (BN)	16.87	14.56	30.55	3.63***	0.0007
Mean	Sponsor # of funds	9.40	8.49	14.78	2.92***	0.0038

The pattern observed above lends credence to the findings of Strömberg (2008) and Achleitner & Figge (2014), the latter noting that SBOs grew from 2% of total enterprise value during 1985-1980 to impressive 25% from 2005-mid-2007 (Kaplan & Strömberg, 2009). Our results thus support the continuation of this trend. Moreover, while further systematic scrutiny would be required, this notion could indeed support the hypothesis that PE sponsors increasingly have to resort to other and more operationally-oriented mechanisms, to the extent that previous PE ownership has necessarily exhausted the conventional value creation levers (Achleitner, Figge, & Lutz, 2012; Kitzmann & Schiereck, 2009; Sousa, 2010; Wang, 2012).

We do not find evidence for a change in the tendency of PE sponsors to engage in syndication of deals, as evidenced by the lack of a statistically significance difference for the *Consortium* dummy. For both subsamples, we find that approximately 25-30% of all deals are carried out by a consortium of two or more sponsors. As documented by Huyghebaert & Priem (2017) as well as Meuleman, Wright, Manigart, & Locket (2009), syndication is principally carried out for the purpose of risk-sharing and opportunity to benefit from knowledge complementarities. With these rationales carrying close to time-invariant applicability, we find that the lack of a significant change in the prevalence of consortium deals is rather unsurprising.

The last two variables proxy the size and experience of the PE sponsor, measured in the average capital committed and number of funds raised from the first vintage up until the time of the IPO, respectively. Fully in line with what may be expected, we find a significant increase in both committed capital and number of funds raised by the sponsors for the post-crisis subsample, both metrics almost doubling from one period to the next. Hence, these findings lend testimony to the continued dominance of large, well-established sponsor firms (Døskeland & Strömberg, 2018) as also documented in our sample per App. 5.

9.3.2. Conventional Levers of Value Creation

The table below presents a selected range of what Achleitner & Figge (2014) coin the conventional levers of PE value creation, principally concerned with leverage as well as control, monitoring, and incentive mechanisms (Cumming, Siegel, & Wright., 2007; Gertner & Kaplan, 1998; Spliid, 2007).

TABLE 9.14: CONVENTIONAL LEVERS OF VALUE CREATION

Null hypothesis = No difference between the subsamples

Type	Variable	Full Sample	Pre-crisis Subsample	Post-crisis Subsample	Test Statistic	P-value
Mean	PE Ownership Change	-23.33%	-23.85%	-20.22%	3.03***	0.0031
Mean	Insider Ownership Change	-1.81%	-1.89%	-1.31%	1.64	0.1034
Mean	Variable Pay Component	111.75%	110.83%	117.15%	0.33	0.7378
Proportion	Chairman of the Board	31.13%	29.78%	39.13%	*N/A*	0.2292
Mean	PE Board Representation	46.69%	46.64%	47.00%	0.14	0.8919
Mean	Leverage, pre-IPO	58.45%	60.17%	48.51%	-2.52**	0.0138
Mean	Leverage, post-IPO	41.22%	41.83%	37.71%	-1.18	0.2389

With regards to the ownership structure, we test two variables of interest; the change in the ownership stake of the PE sponsor and that of insiders, comprising directors and executives of the company (Cao, 2012). While the first variable thus effectively relates to the control effect, given that a high ownership stake facilitates direct influence over firm decisions (Levis, 2011), the insider ownership stake proxies the use of longer-term incentives (Cao, 2012; Filatotchev, 2012). We complement the latter by also examining the use of variable pay for top management, to a greater extent resembling short-term incentives (Cumming et al., 2007).

For the two incentive variables, we find no significant differences between the subsamples. In both cases, the insider ownership falls by approximately 1.5% - 2% after the IPO. Variable pay, conforming fully with the traditional PE operating model (Jensen, 1986; 1989; Kaplan, 1989b, Muscarella & Vetsuypens, 1990), constitutes a high percentage of total executive compensation, averaging around 112% of the fixed salary component. While we report the figures only at the very time of the IPO, a

fruitful avenue for future research would be to examine the gradual development in the use of incentive pay post-IPO. The latter may well find inspiration in Leslie & Oyer (2009) who document rather quick convergence in compensation differences between PE-backed and non-backed IPO firms.

What is interesting to note is the significant difference in the PE ownership change, measuring how much the sponsors exit in the IPO. In both cases, the stake held by the sponsor is reduced, yet we find that PE sponsors tend to shed less of their ownership stake for the post-crisis subsample, allowing for greater retention of control even as the firm is listed for public ownership. Particularly, while the average pre-crisis sponsor exits 23.85% of their stake in the IPO, the comparable figure for the post-crisis sample stands significantly lower at 20.22%. In comparison, Levis (2011) documents an average reduction in PE ownership of 29.8%, falling from 55.9% pre-IPO to 26.1%. Paralleling this, Cao (2013) finds that PE ownership is reduced from 60.19% to 39.77% in the IPO. Further comments on the trend toward greater retention of control post-IPO will follow in the next section when discussing holding period, since the dynamics between these two variables may reveal an interesting change in the approach of PE to their active ownership role.

In both periods, PE sponsors continue to hold substantial board control with up towards 50% of the board members being affiliates from the PE firm. In terms of assuming control of the chairman role, we document quite a notable increase with 39.13% of the firms in the post-crisis sample having a chairman installed who is affiliated with the PE firm, up from 29.78% pre-crisis. However, we fail to document statistical significance of the increase and thus encourage further examination before concluding upon this pattern. Our metrics seem to largely parallel those reported in existing literature with Cao & Lerner (2009) finding that approximately 40% of the boards are controlled by the PE sponsor and 30% of the sample has a chairman from the PE firm installed. Approximating these findings, Cao (2013) reports average PE board representation of 38.35% at the time of the IPO from 1981-2006. Hence, these conventional governance levers of control and monitoring seem, unsurprisingly, to be of continued importance for the PE operating model.

Finally, we compute the leverage ratio, defined as Long-Term-Debt-to-Total-Assets, immediately prior to the IPO as well as following the offering, given the prototypical use of proceeds from the issue to pay down debt (Cao, 2013; Levis, 2011). Worth noting, the pre-crisis subsample shows a significantly higher amount of leverage prior to the offering, standing at 60.17% compared to 48.51% for the firms bought out after the crisis. We report no statistical difference between the leverage ratios after the listing with the average figure standing around 40%, confirming the tendency to reduce

leverage levels after the IPO in line with Cao (2013) likewise documenting a decrease in leverage from 56.55% prior to the IPO down to 35.82% after the offering.

9.3.3. Operational Levers of Value Creation

The third and final component of the comparative analysis examines our key variables of interest, namely those related to operational engineering (Kaplan & Strömberg, 2009). Given the recency of this field of empirical inquiry, comparison with existing literature remains difficult. We have nevertheless sought to incorporate reflections whenever possible.

TABLE 9.15: OPERATIONAL LEVERS OF VALUE CREATION

Null hypothesis = No difference between the subsamples

Type	Variable	Full Sample	Pre-crisis Subsample	Post-crisis Subsample	Test Statistic	P-value
Mean	Holding Period	3.90	4.03	3.15	-3.58***	0.0005
Proportion	Buy-and-Build	21.70%	19.49%	34.78%	*N/A*	0.0317**
Mean	Speciali-zation (ICA)	2.33	2.32	2.34	0.06	0.9530
Proportion	Management Turnover	27.36%	28.68%	19.57%	*N/A*	0.2168
Mean	PE Board Expertise	24.95%	22.52%	39.35%	2.72***	0.0069
Proportion	Operating Partner	20.13%	19.12%	26.09%	*N/A*	0.3194

Quite interestingly, we find that the holding period for the post-crisis sample is significantly lower than the pre-crisis sample. Several factors could contribute to this. Firstly, it remains important to consider that the post-crisis sample may not be fully representative of the population since many of the firms acquired by PE after 2008 have presumably not been exited yet, as hinted at earlier. A natural bias thus inherently characterizes the *Holding Period* variable, pulling it downward for the post-crisis sample.

The picture becomes even clearer if noting that the maximum holding period for the pre-crisis sample stands at 14 years and shows much higher standard deviation, while the maximum for the post-crisis sample is only 5.81 years, since insufficient time has lapsed for us to witness equivalently long holding period figures for this group of firms. The medians are, not surprisingly given the presence of a few extreme values in the pre-crisis group, much closer.

TABLE 9.16: HOLDING PERIOD FIGURES – REPORTED IN YEARS

Statistic	Pre-crisis Subsample	Post-crisis Subsample
Max	14.46	5.81
Min	0.21	0.47
Median	3.46	3.09
Mean	4.03	3.15
Standard deviation	2.56	1.29

While caution must be applied given the aforementioned sample bias, another potential explanation may command consideration. In the analysis of conventional levers of value creation, we noted that the reduction in PE ownership post-IPO appears significantly smaller post-crisis. The shorter holding period could thus be a manifestation of a changing approach to the very exit decision. Indeed, it could be that PE sponsors increasingly aim for a substantial degree of control post-IPO, reducing their ownership stake more slowly and deviating from the proverbial short-termism that PE sponsors have frequently been accused of practicing (Bain, 2018; INSEAD, 2018). Compared to other empirical findings, the holding period figures seem largely to resemble the prevailing picture. Particularly, Cao (2012) documents a mean holding period of 3.75 years and a median of 2.83, Muscarella & Vetsuypens report a mean of 2.89 years and a median of 2.41, and Levis (2011) finds a mean of 3.7 years versus a median of 3.0. If anything, we find a slightly longer holding period, although this may well be the result of differences in the approach to sample identification.

We find that the prevalence of Buy-and-Build is significantly higher in the post-crisis sample. Particularly, more than one third of the sponsors pursued such initiatives compared to only 20% in the pre-crisis sample. Our findings thus seem to confirm a notion that has long been emphasized in various industry reports, although much less subject to scholarly scrutiny; namely that such direct strategic efforts are of growing popularity among PE sponsors (Ernst & Young, 2016; PE Hub, 2015; Thomas H. Lee, 2012). In comparison, Muscarella & Vetsuypens (1990) find that 25% of their PE-backed IPO sample engaged in some sort of acquisitions during the private period. Since the designation of the *Buy-and-Build* variable in our study rests on more stringent criteria, being preconditioned not only on acquisition activity at the IPO firm level but also the express mention of the strategy by the sponsor in Preqin, we find reason to believe that there is indeed some gravitation toward greater use of this inorganic growth strategy. Again, we do nevertheless warrant further examination before claiming causality since it may indeed be the case that the shift pertains not to the PE sponsors value creation strategies but rather selection bias (Bernstein & Sheen, 2016). As such it remains crucial to determine

whether the apparent increased use of Buy-and-Build is simply a result of PE targeting firms which are already relying predominantly on acquisitions as their main growth strategy.

Interestingly, we do not find that sponsors in the post-crisis sample are significantly more specialized. In fact, the average ICA measure for the two groups are close to identical; 2.32 for the pre-crisis sample vs. 2.34 for the post-crisis sample. Hence, in both periods, the average sponsor is relatively specialized in industry terms with ICA measures strictly above 1. Worth noting, Rigamonti et al. (2016) find that relatively specialized sponsors are more likely to utilize IPOs as exit route, lending testimony to our finding.

In comparing the proportion of PE board members who possess expertise within the industry of the portfolio firm, we find that this figure is significantly higher post-crisis, standing at 39.35% versus 22.52% for the pre-crisis sample. Worth noting, the preceding section revealed no difference in the sheer magnitude of PE board representation. Existing literature on the topic remains scarce, although Gertner & Kaplan (1998) contribute an important impetus by studying the dynamics and structure of RLBO boards as well as basic characteristics of the directors compared to non-PE-owned public companies, reporting discernible differences between the two. Particularly, they find that PE directors tend to be younger, less tenured and receive larger equity stakes while the boards in general are smaller and meet less frequently. We believe that studying the professional background and expertise of these PE representatives may be worth considering for future scholarly inquiries.

Thus far, we seem able to conclude that, while PE sponsors do not appear to have changed the extent to which they obtain board control, they indeed seem more concerned with instilling industry-savvy representatives. This notion, combined with the lack of significant deviation in terms of specialization at the sponsor level, points to yet another pertinent distinction. Particularly, it seems relevant to discern how PE firms work with specialization at various levels – such as those of the firm, funds, all the way down to individual employees of the GP.

Finally, we report no significant deviation with respect to change in top management and the use of OPs. With regards to the latter, we do indeed find that the post-crisis sample shows a higher proportion of OPs, standing at 26.09% compared to just 19.12% in the pre-crisis sample. Given the relatively small sample size, we may well expect that this figure, assuming that the observed pattern continues to hold true, will eventually exhibit significant deviation, since enough time will have passed to reduce the standard deviation sufficiently. As mentioned throughout the paper, academia has seen few

if any studies of the prevalence and impact of OPs (Axial, 2015). We hope our inclusion of the variable inspires future scholars to inquire deeper into this mechanism.

With regards to management turnover, we find that the PE sponsors instigate immediate changes to the executive team in approximately 28.70% of the cases pre-crisis versus 19.57% post-crisis, albeit statistically insignificant. In comparison, Muscarella & Vetsuypens (1990) document comparable figures between 15%-19% in the period 1983-1987 for their sample of PE-backed IPOs, depending on which exact operationalization of the variable is employed. Interestingly, Guo et al. (2011) who investigate buyouts in general, not limited to PE-backed IPOs, document that 37.2% of CEOs are replaced immediately following the buyout. Likewise, Gong & Wu (2010) document a CEO turnover rate of 51% post-LBO, though allowing for a longer time horizon of two years. A natural avenue for future research would thus be to document whether this proportion varies in a predictable manner according to the exit route utilized by the sponsor.

9.3.4. Sub-conclusion for Comparative Analysis

To summarize our findings from the preceding analysis, we find that the use of Buy-and-Build strategies as well as the tendency to instill PE board representatives with industry expertise is significantly more pronounced for firms acquired post-crisis. While the conventional governance levers of control and incentive alignment seem to maintain their importance in recent time, lending testimony to the sustainability of the PE operating model, we do find that firms acquired after the crisis have lower leverage ratios prior to the IPO. This notion could lend further support to the hypothesized shift away from heavy reliance on financial engineering. We furthermore find that sponsors in the post-crisis subsample reduce their ownership stake to a lesser extent, potentially symptomatic of a changing approach to active ownership in the post-IPO period. For the variables of operational engineering where we report no statistical difference, this may be impacted by the relatively small sample size and warrants further scrutiny to determine whether a matter of empirical reality or sample bias. Overall, we do find partial support for **H2(a),** pending further empirical inquiry to cement our findings.

9.4. MULTIPLE REGRESSION ANALYSIS OF DIFFERENCES IN PERFORMANCE

To finalize the analysis of results, we report the findings for the multiple cross-sectional regression analysis, aimed at deriving explanations for which factors may drive differences in the performance of the PE-backed IPOs; more specifically, which operational levers are associated with both operating

and aftermarket performance per the hypotheses presented in section 6, specifically **H3(a)**, **H3(b)**, **H4(a)**, and **H4(b)**.

To enhance structural coherence, we first present and discuss the base specification after which the various altered versions are presented to examine which contingencies may moderate the main effects between the explanatory variables and performance. Due to scope limitations, we reserve a substantial fraction of the tables depicting the regression output for the appendix, although their implications are discussed in the main body of the text.

Where applicable, and deemed informative for the discussion, parallels will be drawn to previous literature as to contextualize our findings and elucidate the contribution this study makes in seeking to disentangle the mystery, as cemented in the empirical review, of which factors are associated with performance.

9.4.1. Drivers of Aftermarket Performance

Base Specification

Shown below is the regression output for the base specification which includes the three control variables, being *Ln (Total Assets)*, *Ln (Sponsor Size)*, and the *Consortium* dummy, as well as the six operational engineering mechanisms which collectively form the basis for our hypotheses. Hence, while the control variables are crucial in enhancing the validity of entertaining inferential statistics, we deliberately focus on the six value creation levers, as specified in section 8.3.1.

Firstly, we observe that the coefficient estimate for *Buy-and-Build* is negative and significant for the 6- and 24-month period at the 5% and 10% level, respectively, hence contradicting the findings of Nikoskelainen & Wright (2007) who find that add-on acquisitions are value creating, though adopting fund returns as the performance measure. Particularly, the coefficients of -0.0968 and -0.1337 suggest that the BHARs are reduced between 10-13%, ceteris paribus, if the sponsor relies on such inorganic growth strategy in the private period. Interestingly, it thus appears that investors do not necessarily associate add-on investments with value creation, potentially finding some merit in the concept of empire building (Thomsen & Conyon, 2012). This is issue has often been highlighted as a significant problem in large, mature companies, as explained in the section pertaining to governance engineering and reduction of the generic principal-agent problem (Jensen, 1989).

Due to the hypothesized recent reliance on operational measures vis-à-vis financial engineering (Kaplan & Strömberg, 2009; Renneboog & Vansteenkiste, 2017), it could be the case that investors are still of the conventional mindset that PE sponsors must instill cost cutting measures and apply leverage as to provide any value. Although speculative, it could seem that pursuing inorganic growth is regarded as a negative signal, in that investors have yet to recognize that the PE model is changing due to the commoditization of the conventional value drivers (Braun et al., 2017; Hammer et al., 2017). Still, we advise caution in interpretation given the lack of persistence across the time horizons.

In addition, we observe that having an OP installed by the sponsor is positively associated for the 6-month period at the 5% level, with a coefficient estimate of 0.1388, implying that the presence of these seasoned former executives increases the 6-month BHAR by around 14%, on average, all else being strictly equal. The dummy remains insignificant for the other time periods. While literature remain scare on this particular topic, our finding does lend credence to the fact that OPs may add value in the form deep industry expertise and experience (Thomas H. Lee, 2012). Indeed, Gompers et al. (2016) also document positive correlations between the use of OPs and performance.

While unsubstantiated, it could be considered whether the lack of significance for the longer time periods is a result of the OPs having fulfilled their role at the time of the listing and thus leaves the firm shortly hereafter, although further inquiry is necessary. Lastly, the coefficient estimate for the *Board Expertise* variable is positive and significant for the 24-month period following the IPO at the 10% level, while remaining insignificant for the other periods. Albeit ambiguous, this could lend some support to Acharya et al. (2013), who find a positive association between industry expertise and performance.

Unsurprisingly, we observe relatively humble R-squared, and adjusted R-squared, values across the time horizons, confirming the difficulty in discerning which factors are contributive to stock price performance (Bodie et al., 2014; Pedersen, 2015). When we compute specifications which exclude fixed effects, as shown in App. 19, we report results largely in line with those thus presented, with the only noteworthy exception being that the coefficient estimate for *Holding Period* now being positive and significant for the 6- and 12-month period.

TABLE 9.17: AFTERMARKET PERFORMANCE (BHAR BASED ON S&P 500)
BASE SPECIFICATION REGRESSION

Coefficient	6 Months	12 Months	24 Months	36 Months
Intercept	0.3469 (1.30)	0.4730 (1.28)	-0.3590 (-0.77)	-0.6871 (-1.03)
LN (Total Assets)	-0.0300 (-1.26)	-0.0280 (-0.85)	0.0433 (1.08)	0.0609 (1.06)
LN (Sponsor Size)	0.0006 (0.03)	0.0097 (0.38)	0.0301 (0.97)	0.0577 (1.31)
Consortium	0.0097 (0.20)	-0.0264 (-0.39)	-0.1054 (-1.28)	-0.1424 (-1.22)
Holding Period	0.0127 (1.29)	0.0160 (1.18)	0.0159 (0.93)	0.0298 (1.17)
Specialization	0.0826 (1.55)	0.0029 (0.04)	0.0487 (0.54)	0.0705 (0.55)
Buy-and-Build	-0.0968 (-2.01)**	-0.0868 (-1.30)	-0.1337 (-1.66)*	-0.0987 (-0.86)
Management Turnover	-0.0342 (-0.78)	-0.0323 (-0.54)	-0.0676 (-0.92)	-0.1192 (-1.14)
Board Expertise	0.0907 (1.30)	0.1177 (1.22)	0.2199 (1.86)*	0.1633 (0.98)
Operating Partner	0.1388 (2.41)**	0.0234 (0.29)	0.0909 (0.93)	0.0850 (0.62)
Year Fixed Effects?	Yes	Yes	Yes	Yes
Industry Fixed Effects?	Yes	Yes	Yes	Yes
R-Squared	0.1987	0.1577	0.1839	0.1233
Adjusted R-Squared	0.0895	0.0426	0.0699	0.0540
N	318	317	311	298

Interaction between Sponsor Specialization and SBO

Per hypothesis **H4(a)**, we test to see whether the effect of specialization is particularly pronounced in SBOs, through the introduction of the *SBO* dummy variable that interacts with the already deployed *Specialization* variable.

Worth noting, we find weak evidence for SBOs generally enjoying superior performance, with a significant positive coefficient for the 24-month post-IPO at the 10 % level. As discussed in the empirical review, literature remains limited on the performance of SBOs, compared to other contemporary research on PE, and little evidence thus discusses potential reasons for why and how PE owners unleash value in such deals (DeGeorge et al., 2016). If anything, theory suggests that, preconditioned on the

effectiveness of the former sponsors, little to no value can be further extracted and SBOs should, following this logic, underperform (Wright et al., 2009). We thus find it interesting that our findings do not confirm but rather contradicts, if weakly, the theoretical expectations with the *SBO* dummy being significantly positive in one period. Other scholars have found differing results. Achleitner & Figge (2014) document no significantly different performance of SBOs and DeGeorge et al. (2016) find that they might in fact be value destroying, on a risk-adjusted basis. Our results thus hint, albeit carefully, at a potentially changing pattern, perhaps coinciding with the postulated change to the PE operating model.

Interestingly, the *Specialization* variable becomes significant for the 6-month following the IPO compared to the base case specification. While not being persistent across the other periods, it does lend some credence to the claims of Cressy et al. (2007) and Gottschalg & Wright (2011), who find that industry specialization could confer some advantage. Even more interesting insights arise as we extend the analysis to the *SBO*Specialization* interaction.

We find a negative and significant coefficient for *SBO*Specialization* for the 24- and 36-month windows. Hence, while the coefficient for *Specialization* is positive, albeit largely insignificant, the *SBO* variable seems to have a negative moderating effect. As hypothesized, we would expect a positive association due to the knowledge advantage flowing from specialization, allowing the sponsor to generate value over and above that unleashed by the former PE owner (Achleitner & Figge, 2014; Le Nadant et al., 2018). It nevertheless could appear that investors are not fully convinced that specialized sponsors provide anything in excess of the more traditional, generalist sponsor firm, even seeming to penalize them in the long term.

With the somewhat mixed empirical results characterizing scholarly work on the topic, finding both arguments for specialization (Cressy et al., 2007; Gottschalg & Wright, 2011) and more ambiguous results (Brigl et al., 2008; Lossen, 2006), more empirical work is called for. Thus, the puzzle remains as to whether sponsors that are specialized in industry terms are able to leverage their additional expertise or whether it, in fact, acts as detriment to the performance of SBO firms.

TABLE 9.18: AFTERMARKET PERFORMANCE (BHAR BASED ON S&P 500) INCLUDING SPECIALIZATION*SBO INTERACTION TERM

Coefficient	6 Months	12 Months	24 Months	36 Months
Intercept	0.3312 (1.22)	0.4392 (1.18)	-0.4700 (-1.02)	-0.7529 (-1.13)
LN (Total Assets)	-0.0276 (-1.15)	-0.0224 (-0.68)	0.0583 (1.47)	0.0707 (1.24)
LN (Sponsor Size)	-0.0007 (-0.04)	0.0066 (0.26)	0.0215 (0.70)	0.0514 (1.17)
Consortium	0.0104 (0.21)	-0.0250 (-0.37)	-0.1007 (-1.25)	-0.1325 (-1.13)
Holding Period	0.0148 (1.49)	0.0204 (1.49)	0.0235 (1.38)	0.0374 (1.45)
Buy-and-Build	-0.0958 (-1.98)**	-0.0845 (-1.27)	-0.1286 (-1.66)*	-0.0982 (-0.86)
Management Turnover	-0.0270 (-0.61)	-0.0157 (-0.26)	-0.0238 (-0.32)	-0.0821 (-0.78)
Board Expertise	0.0928 (1.33)	0.1227 (1.27)	0.2350 (2.02)**	0.1713 (1.03)
Operating Partner	0.1389 (2.40)**	0.0235 (0.30)	0.0910 (0.95)	0.0779 (0.57)
Specialization	0.0869 (1.65)*	0.0126 (0.17)	0.0736 (0.83)	0.0827 (0.65)
SBO	0.0299 (0.51)	0.0653 (0.80)	0.1727 (1.78)*	0.1192 (0.86)
Specialization*SBO	-0.0985 (-0.75)	-0.2306 (-1.27)	-0.6128 (-2.83)***	-0.5746 (-1.84)*
Year Fixed Effects?	Yes	Yes	Yes	Yes
Industry Fixed Effects?	Yes	Yes	Yes	Yes
R-Squared	0.2013	0.1653	0.2197	0.1380
Adjusted R-Squared	0.0860	0.0443	0.1040	0.0387
N	318	317	311	298

Interaction between Post-Crisis and Selected Variables

Given the focus of this paper on discerning potential differences in the sponsors' approach to value creation before versus after the financial crisis, we perform regressions with the introduction of a post-crisis dummy and interaction terms with selected variables. The latter were chosen based on the regressions seen in App. 20, dividing the sample into pre- and post-crisis subgroups. Specifically, variables that tested significant in one subsample but not the other, were introduced below in an interaction with the aforementioned *Post-crisis* dummy to confirm that the apparent difference is indeed statistically significant and not simply a result of different sample sizes or other methodological intricacies.

We notice that firms acquired post-crisis underperform in the 36-month period, as depicted in the negative and significant coefficient estimate for the *Post-crisis* dummy. Now, given the limited sample of firms acquired post-crisis, it would be interesting to see how this pattern develops over time as a larger number of firms are divested through IPOs. Owing to this limitation, drawing definite inferences based on this particular result might prove to be slightly premature, albeit the analysis still provides important hints as to a potential shift in the performance of PE-backed IPOs. Of greater interest, when examining the *Post-crisis*Buy-and-Build* interaction term, we find that the main effects for each of the variables are negative. However, the interaction itself shows a positive and significant coefficient for the 6-month period, being indicative of the negative impact of adopting Buy-and-Build strategies, at the least, being moderated in positive direction for firms acquired after the crisis.

In the base specification, we proposed that investors might still operate from a traditional PE-model mindset, thus associating Buy-and-Build with value-destroying empire building rather than value-enhancing add-on investments based on careful strategic deliberation (Hammer et al., 2017; Thomsen & Conyon, 2012). Indeed, we even remain effectively unable to claim that the latter is necessarily the case as we do not examine the various add-on acquisitions. One explanation for our findings rests with the possibility that the market may indeed begin to recognize the value of employing such strategic mechanisms (Borell & Heger, 2013; Braun et al., 2017; Hammer, Hinrichs, & Schweizer, 2016; Hammer et al., 2017). Alternatively, it may indeed be that the very use of inorganic growth strategies by the PE sponsor has changed, gravitating more toward pursuing strategic rather than merely growth-enhancing acquisitions, and thus de facto starting to contribute positively to intrinsic firm value. To elucidate this further would require entertaining theories of market efficiency and investor rationality (Bodie et al., 2014; Pedersen, 2015), which remains beyond the scope of this paper. Also, per the same logic, while the comparative analysis elucidated whether the prevalence of operational mechanisms has altered over time, we do not delve into whether the mechanisms themselves have changed.

As such, this route of using the target firm as a platform for further investments might capture a new approach for PE firms as seen in the case of Burger King, backed by 3G Capital (Forbes, 2017) where several add-on acquisitions occurred even post-IPO, which is not uncommon (Borell & Heger, 2013). Combined with the findings in Table 9.14, which shows significantly greater retention of ownership post-crisis, it could be the case that many sponsors continue to target operational improvements even

after the listing. Combined with the significantly lower holding period after the crisis, this argument becomes increasingly interesting to consider.

TABLE 9.19: AFTERMARKET PERFORMANCE (BHAR BASED ON S&P 500) INCLUDING POST-CRISIS INTERACTION TERMS

Coefficient	6 Months	12 Months	24 Months	36 Months
Intercept	0.3131 (1.42)	0.1260 (0.41)	-0.1711 (-0.43)	0.2950 (-0.52)
LN (Total Assets)	-0.0298 (-1.31)	-0.0151 (-0.47)	0.0533 (1.37)	0.0397 (0.73)
LN (Sponsor Size)	-0.0086 (-0.48)	0.0002 (0.01)	0.0190 (0.61)	0.0642 (1.48)
Consortium	0.0096 (0.20)	-0.0204 (-0.30)	-0.1315 (-1.60)	-0.1637 (-1.43)
Holding Period	0.0151 (1.70)*	0.0270 (2.15)**	0.0047 (0.29)	-0.0012 (-0.05)
Specialization	0.0876 (1.71)*	0.0126 (0.18)	0.0306 (0.35)	0.0508 (0.42)
Buy-and-Build	-0.0748 (-1.56)	-0.0789 (-1.18)	-0.1394 (-1.70)*	-0.1023 (-0.90)
Management Turnover	-0.0308 (-0.72)	-0.0387 (-0.65)	-0.0769 (-1.04)	-0.1257 (-1.23)
Board Expertise	0.0180 (0.26)	0.0616 (0.62)	0.1191 (0.98)	0.0287 (0.17)
Operating Partner	0.1367 (2.47)**	0.0319 (0.41)	0.0791 (0.83)	0.0840 (0.63)
Post-crisis	-0.0314 (-0.49)	0.0953 (1.06)	-0.1388 (-1.26)	-0.3705 (-2.45)**
Post-crisis*Buy-and-Build	0.3145 (2.20)**	0.0612 (0.31)	0.1747 (0.71)	-0.0409 (-0.12)
Post-crisis*Board Expertise	0.3958 (2.67)***	0.3530 (1.69)*	0.2552 (1.00)	0.3483 (0.99)
Year Fixed Effects?	No	No	No	No
Industry Fixed Effects?	Yes	Yes	Yes	Yes
R-Squared	0.1727	0.1037	0.1104	0.0904
Adjusted R-Squared	0.1045	0.0294	0.0356	0.0101
N	318	317	311	298

Investigating the second interaction term, being *Post-crisis*Board Expertise*, it seems that the effect of installing board members with industry is moderated in a positive direction for firms acquired after the crisis, with the coefficient being statistically significant for the 6- and 12-month windows. Providing backing for these findings, several macroenvironmental changes have been found to force deviation from heavy reliance on leverage, as mentioned several times (Andersen, 2015; Cleary Gottlieb, 2018). Hence, scholars have directed attention to the importance of knowledge and expertise as a conduit for attaining a competitive advantage and improve portfolio firm performance (Cressy et al., 2007; Rigamonti et al., 2016). Not only do we find empirical support for this stipulation but furthermore remain, to the best of our knowledge, among the first to engage in systematic analysis of how the value of such expertise may exhibit sensitivity to specific contingencies; in our case, the financial crisis.

Sub-conclusion for Aftermarket Performance

Summarizing briefly, we do find that the implementation of an OP is associated positively with performance together with board expertise, each for one of the tested time periods. Thus, we find only partial support for hypothesis **H3(a)**, with several of the explanatory variables remaining insignificant. Inevitably, it could be that the findings remain contingent upon idiosyncratic firm characteristics. With regards to the hypothesized relationship between SBOs and sponsor specialization, we fail to find support for the latter. Rather, we find weakly contradicting evidence, depicted in the apparent adverse effect on long-term aftermarket performance. Therefore, we cannot confirm hypothesis **H4(a)** when adopting stock price returns as the performance measure of interest.

With regards to the hypothesized moderating effect of the crisis, it does appear that the positive main effect of PE board expertise is significantly more pronounced for firms acquired post-crisis, while the use buy-and-build strategies, whose main effect is negative, is moderated in positive direction. We therefore find some support for **H4(b)**. The findings from the comparative analysis, coupled with those thus presented, could be symptomatic of a general shift in not only how sponsors approach value creation but also in which actions are as perceived as driving value according to investors. Discerning whether these actions are genuinely accretive to intrinsic firm value, or the sponsors are simply apt in entertaining compelling enough rhetoric to convince the market that they are, is a discussion outside the scope of the paper, although highly relevant.

9.4.2. Drivers of Operating Performance

The following presents the regressions with the measures of operating performance as the dependent variables, being revenue growth, ATO ratio, and EBITDA margin, the latter two adjusted by the industry median.

Base Specification

Commencing with the base specification, little to no significance for the six operational levers are documented for the ATO ratio. For the year prior to the IPO, being T-1, we observe that *Holding Period* appears positively associated with the measure, in line with our hypothesis, based on the presumed need for the sponsor to have sufficient time to implement efficiency-enhancing measures (Kaplan & Strömberg, 2009). A more in-depth discussion will succeed when discussing the EBITDA margin regression. We do find it peculiar how few of the operational levers tested seem to affect ATO, given how renowned sponsors are for targeting efficiency improvements (Andersen, 2015; Kaplan & Strömberg, 2009; Spliid, 2007). Indeed, it may well be the case that the associations are circumscribed by various firm idiosyncrasies, which impedes the ability to draw generalizations for the sample; a speculation delved further into as we introduce various interaction terms.

Scrutinizing the regression on the EBITDA margin, we again observe that *Holding Period* exhibits a positive association, now being significant across all time periods with the exception of T0. With the EBITDA margin proxying the operational profitability of the firm, it seems logical that a sufficiently long holding period allows the sponsor to implement measures indeed affecting the operational side of analytical income statement (Kaplan, 1989b; Muscarella & Vetsuypens, 1990; Petersen et al., 2017). Nevertheless, it may be worth considering whether the relationship is strictly linear, as echoed in the discussion of both Cao & Lerner (2009) and Levis (2011). Given that linearity constitutes an assumption of OLS regression methodology, other models would have to be specified to test the aforementioned.

Our findings overall parallel Cao (2008; 2011) who note that portfolio companies which have been under private ownership for only a short period of time seem to suffer in terms of performance relative to peers enjoying longer time under PE ownership. Similarly, Badunenko et al. (2010) report a negative link between short holding periods and firm performance.

Interestingly, we find that *Specialization* appears negatively associated with the EBITDA margin for T-1, T0 and T+1, being significant at the 5% and 10% level. Albeit speculative, one could entertain considerations as to whether this results from particular traits of specialized sponsor firms, particularly the extent to which they may prioritize other dimensions than profitability, such as top line growth. This particular point will be addressed further when performing the regression on revenue growth.

Interestingly, Cressy et al. (2007) similarly fail to find support for the positive impact of specialization on profitability. Contrasting both the aforementioned and our own findings, several scholars have found that industry specialization has proven advantageous for profitability in the VC industry (Gompers, Kovner, Lerner, & Scharfstein, 2008; Norton & Tenenbaum, 1993). While we continue to find it puzzling that specialization of PE sponsors appears to exert a negative impact on profitability, it may well be the case that discrepancies exist as to which factors drive performance in the VC versus the buyout segment.

Furthermore, for the T-1 and T+3 EBITDA margin regressions, we find that the coefficient estimates for the *Buy-and-Build* variable are negative and significant at the 10% level. It could be, though further examination is warranted, that firms pursuing add-on investments are sacrificing profitability for top-line growth, very akin to newly started companies, or perhaps fail to realize the projected cost synergies, thus negatively affecting profitability (Brealey et al., 2016; Gugler et al., 2003; Larsson & Finkelstein, 1999; Ravenscraft & Scherer, 1989). Delving into the accounting mechanisms, it could be that the acquisitions, on average, lead to a relatively higher level of revenue growth vis-à-vis EBITDA, which, all else equal, would result in an overall reduction of the margin. Again, this cements the pertinence of examining the impact of operational drivers across a spectrum of performance measures.

In terms of general M&A literature, no definite consensus exists. While some scholars do indeed find increases in operating performance and profitability (Healy et al., 1992), others yet report differing results with a decrease in profitability measures (Gugler, et al., 2003; Ravenscraft & Scherer, 1989). Interestingly, and lending some support to the logic presented regarding compromising profitability for top-line growth, Borell & Heger (2013) do indeed find that PE firms, who engage in buy-and-build strategies, seem to devote a substantial amount of resources and attention to enhancing this specific dimension of performance. However, contrasting our results, the authors also find that buy-

and-build has a positive effect on profitability, though only for specific subsamples rather than their entire dataset.

The last variable for which we document statistical significance for the regression on profitability is that of *Management Turnover*, albeit only in T+2 at the 10% level. This result is consistent with our expectations, as PE firms who identify inefficiencies among incumbent management are typically capable and willing to react on this rather quickly, hereby unleashing latent value through a reduction in agency costs and moreover facilitating greater ease of instigating operational and strategic changes (Andersen, 2015; Gong & Wu, 2011; Martin & McConnell, 1991). Also, these findings resonate with those of Gong & Wu (2011) as well as Martin & McConnell (1991) who document a reduction in managerial inefficiencies subsequent to takeovers. However, due to the lack of persistent significance, we do advise caution in drawing too conclusive inferences.

In the final panel of the base specification, we adopt Revenue Growth as the dependent variable and notice two results worthy of discussion. Firstly, the coefficient estimate for *Specialization* is positive and statistically significant for some of the tested periods, being *T-1 to T+0* and *T-1 to T+2*. As alluded to when discussing the results from the regression on profitability, it could be the case that specialized PE firms pursue strategic objectives which rests predominantly on enhancing top-line growth rather than generating profits, with similar suggestion presented by Cressy et al. (2007). Aligned with our findings, Le Nadant et al. (2018) likewise find a positive effect of industry specialization on growth. Hence, we encourage further inquiry into how the strategies pursued by specialized PE firms may differ from their relatively unspecialized peers.

Finally, the regression on Revenue Growth returns a significant coefficient for *Board Expertise*, though with the opposite of the hypothesized sign. This apparent negative association persists *T-1 to T0* and *T-1 to T+2* both at the 10% level. Initially, it may seem counterintuitive that added industry expertise should hurt top-line growth. Nevertheless, delving into theory on the role of the board of directors may aid in unraveling the apparent mystery. Particularly, one potential explanation rests with the possibility that board members possessing deep industry expertise tend to occupy several board positions simultaneously, by itself being a contributive factor to their vast knowledge, but also leaving them able to allocate proportionally less time to each individual company board. Metaphorically, this expertise can thus come to embody a double-edged sword.

The notion that several directorships may have an adverse impact on firm performance is supported by Hauser (2018) who investigates the concept of' 'busy directors' and finds that the amount of work by each board member is inversely related to performance of the firms they occupy board positions at. As such the monitoring and advisory role of the board, particularly after the buyout, may be drastically reduced if its directors are indeed too busy to properly provide the guidance and expertise, they would otherwise bring with them (Houlden, 1990; Jensen, 1989; Kaplan & Strömberg, 2009). Given that some scholars question the efficacy and added value of boards in general (Adams, Hermalin, & Weisbach, 2010; Bhagat & Black, 1999), it would be highly interesting to scrutinize if the concept of busy directors indeed applies to the boards of companies acquired by PE, and more generally investigate the nature and dynamics of PE boards, potentially finding inspiration in Gertner & Kaplan (1998).

When we run regressions excluding all fixed effects, presented in App. 21, we do report a few changes. Particularly, we now seem to observe a positive association between efficiency, as measured in ATO, and *Management Turnover* with the coefficient estimate being statistically significant at the 5% level for all time periods. The same applies to the *Holding Period* and *Board Expertise* variables, hence providing some additional support to hypothesis **H3(b).** For the regression on the EBITDA margin, the evidence against the favorable impact of sponsor specialization strengthens, showing greater persistence and statistical significance.

The regression table for the base specification can be seen below.

TABLE 9.20: OPERATING PERFORMANCE - BASE SPECIFICATION REGRESSION

	ATO RATIO					EBITDA MARGIN					REVENUE GROWTH			
Coefficient	**T-1**	**T0**	**T+1**	**T+2**	**T+3**	**T-1**	**T0**	**T+1**	**T+2**	**T+3**	**T-1 to T0**	**T-1 to T+1**	**T-1 to T+2**	**T-1 to T+3**
Intercept	0.7513	0.8056	0.4147	0.1696	0.5129	-0.0666	-0.0177	-0.0420	-0.1288	-0.1665	0.4988	1.0708	1.3211	1.8766
	(1.32)	(1.44)	(0.70)	(0.28)	(0.92)	(-1.01)	(-0.25)	(-0.48)	(-1.35)	(-2.01)**	(0.95)	(1.10)	(1.84)*	(2.33)**
LN (Total Assets)	-0.1034	-0.1087	-0.0874	-0.0477	-0.0429	-0.0202	-0.0262	-0.0269	-0.0181*	-0.0076	-0.0838	0.0127	-0.2016	-0.1924
	(-2.09)**	(-2.24)**	(-1.81)*	(-0.95)	(0.91)	(-3.54)***	(-4.29)***	(-3.83)***	(-2.28)**	(-1.09)	(-1.83)*	(0.16)	(-3.38)***	(-2.82)***
LN (Sponsor Size)	-0.0188	-0.0122	-0.0028	-0.0243	-0.0232	0.0046	0.0078	0.0106	0.0111	0.0124	0.0396	-0.1092	0.0450	0.0250
	(-0.50)	(-0.33)	(-0.08)	(-0.63)	(-0.63)	(1.06)	(1.67)*	(1.97)*	(1.82)*	(2.28)**	(1.13)	(-1.81)*	(0.98)	(0.47)
Consortium	-0.0071	-0.0429	-0.0130	-0.0316	-0.1141	0.0210	0.0276	0.0284	0.0262	0.0231	-0.1362	-0.2550	-0.1810	-0.2028
	(-0.07)	(-0.43)	(-0.13)	(-0.31)	(-1.17)	(1.77)*	(2.17)**	(1.95)*	(1.62)	(1.60)	(-1.45)	(-1.56)	(-1.50)	(-1.45)
Holding Period	0.0365	0.0194	0.0249	0.0284	0.0064	0.0067	0.0030	0.0067	0.0057	0.0073	-0.0295	-0.0259	-0.0164	0.0146
	(1.78)*	(0.96)	(1.23)	(1.29)	(0.30)	(2.82)***	(1.20)	(2.27)**	1.64*	(2.33)**	(-1.55)	(-0.78)	(-0.63)	(0.48)
Specialization	0.0289	0.0248	0.0725	0.1040	0.0785	-0.0242	-0.0339	-0.0294	-0.0113	-0.0112	0.1804	0.2711	0.2593	0.2529
	(0.26)	(0.23)	(0.68)	(0.94)	(0.75)	(-1.91)*	(-2.50)**	(-1.89)*	(-0.65)	(-0.72)	(1.78)*	(1.55)	(1.98)**	(1.67)
Buy-and-Build	-0.0696	0.0107	-0.0605	-0.0600	-0.0838	-0.0206	-0.0128	-0.0219	-0.0236	-0.0254	0.0790	0.1012	0.0331	0.0271
	(-0.69)	(0.11)	(-0.63)	(-0.60)	(-0.89)	(-1.78)*	(-1.04)	(-1.56)	(-1.49)	(-1.83)*	(0.85)	(0.64)	(0.28)	(0.20)
Management Turnover	0.1076	0.1301	0.1137	0.1243	0.1056	0.0051	0.0145	0.0190	0.0262	0.0087	-0.0505	-0.1176	-0.0055	-0.1581
	(1.19)	(1.46)	(1.29)	(1.36)	(1.22)	(0.48)	(1.29)	(1.48)	(1.82)*	(0.68)	(-0.60)	(-0.81)	(-0.05)	(-1.26)
Board Expertise	0.1321	0.0690	0.1084	0.0482	-0.0347	-0.0084	-0.0051	-0.0134	-0.0265	-0.0078	-0.2303	-0.0188	-0.3206	-0.2999
	(0.92)	(0.49)	(0.77)	(0.33)	(-0.25)	(-0.51)	(-0.28)	(-0.65)	(-1.16)	(-0.38)*	(-1.72)*	(-0.08)	(-1.88)*	(-1.51)
Operating Partner	0.1367	0.0628	0.1202	0.1466	0.1706	0.0106	-0.0087	0.0006	0.0088	-0.0068	-0.0710	-0.0832	0.1477	0.1076
	(1.16)	(0.54)	(1.05)	(1.24)	(1.50)	(0.78)	(-0.60)	(0.03)	(0.47)	(-0.40)	(-0.65)	(-0.44)	(1.06)	(0.66)
Year Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.4662	0.4719	0.4891	0.4868	0.4902	0.5954	0.5904	0.5500	0.4656	0.5207	0.1576	0.1295	0.2009	0.2181
Adjusted R-Squared	0.3900	0.3962	0.4117	0.4041	0.4001	0.5376	0.5356	0.4819	0.3796	0.4359	0.0367	0.0523	0.0826	0.0800
N	305	305	290	275	254	305	305	290	275	254	305	290	275	254

Interaction between Sponsor Specialization and SBO

In section 9.4.1. on aftermarket performance, we failed to find support for **H4(a)**, concerned with whether the main effect of sponsor specialization is moderated in SBOs. To test whether our conclusion is sensitive to the type of performance measure, we repeat the regressions on operating performance, now in specifications that include the *Specialization*SBO* interaction, again capturing the differential effect on the association between sponsor specialization and performance if the portfolio firm was acquired in an SBO.

When examining the results from the regression on ATO, what is highly interesting, and contrasts the lack of significant explanatory variables in the base regression, we observe a positive significant coefficient estimate for the *Specialization*SBO* interaction term. Remaining significant at the 10% level for T-1, T0, T+2 and at the 1% level for T+3, this finding lends testimony to the hypothesis that specialized PE firms may be at greater ability to improve performance, at least in terms of efficiency, after the traditional levers have been exhausted by the previous sponsor (Achleitner & Figge, 2014; Le Nadant et al., 2018).

Another noteworthy insight arises as we compare these findings to the regression on aftermarket performance. In the latter, we found the exact opposite, with the sign of the coefficient for the interaction term being negative, and significant for the 24- and 36-month periods, thus showing that the market effectively seems to penalize SBO firms acquired by specialized sponsors. We propose two potential explanations for this discrepancy.

The first explanation, departing from theories of market efficiency and investor rationality (Pedersen, 2015), is based on the presumption that the market remains of the conviction that, once traditional measures of value creation have been exhausted, little to no room remains for the new sponsors to further add value (Le Nadant et al., 2018) – irrespectively of the expertise, knowledge and skills of the PE firm undertaking the SBO.

An alternative explanation departs from the possibility that the efficiency enhancements in SBOs, facilitated by sponsor specialization, compromises other dimensions of firm performance. Given the deliberation to adopt several performance measures, we are able to provide some insight on the aforementioned as we extend the analysis to the impact on growth and profitability, although additional measures of performance would inevitably have to be included to provide an exhaustive picture.

For the regressions employing the EBITDA margin and Revenue Growth as the dependent variables, we do not document any significant moderating effect, be that positive or negative, for the *Specialization*SBO* interaction term. Consequently, we fail to find evidence that the application of specific industry expertise by the sponsor in SBOs translates into superior profitability or top-line growth. Nevertheless, an argument could be advanced that, if the SBO firm becomes more efficient without these improvements simultaneously cannibalizing on other dimensions, then operating performance is positively impacted by sponsor specialization at the margin (Kaplan & Strömberg, 2009).

Indeed, the latter does seem to be the case since we do not observe any negative, significant coefficient estimates for the interaction term in the EBITDA margin and revenue growth regressions. Nevertheless, as mentioned earlier, the conclusion regarding the overall benefits of sponsor specialization in SBOs remains ambiguous, given the signs, albeit weak, of negative associations with aftermarket performance.

TABLE 9.21: OPERATING PERFORMANCE INCLUDING SPECIALIZATION*SBO INTERACTION TERM

	ATO RATIO					EBITDA MARGIN					REVENUE GROWTH			
Coefficient	**T-1**	**T0**	**T+1**	**T+2**	**T+3**	**T-1**	**T0**	**T+1**	**T+2**	**T+3**	**T-1 to T0**	**T-1 to T+1**	**T-1 to T+2**	**T-1 to T+3**
Intercept	0.7115	0.7558	0.4045	0.1450	0.4926	-0.0584	-0.0108	-0.0416	-0.1242	-0.1614	0.5590	1.1577	1.3214	1.8466
	(1.25)	(1.35)	(0.68)	(0.24)	(0.88)	(-0.89)	(-0.15)	(-0.48)	(-1.29)	(-1.93)*	(1.05)	(1.18)	(1.83)*	(2.27)**
LN (Total Assets)	-0.1115	-0.1165	-0.0938	-0.0535	-0.0492	-0.0211	-0.0270	-0.0278	-0.0180	-0.0080	-0.0847	0.0156	-0.1974	-0.1883
	(-2.25)**	(-2.40)**	(-1.94)*	(-1.06)	(-1.05)	(-3.71)***	(-4.42)***	(-3.94)***	(-2.25)**	(-1.13)	(-1.84)*	(0.20)	(-3.30)***	(-2.75)***
LN (Sponsor Size)	-0.0121	-0.0053	0.0026	-0.0189	-0.0166	0.0051	0.0082	0.0113	0.0109	0.0125	0.0389	-0.1139	0.0415	0.0223
	(-0.32)	(-0.14)	(0.07)	(-0.49)	(-0.46)	(1.17)	(1.75)*	(2.09)**	(1.77)*	(2.29)**	(1.10)	(-1.88)*	(0.90)	(0.42)
Consortium	-0.0028	-0.0374	-0.0107	-0.0338	-0.1213	0.0198	0.0265	0.0284	0.0254	0.0221	-0.1443	-0.2686	-0.1762	-0.1939
	(-0.03)	(-0.37)	(-0.11)	(-0.33)	(-1.25)	(1.68)*	(2.09)**	(1.94)*	(1.56)	(1.52)	(-1.51)	(-1.64)	(-1.45)	(-1.37)
Holding Period	0.0340	0.0173	0.0236	0.0262	0.0037	0.0060	0.0024	0.0064	0.0055	0.0070	-0.0317	-0.0284	-0.0140	0.0179
	(1.66)*	(0.85)	(1.16)	(1.17)	(0.18)	(2.53)**	(0.96)	(2.17)**	(1.54)	(2.17)**	(-1.65)*	(-0.85)	(0.58)	(0.58)
Buy-and-Build	-0.0771	0.0031	-0.0657	-0.0622	-0.0844	-0.0216	-0.0138	-0.0226	-0.0235	-0.0254	0.0774	0.1034	0.0344	0.0269
	(-0.77)	(0.03)	(-0.68)	(-0.62)	(-0.91)	(1-.88)*	(-1.11)	(-1.63)*	(-1.47)	(-1.81)*	(0.83)	(0.65)	(0.20)	(0.20)
Management Turnover	0.0863	0.1043	0.0982	0.1062	0.0791	0.0015	0.0112	0.0167	0.0263	0.0080	-0.0590	-0.1192	0.0090	-0.1448
	(0.94)	(1.16)	(1.10)	(1.15)	(0.91)	(0.14)	(0.99)	(1.28)	(1.80)*	(0.61)	(-0.69)	(-0.81)	(-1.14)	(-1.14)
Board Expertise	0.1292	0.0670	0.1055	0.0482	-0.0297	-0.0088	-0.0055	-0.0138	-0.0264	-0.0074	-0.2313	-0.0172	-0.3208	-0.3040
	(0.90)	(0.47)	(0.75)	(0.34)	(-0.22)	(-0.53)	(-0.30)	(-0.67)	(-1.16)	(-0.36)	(-1.72)*	(-0.07)	(-1.53)	(-1.53)
Operating Partner	0.1463	0.0735	0.1274	0.1581	0.1769	0.0104	-0.0088	0.0014	0.0082	-0.0071	-0.0763	-0.0958	0.1409	0.1082
	(1.25)	(0.64)	(1.11)	(1.34)	(1.57)	(0.77)	(-0.60)	(0.08)	(0.44)	(-0.42)	(-0.70)	(-0.51)	(0.66)	(0.66)
Specialization	0.0220	0.0188	0.0682	0.1025	0.0764	-0.0259	-0.0354	-0.0302	-0.0115	-0.0114	0.1749	0.2676	0.2612	0.2550
	(0.20)	(0.17)	(0.64)	(0.93)	(0.73)	(-2.04)**	(-2.61)***	(-1.93)*	(-0.65)	(-0.73)	(1.71)*	(1.53)	(1.67)*	(1.67)*
SBO	0.0240	0.0388	0.0143	0.0307	0.0146	-0.0196	-0.0172	-0.0014	-0.0086	-0.0098	-0.1105	-0.1682	0.0112	0.0647
	(0.20)	(0.33)	(0.12)	(0.26)	(0.13)	(-1.41)	(-1.15)	(0.08)	(-0.46)	(-0.58)	(-0.99)	(-0.89)	(0.08)	(0.39)
Specialization*SBO	0.5201	0.5196	0.3801	0.4564	0.6244	0.0474	0.0438	0.0513	-0.0118	0.0094	0.0055	-0.2578	-0.3179	-0.2515
	(1.92)*	(1.95)*	(1.45)	(1.68)*	(2.43)***	(1.52)	(1.31)	(1.34)	(-0.27)	(0.24)	(0.02)	(-0.60)	(-0.72)	(-0.67)
Year Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.4735	0.4795	0.4934	0.4929	0.5039	0.6025	0.5992	0.5533	0.4663	0.5216	0.1607	0.1332	0.2204	0.2204
Adjusted R-Squared	0.3938	0.4004	0.4120	0.4063	0.4107	0.5423	0.5380	0.4815	0.3750	0.4318	0.0331	0.0602	0.0740	0.0740
N	305	305	290	275	254	305	305	290	275	254	305	290	275	254

Interaction between Post-Crisis and Selected Variables

Per **H4(b)**, we compute the regression model, now introducing a *Post-crisis* dummy which is set to interact with a selected range of the six operational levers, comprising our explanatory variables. Again, the latter are chosen based on regressions in App. 20 which divides the base specification into a pre- and post-crisis subsample. Hence, the purpose of the interaction term is to test whether any apparent differences between the subsamples are of statistical significance. As such, the same explanatory variables are not necessarily tested for each of the dependent variables.

Firstly, for the regression on ATO, we let the *Post-crisis* dummy interact with *Holding Period* and *Board Expertise*, respectively. While the former fails to test significant, we observe strong indications that industry expertise of PE board members has a positive moderating effect on firm efficiency post-crisis. Exhibiting a positive and significant coefficient estimate across all tested periods, this could suggest that injection of intimate industry knowledge appears of increased importance for reaping efficiency gains in more recent times.

Compared to the base specification, no evidence was found for the level of board expertise having any impact whatsoever on the level ATO. Owing to differing sample sizes, the number of firms acquired prior to the crisis is, naturally, substantially higher than the amount acquired after the crisis simply due to the limited time that has elapsed since the passing of the latter. As such, it would of great interest to entertain further studies once the number of divestments in more recent times has increased. Particularly, we would be interested to see if our findings prove consistent, thus echoing the conclusions reached by Bernstein & Sheen (2016), who document how industry expertise of individual PE representatives is conducive to operational performance.

TABLE 9.22: OPERATING PERFORMANCE INCLUDING POST-CRISIS INTERACTION TERMS

	ATO RATIO					EBITDA MARGIN					REVENUE GROWTH			
Coefficient	**T-1**	**T0**	**T+1**	**T+2**	**T+3**	**T-1**	**T0**	**T+1**	**T+2**	**T+3**	**T-1 to T0**	**T-1 to T+1**	**T-1 to T+2**	**T-1 to T+3**
Intercept	0.9413 (1.94)*	0.9028 (1.89)*	0.6937 (1.29)	0.5872 (1.07)	0.7028 (1.39)	0.0266 (0.48)	0.0600 (1.01)	0.0661 (0.85)	0.0276 (-0.33)	0.0484 (-0.67)	0.5141 (1.17)	1.2851 (1.53)	1.5048 (2.42)**	1.8730 (2.70)***
LN (Total Assets)	-0.0890 (-1.87)*	-0.0894 (-1.91)*	-0.0791 (-1.68)*	-0.0348 (-0.71)	-0.0299 (-0.65)	-0.0237 (-4.33)***	-0.0302 (-5.16)***	-0.0295 (-4.32)***	-0.0184 (-2.44)**	-0.0120 (-1.81)*	-0.0754 (-1.73)*	0.0190 (0.26)	-0.1759 (-3.15)***	-0.1766 (-2.77)***
LN (Sponsor Size)	-0.0305 (-0.82)	-0.0246 (0.68)	-0.0077 (-0.21)	-0.0389 (-1.01)	-0.0330 (-0.90)	0.0043 (1.02)	0.0076 (1.68)*	0.0111 (2.10)**	0.0103 (1.76)*	0.0115 (2.22)**	0.0325 (0.97)	-0.1102 (-1.93)*	0.0318 (0.73)	0.0242 (0.48)
Consortium	-0.0616 (-0.60)	-0.0820 (-0.81)	-0.0660 (-0.66)	-0.0856 (-0.82)	-0.1079 (-1.10)	0.0181 (1.54)	0.0280 (2.22)**	0.0285 (1.95)*	0.0247 (1.55)	0.0214 (1.52)	-0.1381 (-1.47)	-0.2716 (-1.72)*	-0.1912 (-1.62)	-0.1863 (-1.37)
Holding Period	0.0503 (2.37)**	0.0374 (1.79)*	0.0366 (1.74)*	0.0363 (1.61)	0.0176 (0.82)	0.0008 (0.35)	-0.0026 (-1.02)	0.0014 (0.46)	0.0007 0.20	-0.0004 (-0.13)	-0.0239 (-1.38)	-0.0239 (-0.81)	-0.0082 (-0.35)	0.0150 (0.55)
Specialization	-0.0063 (-0.06)	-0.0068 (-0.06)	0.0414 (0.39)	0.0531 (0.48)	0.0633 (0.60)	-0.0279 (-2.26)**	-0.0353 (-3.67)***	-0.0282 (-1.84)*	-0.0120 (-0.71)	-0.0135 (-0.89)	0.1659 (1.69)	0.2586 (1.56)	0.2664 (2.12)**	0.2784 (1.90)*
Buy-and-Build	-0.0559 (-0.06)	0.0249 (0.25)	-0.0416 (-042)	-0.0360 (-0.35)	-0.0715 (-0.75)	-0.0224 (-1.94)*	-0.0143 (-1.16)	-0.0221 (-1.55)	-0.0252 (-1.61)	-0.0273 (-1.99)**	0.1116 (1.21)	0.1350 (0.88)	0.0594 (0.51)	0.0521 (0.40)
Management Turnover	0.1242 (1.37)	0.1328 (1.49)	0.1156 (1.29)	0.1156 (1.24)	0.0757 (0.85)	0.0047 (0.45)	0.0152 (1.37)	0.0145 (1.11)	0.0201 (1.40)	0.0057 (0.45)	-0.0681 (-0.82)	-0.1092 (-0.78)	-0.0413 (-0.39)	-0.1725 (-1.42)
Board Expertise	-0.0043 (-0.03)	-0.0429 (-0.30)	-0.0541 (-0.37)	-0.1132 (-0.76)	-0.1682 (-1.18)	-0.0187 (-1.15)	-0.0160 (-0.91)	-0.0258 (-1.27)	-0.0407 (-1.85)*	-0.0269 (-1.37)	-0.2367 (-1.84)*	-0.0470 (-0.22)	-0.3121 (-1.93)*	-0.3404 (-1.82)*
Operating Partner	0.1519 (1.31)	0.0836 (0.73)	0.1502 (1.30)	0.1384 (1.17)	0.1624 (1.44)	0.0107 (0.81)	-0.0048 (-0.34)	-0.0041 (-0.24)	-0.0008 (-0.04)	-0.0081 (-0.50)	-0.1006 (-0.95)	-0.1081 (-0.60)	0.0998 (0.74)	0.1075 (0.69)
Post-crisis	0.0155 (0.11)	0.0764 (0.53)	-0.0148 (-0.10)	-0.0600 (-0.41)	-0.0217 (-0.15)	-0.0395 (-2.39)**	-0.0288 (-1.63)	-0.0416 (-2.02)**	-0.0476 (-2.10)**	-0.0489 (-2.37)**	0.0845 (0.70)	-0.0412 (-0.20)	-0.0570 (-0.37)	-0.0751 (-0.41)
Post-crisis*Holding Period	0.0980 (1.06)	0.0899 (0.99)	0.0820 (0.92)	0.0434 (0.46)	0.0387 (0.44)	-0.0150 (-1.44)	-0.0211 -(1.89)*	-0.0152 (-1.19)	-0.0204 (-1.46)	-0.0207 (-1.68)*	N/A	N/A	N/A	N/A
Post-crisis*Board Expertise	0.8404 (2.60)***	0.7487 (2.36)**	0.9719 (3.06)***	1.0316 (3.11)***	0.5784 (1.86)*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Post-crisis*Specialization	N/A	N/A	N/A	N/A	N/A	0.0251 (0.71)	0.0337 (0.89)	-0.0034 (-0.08)	-0.0482 (-0.99)	-0.0170 (-0.36)	-0.0232 (-0.08)	-0.1512 (-0.32)	-0.4288 (-1.19)	-0.3463 (-0.78)
Year Fixed Effects?	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Industry Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.4215	0.4219	0.4286	0.4150	0.4179	0.5664	0.5638	0.5010	0.4272	0.4901	0.1017	0.0992	0.1710	0.1851
Adjusted R-Squared	0.3717	0.3722	0.3768	0.3589	0.3569	0.5269	0.5261	0.4558	0.3722	0.4366	0.0279	0.0213	0.0950	0.1036
N	305	305	290	275	254	305	305	290	275	254	305	290	275	254

For the regression on the EBITDA margin, we introduce two interaction terms; between the *Post-crisis* dummy and *Holding Period* as well as the *Specialization*, respectively. We document negative and significant coefficient estimates for *Post-crisis*Holding period* for T0 and T+3. Interestingly, although the signs are weak, it could appear that the length of the private ownership period has a negative moderating effect on profitability for firms acquired after the crisis. Combining these findings with the comparative analysis of section 9.3, it is worth noting that the average holding period for companies acquired after the crisis is significantly lower. Compared to other scholars, the reported holding period for the post-crisis subsample is likewise lower (Cao, 2012; Levis, 2011). We propose the argument that, prior to the financial crisis, and in earlier stages of the PE industry lifecycle, the IPO constituted a more definitive exit event than may be the case today. As such, holding period, in the traditional sense of strictly demarking the stage in which the PE sponsors pursue value-enhancing endeavors (Gilligan & Wright, 2014; Kaplan & Strömberg, 2009), may need revisitation. Particularly, it could indeed be that the sponsors, as alluded to earlier, continue to maintain meaningful presence and exert active ownership after the listing.

Noting that the average decrease in PE ownership post-IPO, per Table 9.14, is significantly lower for the post-crisis subsample, does indeed lend credence to the idea that the involvement of PE firms does not necessarily subside immediately following the listing. Should the posited relationship hold true, we encourage further inquiry into the reasons underlying the sponsor's decision to undertake an IPO rather than retain the portfolio firm remain under private ownership, if possibilities for further value creation still exists. Albeit further examination is needed, the listing decision could be impacted by a range of factors, such as pressure from investors in the portfolio firm to kickstart the appropriation of returns, the desire to use gross proceeds to pay down debt, exploit favorable market options etc. (Cao, 2011; Jenkinson et al., 2018).

Further surveying the results from the regression on profitability, we detect signs that firms acquired post-crisis exhibit worse performance for all tested periods except T0 at the 5% level, captured in the negative and significant coefficient estimate for the *Post-crisis* dummy. Particularly, the coefficients range from approximately -0.0395 to -0.0489, indicating that firms acquired post-crisis, all else being strictly equal, exhibit industry-adjusted EBITDA margins between 4-5 percentage points below the remainder of the sample, on average. Given the financial meltdown ramifying through the global economy pursuant to the crisis, we do not find these results surprising. Indeed, as noted by Lund, Manyika, Mehta, & Goldshtein (2018) as well as Prasad et al. (2015), regaining financial health and

profitability after such a macroeconomic shock is often a lengthy process, furthermore being highly contingent on the given industry and country that the individual firm is present in (Prasad et al., 2015)

As for the last dependent variable, being Revenue Growth, we test for the interaction between *Post-crisis* and *Specialization* yet fail to document any statistical significance. Hence, we do not find convincing evidence that the effect of specialization on top-line growth is significantly moderated by the crisis. Again, for all tests including the *Post-crisis* dummy, it should be noted that the sample size for companies after the crisis is significantly lower than that of firms acquired before the crisis, leading to high standard errors. The sample size for the firms acquired post-crisis may well have to increase substantially before statistical significance can be detected. Hence, a debate inevitably remains as to whether the results are rooted in empirical reality or potentially caused by sample biases, as mentioned in section 8.5 on limitations. Irrespectively, we hope to provide compelling evidence for the importance of entertaining such comparative analysis, given the development of the PE industry, and also provide inspiration on how to, in practice, carry out such studies.

Sub-conclusion for Operating Performance

Synthesizing the findings from the base specification regression, we detect some indications that firms acquired by sponsors applying buy-and-build strategies perform worse in terms of profitability. The same applies to firms acquired by specialized sponsors. We do find, however, that specialization appears positively associated with top-line growth whereas industry expertise held by PE board members exhibits a negative effect. Revisiting the hypothesized positive association between the operational levers of value creation and operating performance, we therefore only find weak evidence to support hypothesis **H3(b)**, given the variation across the six explanatory variables.

For the hypothesis pertaining to the advantage of sponsor specialization in firms acquired through SBOs, we report positive and significant interaction terms in the regression on ATO for close to all time periods while failing to find any statistical significance for the two other dependent variables. As such, it does appear that specialization has a positive moderating effect on operating efficiency in SBOs (Cressy et al., 2007; Le Nadant et al., 2018), lending some support to **H4(a)**, albeit not consistent for the other operating performance measures. Lastly, we examine whether the associations between the tested operational levers and performance are moderated as we distinguish between firms acquired prior to versus after the crisis. While we find evidence speaking in favor of a more pro-

nounced, positive impact of board expertise on efficiency after the crisis, this remains the only significant and positive variable, with other interaction terms failing to test significant. In fact, the interaction term *Post-crisis*Holding Period* is negative and significant for some of the periods in the EBITDA margin regression, contradicting expectations, although we do provide explanations as for why this may be the case. As such, the hypothesis **H4(b)** is, at best, weakly supported.

10. DISCUSSION

10.1. DISCUSSION AND SUGGESTIONS FOR FUTURE RESEARCH

Reflecting upon the results of the analysis, we firstly document outperformance of PE-backed IPOs quite consistently in terms of efficiency, as measured in the ATO ratio, as well as aftermarket performance. With regards to the latter, although we do find indications of superior performance across all measured time periods, this seems to be reduced for the longer-time windows, or at the very least be driven by a few firms which perform extremely well. Hence, we encourage further examination of the role of the PE sponsor in the post-IPO period and reduction in ownership stakes to proxy whether the apparent performance deterioration may be associated with the gradual exit of the sponsor firm (Cao, 2013).

Our final measure of performance, namely the EBITDA margin, continues to be a puzzle with only weak signs of outperformance relative to the non-backed peers, contrasting expectations. We thus advocate further inquiry into this particular measure of performance as to triangulate the results and disentangle potential explanations, should the pattern prove robust. Interestingly, for both the ATO ratio as well as stock price returns, the documented performance appears to persist after the financial crisis, lending some credence to the findings of Bernstein et al. (2018). We would be pleased to see scholars repeat the analysis of the potential impact, or lack hereof, of the crisis, preferably adopting a different unit of analysis such as the fund-level.

The lack of significance for a range of the levers of operational engineering, tested in the multiple cross-sectional regression analysis, remains an interesting finding, in and by itself. Indeed, contrasting the more conventional levers, it is likely that the advantages of operational engineering may to a greater extent be contingent upon the situation facing the specific portfolio firm (Døskeland & Strömberg, 2018). Moreover, as the PE industry fights to decommoditize itself and identify avenues for differentiation in the pursuit of superior performance, the drivers of value creation are bound to become more tacit and increasingly difficult to identify, particularly as interdependencies flourish

(Berg & Gottschalg, 2005). As such, the more a given sponsor deviates from the prototypical focus on leverage and control, the greater the idiosyncrasy and causal ambiguity inherent in their operating model, and the more difficult is the task of disentangling exactly which specific action contributes positively to performance at the margin (Braun et al., 2017; Hammer et al., 2017).

With inspiration from the field of strategic management and the resource-based view, the apparent gravitation away from the use of conventional mechanisms implies that the very value creation strategy of the sponsor could come to resemble a VRIN resource, hindering the immediate replication by competing PE peers (Barney, 1990; Døskeland & Strömberg, 2018; Lippman & Rumelt, 1982; Teece & Pisano, 1994). This development, nevertheless, simultaneously serves to impede strict generalization with regards to the value of different operational levers. While we have sought to construct a comprehensive framework as to contribute a first attempt at modelling the prevalence and impact of levers aimed at driving operational and strategic improvement, and do indeed document interesting findings, much groundwork remains.

One noteworthy mention is the study of Castellaneta & Gottschalg (2014) who note that sponsor resource endowment heterogeneity implies performance heterogeneity at the level of the portfolio firm, with this causal relationship being circumscribed by several contingencies. Mirroring this logic, we find evidence that the value of certain operational levers, namely sponsor specialization, is contingent upon portfolio firm characteristics. Specifically, we document that the positive association between ATO and specialization is moderated in a positive direction if the portfolio firm was acquired through an SBO. We thus encourage further exploration of the applicability of the resource-based view to this particular setting, potentially framed within a small-sample research design.

To execute on the aforementioned, we propose the use of idiographic methodology, owing exactly to the difficulty in drawing generalizations. Such examination could preferably be based on the case study approach (Yin, 2003), exploring the situation of a single or limited number of PE-owned firms, thus allowing for deep and contextual inquiry into the dynamics between PE ownership and portfolio firm performance. While recent times seem to have developed a preference for large-sample studies in the quest to unravel and demystify PE as an industry, examples of case studies on LBOs do indeed exist (Baker, 1992; Baker & Wruck, 1989) and could provide motivation for such research.

While large scale studies indeed appear appealing in their potential to draw broad generalizations at the population level, it is exactly the patient, thorough inquiry into the nuances of PE value creation that the discussion seems to be in dire need of. We believe that this angle could potentially help future

scholars construct a taxonomy of various PE operating archetypes, and particularly the conditions which render any specific one marginally contributive to performance. Inspiration may be found in Filatotchev (2012) who contrast PE sponsors' use of *informal* versus *formal* governance mechanisms, and further examine their respective performance implications, although we encourage broadening the focus to encompass operational drivers.

Another natural extension to this study would be to examine whether our findings are robust to other geographical settings. Particularly, we would be interested to see whether the apparent change in the operating model of PE sponsors is uniquely tied to the US market, traditionally the core market for the PE industry (Bain, 2018; Kaplan & Strömberg, 2009), or also permeates other geographical settings.

Furthermore, we would hope to see future research widen the sample as to include a broader spectrum of firms acquired by PE, rather than only those who are subsequently listed on the public markets, to proxy whether the patterns we observe are unique to portfolio firms exited through IPOs or persist across buyouts in general. Hence, such inquiry could contribute pertinent insight regarding whether and how the strategy for value creation varies across different types of exits. Scholars may find inspiration in Rigamonti et al. (2016) who examine exactly this dimension, employing particular focus to the role of sponsor specialization.

Finally, we believe the time may be ripe for a revisitation of the role of PE and buyout activity on broader society and the economy as a whole, hence encouraging studies adopting a more macroenvironmental perspective. Much has happened since Shleifer & Summer's (1988) notorious critique gave birth to a skeptical rhetoric. While we do not seek to posit that the apparent change to the archetypical PE operating model is universally beneficial – in fact, we refrain from entertaining normative considerations altogether – we believe that an exoneration of the Barbarians may at least be worthy of discussion. We hope to see future work contribute to the foundation for engaging in such.

10.2. PRACTICAL IMPLICATIONS

In terms of practical implications, we believe that three particular groups of practitioners may be interested in our findings; GPs, LPs, and corporate stakeholders. We elaborate on each of the three in the following, paying greatest attention to the two first.

From the viewpoint of the GPs, we confirm the heightened importance of establishing capabilities in driving operational and strategic improvements at the portfolio firm level. With competition for targets reaching record highs (Bain, 2018; Pitchbook, 2018a), GPs will thus continue to face growing pressure to unleash value in new and often creative ways to justify higher acquisitions prices. We find indications that the causal link to performance may be profoundly specific to the unique situation of the portfolio firm. This may force sponsors to rethink their very operating model and strive to build dynamic capabilities and organizational ambidexterity to sustain competitive advantage in aggressive, rivalrous waters (Raisch & Birkinshaw, 2008; Teece & Pisano, 1994).

Given the relative complexity of engaging in operational engineering, sponsors may have to prepare themselves for an extension of the holding period, implying relatively longer horizons before returns can be appropriated and returned to LPs (Døskeland & Strömberg, 2018). Hence, we may witness a changing dynamic between the GP and the LPs. PE firms which are apt in navigating this intricacy and thus preserve important relational ties to its LPs are likely to find themselves in a position of reputational and social capital, facilitating greater success in future fundraising (Adler & Kwon, 2002; Kaplan & Schoar, 2005).

Finally, we document heightened importance of involving people with relevant expertise, implying that GPs may want to look beyond the archetypical profile of PE fund managers to instead focus on people with relevant industry and executive experience (Matthews et al., 2009). Such adjustment to HR practices can help sustain a pool of valuable human capital, being instrumental in both the pre-investment screening of potential targets as well as the post-investment phase, and thus contribute to ensuring strategic resources which are, in their very nature, difficult to imitate or substitute for (Barney, 1991).

Extending on the aforementioned, we nevertheless warrant caution in simply expanding the deal team by increasing the number of FTEs. Specifically, one of the advantages of the PE model rests exactly with the relatively lean, centralized organization (Filatotchev, 2012; Jensen, 1986; 1989). As such, we encourage GPs to approach any potential changes to its employee base carefully, paying particular attention to when the expertise is strictly needed to reside internally and when it can be procured from the outside through the hiring of external advisors.

From the perspective of the LPs, the above reflections imply that the pre-investment screening of GPs may well increase in complexity. To be specific, we find reason to believe that the days where rather passive investment based on reputational factors could lock in a satisfying return on committed capital

may be over. While LPs have traditionally been able to rely on harnessing relationships with selected well-performing GPs, owing to the documented return persistence (Kaplan & Schoar, 2005), we do not believe it is a given that this trend will continue as PE sponsors push to differentiate themselves, resulting in greater heterogeneity in both strategies pursued and returns generated.

In addition, we find it likely that LPs may have to become more involved in the post-investment phase to evaluate the quality of the GP and guide future capital allocation decisions. Given the diversification strategy pursued by LPs, which puts a very genuine constraint on their active involvement (Døskeland & Strömberg, 2018; Thomsen & Conyon, 2012), this is likely to pose a future challenge. Furthermore, should the investment phase lengthen due to heightened complexity in the due diligence stage, LPs should prepare themselves for a potential increase in the fees commanded by the GP (Metrick & Yasuda, 2010).

While GPs may push for higher management fees, LPs could conversely argue that the trend toward longer fund lives exerts downward pressure on returns, which ought to justify lower fees. Indeed, Rizzi (2009) suggests that a likely consequence of the crisis is exactly the push for fee reductions from LPs. We are curious to see how this dynamic eventually plays out and whether we will witness convergence around fee levels, as has traditionally been the case, or whether PE will eventually approach the VC industry, which is characterized by fee level heterogeneity across sponsors (Bain, 2018; Døskeland & Strömberg, 2018).

As PE firms continue to push for differentiation and increase their reliance on non-commoditized value creation levers, we would not be surprised to witness discrepancies in fee levels starting to soar, especially given the heightened information asymmetry which will inevitably flourish out of the growing difficulty for the LP in screening GP quality (Hammer et al., 2017; Metrick & Yasuda, 2010). As such, LPs will want to very carefully engage in on-going evaluation of their commitment to PE in their portfolio to ensure that the returns earned by this asset class are satisfactory.

Finally, reflecting briefly upon the dynamic between corporate stakeholders of the acquired firms and the PE sponsors, we believe that executives and directors alike must prepare for still greater interaction and engagement with the GPs on operational and strategic matters. Hence, the relationship with the sponsor firm is likely to become somewhat tighter, encouraging more intimate collaboration to ensure generation of value.

11. CONCLUSION

This study sought to elucidate the performance of and approach to value creation in PE-backed IPOs in the US by adopting a three-pronged analytical approach.

Firstly, we examine the aftermarket and operating performance for the three years subsequent to flotation, when adjusting by various benchmarks. Particularly, we compute the BHARs and document solid signs of outperformance vis-à-vis the market and a matched control group of non-backed firms for the 6- and 12-month period. The evidence nevertheless weakens in the long-run, captured in for the 24- and 36-month windows. This holds true both when testing for difference from zero of the mean and median BHARs as well as when running an OLS regression which controls for selected firm characteristics.

Similar indications of superior performance relative to the non-backed peers pertain to firm efficiency, as measured in the industry-adjusted ATO ratio. Interestingly, and contrasting expectations, we report weak to no signs of superior profitability, embodied in the industry-adjusted EBITDA margin. The findings are robust to several tests. The financial crisis appears to exert no moderating effect on aftermarket performance and efficiency, potentially implying some resilience awarded by PE ownership. The latter is further supported if noting that PE-backing seems to offset, at least to some extent, the detrimental impact of the financial crisis on IPO firm profitability. In sum, we find support for **H1(a)** but only partially so for **H1(b)** due to the ambiguity surrounding the profitability measure.

Secondly, we inquire into the hypothesized shift toward operational engineering and, in line with trends described by practitioners, confirm the tendency to rely less on financial engineering, evident from the significantly lower leverage ratios characterizing the firms acquired after the crisis. Being symptomatic of an interesting dynamic, we find that the post-crisis firms are held under private ownership for a shorter period of time but that their sponsors tend to retain greater equity ownership post-IPO. Although further examination is warranted, this could be indicative of a shift in the very approach to the active ownership role.

Lending credence to the apparent ambidexterity of the PE model, we find that sponsors in the post-crisis period continue to invoke mechanisms of board control and high-powered incentives, but simultaneously apply greater emphasis to injecting relevant expertise and pursuing Buy-and-Build strategies as a complement to the traditional governance levers. Hence, we claim some support for **H2(a)**.

Thirdly, we estimate a cross-sectional multiple regression model in which we introduce six selected operational engineering mechanisms as explanatory variables, in seeking to discern which factors may contribute to PE-backed IPO aftermarket and operating performance. Specifically, we test: *Holding Period, Sponsor Specialization, Buy-and-Build, Management Turnover, Board Expertise,* and the use of *Operating Partners.* In the base specifications, we document mixed results across the performance measures, lending testimony to the difficulty in disentangling the drivers of portfolio firm performance. As such, we cannot claim consistent support for **H3(a)** and **H3(b)**.

Due to the inherent moderating effect of context and firm idiosyncrasies, we compute specifications which introduce interaction terms in seeking to, at least partially, unravel the mystery. Firstly, we hypothesize that the main effect of sponsor specialization on performance is moderated in a positive direction if the IPO firm was acquired through an SBO. While we do confirm that this is the case in terms of efficiency (ATO), a similar relationship is not reflected in aftermarket performance, with the market, in fact, seeming to penalize SBO firms backed by specialized sponsors. Conclusively, we find partial support for **H4(a)**, although the observed ambiguity cements the importance of discerning how the impact of PE actions affects various performance dimensions differently.

Lastly, we stipulate that the effect of the six operational levers is moderated in a positive direction if the IPO firm was acquired after the financial crisis in 2008. For aftermarket performance, we find indications that PE board expertise and Buy-and-Build appear to be of comparatively greater importance than pre-crisis, albeit only in the short run. Board expertise, likewise, has a more pronounced positive effect on efficiency when the firm was acquired post-crisis, furthermore being consistent across all time periods. Interestingly, we find that holding period has a negative moderating effect on the EBITDA margin for post-crisis firms. This observation could lend further support to the proposed change in the manner by means of which the sponsors approach the very exit decision, although we leave further examination to future research. Again, we can, at best, claim partial support for **H4(b).**

Inevitably, much more can be said on the potential gravitation toward a new era for PE than what can reasonably be exhausted in a single paper. We hope to see future scholars venture down the avenues revealed in this study, particularly the importance of resource heterogeneity residing at the level of the sponsor and the additional contingencies which circumscribe the relation with portfolio firm performance. Finally, we encourage revisiting the role of PE in society as a whole to examine the interplay with, and impact on, the general economy and assess the continued validity of the, often times, skeptical narrative surrounding the industry.

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APPENDIX

The following sections contain selected appendices to the main body of the paper. Unless specifically indicated, all the graphs, figures, and tables are created by the authors. In line with the approach followed in the rest of the paper, we report significance as:
*** = significant at the 1% level, ** = significant at the 5% level, * = significant at the 10% level.

APPENDIX 1: GLOBAL DEAL VOLUME AND VALUE FOR Q1'19

Investigating the current state of the PE industry for Q1'19, it is evident that the US market remains the absolute leader both in terms of deal volume and value. Accounting for 40.00% of the deal volume and 54.82% of the value of those deals, the US continues to account for the majority of PE activity.

GLOBAL DEAL VOLUME FOR Q1'19

Country	No. of Deals	% of Total
US	3,736	62.1%
China	505	8.4%
UK	259	4.3%
Japan	189	3.1%
France	174	2.9%
Canada	161	2.7%
Other	990	16.5%
Global Total	6,014	100.0%

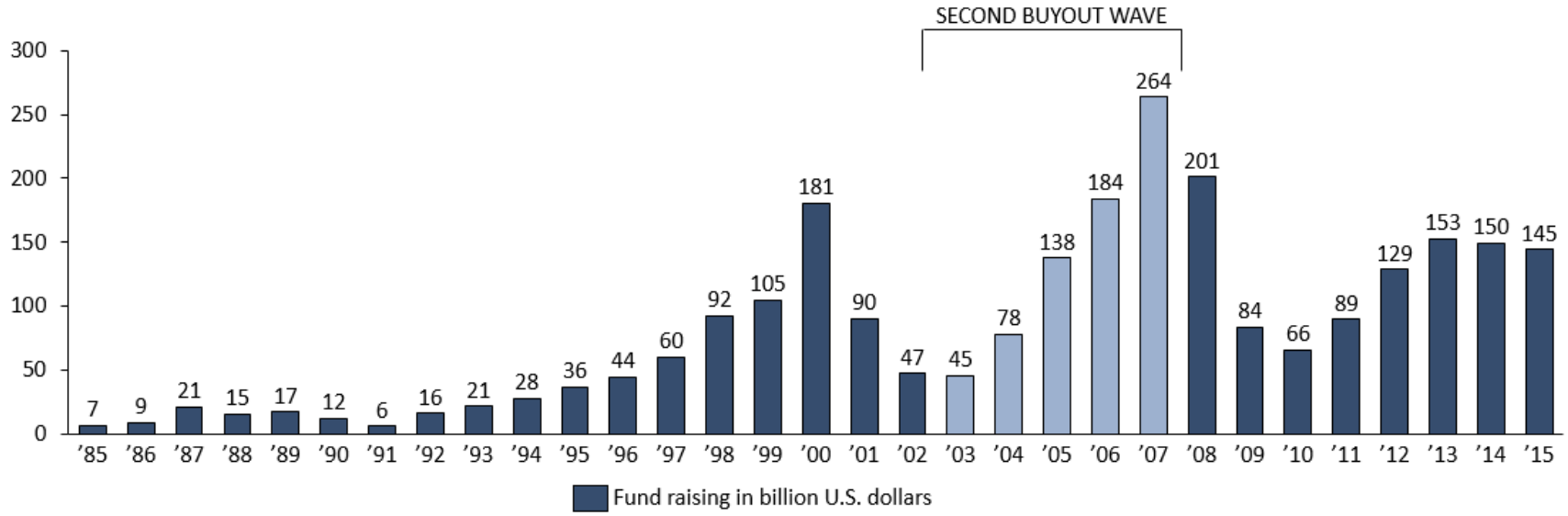
GLOBAL DEAL VALUE FOR Q1'19

Country	$ million	% of Total
US	90,643	47.6%
China	14,577	7.7%
UK	14,466	7.6%
Germany	13,987	7.3%
Australia	7,072	3.7%
France	6,677	3.5%
Other	42,949	22.6%
Global Total	190,371	100.0%

Source: Preqin (2019).

APPENDIX 2: VALUE OF PE FUNDS RAISED IN THE US, 1985-2015

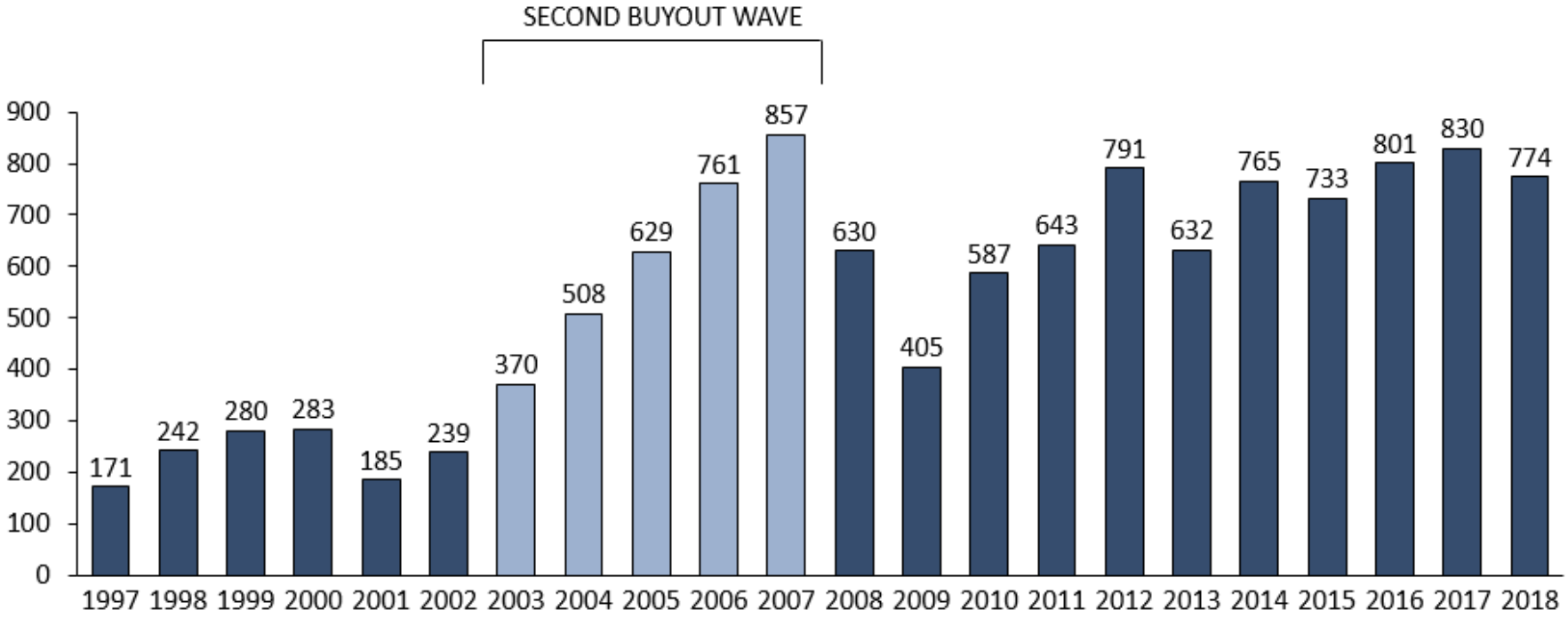
The graph below shows the aggregate dollar value of funds raised annually by PE companies over the course of the last decades. The figure is crafted by the authors of this paper, based on data sourced from the Statista database.



Source: Statista (2019).

APPENDIX 3: NUMBER OF BUYOUTS COMPLETED IN THE US, 1997 – 2018

The graph below shows the annual number of buyouts completed in the US, across all industries.



Source: Preqin (2019).

APPENDIX 4: OVERVIEW OF HYPOTHESES TESTED

Analysis of Performance

H1(a): IPO firms backed by PE exhibit superior aftermarket performance compared to the market and non-backed IPO firms

H1(b): IPO firms backed by PE exhibit superior operating performance compared to non-backed IPO firms

Comparative Analysis of Approach to Value Creation

H2(a): The use of operational engineering levers of value creation by the PE sponsor is more pronounced for firms acquired in the period after the financial crisis

Operational Levers Associated with Aftermarket and Operating Performance

H3(a): The use of operational engineering levers of value creation is positively associated with aftermarket performance

H3(b): The use of operational engineering levers of value creation is positively associated with operating performance

Contingencies Moderating the Main Effects

H4(a): The effect of sponsor specialization on performance is positively moderated for IPO firms acquired by the sponsor in an SBO

H4(b): The effect of the operational engineering levers on performance is positively moderated for IPO firms acquired by PE after the financial crisis

APPENDIX 5: DISTRIBUTION OF BUYOUTS ACROSS SPONSOR FIRMS

The table below depicts the fraction of buyouts in our sample of 318 PE-backed IPOs that each sponsor is accountable for. We report up until the cumulative % exceeds 50% of the grand total. Hence, the five most active sponsors, in terms of buyouts conducted, are responsible for almost 25% of the buyouts in our sample while the 19 most active are responsible for more than 50%. The total number of sponsor firms included in our sample equals 122.

DISTRIBUTION OF BUYOUTS ON PE SPONSOR FIRM

Sponsor Name	% of Grand Total	Cumulative % of Grand Total
Blackstone Group	5.66%	5.66%
Carlyle Group	4.72%	10.38%
Apollo Global Management	4.72%	15.09%
Bain Capital	4.40%	19.50%
KKR	3.77%	23.27%
TPG	3.14%	26.42%
Warburg Pincus	3.14%	29.56%
Welsh, Carson, Anderson & Stowe	2.52%	32.08%
Madison Dearborn Partners	2.52%	34.59%
GTCR	2.52%	37.11%
Fortress Investment Group	2.20%	39.31%
TA Associates	2.20%	41.51%
Apax Partners	1.57%	43.08%
Leonard Green & Partners	1.57%	44.65%
Oaktree Capital Management	1.26%	45.91%
Bruckmann, Rosser, Sherrill & Co	1.26%	47.17%
Oak Hill Capital Partners	1.26%	48.43%
Onex	1.26%	49.69%
CHS Capital	1.26%	50.94%

Source: IPO prospecti, Preqin (2019)

APPENDIX 6: DISTRIBUTION ON TYPE OF BUYOUTS

The table below shows the split of the 318 PE-backed IPOs on the type of buyout as reported in Preqin, revealing that the majority of deals are categorized as traditional buyouts, followed by Public-to-Private deals and recapitalizations. Given the approach to sample identification employed in this study, this remains in line with expectations. The firms which are categorized as being acquired in either a 'Merger' or 'Restructuring' have been double-checked with regards to qualification as part of the sample due to the meagre representation in these segments, and we remain confident in the fairness of including these.

DISTRIBUTION ON DEAL TYPE

Deal Type	% of Grand Total
Buyout	64.47%
Growth Capital	7.86%
Merger	0.94%
Public-to-Private	14.78%
Recapitalisation	11.32%
Restructuring	0.63%
Grand Total	**100.00%**

Source: Preqin (2019).

APPENDIX 7: RAW BUY-AND-HOLD RETURNS

The table below depicts the raw mean and median BHRs, unadjusted for the market, for the group of PE-backed IPOs and the matched control group, respectively, over the four defined time windows.

RAW BHR – PE BACKED VS. MATCHED CONTROL GROUP

	6 Months		12 Months		24 Months		36 Months	
	Mean	**Median**	**Mean**	**Median**	**Mean**	**Median**	**Mean**	**Median**
PE-backed IPOs	6.16%	3.35%	12.04%	10.00%	11.22%	8.89%	14.34%	4.03%
Matched Control IPOs	-4.23%	-5.57%	-7.33%	-9.51%	-5.41%	-20.70%	-1.57%	-22.44%

Source: CRSP (2019), Datastream (2019).

APPENDIX 8: VALUE-WEIGHTED BHAR FOR PE-BACKED IPOS

The table below depicts the results when we value-weigh the BHARs for the PE-backed IPOs by the market capitalization at the time of the IPO, following the method put forth by Levis (2011). We detect signs of outperformance vis-à-vis the market of approximately 6.5 – 7% for each period with the 36-month mean being statistically different from zero, deviating from the result found when using equal-weighted BHARs, though only at the 10% level. The medians remain unchanged relative to the base case as they are unaffected by the weighing scheme. As such, we can deduce, although with some caution, that PE-backed firms with larger market capitalizations at the time of the IPO tend to experience less performance deterioration post-IPO than smaller firms.

VALUE-WEIGHTED BHAR BASED ON S&P 500 FOR PE-BACKED IPO GROUP

Null hypothesis: The mean/median equals zero. High test statistics reject the null.

	Mean	**Median**	**N**
6 Months	6.41% (3.43)***	7.45% (6,654)***	318
12 Months	6.89% (2.80)***	10.14% (5,740)***	317
24 Months	7.05% (2.33)**	-1.12% (1,354)	311
36 Months	6.83% (1.64)*	-4.35% (211)	298

Source: CRSP (2019), Datastream (2019), Thomson One (2019).

APPENDIX 9: AFTERMARKET PERFORMANCE TESTS, PRE- VERSUS POST-CRISIS

To proxy the potential impact of the financial crisis on the performance patterns documented in section 9.2.1, we present three tests in the following. Appendix 9(a) repeats the test of mean (Student's t-test) and median (Wilcoxon Signed Rank Test) BHARs, but including only firms listed after the financial crisis in 2008. Appendix 9(b) reruns the OLS regression analysis, also including only firms listed post-crisis. Finally, Appendix 9(c) conducts a t-test for difference in mean BHARs, assuming unequal variances, for the firms listed prior to versus after the crisis. Hence, all of the aforementioned tests serve to complement and triangulate the results presented in the main body of the text.

Source: CRSP (2019), Datastream (2019), Thomson One (2019).

Appendix 9(a): Test of Mean and Median BHAR for Firms Listed Post-Crisis

BHAR BASED ON S&P 500 - TEST OF MEANS AND MEDIANS INCLUDING ONLY FIRMS LISTED POST-CRISIS *Null hypothesis: The mean/median equals zero. High test statistics reject the null.*						
	PE-backed IPOs			**Matched Control Group**		
	Mean	**Median**	**N**	**Mean**	**Median**	**N**
6 Months	12.22% (4.04)***	9.83% (1,635)***	141	-1.20% (-0.44)	-2.17% (-475)	138
12 Months	16.88% (3.78)***	10.95% (1,498)***	141	-11.02% (-3.34)***	-9.52% (-1,682)***	138
24 Months	7.78% (1.51)	0.00% (382)	139	-24.80% (-4.46)***	-20.20% (-2,041)***	138
36 Months	3.39% (0.41)	-7.09% (350)	135	-28.96% (-5.32)***	-30.44% (-2,282)***	132

Appendix 9(b): BHAR Regression Including Only Firms Listed Post-Crisis

AFTERMARKET PERFORMANCE (BHAR BASED ON S&P 500) REGRESSION WITH ONLY FIRMS LISTED POST-CRISIS				
Coefficient	**6 Months**	**12 Months**	**24 Months**	**36 Months**
Intercept	0.7922 (2.15)**	0.2489 (0.49)	0.1991 (0.32)	-0.3062 (-0.34)
PE Dummy	0.1150 (2.30)**	0.2757 (4.00)***	0.1910 (2.21)**	0.1916 (1.51)
LN (Total Assets)	-0.0148 (-0.81)	-0.0077 (-0.31)	0.0853 (2.55)**	0.1254 (2.59)**
Year Fixed Effects?	Yes	Yes	Yes	Yes
Industry Fixed Effects?	Yes	Yes	Yes	Yes
R-Squared	0.1389	0.1582	0.1381	0.1072
Adjusted R-Squared	0.0758	0.0964	0.0743	0.0385
N	279	279	277	267

Appendix 9(c): Test of Difference in Mean BHARs for Pre vs. Post-Crisis Listings

TEST FOR DIFFERENCE IN MEAN BHAR BASED ON S&P 500 PRE VS. POST-CRISIS LISTINGS *Null hypothesis: No difference between the means. High test statistics reject the null.*								
	6 Months		**12 Months**		**24 Months**		**36 Months**	
	Pre	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
Mean BHAR	8.95%	12.22%	9.57%	16.88%	6.58%	7.78%	10.94%	3.39%
N	177	141	176	141	172	139	163	135
Test Statistic (Pre-Post)	-0.77		-1.26		-0.17		0.67	

APPENDIX 10: ROBUSTNESS TESTS OF AFTERMARKET PERFORMANCE – OLS REGRESSIONS

The tables presented in the following depict the results from running various moderated specifications of the OLS base regression on the BHARs, adjusted by the S&P 500 market index, for the entire sample of PE-backed IPOs and the matched control group. The coefficient estimate of interest is that for the *PE Dummy*, with a positive and statistically significant estimate being indicative of outperformance relative to the non-backed IPO firms. As elaborated on in the main body of the text, we run four separate robustness tests in which we (1) exclude fixed effects, (2) exclude firms in the *High Technology* industry, (3) exclude extreme values, and finally (4) include the entire control group of non-backed firms.

Source: CRSP (2019), Datastream (2019), Thomson One (2019).

Appendix 10(a): BHAR Regression - Excluding Fixed Effects

AFTERMARKET PERFORMANCE (BHAR BASED ON S&P 500) REGRESSION EXCLUDING FIXED EFFECTS				
Coefficient	**6 Months**	**12 Months**	**24 Months**	**36 Months**
Intercept	-0.1534 (-2.10)**	-0.2343 (-2.51)**	-0.5411 (-4.58)***	-0.5364 (-4.04)***
PE Dummy	0.1522 (4.67)***	0.2132 (5.13)***	0.1944 (3.71)***	0.2930 (5.02)***
LN (Total Assets)	0.0158 (1.27)	0.0224 (1.41)	0.0624 (3.09)***	0.0472 (2.09)**
Year Fixed Effects?	No	No	No	No
Industry Fixed Effects?	No	No	No	No
R-Squared	0.0433	0.0521	0.0516	0.0615
Adjusted R-Squared	0.0464	0.0495	0.0489	0.0587
N	733	728	720	678

Appendix 10(b): BHAR Regression - Excluding Firms in High Tech. Industry

AFTERMARKET PERFORMANCE (BHAR BASED ON S&P 500) REGRESSION EXCLUDING FIRMS IN 'HIGH TECHNOLOGY' INDUSTRY				
Coefficient	**6 Months**	**12 Months**	**24 Months**	**36 Months**
Intercept	0.4363 (2.58)**	0.2722 (1.17)	0.2223 (0.74)	-0.8957 (-2.73)***
PE Dummy	0.1339 (3.53)***	0.1639 (3.21)***	0.1481 (2.30)**	0.2312 (3.26)***
LN (Total Assets)	-0.0021 (-0.13)	0.0160 (0.76)	0.0696 (2.53)**	0.0842 (2.81)***
Year Fixed Effects?	Yes	Yes	Yes	Yes
Industry Fixed Effects?	Yes	Yes	Yes	Yes
R-Squared	0.1355	0.1231	0.1286	0.1228
Adjusted R-Squared	0.0854	0.0719	0.0771	0.0673
N	603	599	592	556

Appendix 10(c): BHAR Regression - Excluding Extreme Values

AFTERMARKET PERFORMANCE (BHAR BASED ON S&P 500) REGRESSION EXCLUDING EXTREME VALUES				
Coefficient	**6 Months**	**12 Months**	**24 Months**	**36 Months**
Intercept	0.2153 (1.47)	0.1339 (0.67)	-0.3089 (-1.27)	-0.8186 (-2.80)***
PE Dummy	0.1586 (5.28)***	0.2015 (4.94)***	0.1823 (3.74)***	0.2064 (3.48)***
LN (Total Assets)	-0.021 (-1.64)	0.0012 (0.07)	0.0582 (2.77)***	0.0730 (2.87)***
Year Fixed Effects?	Yes	Yes	Yes	Yes
Industry Fixed Effects?	Yes	Yes	Yes	Yes
R-Squared	0.1936	0.1481	0.1716	0.1376
Adjusted R-Squared	0.1538	0.1060	0.1301	0.0916
N	725	722	714	672

Appendix 10(d): BHAR Regression - Using Full Control Group

AFTERMARKET PERFORMANCE (BHAR BASED ON S&P 500) REGRESSION WITH FULL CONTROL GROUP				
Coefficient	**6 Months**	**12 Months**	**24 Months**	**36 Months**
Intercept	0.0179 (0.20)	-0.1600 (-1.25)	-0.1369 (-0.40)	-0.5293 (-3.02)***
PE Dummy	0.1008 (2.45)**	0.1319 (2.31)**	0.1427 (0.94)	0.1472 (1.94)*
LN (Total Assets)	0.0057 (0.90)	0.0167 (1.90)*	0.0022 (0.09)	0.0318 (2.72)***
Year Fixed Effects?	Yes	Yes	Yes	Yes
Industry Fixed Effects?	Yes	Yes	Yes	Yes
R-Squared	0.0431	0.0328	0.0197	0.0383
Adjusted R-Squared	0.0275	0.0168	0.0032	0.0211
N	2,118	2,088	2,054	1,930

APPENDIX 11: ROBUSTNESS TEST OF AFTERMARKET PERFORMANCE – TEST OF MEANS AND MEDIANS

The tables below present the analyses of mean (Student's t-test) and median (Wilcoxon Signed Rank) BHARs, when we subject them to the same robustness tests as presented in the appendix above. Source: CRSP (2019), Datastream (2019).

Appendix 11(a): Test of Mean and Median BHAR - Excluding Firms in High Tech. Industry

BHAR BASED ON S&P 500 EXCLUDING FIRMS IN 'HIGH TECHNOLOGY' INDUSTRY *Null hypothesis: The mean/median equals zero. High test statistics reject the null.*						
	PE-backed IPOs			**Matched Control Group**		
	Mean	**Median**	**N**	**Mean**	**Median**	**N**
6 Months	12.04% (5.34)***	8.36% (5,974)***	280	-5.46% (-2.41)**	-8.70% (-6,987)***	323
12 Months	14.39% (4.69)***	11.08% (5,137)***	280	-8.11% (-2.69)***	-11.72% (-7,147)***	319
24 Months	8.89% (2.34)**	0.01% (1,668)	275	-15.09% (-3.90)***	-23.95% (-9,766)***	317
36 Months	5.80% (1.14)	-4.50% (-2.5)	262	-24.07% (-7.30)***	-30.44% (-10,665)***	294

Appendix 11(b): Test of Mean and Median BHAR - Excluding Extreme Values

BHAR BASED ON S&P 500 EXCLUDING EXTREME VALUES *Null hypothesis: The mean/median equals zero. High test statistics reject the null.*						
	PE-backed IPOs			**Matched Control Group**		
	Mean	**Median**	**N**	**Mean**	**Median**	**N**
6 Months	9.98% (4.92)***	7.04% (6,492)***	315	-9.91% (-5.37)***	-9.85% (-14,010)***	410
12 Months	11.50% (4.25)***	9.65% (5,423)***	315	-13.24% (-5.95)***	-15.23% (15,012)***	407
24 Months	5.76% (1.68)*	-1.27% (1,044)	309	-22.22% (-8.66)***	-26.81% (-19,520)***	405
36 Months	2.20% (0.50)	-5.54% (-530)	293	-27.59% (-9.77)***	-31.40% (-19,176)***	379

Appendix 11(c): Test of Mean and Median BHAR - Full Control Group

BHAR BASED ON S&P 500 FULL CONTROL GROUP *Null hypothesis: The mean/median equals zero. High test statistics reject the null.*		
	Mean	**Median**
6 Months	-0.35% (-0.2434)	-8.71% (-175,019)***
12 Months	-4.70% (-2.86)***	-16.78% (-257,656)***
24 Months	-8.38% (-1.55)	-29.95% (-336,025)***
36 Months	-13.88% (-5.30)***	-37.84% (-283,402)***

APPENDIX 12: DISTRIBUTION ON IPO YEAR – FULL CONTROL GROUP

The table below depicts the distribution on IPO year for the sample of 318 PE backed IPOs and the entire control group of 1,800 non-backed firms.

DISTRIBUTION ON IPO YEAR

Year	PE-backed IPOs	Full Control Group
1997	2.20%	11.99%
1998	1.89%	7.49%
1999	3.46%	10.93%
2000	5.03%	6.83%
2001	2.20%	2.50%
2002	2.52%	3.44%
2003	3.46%	3.11%
2004	7.55%	7.16%
2005	10.69%	5.38%
2006	10.69%	5.16%
2007	5.35%	6.10%
2008	0.63%	0.67%
2009	5.97%	2.22%
2010	5.35%	4.33%
2011	5.35%	4.38%
2012	8.18%	4.22%
2013	9.75%	6.27%
2014	9.75%	7.82%

Source: Preqin (2019), Thomson One (2019), Zephyr (2019).

APPENDIX 13: UNADJUSTED OPERATING PERFORMANCE

The table below shows the development in the raw, unadjusted operating performance measures for the PE-backed IPOs. The figures are reported for the year prior to the IPO up until the third year after the listing.

UNADJUSTED OPERATING PERFORMANCE
PE-BACKED IPO GROUP

	T-1		T0		T+1		T+2		T+3	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
ATO Ratio	1.10	0.87	1.13	0.88	1.24	0.94	1.17	0.95	1.15	0.95
EBITDA Margin (%)	13.60%	12.17%	15.31%	13.03%	15.33%	13.75%	14.73%	13.88%	14.07%	12.53%

Source: COMPUSTAT (2019), CRSP (2019).

APPENDIX 14: OPERATING PERFORMANCE REGRESSION – INCLUDING ONLY FIRMS LISTED POST-CRISIS

The table below presents the results from rerunning the OLS regression model for the operating performance measures, but including only those firms listed after the financial crisis in 2008. Hence, it serves to complement the results presented in the main body of the text, in section 9.2.5.

OPERATING PERFORMANCE
REGRESSION INCLUDING ONLY FIRMS LISTED POST-CRISIS

PANEL A: ATO RATIO

Coefficient	**T-1**	**T0**	**T+1**	**T+2**	**T+3**
Intercept	0.9322 (0.93)	0.3899 (0.43)	0.1877 (0.24)	-0.0571 (-0.07)	0.3038 (0.45)
PE Dummy	-0.1460 (-1.04)	0.0890 (0.71)	0.1713 (1.57)	0.1229 (1.11)	0.1559 (1.57)
LN (Total Assets)	-0.0650 (-1.21)	-0.0304 (-0.63)	-0.0225 (-0.54)	-0.0086 (-0.20)	-0.0297 (-0.78)
Year Fixed Effects?	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects?	Yes	Yes	Yes	Yes	Yes
R-Squared	0.2861	0.3191	0.3861	0.3724	0.3615
Adjusted R-Squared	0.2306	0.2661	0.3377	0.3223	0.3061
N	278	278	275	258	239

PANEL B: EBITDA MARGIN

Coefficient	**T-1**	**T0**	**T+1**	**T+2**	**T+3**
Intercept	-0.2401 (-0.09)	-0.0723 (-0.63)	-0.2343 (-0.82)	-0.3282 (-0.86)	-0.6047 (-0.91)
PE Dummy	0.0796 (0.21)	0.0176 (1.11)	0.0357 (0.89)	0.0392 (0.71)	0.0764 (0.79)
LN (Total Assets)	0.0884 (0.61)	0.00678 (1.11)	0.0239 (1.57)	0.0381 (1.81)*	0.0619 (1.66)*
Year Fixed Effects?	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects?	Yes	Yes	Yes	Yes	Yes
R-Squared	0.0371	0.1315	0.1348	0.1417	0.2013
Adjusted R-Squared	0.0178	0.0639	0.0667	0.0731	0.1320
N	278	278	275	258	239

APPENDIX 15: ROBUSTNESS TESTS OF OPERATING PERFORMANCE

The tables presented in the following each consists of two panels, containing the results from running the OLS regression model on the industry-adjusted ATO ratio (Panel A) and EBITDA margin (Panel B), when we alter the base specification to test the robustness of our findings. Particularly, as in the case for aftermarket performance, we compute specifications which (1) exclude fixed effects, (2) exclude firms in the *High Technology* industry, and (3) include the entire control group of non-backed firms. Additionally, since we regress on the industry-adjusted measures, we include regressions in which we include year fixed effects, but no industry fixed effects. The coefficient estimate of interest is that for the *PE Dummy*, with a positive and statistically significant estimate being indicative of outperformance relative to the non-backed IPO firms.

Source: COMPUSTAT (2019), CRSP (2019), Thomson One (2019).

Appendix 15(a): Operating Performance Regression – Excluding Fixed Effects

OPERATING PERFORMANCE REGRESSION EXCLUDING FIXED EFFECTS					
PANEL A: ATO RATIO					
Coefficient	**T-1**	**T0**	**T+1**	**T+2**	**T+3**
Intercept	0.2987 (1.50)	-0.2445 (-1.32)	-0.2628 (-1.51)	-0.0909 (-0.52)	-0.0612 (-0.33)
PE Dummy	-0.0268 (-0.31)	0.2044 (2.50)**	0.2165 (2.81)***	0.1754 (2.26)**	0.1677 (2.05)**
LN (Total Assets)	-0.0424 (-1.25)	-0.004 (0.30)	0.0125 (0.42)	-0.0072 (-0.24)	-0.0138 (-0.44)
Year Fixed Effects?	No	No	No	No	No
Industry Fixed Effects?	No	No	No	No	No
R-Squared	0.0032	0.0138	0.0150	0.0086	0.0075
Adjusted R-Squared	0.0029	0.0086	0.0122	0.0055	0.0040
N	718	718	703	645	579
PANEL B: EBITDA MARGIN					
Coefficient	**T-1**	**T0**	**T+1**	**T+2**	**T+3**
Intercept	-0.1414 (-0.50)	-0.1205 (-3.16)***	-0.0661 (-1.82)*	-0.0386 (-0.70)	-0.1590 (-1.91)*
PE Dummy	0.1647 (1.31)	0.0219 (1.30)	0.0291 (1.81)*	0.0427 (1.74)*	0.0543 (1.47)
LN (Total Assets)	-0.0036 (-0.07)	0.0147 (2.26)**	0.0055 (0.89)	-0.0007 (-0.07)	0.0157 (1.11)
Year Fixed Effects?	No	No	No	No	No
Industry Fixed Effects?	No	No	No	No	No
R-Squared	0.0027	0.0150	0.0090	0.0054	0.0092
Adjusted R-Squared	0.0001	0.0122	0.0061	0.0023	0.0057
N	718	718	703	645	579

Appendix 15(b): Operating Performance Regression – Excluding Industry Fixed Effects

OPERATING PERFORMANCE BASE SPECIFICATION EXCLUDING INDUSTRY FIXED EFFECTS					
PANEL A: ATO RATIO					
Coefficient	**T-1**	**T0**	**T+1**	**T+2**	**T+3**
Intercept	0.6605 (2.37)**	0.1071 (0.41)	-0.0287 (-0.12)	0.0878 (0.36)	0.1064 (0.41)
PE Dummy	-0.0101 (-0.11)	0.2218 (2.71)***	0.2385 (3.09)***	0.1941 (2.48)**	0.1924 (2.32)**
LN (Total Assets)	-0.1003 (-2.72)***	-0.0502 (-1.46)	-0.0340 (-1.23)	-0.0495 (-1.51)	-0.0494 (-1.44)
Year Fixed Effects?	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects?	No	No	No	No	No
R-Squared	0.0647	0.0745	0.0762	0.0647	0.0574
Adjusted R-Squared	0.0392	0.0492	0.0505	0.0363	0.0253
N	718	718	703	645	579
PANEL B: EBITDA MARGIN					
Coefficient	**T-1**	**T0**	**T+1**	**T+2**	**T+3**
Intercept	-0.3353 (-0.82)	-0.1382 (-2.55)**	-0.1867 (-3.60)***	-0.2016 (-2.57)**	-0.5659 (-4.87)***
PE Dummy	0.1457 (1.13)	0.0245 (1.43)	0.0291 (1.78)*	0.0437 (1.75)*	0.0500 (1.33)
LN (Total Assets)	0.0340 (0.63)	0.0138 (1.93)	0.0148 (1.67)*	0.0091 (0.87)	0.0382 (2.45)**
Year Fixed Effects?	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects?	No	No	No	No	No
R-Squared	0.0162	0.0544	0.0380	0.0467	0.0574
Adjusted R-Squared	0.0106	0.0286	0.0112	0.0178	0.0253
N	718	718	703	645	579

Appendix 15(c): Operating Performance Regression – Including Leverage Control

OPERATING PERFORMANCE REGRESSION WITH LEVERAGE CONTROL					
PANEL A: ATO RATIO					
Coefficient	**T-1**	**T0**	**T+1**	**T 2**	**T+3**
Intercept	0.8365 (2.10)**	0.6381 (1.78)*	0.3190 (0.94)	-0.1221 (-0.33)	-0.1354 (-0.29)
PE Dummy	-0.0832 (-0.96)	0.1836 (2.34)**	0.2484 (3.37)***	0.1624 (2.15)**	0.1454 (1.77)*
LN (Total Assets)	-0.0665 (-1.77)*	-0.0467 (-1.38)	-0.0178 (-0.57)	-0.0056 (-0.18)	-0.0121 (-0.35)
Leverage Ratio	0.0465 (0.30)	0.0858 (0.61)	0.0713 (-0.54)	-0.0354 (-0.26)	-0.0287 (-0.20)
Year Fixed Effects?	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects?	Yes	Yes	Yes	Yes	Yes
R-Squared	0.3327	0.3800	0.4103	0.3959	0.3585
Adjusted R-Squared	0.3001	0.3497	0.3809	0.3629	0.3191
N	687	687	673	618	555
PANEL B: EBITDA MARGIN					
Coefficient	**T-1**	**T0**	**T+1**	**T+2**	**T+3**
Intercept	-0.3954 (-0.57)	-0.1716 (-1.86)*	-0.3543 (-4.20)***	-0.1889 (-1.32)	-0.3647 (-1.60)
PE Dummy	0.0538 (0.35)	0.0292 (1.54)	0.0268 (1.58)	0.0366 (1.26)	0.0348 (0.87)
LN (Total Assets)	0.0396 (0.60)	0.0122 (1.40)	0.0091 (1.17)	0.0093 (0.75)	0.0184 (1.08)
Leverage Ratio	0.2245 (0.82)	0.0150 (0.42)	-0.0091 (-0.28)	0.0085 (0.16)	0.0346 (0.49)
Year Fixed Effects?	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects?	Yes	Yes	Yes	Yes	Yes
R-Squared	0.0309	0.0700	0.0753	0.0700	0.0805
Adjusted R-Squared	0.0166	0.0244	0.0290	0.0192	0.0240
N	687	687	673	618	555

Appendix 15(d): Operating Performance Regression – Excluding Industry Fixed Effects with Leverage Control

OPERATING PERFORMANCE REGRESSION WITH LEVERAGE CONTROL AND NO INDUSTRY FIXED EFFECTS					
PANEL A: ATO RATIO					
Coefficient	**T-1**	**T0**	**T+1**	**T+2**	**T+3**
Intercept	0.7289 (2.46)**	0.2093 (0.76)	0.0300 (0.11)	0.1432 (0.54)	0.1736 (0.63)
PE Dummy	-0.0438 (-0.46)	0.1822 (2.07)**	0.2166 (2.58)**	0.1704 (1.99)**	0.1545 (1.72)*
LN (Total Assets)	-0.1129 (-2.76)***	-0.0713 (-1.87)*	-0.0503 (-1.38)	-0.0577 (-1.57)	-0.0601 (-1.56)
Leverage Ratio	0.0995 (0.56)	0.1767 (1.06)	0.0571 (0.35)	0.0357 (0.22)	0.0793 (0.47)
Year Fixed Effects?	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects?	No	No	No	No	No
R-Squared	0.0572	0.0616	0.0621	0.0540	0.0493
Adjusted R-Squared	0.0289	0.0334	0.0333	0.0222	0.0137
N	687	687	673	618	555
PANEL B: EBITDA MARGIN					
Coefficient	**T-1**	**T0**	**T+1**	**T+2**	**T+3**
Intercept	-0.2776 (-0.63)	0.1401 (-2.41)**	0.1554 (-2.93)***	-0.1608 -(1.94)*	-0.4269 (-3.80)***
PE Dummy	0.1214 (0.86)	0.0242 (1.30)	0.0306 (1.80)*	0.0428 (1.60)	0.0357 (0.96)
LN (Total Assets)	0.0155 (0.25)	0.0131 (1.63)	0.0175 (1.60)	0.0072 (0.63)	0.0294 (1.87)*
Leverage Ratio	0.2256 (0.85)	0.0121 (0.34)	-0.0210 (-0.64)	-0.0358 (-0.07)	0.0310 (0.44)
Year Fixed Effects?	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects?	No	No	No	No	No
R-Squared	0.0177	0.0549	0.0342	0.0430	0.0441
Adjusted R-Squared	0.0118	0.0265	0.0046	0.0110	0.0082
N	687	687	673	618	555

Appendix 15(e): Operating Performance Regression – Excluding Firms in High Tech. Industry

OPERATING PERFORMANCE REGRESSION EXCLUDING FIRMS IN 'HIGH TECHNOLOGY' INDUSTRY					
PANEL A: ATO RATIO					
Coefficient	**T-1**	**T0**	**T+1**	**T+2**	**T+3**
Intercept	0.9159 (2.25)**	0.7444 (2.03)**	0.4376 (1.28)	0.0444 (0.12)	0.0123 (0.03)
PE Dummy	-0.0428 (-0.47)	0.1780 (2.16)**	0.2400 (3.17)***	0.1732 (2.22)**	0.1524 (1.76)*
LN (Total Assets)	-0.0685 (-1.79)*	-0.0478 (-1.38)	-0.0328 (-1.04)	-0.0281 (-0.87)	-0.0292 (-0.82)
Year Fixed Effects?	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects?	Yes	Yes	Yes	Yes	Yes
R-Squared	0.3596	0.4288	0.4603	0.4388	0.3937
Adjusted R-Squared	0.3250	0.3980	0.4305	0.4047	0.3522
N	586	586	574	524	470
PANEL B: EBITDA MARGIN					
Coefficient	**T-1**	**T0**	**T+1**	**T+2**	**T+3**
Intercept	-0.4906 (-0.63)	-0.1928 (-1.90)*	-0.4160 (-4.22)***	-0.2541 (-1.58)	-0.5382 (-1.93)*
PE Dummy	0.1107 (0.64)	0.0400 (1.75)*	0.0364 (1.67)*	0.0534 (1.59)	0.0706 (1.40)
LN (Total Assets)	0.0635 (0.87)	0.0156 (1.62)	0.0102 (1.13)	0.0118 (0.85)	0.0251 (1.21)
Year Fixed Effects?	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects?	Yes	Yes	Yes	Yes	Yes
R-Squared	0.0306	0.0777	0.0823	0.0840	0.1051
Adjusted R-Squared	0.0218	0.0278	0.0319	0.0282	0.0438
N	586	586	574	524	470

Appendix 15(f): Operating Performance Regression – Full Control Group

NB: The entire control group is smaller than in the analysis of aftermarket performance due to lesser data availability of accounting measures in COMPUSTAT, explaining the overall smaller sample size reported in the table below.

OPERATING PERFORMANCE REGRESSION WITH FULL CONTROL GROUP					
PANEL A: ATO REGRESSION					
Coefficient	**T-1**	**T0**	**T+1**	**T+2**	**T+3**
Intercept	-1.1525 (-0.23)	0.7106 (5.21)***	0.6197 (2.95)***	0.5225 (3.43)***	0.6479 (3.85)***
PE Dummy	-0.2332 (-1.15)	0.2890 (5.19)***	0.3172 (3.73)***	0.1994 (3.47)***	0.1507 (2.52)**
LN (Total Assets)	-0.1200 (-0.23)	-0.0675 (-4.73)***	-0.060 (-2.75)***	-0.0483 (-3.22)***	-0.059 (-3.74)***
Year Fixed Effects?	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects?	Yes	Yes	Yes	Yes	Yes
R-Squared	0.1639	0.3206	0.1511	0.2677	0.2856
Adjusted R-Squared	0.1545	0.3097	0.1362	0.2530	0.2692
N	1,956	1,956	1,800	1,574	1,385
PANEL B: EBITDA MARGIN					
Coefficient	**T-1**	**T0**	**T+1**	**T+2**	**T+3**
Intercept	0.3104 (-1.50)	-0.1021 (-2.84)***	-0.1642 (-3.80)***	-0.4702 (-3.65)***	-0.2125 (-2.58)***
PE Dummy	0.0648 (0.77)	0.0253 (1.74)*	0.0195 (1.13)	0.0388 (0.81)	0.0308 (1.07)
LN (Total Assets)	0.0239 (1.08)	0.0076 (1.99)**	0.0047 (0.61)	0.0169 (1.31)	0.0046 (0.58)
Year Fixed Effects?	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects?	Yes	Yes	Yes	Yes	Yes
R-Squared	0.0135	0.0588	0.0475	0.0497	0.0606
Adjusted R-Squared	0.0030	0.0400	0.0301	0.0298	0.0380
N	1,956	1,956	1,800	1,574	1,385

APPENDIX 16: CHI-SQUARED TESTS FOR COMPARATIVE ANALYSIS

The table below depicts the results from running Chi-Squared tests for independence of the basic characteristics, conventional levers, and operational levers of value creation.

CHI-SQUARED TESTS FOR INDEPENDENCE *Null hypothesis = Independence of the variables. High test statistics reject the null.*				
PANEL A: BASIC CHARACTERISTICS				
Variable	**Pre-crisis Subsample**	**Post-crisis Subsample**	**Chi-Squared Test Statistic**	**P-Value**
SBO	13.97%	34.78%	12.09***	0.0005
Consortium	31.62%	23.91%	1.10	0.2939
PANEL B: CONVENTIONAL LEVERS				
Variable	**Pre-crisis Subsample**	**Post-crisis Subsample**	**Chi-Squared Test Statistic**	**P-Value**
Chairman of the Board	29.78%	39.13%	1.61	0.2052
PANEL C: OPERATIONAL LEVERS				
Variable	**Pre-crisis Subsample**	**Post-crisis Subsample**	**Chi-Squared Test Statistic**	**P-Value**
Buy-and-Build	19.49%	34.78%	5.42**	0.0199
Management Turnover	28.68%	19.57%	1.64	0.1998
Operating Partner	19.12%	26.09%	1.19	0.2756

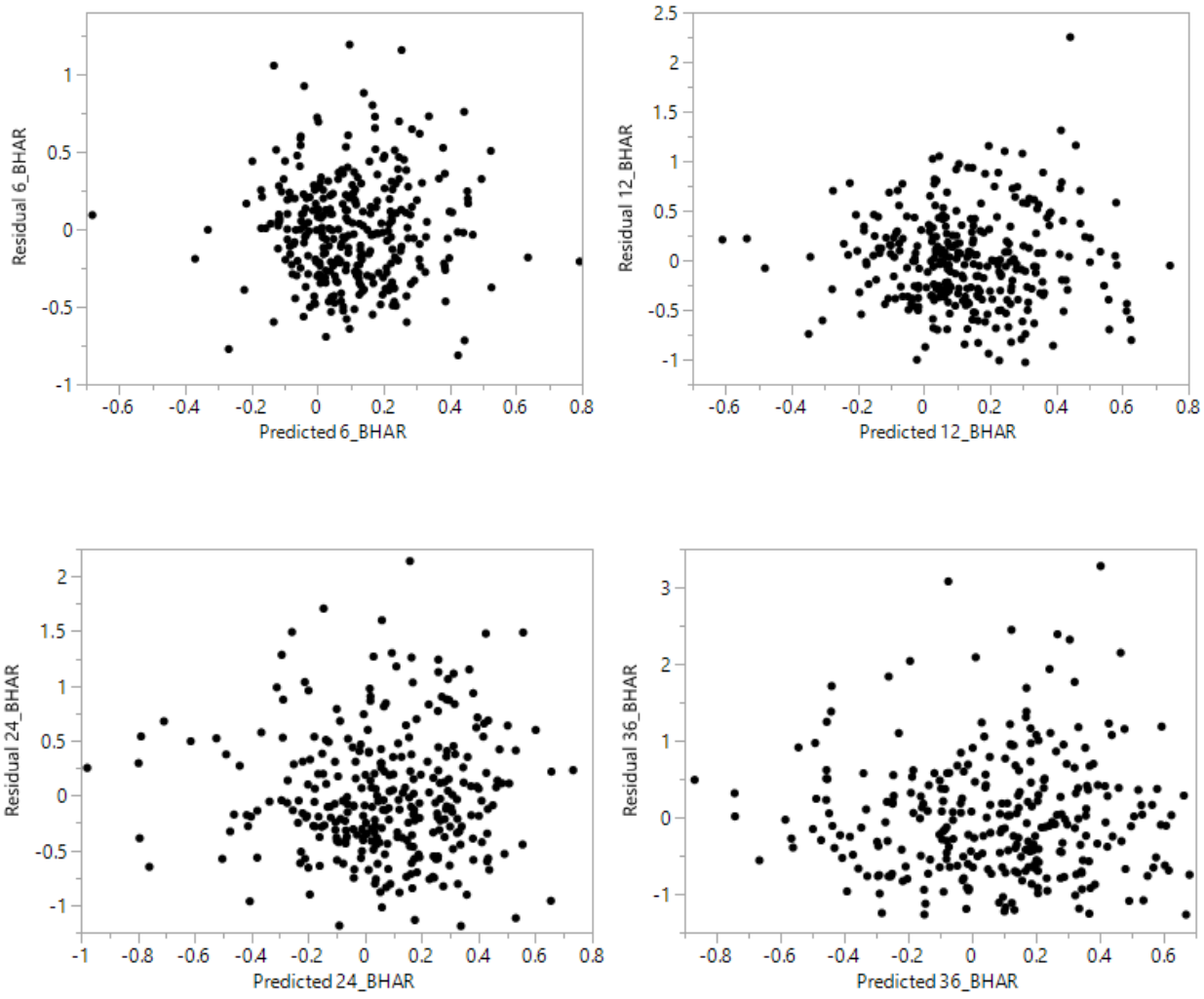
APPENDIX 17: TEST FOR MULTICOLLINEARITY

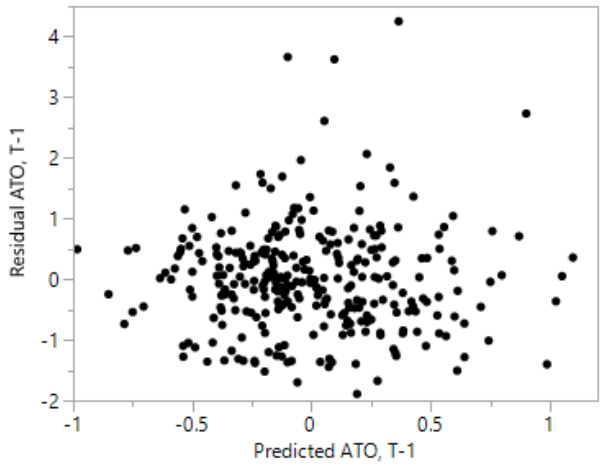
The table below presents the bivariate correlation estimates between all the control variables and explanatory variables included in the cross-sectional regression analysis of which operational levers of value creation are associated with performance. In line with general consensus within the field, we employ the benchmark of absolute 0.7 to determine whether to exclude any variables. As shown below, none of the bivariate correlations exceed this number (Dormann et al., 2012; Gujarati, 2011).

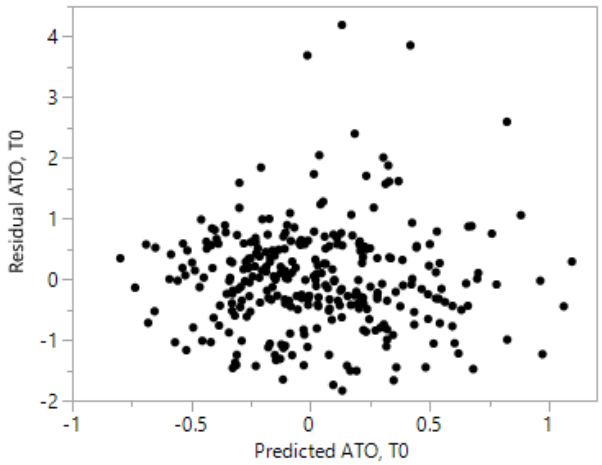
Variables	Ln(Total Assets)	Ln(Sponsor Size)	Consortium	Specialization	Buy-and-Build	Management Turnover	Board Expertise	Operating Partner	Holding Period
Ln(Total Assets)	1								
Ln(Sponsor Size)	0.5789	1							
Consortium	0.2005	0.0777	1						
Specialization	-0.1251	-0.2061	-0.0169	1					
Buy-and-Build	0.2139	0.2048	0.0191	0.0043	1				
Management Turnover	-0.0837	-0.0849	0.0634	0.1000	-0.0574	1			
Board Expertise	0.0980	0.1821	0.0785	0.0045	0.0964	0.0334	1		
Operating Partner	0.2375	0.1492	0.0933	-0.0283	0.2105	-0.0823	0.0179	1	
Holding Period	0.0497	0.0720	-0.0419	0.0424	-0.0029	-0.0814	-0.0542	0.0914	1

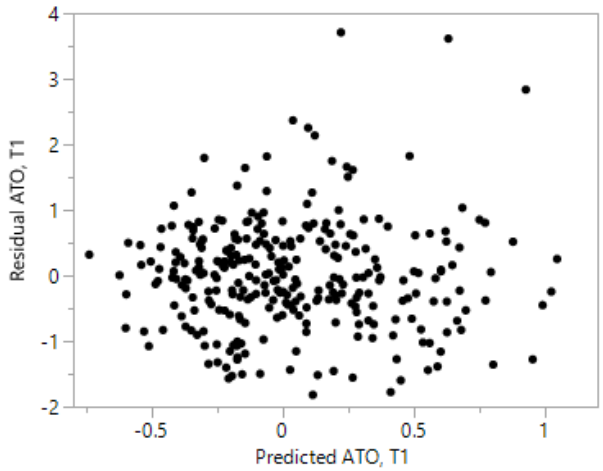
APPENDIX 18: TEST FOR HETEROSCEDASCITY

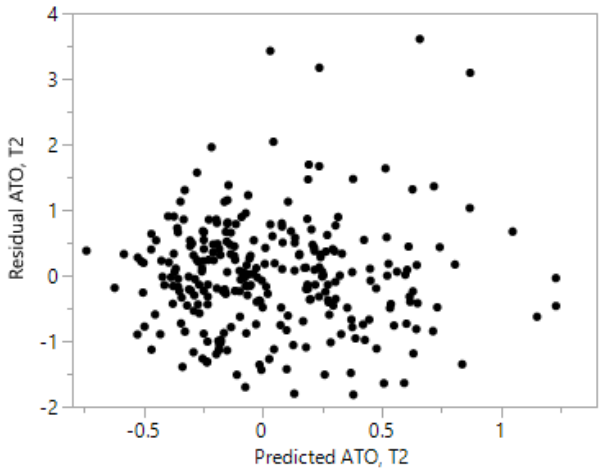
The graphs below depict the bivariate fit between the predicted values, per our estimation of the multiple cross-sectional regression model, and the residuals to test for constant variance of the error term (Gujarati, 2011).

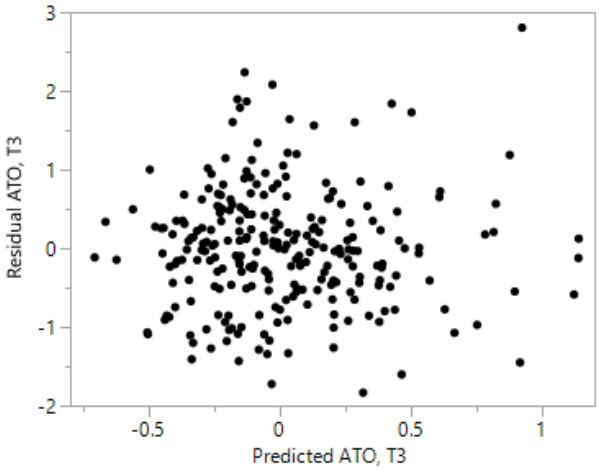


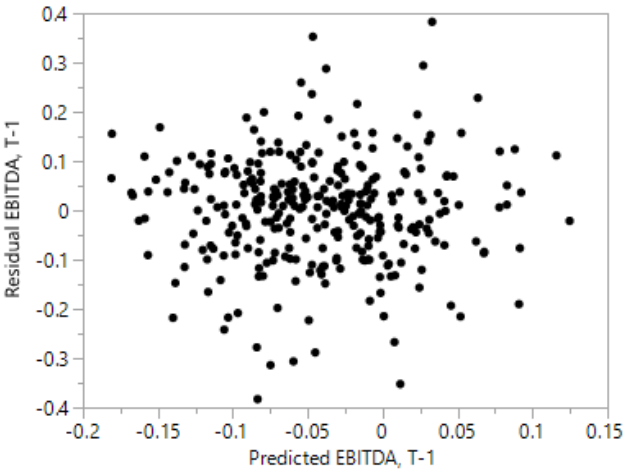

Residual ATO, T-1
Predicted ATO, T-1

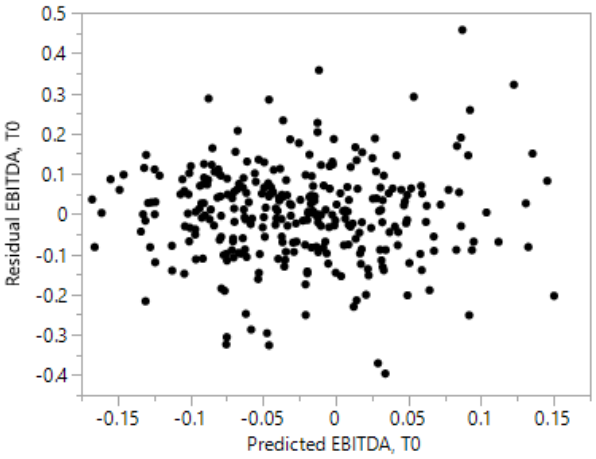

Residual ATO, T0
Predicted ATO, T0

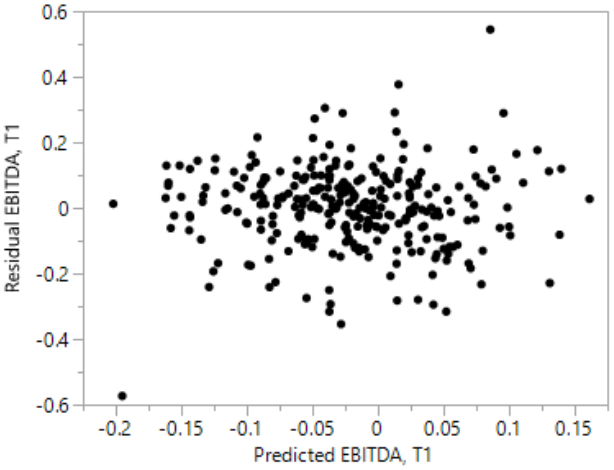

Residual ATO, T1
Predicted ATO, T1

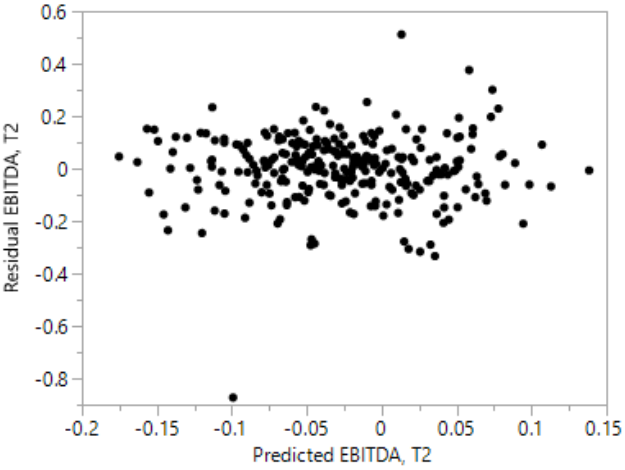

Residual ATO, T2
Predicted ATO, T2

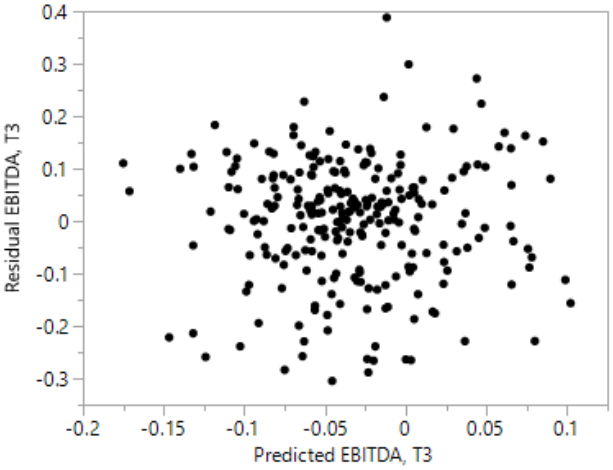

Residual ATO, T3
Predicted ATO, T3


Residual EBITDA, T-1
Predicted EBITDA, T-1


Residual EBITDA, T0
Predicted EBITDA, T0


Residual EBITDA, T1
Predicted EBITDA, T1


Residual EBITDA, T2
Predicted EBITDA, T2


Residual EBITDA, T3
Predicted EBITDA, T3

APPENDIX 19: AFTERMARKET PERFORMANCE REGRESSION EXCLUDING FIXED EFFECTS

The table below depicts the results from computing the multiple regression on BHARs when we exclude year and industry fixed effects.

AFTERMARKET PERFORMANCE (BHAR BASED ON S&P 500): NO FIXED EFFECTS

Coefficient	6 Months	12 Months	24 Months	36 Months
Intercept	0.3191 (2.09)**	0.2700 (1.29)	-0.1378 (-0.53)	-0.2806 (-0.80)
LN (Total Assets)	-0.0329 (-1.55)	-0.0231 (-0.79)	0.0348 (0.97)	0.0066 (0.13)
LN (Sponsor Size)	-0.0137 (-0.78)	-0.0090 (-0.37)	0.0051 (0.17)	0.0460 (1.11)
Consortium	0.0196 (0.42)	-0.0360 (-0.57)	-0.1185 (-1.51)	-0.1306 (-1.21)
Holding Period	0.0208 (2.40)**	0.0301 (2.54)**	0.0125 (0.82)	0.0050 (0.23)
Specialization	0.0780 (1.53)	0.0053 (0.08)	-0.0133 (-0.15)	-0.0072 (-0.06)
Buy-and-Build	-0.0780 (-1.68)*	-0.0647 (-1.00)	-0.1379 (-1.71)*	-0.0750 (-0.68)
Management Turnover	-0.0150 (-0.35)	-0.0288 (-0.50)	-0.0655 (-0.91)	-0.1087 (-1.10)
Board Expertise	0.0519 (0.80)	0.1167 (1.30)	0.1329 (1.19)	0.0593 (0.39)
Operating Partner	0.1383 (2.55)**	0.0658 (0.89)	0.1313 (1.45)	0.1246 (0.98)
Year Fixed Effects?	No	No	No	No
Industry Fixed Effects?	No	No	No	No
R-Squared	0.0736	0.0372	0.0351	0.0232
Adjusted R-Squared	0.0465	0.0089	0.0063	0.0074
N	318	317	311	298

APPENDIX 20: REGRESSION ANALYSIS OF PERFORMANCE DRIVERS FOR FIRMS ACQUIRED PRIOR TO VERSUS AFTER THE CRISIS

The table below depicts the explanatory variables which are included with the *Post-crisis* dummy as interaction terms to test hypothesis **H4(b)**, stipulating that the association between the operational levers of value creation and performance is moderated in a positive direction for firms acquired post-crisis.

VARIABLES SELECTED FOR INTERACTION TERMS			
Aftermarket Performance	**ATO Ratio**	**EBITDA Margin**	**Revenue Growth**
Buy-and-Build	Holding Period	Holding Period	Specialization
Board Expertise	Board Expertise	Specialization	*N/A*

The variables are selected based on running two separate regressions; one which includes the firms acquired pre-crisis and one which includes those acquired post-crisis for each of the performance measures. We then observe where a difference exists between the two subsamples with regards to the prevalence of statistical significance for the coefficient estimates. Hence, to determine whether the apparent disparity is statistically significant, thus taking into account the potential influence of sample size, we run a specification in which we allow these variables to interact with the *Post-crisis* dummy, as reported in the main body of the text.

The regressions for the subsamples are presented on the following three pages.

Appendix 20(a): Aftermarket Performance Regressions for Pre- and Post-crisis Subsamples

AFTERMARKET PERFORMANCE (BHAR BASED ON S&P 500): SUBSAMPLES OF FIRMS ACQUIRED PRE- AND POST-CRISIS

	PRE-CRISIS				POST-CRISIS			
Coefficient	**6 Months**	**12 Months**	**24 Months**	**36 Months**	**6 Months**	**12 Months**	**24 Months**	**36 Months**
Intercept	0.3615 (1.12)	0.2224 (0.52)	-0.3618 (-0.65)	-0.1044 (-0.13)	0.0829 (0.12)	0.4340 (0.30)	-0.5178 (-0.35)	-1.7728 (-0.90)
LN (Total Assets)	-0.0327 (-1.25)	-0.0149 (-0.43)	0.0353 (0.81)	0.0227 (0.36)	0.0832 (1.05)	-0.0401 (-0.24)	0.0849 (0.51)	0.1559 (0.68)
LN (Sponsor Size)	-0.0038 (-0.18)	0.0142 (0.52)	0.0374 (1.09)	0.0558 (1.12)	-0.0282 (-0.51)	0.0457 (0.40)	0.0684 (0.59)	0.1118 (0.68)
Consortium	0.0255 (0.48)	0.0019 (0.03)	-0.0716 (-0.80)	-0.1299 (-1.01)	-0.1593 (-0.95)	-0.3819 (-1.10)	-0.7784 (-2.22)**	-0.5312 (-1.09)
Holding Period	0.0132 (1.14)	0.0228 (1.48)	0.0031 (0.15)	-0.0104 (-0.34)	-0.0386 (-0.88)	-0.0257 (-0.28)	0.0397 (0.44)	0.1392 (1.15)
Specialization	0.0968 (1.65)*	0.0118 (0.15)	0.0744 (0.76)	0.1244 (0.88)	-0.0385 (-0.29)	-0.0744 (-0.27)	-0.3307 (-1.18)	-0.4987 (-1.34)
Buy-and-Build	-0.1296 (-2.53)**	-0.1056 (-1.54)	-0.1574 (-1.84)*	-0.0747 (-0.61)	0.1160 (0.66)	-0.2472 (-0.68)	-0.2971 (-0.81)	-0.6342 (-1.29)
Management Turnover	-0.0349 (-0.72)	-0.0331 (-0.52)	-0.1065 (-1.32)	-0.1372 (-1.18)	-0.0605 (-0.47)	-0.0924 (-0.35)	0.2325 (0.86)	0.0781 (0.20)
Board Expertise	-0.0165 (-0.20)	0.0242 (0.21)	0.1559 (1.10)	0.0273 (0.13)	0.4553 (3.37)***	0.4467 (1.60)	0.5232 (1.86)*	0.7282 (1.94)*
Operating Partner	0.1609 (2.51)**	0.0315 (0.37)	0.0412 (0.39)	-0.0086 (-0.06)	0.0472 (0.28)	-0.0105 (-0.03)	0.4089 (1.17)	0.5920 (1.24)
Year Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.2384	0.1737	0.2083	0.1228	0.6022	0.4395	0.5065	0.5240
Adjusted R-Squared	0.1137	0.0378	0.0746	0.0337	0.2216	0.0966	0.0344	0.0479
N	271	270	265	253	47	47	46	45

Appendix 20(b): Operating Performance Regressions for Post-crisis Subsample

OPERATING PERFORMANCE: POST-CRISIS SUBSAMPLE

	ATO RATIO					EBITDA MARGIN					REVENUE GROWTH			
Coefficient	**T-1**	**T0**	**T+1**	**T+2**	**T+3**	**T-1**	**T0**	**T+1**	**T+2**	**T+3**	**T-1 to T0**	**T-1 to T+1**	**T-1 to T+2**	**T-1 to T+3**
Intercept	-3.9455 (-1.54)	-3.9643 (-1.45)	-4.0949 (-1.68)	-5.1186 (-2.24)**	-3.5168 (-1.46)	-0.1235 (-0.42)	-0.1241 (-0.36)	0.1042 (0.30)	0.0498 (0.19)	-0.1991 (-0.75)	-0.0807 (-0.04)	1.8211 (0.67)	3.3738 (1.56)	3.5929 (1.66)
LN (Total Assets)	0.4573 (1.59)	0.3982 (1.30)	0.4112 (1.43)	0.6050* (2.21)**	0.4030 (1.22)	0.0184 (0.56)	0.0301 (0.79)	-0.0390 (-0.95)	-0.0002 (-0.01)	0.0289 (0.79)	-0.1960 (-0.82)	-0.3892 (-1.21)	-0.5747 (-2.21)**	-0.6244 (-2.21)*
LN (Sponsor Size)	-0.1554 (-0.92)	-0.0966 (-0.54)	-0.0629 (-0.35)	-0.1129 (-0.67)	-0.0692 (-0.32)	-0.0136 (-0.71)	-0.0224 (-0.99)	0.0102 (0.40)	-0.0149 (-0.77)	-0.0183 (-0.78)	0.1930 (1.38)	0.2006 (1.00)	0.2099 (1.32)	0.2756 (1.44)
Consortium	0.4869 (0.89)	0.5999 (1.03)	0.5551 (1.00)	0.5031 (0.97)	0.1792 (0.32)	0.0373 (0.60)	0.0991 (1.35)	-0.0259 (-0.33)	0.0461 (0.77)	0.0377 (0.62)	0.1112 (0.24)	0.2466 (0.40)	0.5114 (1.04)	0.3487 (0.70)
Holding Period	0.3083 (2.20)**	0.2986 (2.00)*	0.2627 (1.97)*	0.2273 (1.75)*	0.1649 (1.17)	-0.0052 (-0.33)	-0.0053 (-0.28)	0.0025 (0.13)	-0.0119 (-0.79)	-0.0081 (-0.52)	0.0518 (0.44)	0.0221 (0.15)	0.0070 (0.06)	-0.0254 (-0.20)
Specialization	0.4209 (0.87)	0.4157 (0.81)	0.3771 (0.82)	0.7300 (1.61)	0.6821 (1.24)	0.0195 (0.35)	0.0183 (0.28)	-0.0258 (-0.39)	-0.0581 (-1.11)	0.0138 (0.23)	0.1989 (0.50)	0.2084 (0.41)	-0.3506 (-0.82)	-0.2474 (-0.50)
Buy-and-Build	-0.1198 (-0.24)	-0.1255 (-0.23)	-0.3238 (-0.67)	-0.4895 (-1.06)	-0.3342 (-0.67)	-0.0708 (-1.23)	-0.0809 (-1.20)	-0.0868 (-1.26)	-0.0308 (-0.58)	-0.0265 (-0.48)	-0.6165 (-1.51)	-0.5818 (-1.08)	-0.6146 (-1.40)	-0.6379 (-1.42)
Management Turnover	0.4764 (1.15)	0.4420 (1.00)	0.3838 (0.89)	0.2609 (0.64)	0.2799 (0.62)	0.0507 (1.08)	0.0483 (0.88)	0.0498 (0.81)	0.0246 (0.52)	0.0185 (0.37)	-0.3555 (-1.04)	-0.6356 (-1.32)	-0.7755 (-1.20)	-0.6705 (-1.65)
Board Expertise	1.0184 (2.05)*	0.8822 (1.69)*	1.0090 (2.15)**	0.9866 (2.25)**	0.4345 (0.91)	0.0110 (0.19)	0.0256 (0.39)	0.0248 (0.37)	0.0058 (0.11)	0.0633 (1.20)	-0.3661 (-0.89)	-0.3870 (0.74)	-0.4984 (-0.62)	-0.4868 (-1.13)
Operating Partner	0.1827 (0.35)	0.0289 (0.05)	-0.0075 (-0.01)	-0.0961 (-0.20)	0.2041 (0.39)	0.0012 (0.02)	-0.0034 (-0.05)	0.0026 (0.04)	0.0218 (0.38)	0.0175 (0.30)	-0.3843 (-0.90)	-0.6647 (-1.17)	-0.2880 (-0.62)	-0.1772 (-0.38)
Year Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.6580	0.6237	0.6912	0.7518	0.5808	0.7569	0.7144	0.8019	0.8465	0.8300	0.3970	0.4379	0.6520	0.7095
Adjusted R-Squared	0.2998	0.2295	0.3515	0.4307	0.3392	0.5023	0.4152	0.5841	0.6478	0.5806	0.2470	0.1805	0.1976	0.2835
N	47	47	43	40	38	47	47	43	40	38	47	43	40	38

Appendix 20(c): Operating Performance Regressions for Pre-crisis Subsample

OPERATING PERFORMANCE: PRE-CRISIS SUBSAMPLE

	ATO RATIO					EBITDA MARGIN					REVENUE GROWTH			
Coefficient	**T-1**	**T0**	**T+1**	**T+2**	**T+3**	**T-1**	**T0**	**T+1**	**T+2**	**T+3**	**T-1 to T0**	**T-1 to T+1**	**T-1 to T+2**	**T-1 to T+3**
Intercept	1.0623 (1.67)*	1.1034 (1.80)*	0.7451 (1.11)	0.6368 (0.92)	0.9102 (1.36)	-0.1387 (-1.89)*	-0.1183 (-1.54)	-0.1490 (-1.55)	-0.1917 (-1.60)	-0.2288 (-2.28)**	0.4929 (0.78)	1.2847 (1.06)	1.7612 (2.03)**	2.5889 (2.61)***
LN (Total Assets)	-0.1348 (-2.68)**	-0.1310 (-2.71)***	-0.1064 (-2.17)**	-0.0763 (-1.48)	-0.0632 (-1.25)	-0.0198 (-3.43)***	-0.0260 (-4.28)***	-0.0216 (-3.09)***	-0.0164 (-1.85)*	-0.0076 (-1.00)	-0.0683 (-1.37)	0.0702 (0.80)	-0.1763 (-2.73)***	-0.1750 (-2.34)**
LN (Sponsor Size)	-0.0132 (-0.33)	-0.0167 (-0.44)	-0.0116 (-0.30)	-0.0386 (-0.94)	-0.0440 (-1.08)	0.0079 (1.72)*	0.0132 (2.75)***	0.0136 (2.47)**	0.0148 (2.10)**	0.0180 (2.97)***	0.0236 (0.60)	-0.1762 (-2.53)**	0.0013 (0.03)	-0.0356 (-0.59)
Consortium	-0.0388 (-0.37)	-0.0809 (-0.81)	-0.0448 (-0.45)	-0.0732 (-0.71)	-0.1130 (-1.10)	0.0187 (1.57)	0.0235 (1.87)*	0.0366 (2.56)**	0.0280 (1.57)	0.0228 (1.48)	-0.1463 (-1.43)	-0.3079 (-1.70)*	-0.2469 (-1.91)*	-0.3062 (-2.01)**
Holding Period	0.0273 (1.22)	0.0147 (0.68)	0.0190 (0.86)	0.0248 (0.99)	0.0001 (0.00)	0.0085 (3.29)***	0.0062 (2.29)**	0.0100 (3.18)***	0.0079 (1.84)*	0.0097 (2.58)*	-0.0247 (-1.11)	-0.0266 (-0.67)	-0.0240 (-0.77)	0.0056 (0.15)
Specialization	0.0423 (0.38)	0.0367 (0.34)	0.0928 (0.85)	0.0866 (0.77)	0.0448 (-0.92)	-0.0269 (-2.08)**	-0.0385 (-2.84)***	-0.0294 (-1.89)*	-0.0026 (-0.14)	-0.0080 (-0.48)	0.1776 (1.60)	0.2763 (1.48)	0.2928 (2.08)**	0.2363 (1.45)
Buy-and-Build	-0.0849 (-0.85)	0.0054 (0.06)	-0.0610 (-0.64)	-0.0429 (-0.43)	-0.0896 (1.23)	-0.0083 (-0.72)	0.0015 (0.12)	-0.0058 (-0.43)	-0.0139 (-0.81)	-0.0133 (-0.92)	0.1285 (1.31)	0.1388 (0.81)	0.1040 (0.83)	0.1183 (0.82)
Management Turnover	0.0936 (1.01)	0.1225 (1.36)	0.1051 (1.16)	0.1252 (1.32)	0.1142 (-0.85)	-0.0098 (-0.92)	0.0044 (0.39)	0.0045 (0.35)	0.0129 (0.79)	-0.0064 (-0.46)	0.0056 (0.06)	-0.0701 (-0.43)	0.0932 (0.79)	-0.0705 (-0.51)
Board Expertise	-0.0433 (-0.27)	-0.0893 (-0.58)	-0.1011 (-0.65)	-0.1676 (-1.04)	-0.1365 (1.14)	0.0026 (0.14)	-0.0031 (-0.16)	0.0034 (0.15)	-0.0221 (-0.79)	-0.0164 (-0.68)	-0.2255 (-1.48)	0.1337 (0.47)	-0.2611 (-1.29)	-0.1831 (-0.77)
Operating Partner	0.1377 (1.13)	0.0638 (0.54)	0.1393 (1.15)	0.1629 (1.31)	0.1426 (1.14)	0.0135 (0.96)	-0.0051 (-0.34)	-0.0070 (-0.41)	0.0090 (0.42)	-0.0047 (-0.25)	-0.0401 (-0.33)	-0.0926 (-0.43)	0.1496 (0.96)	0.0983 (0.53)
Year Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.5080	0.5228	0.5313	0.5262	0.5323	0.6102	0.6283	0.5420	0.4113	0.5010	0.1758	0.1636	0.2487	0.2658
Adjusted R-Squared	0.4237	0.4408	0.4457	0.4343	0.4318	0.5435	0.5641	0.4583	0.2971	0.3939	0.0341	0.0108	0.1030	0.1082
N	258	258	247	235	216	258	258	247	235	216	258	247	235	216

APPENDIX 21: OPERATING PERFORMANCE REGRESSIONS EXCLUDING FIXED EFFECTS

The table below depicts the results from computing the multiple regressions on the operating performance measures when we exclude year and industry fixed effects.

OPERATING PERFORMANCE: NO FIXED EFFECTS

	ATO RATIO					EBITDA MARGIN					REVENUE GROWTH			
Coefficient	**T-1**	**T0**	**T+1**	**T+2**	**T+3**	**T-1**	**T0**	**T+1**	**T+2**	**T+3**	**T-1 to T0**	**T-1 to T+1**	**T-1 to T+2**	**T-1 to T+3**
Intercept	0.4630	0.4414	0.2036	0.2564	0.3651	0.1755	0.2197	0.1993	0.1083	0.0600	0.5913	1.5829	1.4862	1.7584
	(1.20)	(1.15)	(0.53)	(0.66)	(0.99)	(3.58)***	(4.23)***	(3.54)***	(1.84)*	(1.10)	(2.07)**	(3.29)***	(4.06)***	(4.22)***
LN (Total Assets)	-0.0505	-0.0496	-0.0299	-0.0048	-0.0216	-0.0352	-0.0422	-0.0418	-0.0289	-0.0214	-0.0857	-0.0011	-0.1744	-0.2006
	(-0.93)	(-0.93)	(-0.55)	(-0.09)	(-0.41)	(-5.13)***	(-5.80)***	(-5.21)***	(-3.39)***	(-2.73)***	(-2.14)**	(-0.02)	(-3.03)***	(-3.35)***
LN (Sponsor Size)	-0.0522	-0.0446	-0.0309	-0.0525	-0.0384	0.0042	0.0070	0.0085	0.0068	0.0078	0.0380	-0.1122	0.0289	0.0273
	(-1.17)	(-1.01)	(-0.69)	(-1.12)	(-0.87)	(0.74)	(1.17)	(1.29)	(0.97)	(1.19)	(1.15)	(-1.99)**	(0.66)	(0.54)
Consortium	-0.1486	-0.1717	-0.1284	-0.1369	-0.1918	0.0310	0.0412	0.0360	0.0317	0.0267	-0.0779	-0.1607	-0.1312	-0.1004
	(-1.25)	(-1.46)	(-1.08)	(-1.12)	(-1.68)	(2.05)**	(2.57)**	(2.06)**	(1.73)*	(1.57)	(-0.88)	(-1.08)	(-1.15)	(-0.77)
Holding Period	0.0565	0.0447	0.0438	0.0442	0.0244	0.0046	0.0016	0.0052	0.0054	0.0049	-0.0327	-0.0348	-0.0053	0.0141
	(2.59)***	(2.07)**	(1.98)**	(1.84)*	(1.06)	(1.66)*	(0.55)	(1.63)*	(1.50)	(1.45)	(-2.02)**	(-1.25)	(-0.23)	(0.54)
Specialization	0.0112	0.0111	0.0687	0.0554	0.0511	-0.0402	-0.0500	-0.0462	-0.0253	-0.0324	0.1815	0.2370	0.2378	0.2798
	(0.09)	(0.09)	(0.53)	(0.42)	(0.41)	(-2.46)**	(-2.88)***	(-2.45)**	(-1.27)	(-1.74)*	(1.90)*	(1.47)	(1.93)*	(1.97)**
Buy-and-Build	-0.1107	-0.0345	-0.1102	-0.0999	-0.1113	-0.0179	-0.0088	-0.0149	-0.0175	-0.0179	0.1131	0.1260	0.0650	0.0607
	(-0.92)	(-0.29)	(-0.92)	(-0.81)	(-0.97)	(-1.17)	(-0.54)	(-0.85)	(-0.94)	(-1.04)	(1.27)	(0.84)	(0.57)	(0.47)
Management Turnover	0.2388	0.2440	0.2234	0.2162	0.1532	0.0019	0.0150	0.0128	0.0204	0.0101	-0.0468	-0.1177	-0.0114	-0.1295
	(2.24)**	(2.30)**	(2.09)**	(1.98)**	(1.47)	(0.14)	(1.04)	(0.81)	(1.23)	(0.65)	(-0.59)	(-0.88)	(-0.11)	(-1.10)
Board Expertise	0.3118	0.2776	0.2853	0.2160	0.1481	-0.0422	-0.0401	-0.0609	-0.0716	-0.0708	-0.1513	-0.0281	-0.2545	-0.2579
	(1.90)*	(1.71)*	(1.74)*	(1.29)	(0.94)	(-2.03)**	(-1.81)*	(-2.52)**	(-2.83)***	(-3.02)***	(-1.25)	(-0.14)	(-1.62)	(-1.45)
Operating Partner	0.0397	-0.0203	0.0089	0.0087	0.0647	0.0290	0.0134	0.0239	0.0242	0.0173	-0.1063	-0.0451	0.0979	0.1140
	(0.29)	(-0.15)	(0.07)	(0.06)	(0.48)	(1.68)*	(0.73)	(1.19)	(1.15)	(0.87)	(-1.06)	(-0.26)	(0.75)	(0.75)
Year Fixed Effects?	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Industry Fixed Effects?	No	No	No	No	No	No	No	No	No	No	No	No	No	No
R-Squared	0.0723	0.0623	0.0538	0.0497	0.0444	0.1474	0.1625	0.1535	0.1022	0.0955	0.0609	0.0491	0.0893	0.0990
Adjusted R-Squared	0.0440	0.0336	0.0234	0.0174	0.0091	0.1214	0.1367	0.1263	0.0717	0.0622	0.0321	0.0185	0.0583	0.0658
N	305	305	290	275	254	305	305	290	275	254	305	290	275	254

APPENDIX 22: OPERATING PERFORMANCE REGRESSIONS INCLUDING ONLY YEAR FIXED EFFECTS

The table below depicts the results from computing the multiple regressions when we include only year fixed effects, since we regress on the industry-adjusted measures of ATO and EBITDA.

OPERATING PERFORMANCE: ONLY YEAR FIXED EFFECTS

	ATO RATIO					EBITDA MARGIN					REVENUE GROWTH			
Coefficient	**T-1**	**T0**	**T+1**	**T+2**	**T+3**	**T-1**	**T0**	**T+1**	**T+2**	**T+3**	**T-1 to T0**	**T-1 to T+1**	**T-1 to T+2**	**T-1 to T+3**
Intercept	0.2664	0.3165	-0.0366	-0.1335	0.2801	0.1218	0.1741	0.1389	0.0651	-0.0342	0.5835	1.4589	1.3601	1.7162
	(0.52)	(0.63)	(-0.07)	(-0.26)	(0.58)	(1.88)*	(2.52)**	(1.86)*	(0.81)	(-0.46)	(1.53)	(2.23)**	(2.72)***	(3.00)***
LN (Total Assets)	-0.0766	-0.0835	-0.0487	-0.0199	-0.0368	-0.0321	-0.0399	-0.0409	-0.0299	-0.0177	-0.0984	-0.0091	-0.2043	-0.2183
	(-1.34)	(-1.48)	(-0.85)	(-0.33)	(-0.67)	(-4.42)***	(-5.15)***	(-4.81)***	(-3.27)***	(-2.08)**	(-2.30)**	(-0.12)	(-3.57)***	(-3.35)***
LN (Sponsor Size)	-0.0311	-0.0242	-0.0145	-0.0265	-0.0214	0.0033	0.0057	0.0069	0.0070	0.0081	0.0429	-0.1102	0.0462	0.0320
	(-0.67)	(-0.53)	(-0.32)	(-0.55)	(-0.47)	(0.56)	(0.91)	(1.01)	(0.95)	(1.16)	(1.24)	(-1.85)*	(1.00)	(0.60)
Consortium	-0.1282	-0.1574	-0.1145	-0.1179	-0.2151	0.0308	0.0400	0.0340	0.0304	0.0241	-0.0734	-0.1492	-0.1149	-0.1198
	(-1.07)	(-1.32)	(-0.96)	(-0.97)	(-1.85)*	(2.02)**	(2.44)**	(1.91)*	(1.62)	(1.35)	(-0.82)	(-0.96)	(-0.98)	(-0.88)
Holding Period	0.0471	0.0315	0.0376	0.0379	0.0110	0.0074	0.0038	0.0072	0.0063	0.0089	-0.0337	-0.0344	-0.0162	0.0125
	(1.92)*	(1.30)	(1.53)	(1.40)	(0.43)	(2.37)**	(1.13)	(1.95)*	(1.52)	(2.26)**	(-1.84)*	(-1.07)	(-0.62)	(0.41)
Specialization	0.0354	0.0316	0.0765	0.0875	0.0508	-0.0342	-0.0467	-0.0428	-0.0195	-0.0250	0.2036	0.2489	0.2400	0.2598
	(0.27)	(0.24)	(0.59)	(0.66)	(0.40)	(-2.05)**	(-2.61)***	(-2.20)**	(-0.95)	(-1.29)	(2.07)**	(1.47)	(1.87)*	(1.75)*
Buy-and-Build	-0.0932	-0.020	-0.1062	-0.1112	-0.1192	-0.0158	-0.0055	-0.0121	-0.0147	-0.0147	0.0775	0.0970	0.0358	0.0443
	(-0.77)	(-0.17)	(-0.90)	(-0.91)	(-1.05)	(-1.03)	(-0.34)	(-0.69)	(-0.79)	(-0.84)	(0.86)	(0.63)	(0.31)	(0.33)
Management Turnover	0.2272	0.2371	0.2312	0.2347	0.1845	0.0003	0.0128	0.0170	0.0255	0.0107	-0.0330	-0.1034	0.0285	-0.1184
	(2.11)**	(2.23)**	(2.18)**	(2.15)**	(1.79)*	(0.02)	(0.88)	(1.07)	(1.52)	(0.68)	(-0.41)	(-0.75)	(0.27)	(-0.97)
Board Expertise	0.2898	0.2354	0.2593	0.1929	0.1670	-0.0381	-0.0372	-0.0506	-0.0594	-0.050	-0.1577	0.0100	-0.2484	-0.2182
	(1.70)*	(1.39)	(1.53)	(1.12)	(1.03)	(-1.76)*	(-1.59)	(-2.00)**	(-2.24)**	(-2.01)**	(-1.23)	(0.05)	(-1.50)	(-1.14)
Operating Partner	0.0339	-0.0357	-0.0075	0.0222	0.0599	0.0252	0.0066	0.0248	0.0296	0.0220	-0.0780	-0.0323	0.1265	0.1162
	(0.24)	(-0.26)	(-0.05)	(0.16)	(0.44)	(1.43)	(0.35)	(1.20)	(1.36)	(1.06)	(-0.75)	(-0.18)	(0.93)	(0.73)
Year Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects?	No	No	No	No	No	No	No	No	No	No	No	No	No	No
R-Squared	0.1466	0.1432	0.1525	0.1555	0.1613	0.2166	0.2202	0.2185	0.1713	0.1585	0.1196	0.0837	0.1466	0.1442
Adjusted R-Squared	0.0667	0.0628	0.0687	0.0669	0.0652	0.1433	0.1468	0.1413	0.0844	0.0621	0.0370	0.0368	0.0571	0.0461
N	305	305	290	275	254	305	305	290	275	254	305	290	275	254

APPENDIX 23: ARCHETYPICAL APPROACHES TO THE USE OF OPERATING PARTNERS

The table below is a direct replica of a recent INSEAD report, detailing the various approaches to engaging operating partners which are found to exist across various PE firms. We thus claim no role in devising the model, but rather include it as a potential way to frame the discussion of the role of operating partners going forward.

Three Models

There are three common models a private equity firm follows when taking the operational route. In a paper from INSEAD, the industry expert model, functional model and generalist model are laid out.

	Industry expert / former senior executive model	Functional model	Generalist model
Profiles of operating partners	· Former senior executives typically CEO or SFO · High-level general managers	· Former executives, consultants, accountants or lawyers with a deep expertise in a functional area, such as procurement, sales & marketing or lean manufacturing	· Former consultants, often complemented with a few years of industry experience
Description	· As senior executives with experience in the industries targeted by the private equity firm, they bring in network and industry/management expertise. · They give high-level strategic advice and generally sit on the board	· They belong to a separate pool of resources, on which the deal team / portfolio management can draw when needed for specific functional skill · They are mostly not attached to one portfolio company, but are deployed across multiple companies where there is a need for a certain functional expertise	· They sit on-site alongside with management and develop a long-term relationship with management over the holding period. · Their role is to lead value creation plan initiative, support and coach management, bring in external expertise and oversee implementation progress · They are assigned to one company at a time
Examples	· Clayton, Dubilier & Rice · Lion Capital · Permira (hybrid former CEO/ generalist) · Silver Lake (hybrid industry expert/generalist) · Sun Capital	· Doughty Handson · PAI Partners · The Blackstone Group (US)	· Apax Partners · Bain Capital · Cerberus (hybrid generalist / functional expert) · CVC Capital Partners · Oaktree (hybrid generalist/ industry expert) · KKR Capstone (hybrid generalist/functional expert) · Texas Pacific Group

Source: INSEAD (2018)