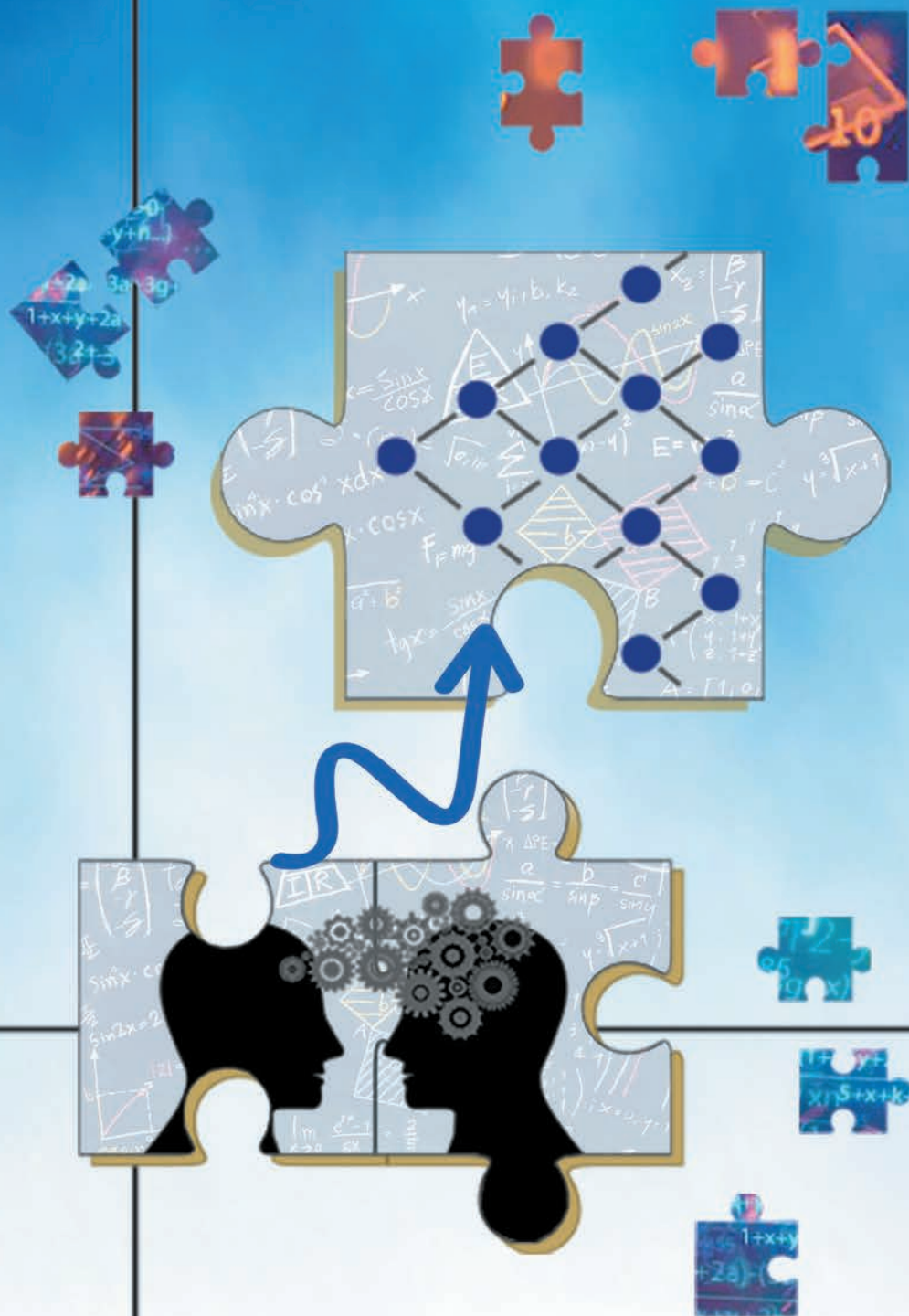**DYARAN SELWIN BANSRAJ**

The Principles of Private Equity: Ownership and Acquisitions

The Principles of Private Equity: Ownership and Acquisitions

The Principles of Private Equity: Ownership and Acquisitions

De beginselen van private equity: eigendom en overnames

Thesis

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Preface

The private equity market is still relatively young, but the market is growing and evolving, establishing a more prominent role in both the academic literature and practice. For academics, the ownership structure in private equity investments has a few interesting and unique features that offer outstanding opportunities to test and discuss economic theories, as exemplified by Jensen (1986) and his discussion of the agency theory. Since this seminal study, many scholars have researched the private equity market, however, as the market matures, new opportunities emerge. This dissertation follows the stream of literature that analyzes the relation between private equity ownership and operating performance, but it distinguishes itself by focusing on one of the key developments in the market. In the changing environment of private equity investments, acquisitions by private equity-owned portfolio companies may be the next key to success. Nowadays, one out of five PE-owned companies complete at least one acquisition, and trends in the market suggest that these acquisitions are becoming more prevalent. Yet, we know very little about how the private equity ownership structure affects acquisition activities. Furthermore, acquisitions in general are frequently associated with agency problems and can have major implications for the future of a company. The theoretical framework in this dissertation substantiates the anticipation value, which helps us to understand the interrelated dependencies between real options in serial acquisitions strategies. The first empirical study focuses on the synergetic value in so-called buy-and-build strategies that account for up to 50% of the buyout market. The second empirical study helps us better understand how the unique feature of private equity ownership may matter for acquisition activities and the real implications of these acquisitions.

Acknowledgements

To understand where you are, you need to know where you have been and where you are going. This dissertation marks the end of an exciting and eventful time and offers great new opportunities. It is the result of several years of work, however, the journey

towards this moment was embarked upon much longer ago, and I did not go through the process alone. I have always believed that the unique group of people you collect around you are a good approximation of yourself. I hope that I can live up to that expectation, since the group of family, friends, and many great colleagues who have supported me throughout this process have been of indefinite value. Therefore, I will remember this period also as one in which I was able to appropriate the value of the collective. Let me take a moment to thank my collective to which I am in great debt.

I gratefully thank my supervisors. We had many excellent discussions that stimulated me personally and that elevated our projects. I thank Vadym Volosovych for his guidance, encouragements, and opportunities to speak my mind. Vadym has provided invaluable support from the beginning of my academic path and I am very happy to have had him as my supervisor. The same is true for Han Smit. Han has been a supervisor, mentor, and a friend. He taught me many lessons, in class, research, and life, and showed me the way of an academic. For me, there were no options outside academia anymore.

I thank my former office mate, Rex Wang, for his advise in the early stages of my PhD. I also thank Nishad Matawlie with whom I shared pain, but mostly laughter. An old bond rejoined and a new bond emerged.

This dissertation has greatly contributed from the feedback that I received from colleagues and fellow academics who I thank. The finance group at Erasmus School of Economics offered an inspiring environment. I feel privileged to have travelled to conferences and to have visited Stockholm School of Economics. Per Strömberg and his colleagues provided me with a deeper and stronger motivation than ever to push for the best.

What is life without a bit of fun? Writing a dissertation can be stressful. With my friends it was easy to forget the frustrations and find balance in life. I thank them for that.

I thank my family. To start with the youngest bunch. Seeing a new generation being born, puts everything in perspective and provides a new view on the past, current, and future. While growing up, under the overseeing eyes of my brother

Sjanil and sister Chara, I was free to explore, investigate, and discover the world. Without doubt, this freedom was a key factor for my character development and it awakened my intrinsic research side. In the later stages of my life, Irene was there as well who took on a similar role during my life as a student and thereafter. Thank you all so much.

Throughout my life, I have been lucky to have the support of two loving parents. At no time during my life, I felt that there were limits to what I could do or to what I wanted to do. It is in this environment in which a passion for continuous learning developed and in which a dream to contribute emerged. While a dissertation may be a first step, bigger things are yet to come. Dear parents, Nersing and Petra, thank you.

Lastly, I want to thank my girlfriend, Martijne. I cannot describe how often she was able to re-energize me, support me when needed, and to motivate me to continue my efforts in academia. I want to acknowledge the ordeals she had to go through with me working late and in the weekends and talking too much about work. Without you, this would not have been possible. Thank you.

Chapter 1

Introduction

1.1 Introduction to Private Equity

Once upon a time, there was private equity. Nowadays, we are familiar with the vocabulary of private equity investments, for example with the term *leveraged buyout*, but this has not always been the case. Although private equity investments have existed in a variety of forms since the beginning of the corporate market, it was the leveraged buyout of RJR Nabisco that marked the new era of private equity and characterized the landscape of private equity as we know it today. The deal may perhaps even be described as the embodiment of private equity power, since it showed that private equity ownership can compete with public ownership. Subsequent deals and research papers supported this notion and some even argued that the private equity ownership structure may be superior to the public form (Jensen, 1989). However, critics claim that the private equity ownership structure is not indefinitely better, and the behavior of private equity firms is actually similar to that of corporate raiders. In that context, the private equity investors behind the RJR Nabisco deal, were famously referred to as barbarians (Burrough and Helyar, 2010).

But since then, the private equity market matured and went through some distinct changes. This dissertation documents and analyzes one of the key developments in this market, namely acquisitions by private equity owned portfolio companies. The

recent surge in acquisitions by private equity owned companies, raises new questions about the private equity ownership model. Which initial conditions may motivate private equity firms to pursue these strategies? Are acquisitions just a tool for private equity firms to deploy more capital in competitive times? Which distinguishing characteristics of the private equity ownership can explain their acquisition performance? Luckily, improvements in data quality offer opportunities to obtain new insights into these questions. This dissertation exploits these opportunities and aims to discover the impact of private equity ownership on acquisition activities and acquisition performance.

1.2   Outline

This dissertation is organized as follows. In Chapter 2 and Chapter 3, attention is devoted to serial acquisitions strategies by private equity. These strategies are a subset of the private equity market, but exemplify an increased focus of private equity firms on operational growth. Chapter 4 generalizes the relation between private equity ownership and acquisition activities.

Chapter 2, "Anticipation Value in Serial Acquisitions", provides a theoretical framework, based on the *anticipation of growth option value*, which can explain the occurrence of serial acquisition strategies in private equity. In the last decades, a buy-and-build type of strategy has emerged within private equity with an apparent opposite aim compared to more traditional leveraged buyouts, which usually center around a highly leveraged structure and cost restructuring. In this serial acquisition strategy, the private equity investor acts as an industry consolidator, with the aim of transforming several smaller companies to an efficient scale before exiting. Although private equity investors act here as strategic serial acquirers, their strategy is difficult to explain with extant theories for serial acquisitions, such as empire building, CEO hubris, desperation for growth, and learning. Our *anticipation argument* advances an alternative account.

In this chapter, we model a buy-and-build strategy as an interrelated chain of

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platform, follow-on, and exit options. The real options framework fits the strategy well, since it can incorporate flexible decision making: conditional on having invested in the platform company, the consolidator has a compound option consisting of follow-on acquisition options and subsequent exit options. The model implies that a major component of the value of the strategy is driven by future growth option value that that goes beyond the focal deal. It is exactly this anticipation of the future growth option value that drives the initiation of the strategy.

We suggest that to be effective in creating potential option value, a buy-and-build strategy requires certain industry conditions when selecting a platform, appropriate company conditions for follow-ons, and financial market conditions at exit, all influencing the exercise of the option chain. We provide empirical evidence for these conditions, using a European sample of buy-and-build strategies by private equity as a natural test setting since it 1) excludes most alternative explanations for serial deals, and 2) the data allow us to specify the platform, follow-on, and exit options. Furthermore, the data provide new evidence of serial acquisition in private equity that contrast with traditional restructuring strategies.

Overall, this chapter provides insights on a general anticipation of real option value in serial acquisitions.

Chapter 3, "Private Equity Funds Acting as Strategic Buyers", analyzes the operating performance of buy-and-build strategies by private equity. Investors generally believe that private equity firms buy companies for financial reasons, such as filling them up with debt to obtain tax benefits, taking advantage of underpricing, or cutting costs. While strategic buyers buy companies with the purpose to realize operating synergies. This chapter argues that we may need to adjust this common perception.

The developments in the private equity suggest that private equity firms now also try to realize operating synergies, through buy-and-build strategies. This strategy has received considerable attention, but is also viewed with skepticism. On the one hand, it is believed to be be a necessity to stimulate fund returns in times – when as a result of competition – traditional value drivers based on financial, governance, and

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cost restructuring have become a common good in the private equity market. On the other hand, the increase in the popularity of this strategy may also be driven by other motives such as multiple arbitrage or as critics argue maybe even window-dressing to motivate fundraising or justify spending committed capital. In this chapter, we explore whether private equity firms indeed use buy-and-build strategies to realize synergies.

A methodological novelty of our approach is to construct *placebo strategies* – the observationally equivalent portfolios constructed from the stand-alone (non-acquired) companies similar to the companies within our observed strategies. This control group mimics the acquisitions in the treated group and can therefore control for inorganic changes in the operating measures, such as the inorganic growth that may result from simply bundling more and more companies in a series of acquisitions. By running a difference-in-differences analysis with this control group, we are able to tease out the organic changes. The difference in outcomes between actual and comparable placebo strategies post acquisition is a plausible measure for the synergetic changes, since synergies are commonly understood as the relative performance compared to non-acquired companies.

We carefully collect private equity investments to closely match them to the conceptual definition of buy-and-build strategies as advanced by Smit (2001). That is, we scan for private equity investments in portfolio companies that act as platforms for subsequent follow-on acquisitions. In these deals, the private equity firm aims to exploit a long term synergetic growth relationship. Then to construct complete strategies, we utilize rich ownership data to map the ownership structures of each investment and to identify the platform company, related follow-on acquisitions, and exits. We identify 818 platforms and related 1,346 follow-on acquisitions, completed between 1997 and 2016 in seven major European private equity markets.

The three main findings are as follows. First, we find that buy-and-builds strategies on average increase the profitability in the long-run. Second, we find a positive relation between these organic improvements and exit decisions. Using a duration analysis, we show that the probability of exiting increases with time and with or-

ganic improvements profitability. Splitting the sample into completed (exited) and uncompleted (non-exited) strategies, indeed shows that the former group drives the positive results and these completed strategies have organically increased their sales and profitability. These results indicate that the organic improvements are a notion of "success", and this hold for both shorter-held and longer-held strategies. Third, by analyzing subsets where synergies are theoretically expected to be different, we evidence that reinforces our interpretation that the organic changes in our strategies represent synergies.

Overall, this chapter shows that private equity firms aim to realize organic improvements that relate to synergies, suggesting that they do act as strategic buyers in buy-and-build strategies.

In **Chapter 4**, "Acquisitions under Private Equity Ownership", I study whether private equity ownership affects acquisition activities and the level of post-acquisition operating performance. I find evidence that suggest that it does: Acquisitions by private equity-owned companies (PE-owned companies) display higher organic growth (that is growth above the size effect due to the acquisitions) than acquisitions by companies that are not owned by private equity (non-PE-owned companies).

More generally, this chapter aims to address whether the ownership structure of the acquirer matters for acquisition activities and post-acquisition success, where I differentiate between PE-owned and non-PE owned companies. While acquisitions are generally believed to be important for the development of companies and industries, the literature on acquisitions is mixed. The literature on mergers and acquisitions frequently associates acquisitions with the inability to deliver expected operating improvements, while the literature on private equity, positively relates private equity ownership to operating performance. So it is a question whether the acquisition performance is different under private equity ownership, and if so, why.

To address my research question, I consider all companies that make acquisitions in seven European countries between 1997–2018 and differentiate the acquirers by the identity of the controlling owner (PE vs. non-PE). In total, I collect over 2,500 acquisitions made by almost 1,200 PE-owned companies and more than 50,000 ac-

quisitions made by over 33,000 non-PE-owned companies. Subsequently, I analyze the post-acquisition operating performance of these deals in a matched difference-in-differences framework. Similar to the previous chapter, this chapter also exploits *placebo strategies* as control groups to measure organic operating changes. The chosen methodology in this chapter aims to address endogeneity concerns that may reflect from private equity timing and selection skills and are conducive of the estimated relation.

The main findings are as follows. First, PE-owned acquirers display significantly higher organic growth than non-PE-owned acquirers. But, while the negative growth found in acquisitions by non-PE-owned companies may be driven by the removal of redundant assets, I do not find any significant differences in profitability. The results do not seem to be driven by private equity firms "cherry-picking" higher quality acquirers, but rather are more in line with PE ownership actually making these companies better.

Second, when analyzing the performance of previously PE-owned companies, I find evidence that suggest that the benefits from private equity ownership seem to "stick" with the portfolio company even after the private equity firm has exited, indicating that private equity ownership has long-term implications for portfolio companies.

Third, several attributes of the private equity ownership structure – related to providing liquidity, improving the governance structure, and providing acquisition experience – may contribute to improved acquisition performance. I analyze this last argument of acquisition experience in more detail and find confirmatory results: PE-owned companies without prior experience show a similar acquisition pattern as experienced non-PE owned companies.[1] Subsequently, I analyze the acquisition patterns and acquisition performance of previously PE-owned companies as well and find results that are in line with the notion that knowledge spillovers from the private equity firm to the PE-owned company.

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[1]The argument is based on two views. First, experience from previous deals may improve the performance in future acquisitions. Second, private equity firms are active acquirers, and therefore may also be experienced and knowledgeable.

Fourth, private equity ownership, is related to a higher likelihood of acquisitions, with a factor ten, which is in line with higher expected value from acquisitions under PE ownership.

Finally, other results indicate that deals completed under private equity ownership may reflect higher quality deals. For example, under private equity ownership, (potential) acquirers are on larger, while their targets are relatively smaller, and both are more profitable compared to non-PE-owned acquirers and targets. Splitting the non-PE-owned acquisitions based on these characteristics, reveals that these are indeed important selection criteria for completing successful deals in terms of operating performance.

Overall, the chapter shows that private equity ownership structurally affects acquisition decisions of portfolio company also by providing acquisition experience. Private equity ownership is thus an alternative route for obtaining acquisition knowledge, which stimulates growth.

Finally, **Chapter 5** summarizes the key findings of this dissertation and concludes. The chapter ends with a discussion on directions for future research.

1.3   Declaration of Contribution

In this section, I declare my contribution to the chapters of this dissertation and also acknowledge the contribution of others.

Chapter 1: The majority of the work in this chapter has been done independently by the author of this dissertation, but was polished using the feedback of the promoter and supervisor.

Chapter 2: This chapter is based on the paper Smit and Bansraj (2019). This chapter consists of two key (integrated) parts. First, the development of a theoretical framework, and second, the empirical testing of the propositions from the theoretical framework. The author of this dissertation strongly contributed to the theoretical framework – which was developed jointly with the co-author – and did the majority of the work for the empirical analysis.

Chapter 3: This chapter is based on the paper Bansraj, Smit, and Volosovych (2020). It has benefited from feedback of Theodosios Dimopoulos, Tim Jenkinson, Sebastian Gryglewicz, Yael Hochberg, William L. Megginson, Peter Severin, Per Strömberg, Daniel Urban and the participants of the 2019 FMA European Conference in Glasgow, the 34th congress of the European Economic Association in Manchester, the 2019 Private Capital Conference in Montreux, the 17th Finance, Risk and Accounting Perspectives Conference at Hanken School of Economics, Helsinki, the 2019 Global Finance Conference, the 2019 European Financial Management Association Conference, the 2019 Private Equity Research Symposium at UNC Chapel Hill, and seminars at Erasmus University Rotterdam, Frankfurt School of Finance and Management, University of Groningen, and Stockholm School of Economics. My contribution includes the formulation of the research question, the data collection and empirical analysis, and the writing of the first draft.

Chapter 4: This chapter is based on the sole-authored paper Bansraj (2020). I thank Han Smit (promoter), Per Strömberg (host during research visit), and Vadym Volosovych (supervisor) for their extensive discussions and feedback. I also thank Sebastian Gryglewicz, Stefan Obernberger, Daniel Urban, and the participants at the seminars of Aarhus University, Cass Business School, Copenhagen Business School, Erasmus University Rotterdam, Goethe University, Lancaster University, NHH Norwegian School of Economics, VU Amsterdam, and University of St. Gallen and the members of Stockholm School of Economics (SSE) and Swedish House of Finance (ShoF) for valuable comments and suggestions. Part of the data for this chapter is the same data that is used in Chapter 3. Any other data used in this chapter is collected by the author of this dissertation. The chapter was polished based on the feedback of the promoter and supervisor.

Chapter 5: The majority of the work in this chapter has been done independently by the author of this dissertation, but was polished using the feedback of the promoter and supervisor.

Chapter 2

Anticipation Value in Serial Acquisitions[1]

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[1]This chapter is based on the paper Smit and Bansraj (2019).

2.1 Introduction

In private equity, corporate raiders traditionally use a highly leveraged capital structure to take under-performing companies private, restructure them, and sell valuable assets separately within a time frame of three to five years. However, in the last decades, a buy-and-build strategy has emerged with an apparent opposite aim. In this serial acquisition strategy, the private equity investor acts as an industry consolidator with the aim of transforming several smaller companies to an efficient scale before exiting.[2] The strategy – which is a hybrid strategy of a strategic and financial investor – is difficult to explain with traditional motives for serial acquisitions. In this chapter, we therefore aim to fill this gap by providing a motive for private equity firms to execute serial acquisitions. We develop a theoretical framework for the conditions that drive the real option value of the strategy, and we provide empirical evidence in line with the notion that the anticipation of real option value is indeed a motive for serial acquisitions by private equity.[3]

Extant theories in the literature explain the execution of serial acquisitions in general, through overconfidence (Billett and Qian, 2008; Malmendier and Tate, 2008), empire building by the CEO, hubris, desperation for growth (Kim et al., 2011), and learning (Fuller et al., 2002; Laamanen and Keil, 2008). These explanations are valid in many settings, but they do not seem to apply to private equity. Because of the active involvement of the owner and concentrated ownership structure of LBOs, agency considerations are different for private equity investors (Jensen, 1989). Unlike in listed firms, the private equity investor can not use its own shares as a transaction currency. As a consequence, overvaluation of the bidder's stock does not directly apply as a transaction motive (Shleifer and Vishny, 2003). Driven by the limited lifetime of most private equity funds, PE investors also exit the investment over

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[2]In a buy-and-build strategy, the investor first acquires a company that acts as a "platform" of the strategy. Subsequently, the platform company acquires companies, which are referred to as "follow-on" acquisitions. Finally, at the end of the strategy, the private equity investor can exit the strategy by selling the combined entities.

[3]Real options refer to projects in which the manager of the project has decision flexibility. For example, a company may intend to acquire a rival in the future, but if market conditions worsen, the company can decide to delay or defer the acquisition. Real option value reflects the value of this flexibility, which is especially beneficial when uncertainty is high.

a pre-specified time span as the fund matures, making traditional empire-building motives unlikely. And lastly, private equity investors are often experienced acquirers, which makes transaction learning a less-likely motive.[4]

In fact, exactly these characteristics of the private equity structure that cause other theories to be less-likely motives, make the buy-and-build strategy by private equity investors an interesting setting to test the anticipation of real options value. Real options theory also applies to serial acquisition strategies in general, but in non-PE serial acquisitions, it may be difficult to differentiate between existing theories and the anticipation argument. Precisely because these existing theories cannot fully explain the observed trend of serial buy-and-build strategies executed by private equity investors, we can use this strategy by private equity as a natural or "clean" setting to isolate and test real option theory for serial acquisitions in a private M&A market. The structure of a buy-and-build strategy by private equity consists of clear platform, follow-on, and exit transactions. Together with the fixed maturities of most private equity funds, these are important premises for us to specify the different real options. So, the findings in this chapter also provide new insights on the anticipation of real option value as a general motive for serial acquisition strategies.

We can think of buy-and-build strategies as a way to collect the expected synergetic value between platform and follow-on companies and the value related to the skills that the investor may bring. But this is not the complete story. We build a model based on real option theory in an industrial organization context (McGrath, 1997; Chi, 2000; Folta and Miller, 2002; Reuer and Tong, 2005; Smit and Trigeorgis, 2017) in which buy-and-build strategies can conceptually be seen as an interrelated chain of platform, follow-on, and exit options (Smit, 2001; Vassolo et al., 2004). By developing a model for these strategies, we provide deeper understanding on the optimal conditions and option interactions that explain why serial acquisitions by private equity occur.[5] The distinguishing aspect of our theoretical argument is the

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[4]Experienced acquirers are less likely to learn in deal making capabilities, but can learn through the development of future sector specialization and resolution of uncertainty.

[5]The real options view on acquisitions is consistent with general findings that mergers tend to occur in up-cycle periods and that mergers are positively related to stock prices, Tobin's q, and economic activity as measured by GNP or industrial production (Nelson, 1959; Rhodes–Kropf and Viswanathan, 2004; Ahern, 2012).

element of anticipation of future option value, where intended transaction depends on the evolution of various uncertainties and value (or "moneyness") of the embedded real options. Applied to buy-and-build strategies, platform acquisitions may provide the private equity investor with valuable options to complete follow-on acquisitions, which subsequently lead to exit opportunities. Consequently, the private equity investors choose a platform in industries, where the anticipated value from follow-on and exit options, which go beyond the focal deal itself, is high (anticipation argument). The anticipation element justifies our theoretical choice, because this element has not been sufficiently integrated in prior M&A research.[6]

We confirm our implications with an empirical analysis using a sample consisting of 2,881 buy-and-build acquisitions from seven European countries between 1998 and 2016. We argue that to be effective in creating potential option value, a buy-and-build strategy requires certain industry conditions when selecting a platform, certain company conditions for follow-ons, and financial market conditions at exit, all influencing the exercise of the option chain. Our theory and empirical evidence reveal such optimal financing, company, and industry conditions that drive the initiation of buy-and-build strategies. Using private equity data, we not only provide new evidence of serial acquisitions in private equity that contrast with the traditional restructuring strategies, but also can isolate the more general effect of anticipation – which applies to public acquisitions as well – from other existing explanations, such as empire-building or learning. In short, by considering serial acquisitions as a chain of different options and by testing it with private equity data, we provide the insight on anticipation of real option value in M&A research on serial acquisitions.

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[6]When real options value is important, then future research may benefit from further integration of real options insights with existing channels such as learning, empire-building motives, overconfidence and mispricing, and agency theory.

2.2 Anticipation of Option Value in Serial Acquisitions

The idea that resources and capabilities may create valuable growth opportunities can already be found in Penrose (1959), Wernerfelt (1984), Barney (1986), and Peteraf (1993), and other proponents of the knowledge-based view, which stipulates that internal growth arises through asset stock accumulation.[7] In the strategic management literature, real options have been applied to acquisitions and indicate that minority stakes (Miller and Folta, 2002), joint ventures (Kogut, 1991; Chi, 2000), strategic alliances (McCarter et al., 2011) and platform acquisitions (Smit, 2001; Smit and Moraitis, 2010) can give firms distinctive advantages in pursuing or exploiting sets of follow-on opportunities. When real options are based on call-option characteristics, the investor makes a small commitment now (by paying the option premium) to gain the right, but not the obligation, to exercise the option in the future. Then, to determine whether to hold, exercise, or abandon the option, the investor monitors how uncertainty develops in its environment (e.g., see Baldwin (1982) and Bowman and Hurry (1993)). The option value is amplified or compounded when the underlying asset of the option is the next real option (Kester, 1984; Geske, 1979; Carr, 1988).

The buy-and-build strategy in private equity presents a hybrid strategy between a serial acquisition strategy by a strategic player and a buyout by a financial player, and it can create value in several ways.[8] First, similar to acquisitions by strategic buyers, a buy-and-build strategy by private equity may unlock growth option value from future opportunities such as follow-on acquisitions. Parts of this growth option value is what we commonly understand as synergies, including those attributable to increases in size and scope. The real options value of these acquisitions may then depend on the competition in the industry (e.g., when acquisitions change the strategic position and nature of competition in the industry, see for example: Bettis and Hitt, 1995;

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[7]Dierickx and Cool (1989) coined the term "asset stock accumulation" to refute Barney (1986)'s argument that resources might be purchased via acquisitions.

[8]Feldman et al. (2016) show that companies may make sub-optimal decisions (from a shareholders perspective) on restructurings such as divestitures. In traditional buyouts, these inefficient companies were typically targeted and restructured by PE.

Kulatilaka and Perotti, 1998; Lambrecht, 2004; Smit and Trigeorgis, 2004; Belderbos and Sleuwaegen, 2005; Chi and Seth, 2009), where value can be created through synergetic acquisitions as operations become integrated, cost efficiency is realized, and the market share is increased.

Second, value may come from the financial expertise of the private equity investor. Private equity investors accumulate knowledge and specialize in industry-, geographical-, or stage-specific investments (as in Dierickx and Cool (1989)). Some private equity funds even specialize in buy-and-build strategies. The private equity investor may therefore provide expertise on completing acquisitions, obtaining financing, and exiting the strategy. For example, the investor is typically able raise a significant amount of debt to finance the acquisitions. Besides creating valuable tax shields, the increase in financial leverage can also strengthen managerial incentives to improve operating efficiency and cash flow management (Jensen and Meckling, 1976). Entrusting these functions to the private equity investor, allows a company's management to focus on growth, integration, and improving margins. The knowledge of the private equity investor may therefore enhance the ability to appropriate the growth option value. Thus, the buy-and-build strategy can derive value from both synergetic growth options commonly found in acquisitions by strategic buyers and from the financial expertise commonly found in investments by financial players (Gorbenko and Malenko, 2014).[9]

The option tree in Figure 2.1 provides a schematic representation of the buy-and-build strategy as a portfolio real options and of the timing of strategic decisions. Table 2.1 provides an overview of the methodology used in this study, corresponding to the strategic decisions in Figure 2.1. As described in the top row in Table 2.1, in the first stage, the investor acquires a platform company. Subsequently, the investor has the option (but not the obligation) to complete follow-on acquisitions, which in turn open up exit opportunities. In each stage, the investor has decision flexibility

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[9]Studies on leveraged buyouts have examined the various sources of value creation, such as the alignment of incentives (Jensen, 1986; Kaplan, 1989a), holding period effects (Kaplan et al., 2009), leverage effects (Guo et al., 2011), and return implications of follow-ons (Nikoskelainen and Wright, 2007), but have not modeled or empirically tested the anticipation value from real options to acquire and exit, which are embedded in a buy-and-build strategy.
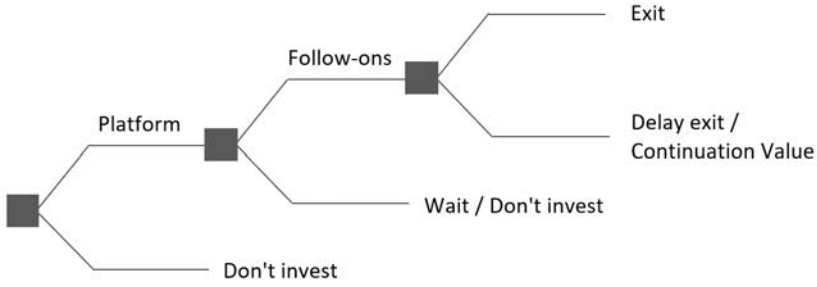
Figure 2.1: Buy-and-build strategies as a portfolio of real options

to exercise the real option or not. Following real option reasoning, the value of a platform is therefore driven not only by its standalone value, but also by the value of its underlying growth options, in this case the portfolio of follow-on and exit real options. The anticipated value of this bundle of corporate real options for the investor, as well as the likelihood of a successful execution of the buy-and-build strategy, will then be different in each industry, since the anticipated value depends on the industry demand uncertainty and on the value and availability of follow-on and exit real options.

In the second stage of a buy-and-build (middle row of Table 2.1), the investor acquires a follow-on company. The exercise of each follow-on acquisition option can be seen as an investment in certain categories of assets (e.g., acquiring either horizontally or vertically related follow-ons), which increases the platform's strategic position and ultimately the availability and value of its exit options. The value of these follow-on options then depends on company fundamentals that are to some extent idiosyncratic. For example, the exercise price and the underlying value of new follow-on options can be favorably affected by potential economies of scale (resulting from efficient scale of facilities or increased market power towards customers/suppliers) and by potential standalone improvements to the follow-on target's performance. The moneyness (value-to-price ratio) of the follow-on option is further affected by an embedded exit option.

In the third stage, as the firm becomes larger and the buy-and-build strategy

matures, the private equity investor is likely to have more attractive exit opportunities, such as a sale to a strategic buyer, flotation via an IPO, or a secondary buyout. We model the exit option as an exchange option where the moneyness of the exit option depends on financial market conditions. The value added by the consolidation ultimately equals to the amount by which the (expected) exit value of the consolidated firm exceeds the sum of the costs of the individual acquisitions. We test whether favorable financial valuations and debt market conditions positively relate to high potential exit option values, which in turn contribute to the number of buy-and-build strategies.

TABLE 2.1: Buy-and-build strategies as a portfolio of real options

Description of strategy	Real options model		Empirical test	
Stages	Option definition	Variables	Hypothesis	Proxies
Stage 1. Platform growth option Industry conditions that are attractive for consolidation	Platform company value = standalone value + compound growth option value	Compound option value, F, depends on moneyness of follow-on option (E/I) and thus the exit option (V/M)	The exercise of platform and embedded follow-on options is related to industry volatility (+), bottom fragmentation (+), top fragmentation (-), customer and supplier fragmentation (+).	Volatility 3-year industry sales; Bottom, Top, Customer, and Supplier fragmentation
Stage 2. Follow–on real option Company conditions that allow for value creation	Exercise of the follow-on option exchanges the (standalone +) embedded exit option value against the (standalone +) premium. Timing depends on option value vs missed synergies (dividend on asset)	Moneyness of the first option (E/I) increases option value	E/I – The likelihood of exercise of a follow-on option in a buy and build is positively related to target operating inefficiency and target size. Company performance is a moderator that amplifies this relationship with target size.	Sales/Assets; Total sales; EBIT/Assets
Stage 3. Exit real option Financial market conditions that allow for value creation	Exercise of second option exchanges company value for exit value. Timing depends on synergies (dividend on asset 1) vs missed investment opportunities from delaying exit (dividend on asset 2)	Moneyness of the second option (V/M) increases option value	V/M – The exercise of the exit option in a buy-and-build strategy is positively related to financial market valuations and lower financing costs.	Industry stock index; High-yield spread

2.2.1 Exit option and financial market conditions

When the buy-and-build strategy is viewed as a sequence of single transactions instead of a strategy with a compound option included, the investor may miss important interactions. Therefore, to fully consider the anticipation of option value in the option chain, we follow the backward induction principle typical in real options analysis. We start at the exit option and work backwards to the selection of the platform industry.

In the third and final stage of the strategy, the investor looks for an exit. We define the *exit option* as an *exchange option* in which the private equity investor may sell the company to a large strategic buyer, to the financial market, or to another private equity fund for the exit value. Let T_s be the *maturity* of the option, (e.g., the end of the fund's life). At maturity, the investor decides to exit (i.e., to exercise the option) when the *exit value* (V) is higher than the *continuation value* of the company at maturity (M), which is equal to the present value of the future cash flows of the company. Alternatively, the investor may forego on the exit option payoff by selling it against the continuation value, for example, to another financial buyer (or in the case of an evergreen fund it may hold the asset indefinitely, also without an exit premium). The exit value, V, follows a stochastic process with an instantaneous expected rate of return μ_V, variance rate σ_V, and a standard Brownian motion, (dZ_V). We include a dividend yield (δ_V) that captures the opportunity costs of missed investments, which result from delaying exit.[10] Thus:

$$dV = (\mu_V - \delta_V)V dt + \sigma_V V dZ_V$$

The continuation value, M, correlates with the exit value ($dZ_v(t)dZ_m(t) = \rho dt$ with $\rho = 1$) and follows a related Brownian motion:

$$dM = (\mu_M - \delta_M)M dt + \sigma_M M dZ_M$$

The drift in the process of the continuation value depends on realized synergies

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[10]Dixit and Pindyck (1994) show that the exercise timing of an American call option is a trade-off between the dividends (opportunity cost of waiting) and the option premium. Without dividend yields, the exit option would simplify to Margrabe's simple exchange model (Margrabe, 1978).

(δ_M) and the growth rate of the firm. Taking uncertainty into account, the exit opportunity can be rewritten as a call-option on the value-to-price ratio in which the continuation value is exchanged for the exit value.[11] We can then find that the exit option value (E) is equal to:

$$\underbrace{E(V, M, \tau_s)}_{\text{Exit Option Value}} = \underbrace{e^{-\delta_V \tau_s} V N_1 \left[d_1 \left(\frac{V}{M} e^{-(\delta_V - \delta_M)\tau_s}, \tau_s \right) \right]}_{\text{Exit Value}} \qquad (1)$$
$$- \underbrace{e^{-\delta_M \tau_s} M N_1 \left[d_2 \left(\frac{V}{M} e^{-(\delta_V - \delta_M)\tau_s}, \tau_s \right) \right]}_{\text{Mature Firm Value}},$$

where:

$$N_1(x) - \text{standard normal distribution, evaluated at } x$$
$$d_1(y, \tau_s) = \frac{\ln y + \sigma^2 \tau_s}{\sigma \sqrt{\tau_s}}$$
$$d_2(y, \tau_s) = d_1(y, \tau_s) - \sigma \sqrt{\tau_s}$$
$$T_s - \text{expiration date of exit option value}$$
$$t - \text{valuation date}$$
$$\tau_s = T_s - t$$
$$\delta = \delta_V - \delta_M$$

The solid curve in Panel A in Figure 2.2 presents the exit option value of a buy-and-build strategy. The exit option increases in value with moneyness, V/M, (along the horizontal axis), and this reflects in part the "multiple arbitrage" of the complete strategy (i.e., the higher valuation multiple of the consolidated entity compared to its parts). We distinguish between an exit premium and a size effect that influence the moneyness of the exit option.

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[11]The dimensionality in the presence of two (partially correlated) stochastic processes can be reduced by expressing continuation value relative to the exit value (as a numeraire). The volatility is a function of the volatilities of the two processes (V and M) and their correlation, $\sigma_E = \sqrt{\sigma_V^2 + \sigma_M^2 - 2\rho\sigma_V\sigma_M}$. Even when the two uncertain variables are perfectly correlated, this exchange option can be exercised when their variances differ. In this option view, the value of a target as part of a buy-and-build strategy should be more uncertain than the price to make the option valuable, i.e. $\sigma_V > \sigma_M$.

Exit premium. In the option view, a favorable resolution of valuation uncertainty (e.g., ex-post resolution of industry index value) as the strategy matures improves the chances of a successful exercise. For example, the value and moneyness of the exit option through an IPO is then likely to be higher during periods of "hot" IPO or deal markets (Lowry, 2002), when the exit values are relatively high compared to the continuation value (high *V/M* multiple).

Financing cost and size effect. Similarly to the regular leveraged buyouts, buy-and-build acquisitions in private equity are more likely to occur when external debt market conditions have improved. Lower financing costs will allow the investor to increase the leverage in buyouts (Axelson et al., 2013; Ivashina and Kovner, 2011), amplifying the total investment in buy-and-build strategies and thereby increasing the number of acquisitions or the size of these acquisitions. Small private firms sell at a discount compared to their larger counterparts in transactions (i.e. small firm discount). When the buy-and-build matures, this discount is mitigated at exit and the size of the company increases the exit value (V) more than the mature firm value (M), thus increasing the moneyness of the exit option ($\frac{V}{M}$) via a size effect. This leads us to the following hypothesis:

Hypothesis 1. *The exercise of the exit option in a buy-and-build strategy is positively related to financial market valuations and lower financing costs.*

2.2.2 Follow-on option and company conditions

Stepping back from the exit option, we can assess the value of follow-on deal opportunities. In stage 2, the investors may decide whether to invest in follow-on acquisitions (conditional on having invested in a platform in a certain industry). This is a compound call option since the follow-on option contains the embedded exit option as its underlying asset.

We can set the standalone value of the follow-on company equal to the present value of the cash flows without any option value or synergies. Then, we can define the underlying asset of the follow-on option as the exit option, including the exit and size premium, and define the exercise price as the acquisition premium. Then, when

exercising the follow-on option, the investor exchanges the acquisition premium (+ standalone value of the follow-on) for the exit option value (+ standalone value of the follow-on).[12] The investor will decide to acquire when the underlying exit option value sufficiently exceeds the exercise price.

We build on the option model of Carr for valuing compound exchange options to allow for a stochastic exercise price, i.e., the acquisition premium of the follow-on is not fixed (Carr, 1988).[13] In Equation 2 below, the follow-on option value is a function of the exit option $(E(V, M, \tau_s))$, the exercise price of the compound call option (I), and time to maturity (τ_f), so $F(E(V, M, \tau_s), I, \tau_f)$, where we assume that the acquisition premium (q) is a percentage of the mature firm (i.e. $I = qM$). The value of the follow-on option then equals:

Follow-on Option Value = Exit Value

$$- \text{ Mature Firm Value}$$

$$- \text{ Acquisition Premium}$$

$$
\begin{aligned}
F(E(V, M, \tau_s), I, \tau_f) = {} & e^{-\delta_V \tau_s} V N_2 \left(d_1 \left(\frac{e^{-\delta \tau_f} P}{P^*}, \tau_f \right), d_1 \left(e^{-\delta \tau_s} P, \tau_s \right) \right) \\
& - e^{-\delta_M \tau_s} M N_2 \left(d_2 \left(\frac{e^{-\delta \tau_f} P}{P^*}, \tau_f \right), d_2 \left(e^{-\delta \tau_s} P, \tau_s \right) \right) \\
& - e^{-\delta_M \tau_f} I N_1 \left(d_2 \left(\frac{e^{-\delta \tau_f} P}{P^*}, \tau_f \right) \right),
\end{aligned}
\tag{2}
$$

where M is the exercise price of the simple call option. The critical value P^* at which the investor is indifferent between exercising exit option and holding the company satisfies:

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[12]For simplicity we assume a single follow-on stage in the model. When the investor decides to exercise its follow-on option then the investor acquires one or multiple potential follow-on targets at the same time.

[13]In contrast to Geske's compound option model with a fixed exercise price (Geske, 1979). Another extension of Carr's model is that it incorporates an an opportunity cost of delay of exercise in the form of a dividend yield. Value creation of the follow-on stems from leveraging core competencies or accumulated assets of the platform onto the follow-on target and thereby improving the operating performance, such effects are represented by a larger value of the payout ratio δ_M. These synergies between the platform and follow-on company are only realized after the exercise of the follow-on option. Thus any foregone synergies when the follow-on is deferred can be interpreted similar to dividends. As noted the dividend yield of the second option δ_V reflects the opportunity costs of new investment opportunities that are only realized after the exercise of the exit option.

$$P^* N_1(d_1(P^*)) - N_1(d_2(P^*)) = q$$

And where

$$N_2(x, y) - \text{standard bivariate normal distribution function,}$$

$$\text{evaluated at } (x, y) \text{ with correlation coefficient: } \sqrt{\frac{\tau_f}{\tau_s}}$$

$$T_f - \text{expiration date of the follow-on option}$$

$$T_s - \text{expiration date of exit option value}$$

$$t - \text{valuation date}$$

$$\tau_f = T_f - t$$

$$\tau_s = T_s - t$$

$$\tau = \tau_s - \tau_f$$

From Equation 2, we learn that the follow-on acquisition is similar to exercising the a call option on the ratio of the exit option and acquisition premium. The dark solid curve in Figure 2.2, Panel B, presents the value of this option, where the underlying value of the option value is $\frac{E}{I}$ and the exercise price equals one. When we compare the compound option in Panel B with a simple exchange call option (in Panel A), we find that compound option value is non-linear with increasing marginal option value due to the embedded underlying exit option. The compound option value (before maturity) of the follow-on option, will be higher as the moneyness increases (along the horizontal axis).

The follow-on options should be in the money to be exercised by the buy-and-build investor, meaning that the embedded exit option value exceeds the premium paid over the standalone value of the follow-on ($\frac{E}{I} > 1$). Thus to be part of a buy-and-build strategy, follow-on acquisition options fulfill certain conditions to become in the money options, either by lowering the exercise price I, or by increasing the value of the exit option, E. The value of the exit option increases with the synergetic value that can be received at exit, V. A suitable follow-on target is one that fulfills certain

Figure 2.2: Growth option values at different stages of the buy-and-build strategy.

The solid dark grey line represents the real option value, the light grey lines show the real option value in absence of uncertainty. The consolidator will exercise the option if the underlying value ($\frac{V}{M}$ in Panel A and $\frac{E}{I}$ in Panel B) exceeds the exercise price (equal to one), and will decide not to invest otherwise.
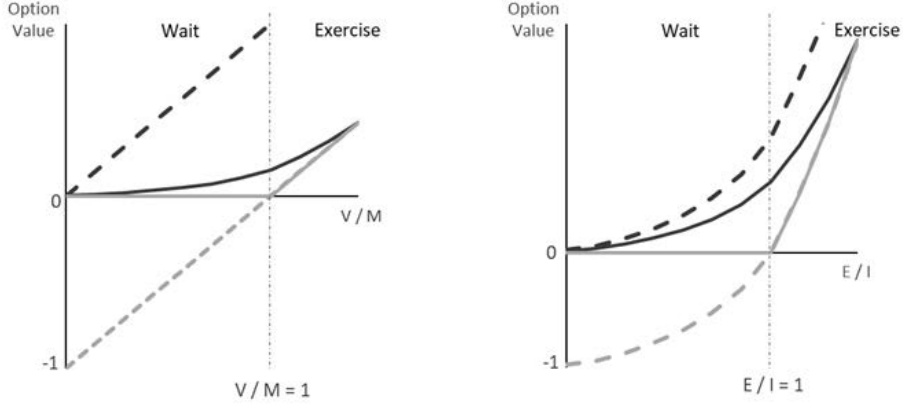
(a) Panel A: Exit option value

(b) Panel B: Follow-on option value

company conditions, regarding operating efficiency, and its performance and size that increases the likelihood that exercising the option is favorable for the consolidator.

Operating inefficiency. Inefficiencies of the target increase the moneyness of the follow-on option (higher $\frac{E}{I}$), since inefficiencies reduce the price of the follow-on target (I is low) and provide opportunities to improve the performance of the follow-on target by restructuring and integrating its operations (E is high since $\frac{V}{M}$ is high). Especially when these operating restructurings represent a core capability of private equity, then this value is appropriable by the investor (Jensen, 1989; Kaplan et al., 2009). For example, the private equity fund can increase efficiency and generate value by obtaining synergies from an extended customer base or by successfully leveraging the differentiating resources or capabilities of the platform onto the follow-on.[14]

Target size and performance. The benefits of a buy-and-build strategy stem

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[14]Realizing such efficiencies and cost reductions depends on corporate capabilities to adapt and change the new organization (Teece et al., 1997). These arguments emphasize the role of learning (Bernardo and Chowdhry, 2002) and thus specialization by the private equity fund.

primarily from creating scale and therefore the moneyness of the follow-on option ($\frac{E}{I}$) increases with target size.[15] Target size amplifies the exit option value when it enhances the benefits from financial market conditions in obtaining debt financing or the size effect. In many instances, a higher operating performance or profitability of the target, lowers the risk of default and is a source of financial synergies when it allows the firm to bear additional debt. Thus, performance strengthens the size effect embedded in the exit option when it can increase a company's available internal financing and debt capacity – the amount it can borrow to finance acquisitions (increasing the moneyness of the exit option, ($\frac{V}{M}$), and thereby the moneyness of the follow-on option, ($\frac{E}{I}$).[16] Therefore, we expect that:

Hypothesis 2. *The (likelihood) of an exercise of a follow-on option in a buy-and-build strategy is positively related to the operating inefficiency and size of the follow-on target. Company performance is a moderator that amplifies this relationship with target size.*

2.2.3 Platform growth option and industry conditions

In the initial stage, the value of an intended buy-and-build strategy can be divided into two distinct value components: The standalone value of the platform and the option value of its acquisition and exit opportunities[17], i.e.:

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[15]For smaller firms it will be more challenging to gain market power through acquisitions, and the added economic value may be insufficient to cover the transaction costs. To exercise the options, the value of an acquisition should increase more than the cost of merging (Lambrecht, 2004; Toxvaerd, 2008). These costs of acquiring or integrating companies can be considered as a part of the exercise price (I) of the acquisition option (Lambrecht, 2004), with I in Equation 2, being the acquisition premium net of the acquisition cost (as a percentage of the underlying).

[16]In addition to the size and performance of follow-ons, the moneyness of the follow-on option also depends on the intensity of competition for follow-on deals, which may increase the acquisition premium (qM) paid by the private equity investor. Gaining a pre-emptive position over a rival (e.g. by buying a minority stake (Folta, 1998; Folta and Miller, 2002; Miller and Folta, 2002), or by setting up an equity alliance (Reuer and Tong, 2010) or a joint venture (Chi, 2000; Reuer and Tong, 2005) increases the acquisition option's proprietary nature by strategically creating disincentives (and perhaps insurmountable entry costs) for competitor bidders.

[17]In general, the value of growth options differ significantly across firms, industries, and countries Myers (1977), Kogut and Kulatilaka (2001), Reuer and Tong (2010), Tong et al. (2008b), and Tong et al. (2008a). Empirical results show that such values rise when firms engage in diversifying joint ventures and take smaller ownership positions in acquisition targets, particularly in international deals.

$$Platform\ Value = Standalone\ Company\ Value \tag{3}$$
$$+\ Compound\ Option\ on\ Follow\text{-}on\ and\ Exit$$

The compound option value of *synergetic follow-on and exit opportunities* is prospective and has decision flexibility, meaning it consists of transactions that the investor may make in the future but does not have to. In the context of the real options model, the value of the initial platform acquisition is then influenced by the prospect to complete follow-on acquisitions and exercise the exit option on favorable terms. Besides the financial market and company conditions that relate to the follow-on and exit option values, the platform value depends on industry conditions that improve these prospects and provide ample acquisition and exit opportunities in the first place.

Demand volatility

Consistent with real options theory, the likelihood of a buy-and-build strategy increases with industry demand volatility. A higher industry sales volatility allows the consolidator to take advantage of a higher upward potential (high value-to-price ratio) by exercising follow-on options or exit option after a positive resolution of industry uncertainty, while limiting losses by not exercising the options after a market downturn.

Fragmentation

Industry fragmentation can be a proxy for the available acquisition and exit opportunities, but it matters in a complex way for the value of a buy-and-build strategy due to the duel nature of the compound option (Folta and O'Brien, 2004). As a consequence, real options modeling predicts a more subtle relationship than just a general notion that the likelihood of buy-and-build increases with fragmentation (as a proxy for acquisition opportunities). On the one hand, the option value of a buy-and-build strategy may increase in the level of industry fragmentation due to the availability of attractive follow-on targets. On the other hand, the option value declines with

industry fragmentation due to a smaller number of large strategic bidders which increase the value of the exit option. To disentangle the various effects we distinguish between the fragmentation of the smallest companies in the industry (bottom fragmentation), fragmentation at largest industry players (top fragmentation), and the fragmentation of customers and suppliers.

Bottom fragmentation and follow-on option value

The fragmentation among the smaller firms of the industry (*bottom fragmentation*) positively affects the value of the follow-on options. The presence of a large pool of available follow-on options is attractive since it suggests a higher probability of being able to acquire many follow-on targets.[18] Thus with the presence of many sizable targets, the consolidating entity can gain market power. However, the size of the potential targets should not be too small, since then the benefits may not outweigh the costs. As a result there exists an interaction of bottom fragmentation and market size.

Top fragmentation and exit option value

A too high fragmentation among the largest firms of the industry (*top fragmentation*) negatively affects the exit option. When there are several sufficiently large strategic buyers active in the industry, then these strategic buyers – to which the consolidated entity contains synergetic values – will pay a higher premium and therefore increase the exit option value of the strategy. This means that $(\frac{V}{M})$ is higher and thus is the exit option value. The exit option in turn increases option value of the follow-on.

Fragmentation along the supply chain

The compound option value of serial acquisition strategies is likely to be higher under conditions of fragmented customers' or suppliers' industries. The higher fragmentation in the supply chain indicates that customers or suppliers are less able to respond changes of the enhanced position of the consolidated firm towards them (Ahern, 2012; Bhattacharyya and Nain, 2011; D. T. Brown et al., 2009; Porter, 1980).

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[18]Smaller companies are likely to be bought at a lower premium on average, but may involve relatively higher transaction costs.

The following hypothesis summarizes this complex relation between industry fragmentation and buy-and-build strategies:

Hypothesis 3. *The exercise of platform and embedded follow-on options is related to industry volatility (+), bottom fragmentation (+), top fragmentation (-), customer and supplier fragmentation (+).*

To sum up, real options theory, applied to buy-and-build strategies, predicts that the initial platform acquisitions are driven by embedded growth options that include the value of identifiable follow-on options that in turn affect the value of the exit option. The compound option value depends on demand volatility and industry conditions such as fragmentation in a complex way, since the exit option and the follow-on option interact. The consolidator creates value (multiple expansion) when the company is able to buy inefficient but profitable targets. Eventually the group is reconfigured by transforming a series of middle-sized companies into a more efficient larger-scale network. At the exit, and as the buy-and-build matures, the improved growth prospects or reduced risk may lead to multiple arbitrage (or an appreciated value) for an industry buyer or to a market re-rating in hot IPO markets.

2.3   Data

Private equity serial transactions have an advantage over public acquisitions, since there is a clear intention of the strategy. The platform acquisition signals the start of the strategy and due to the nature of their fund structures, private equity buy-and-build strategies have fixed time horizons in which they exit, signalling the end of the strategy. This allows us to measure which conditions influence the initiation of strategies, the exercise of acquisition options, and exit decisions.

We collected completed follow-on acquisitions in seven European countries from 1998 to 2016 from Zephyr using the "build-up" deal tag.[19] Specifically, we collected

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[19]Zephyr adds the "build-up" tag as sub-deal type when a private equity investor builds up the company it owns by acquiring other companies to merge them into the larger firm, thus increasing the total value of its investments through synergies among its acquisitions. We further check the deal comments and see that several clearly indicate this intention to grow through acquisitions. From the perspective of our option model, there is an element of anticipation in buy-and-build

majority stake deals in which the target was located in the United Kingdom, France, Spain, Sweden, Norway, Denmark, or Finland.[20] The benefit of using European data is that the private equity market is well-developed and that reporting requirements for private firms are generally high, minimizing the risks related to sample selection due to missing data. Then, to identify platform acquisitions and exits, we manually mapped ownership structures via Orbis.

We identified 2,834 buy-and-build deals, consisting of 762 platform acquisitions and 2,072 follow-on acquisitions. Panel A of Figure 2.3 shows the number of buy-and-build deals and *standalone* private equity deals that were not a part of a buy-and-build strategy over time. From the figure we can see that the private equity market as a whole has grown over time.

Figure 2.3: Private equity activity from 1998 to 2016.
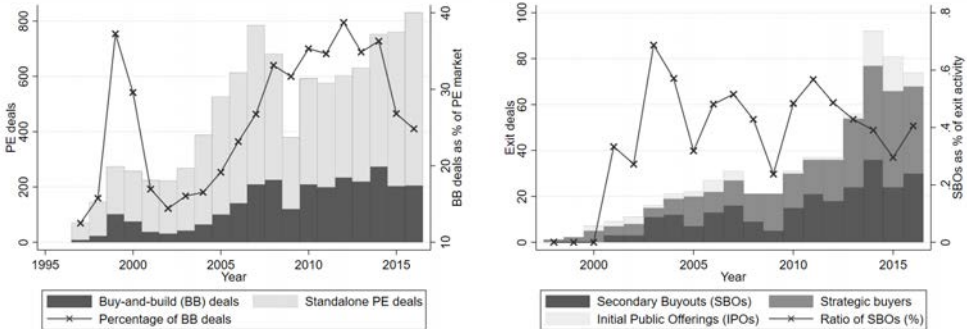
Panel A: Private equity deals   Panel B: Exit activity over time

Table 2.2 presents the number of buy-and-build deals and standalone private equity investments by industry and by country. The most active industry for both types of investments is the *manufacturing* industry, although the relative share of buy-and-build transactions in the private equity market is the highest in *Human Health and social work activities.* The most active deal markets are located in the

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strategies. Therefore, we aim to distinguish between buy-and-build strategies that were determined *ex-ante* and serial acquisition strategies which are determined *ex-post.*

[20]A majority stake deal is a deal in which the acquirer held less than 50 percent of the target's shares before the deal, and more than 50 percent after. For platform deals we collected both majority stake and minority stake deals. We further required that at least the BvD ID number and NACE Rev. 2 code was available.

United Kingdom and France, which have well developed private equity markets, although the relative share of buy-and-build deals is higher in Scandinavian countries.

Additionally, we collected data on 538 exits, consisting of 51 initial public offerings, 265 strategic sales, and 222 secondary buyouts. For 34 strategies we were unable to identify an exit, while 190 strategies were identified as still *active* as of August 1, 2017. An exit represents a deal in which the private equity firm sells its controlling stake to a new investor or on the financial market. Panel B of Figure 2.3 shows the exits divided by type of exit over time. The ratio of secondary buyouts shows clear up-and-down movements that may be related to financial market conditions.[21]

For the financial market valuation, we used Datastream to collect stock prices of the publicly traded companies from stock exchanges in each of the seven countries. We then identified the market value of the median company by 2-digit NACE codes (industry valuation) as a proxy for the potential exit premium.[22] As a proxy for the debt market conditions, we calculated the high-yield spread as the difference between the EU High Yield and the LIBOR in the line with Axelson et al. (2013). The proxy for the debt market conditions, together with other macro-economic indicators, were collected via Datastream as well.[23] In total we collected data on 20,973 country-industry-quarters for the period 1998–2016.

To analyze the company conditions and measure whether targets in buy-and-build strategies offer (synergetic) value, based on the operating efficiency, size, and profitability, we initially collected all companies from the Orbis universe with suffi-

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[21]A secondary buyout is a transaction in which both the acquirer and vendor is a private equity firm (or sponsored by a private equity firm). Y. Wang (2012) finds evidence that the liquidity based market timing is related to exits through secondary buyouts. In a related study Jenkinson and Sousa (2015) find for a more general PE buyouts sample that the preferred exit route depends on both portfolio company characteristics and on conditions in the debt and equity markets. In their research they use a hazard rate model to test dynamics of the time to exit.

[22]Although one would prefer more granular level data on public industry developments, the limited number of publicly traded companies in each country-industry cluster requires aggregating industry observations on a higher level. By using median values, we reduce the sensitivity of having few companies per cluster. Initially the companies were grouped by 2-digit SIC codes. The data for each company came with SIC codes, which we converted to NACE codes based on the available NACE codes in Orbis. If this code was not available we dropped the observation. We also test the sensitivity of this transformation by running the specification using the original SIC codes. Results using the original SIC codes are stronger.

[23]The LIBOR and exchange rate is provided by the Bank of England; BofA ML EU High Yield is provided by the Bank of America Merrill Lynch; GDP and Inflation is provided National Offices.

TABLE 2.2: PE deal sample by industry and country.
The distribution of deals across industries (Panel A) and countries (Panel B) from 1998–2016. The deal sample consists of both platforms and follow-ons.

	B&B Deals	Standalone Deals	Ratio B&B
Panel A: By industry (NACE Main Sectors)			
Agriculture, forestry and fishing	14	27	34%
Mining and quarrying	11	58	16%
Manufacturing	726	2,710	21%
Electricity, gas, steam and air conditioning supply	10	129	7%
Water supply; sewerage, waste management and remediation activities	33	104	24%
Construction	126	286	31%
Wholesale and retail trade; repair of motor vehicles and motorcycles	323	959	25%
Transportation and storage	102	267	28%
Accommodation and food service activities	78	307	20%
Information and communication	408	1,033	28%
Financial and insurance activities	115	400	22%
Real estate activities	29	121	19%
Professional, scientific and technical activities	276	569	33%
Administrative and support service activities	223	521	30%
Public administration and defence; compulsory social security	5	8	38%
Education	55	93	37%
Human health and social work activities	374	364	51%
Arts, entertainment and recreation	49	146	25%
Other service activities	35	62	36%
Total	2,992	8,164	27%
Panel B: By country			
Denmark	155	395	28%
Spain	229	804	22%
Finland	293	443	40%
France	617	1,984	24%
United Kingdom	1,113	3,510	24%
Norway	172	310	36%
Sweden	413	720	36%
Total	2,992	8,166	27%

cient financials in the same year, 4-digit NACE industry, and country.[24] The sample of companies not involved in PE buy-and-build strategies are used as a comparison group for the PE targets. From this initial non-PE sample, we randomly drew 10 percent to create the benchmark sample. We were left with 131,809 company-year observations with sufficient financials in the period 1998–2013. After matching fi-

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[24]We followed the recommendation by Kalemli-Ozcan et al. (2015) to minimize the survivorship bias that is present in Orbis.

nancials to our buy-and-build deal sample, we had complete pre-deal information on 869 buy-and-build acquisitions.

TABLE 2.3: Pre-deal company characteristics.
The sample runs from 1998–2013. Panel A and B respectively present the buy-and-build targets and their industry peers (not involved in a buy-and-build transaction). Panel C and D present respectively the platform and follow-on companies. Variables are winsorized at a 1% and 99% level.

	N	Mean	Std. Dev.	Median	Min	Max
Panel A: Buy-and-build targets						
Operating revenue (ln)	858	16.11	1.73	16.31	6.49	18.12
Total assets (ln)	869	15.96	1.74	16.07	7.51	18.23
Return on assets	869	0.11	0.31	0.09	-2.00	3.17
Asset turnover	869	1.84	1.63	1.53	0.00	13.34
Panel B: Industry peers						
Operating revenue (ln)	130,999	12.62	2.02	12.55	6.49	18.12
Total assets (ln)	136,056	12.42	2.02	12.32	7.05	18.23
Return on assets	136,056	0.12	0.56	0.06	-2.00	3.17
Asset turnover	136,056	1.97	2.06	1.53	0.00	13.34
Panel C: Platforms						
Operating revenue (ln)	363	16.73	1.56	17.05	9.16	18.12
Total assets (ln)	369	16.87	1.39	17.09	7.51	18.23
Return on assets	369	0.09	0.22	0.08	-1.55	1.01
Asset turnover	369	1.44	1.26	1.25	0.00	9.53
Panel D: Follow-ons						
Operating revenue (ln)	495	15.66	1.71	15.73	6.49	18.12
Total assets (ln)	500	15.29	1.66	15.27	9.22	18.23
Return on assets	500	0.12	0.37	0.12	-2.00	3.17
Asset turnover	500	2.14	1.80	1.82	0.00	13.34

We measure the operating efficiency of the company as the sales over assets, or *asset turnover (ATR)*. To proxy for *size* and measure whether targets of buy-and-build acquisitions provide a larger financial base, we take the the natural logarithm of the company's operating revenue. And for *profitability*, we use the return on assets (ROA), using EBIT.

The descriptive statistics for the treated companies and controls are presented in Table 2.3. Platforms have a lower turnover ratio than follow-ons and the benchmark, while follow-ons perform the best on average. In terms of size, both platforms and follow-ons have a higher operating revenue, while the profitability of platforms seem

to be lower than that of both the follow-ons and the benchmark companies.

Finally, we computed proxies for the industry conditions using all companies from the Orbis universe that provide operating revenue. After aggregating the individual companies on a country-industry-year level, we were left with 63,832 observations.

In addition to an inverted Herfindahl measure for fragmentation, the large dataset allows us to create fragmentation measures that capture the distribution within size segments, which can provide insights into the opposite implications of the availability of acquisition options and potential exit opportunities. We calculate the inverted *Bottom herfindahl* and *Top herfindahl* similarly as the standard Herfindahl, but then calculate them within a size segment of an industry. We split companies within industries into terciles based on operating revenue and calculate the *Bottom herfindahl* and *Top herfindahl* for the first and third respectively.

Table 2.4 presents the descriptive statistics of our industry conditions for buy-and-build industries and for non-buy-and-build industries (in which no buy-and-build activity took place). The inverted *Herfindahl* shows that the industry fragmentation is on average higher in buy-and-build industries. Further, buy-and-build industries are on average larger, display lower sales *growth*, and *volatility* of sales seems to be lower. Hence, the statistics suggest that buy-and-build strategies take place in more mature and large stable markets.

2.4   Methodology

To test our expectations about the exit activity and financial market conditions, we exploit the quarterly time-varying variation within each industry, more specifically we run the following specification:[25]

$$BB_{cst} = \alpha + \beta_1 fin\ conditions_{cst-1} + \beta_2 Controls_{ct-1} + \eta_{cs} + U_{cst}, \qquad (4)$$

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[25]An alternative method, would be to use a duration analysis, where the hazard rate equals the exit rate. The benefit of such a model is that it an account for buy-and-build strategies that have not yet exited ('censored' observations) and therefore can more precisely measure the probability of exit and the duration until exit. It is therefore also better equipped to analyze the exit rate, conditional on the number of active strategies.

TABLE 2.4: Buy-and-build industry statistics.
The sample runs from 1998–2013. Industries are defined on a NACE 4-digit level. Panel A presents the summary statistics of buy-and-build industry-year observations. Panel B presents the summary statistics of non-buy-and-build industry-year observations. Variables are winsorized at a 1% and 99% level.

	N	Mean	Std. Dev.	Median	Min	Max
Panel A: Buy-and-build industries						
Fragmentation	1,145	31.66	50.53	13.13	1.00	266.54
Top fragmentation	1,101	2.18	1.18	2.17	0.00	4.67
Bottom fragmentation	1,145	4.74	1.88	4.68	0.00	7.91
Market size (ln)	1,145	8.05	2.01	8.23	-0.74	13.11
Market growth (%)	1,143	0.28	2.73	0.03	-0.97	48.21
Volatility	1,014	0.31	0.47	0.12	0.01	3.32
Panel B: Non-buy-and-build industries						
Fragmentation	62,687	18.84	38.67	5.81	1.00	266.54
Top fragmentation	49,297	1.56	1.15	1.44	0.00	4.67
Bottom fragmentation	62,687	2.96	2.00	2.87	0.00	7.91
Market size (ln)	62,687	5.59	2.84	5.91	-11.13	14.35
Market growth (%)	61,218	1.16	5.82	0.04	-0.97	48.21
Volatility	56,994	0.42	0.62	0.16	0.01	3.32

where BB_{cst} stands for the natural logarithm of the total number of buy-and-build exits plus one in country c, industry sector s, and in time period t. The vector *fin conditions* consists of proxies for financial market and debt market conditions, namely the *financial market valuation* by industry, and the *high-yield spread*. We additionally control for the macro-economic environment by including the *exchange rate* (to USD) and *GDP growth*. Finally, the term η_{cs} describes the industry-country fixed effects.

For the regressions, we create an indicator variable for the financial market conditions. For the financial market valuation, the indicator variable is equal to one when the market value of the median industry constituent is higher than the industry's time-series average, and zero otherwise (referred to as *High Index Values*). Similarly, the indicator variable for the debt market conditions (*High Spread)* is equal to one when the spread is higher than its time-series average, and zero otherwise.[26]

By examining the cross-sectional variation between companies *within* buy-and-

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[26]In a robustness analysis, we test whether the results are sensitive to using a dummy or continuous variable, but results are quantitatively unaffected.

build industries, we can test the implications of the real options model on target company characteristics. We estimate the probability that a company will be part of a buy-and-build strategy as follow:

$$BB_{jt} = \alpha + \beta_1 company\ conditions_{jt-1} + \beta_2 controls_{jt-1} + \eta_{cst} + U_{jt}, \qquad (5)$$

where the BB_{jt} is a dummy variable, which is equal to one if company j is a target in a buy-and-build transaction in year t and otherwise zero. The vector *company conditions* consists of our (lagged) company measures for efficiency, size, and profitability. We further include industry-country-year fixed effects and therefore control for financial market conditions as well.

Finally, to test the industry conditions predicted by our model, we run the following specification:

$$BB_{ict} = \alpha + \beta_1 industry\ conditions_{ict} + \beta_2 controls_{ict} + \eta_{ct} + U_{ict}, \qquad (6)$$

where BB_{ict} is the natural logarithm of the number of buy-and-build deals (plus one) in industry i in country c in year t. The vector *industry conditions* consists of industry characteristics that drive the compound option value, including the fragmentation among the largest companies (*top herfindahl*) and the smallest companies (*bottom herfindahl*). We further add industry sales as a measure of *market size* and the yearly growth rate in sales of the industry as a measure for *market growth* as control variables. Country-year fixed effects is indicated by η_{ct}.

2.5   Results

The results for the exit options and financial market conditions are presented in in columns 1-3 of Table 2.5.

Consistent with Hypothesis 1, we find that exits are more likely during periods of high market valuation. When differentiating between types of exits, we see that this relation generally holds for all exits types. However, in our robustness analyses (untabulated) the results for secondary buyouts are mixed in terms of significance.

TABLE 2.5: Financial market conditions and buy-and-build activity.
The sample runs from 1998–2016. In columns 1-3 and 4-6 the dependent variable is respectively the number of completed exits and acquisitions in a country-industry-quarter cluster. Industries are defined on a NACE 2-digit level. *High index value* is a dummy indicator equal to one when the industry index is above its sample mean value and otherwise zero. *High Spread* is a dummy indicator equal to one when the spread is above its sample mean value and otherwise zero. The spread is calculated as the difference between the EU high-yield bond and the LIBOR. As control variables we added the gross domestic product and currency exchange rate. Variables are lagged by one period. Industry-country fixed effects are included. P-values are provided in the brackets. Standard errors are clustered on an industry dimension.

	Buy-and-build exits			Buy-and-build acquisitions		
	(1)	(2)	(3)	(4)	(5)	(6)
	Exits	Strategic + IPO	SBO	B&B	PL	FO
High Index Values	0.007	0.004	0.002	0.016	0.000	0.015
	(0.000)	(0.001)	(0.002)	(0.004)	(0.868)	(0.000)
High Spread	-0.002	-0.000	-0.002	-0.015	-0.003	-0.012
	(0.170)	(0.827)	(0.045)	(0.000)	(0.183)	(0.000)
Observations	23,195	23,195	23,195	23,195	23,195	23,195
Controls	✓	✓	✓	✓	✓	✓
Adj. R^2	0.0489	0.0308	0.0223	0.152	0.0452	0.126

This may be explained by the notion that a private equity investor would rather sell to a strategic buyer or exit via an IPO than via an SBO, since the former two exit opportunities may lead to higher exit values. This may especially be true during periods of high financial market valuations.

Turning to the high-yield spread. While the relation between the exit rates and cost of debt is generally negative, we only find a significant result for SBO exits. This finding highlights two aspects of private equity investments in line with Axelson et al. (2013). First, private equity investments are positively related to credit market conditions and second, favourable credit market conditions allow the private equity investor to pay higher acquisition prices. If indeed the private equity investor is able to pay more, then the SBO becomes a more attractive exit opportunity. Simultaneously, bids from other private equity firms (who are willing to do the SBO) are more likely to be accepted over the other alternatives, leading to an increase of the number of SBO exits.

According to the model, these higher exit values (higher V/M in the model) in turn lead to a higher the follow-on option value (E/I will be higher) in the second stage. The higher value prompts the consolidator to pursue follow-on acquisitions. If true, we should see that the financial market conditions are also positively related to the number of deals in a buy-and-build strategy. In columns 4-6, we therefore exchange the buy-and-build exits for buy-and-build acquisitions. We find that the financial market valuations are positively related to the number of follow-ons, but we cannot find a significant relation with the number of platforms. This is an important finding, since conditional on the cost of debt, it feels counter-intuitive that in periods of high market valuations, more follow-ons are completed, since acquisition premiums would also be higher. So what may explain this finding? The real options model suggests that the underlying asset of the follow-on option (which is the exit option) increases more in value with changes in the financial market valuations than the exercise price (acquisition premium for the follow-on). In this case, the financial market conditions may be positively related to the restructuring value, the exit premium, or the size effect, which are important determinants for the exit value.[27]

The results on the debt market conditions show that when the high-yield spread is low, more buy-and-build acquisitions are completed, and this result is mainly driven by follow-on acquisitions (column 6). The favorable debt market conditions allow the consolidator to complete more deals and accumulate assets (size effect), thereby bolstering the collection of a larger size premium at exit by the consolidator. Overall, the findings are in line with hypothesis 1 and highlight the importance of the financial market conditions for the value of the exit option in a buy-and-build strategy, which in turn drives the completion of follow-on acquisitions.[28]

Table 2.6 provides the results on the company conditions and follow-on acquisitions. Our measure for operating efficiency, *asset turnover*, is significant and neg-

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[27]While the upward resolution of uncertainty may be a positive signal for future value, the private equity investor still needs to safeguard against overvaluation from a too positive outlook.

[28]We check the robustness of our analyses and include year fixed effects instead of macro-economic controls. Year fixed effects may control for aggregate trends in deal activity and debt market conditions. In the robustness analysis for specifications 4–6, we additionally included proxies for industry conditions such as fragmentation, industry growth, and the volatility of the financial market valuations. Results are quantitatively the same.

atively related to the probability of being a target in a buy-and-build strategy. In columns 4-6 we add an additional measure for operating efficiency, namely the labour productivity, calculated as the sales per employee, which shows a similar result. So, companies that are purchased in buy-and-build strategies are on average less efficient and may offer opportunities to improve the operating performance.

TABLE 2.6: Company conditions and buy-and-build targets.
The sample runs from 1998–2013. *B&B* equals one if a company-year observation is acquired in a buy-and-build transaction and otherwise zero. Similarly, *Platform* and *Follow-on* equal to one when the observation was respectively a platform or follow-on in a transaction. *Operating revenue (ln)* is the natural logarithm of a company's sales and has been demeaned. *Return on assets* (ROA) is calculated as EBIT over total assets. *Asset turnover* and *Labour productivity* are calculated as operating revenue over total assets and as operating revenue ($mln) over the number of employees. Variables are lagged by one period. Industry-year-country fixed effects are included. Industries are defined on a NACE 4-digit level. P-values are provided in the parentheses. Standard errors are two-way clustered on an industry and year dimension.

	(1)	(2)	(3)	(4)	(5)	(6)
	B&B	Platform	Follow-on	B&B	Platform	Follow-on
Oper. revenue (ln)	0.005	0.002	0.002	0.009	0.005	0.004
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Return on assets	0.001	0.001	0.001	0.001	0.001	0.000
	(0.083)	(0.038)	(0.251)	(0.234)	(0.333)	(0.537)
Oper. rev. × ROA	0.002	0.001	0.001	0.005	0.003	0.003
	(0.041)	(0.024)	(0.092)	(0.000)	(0.000)	(0.001)
Asset turnover	-0.001	-0.000	-0.000	-0.001	-0.001	-0.000
	(0.002)	(0.001)	(0.091)	(0.046)	(0.001)	(0.802)
Labour productivity				-0.016	-0.010	-0.007
				(0.000)	(0.000)	(0.005)
Observations	146,572	146,062	146,214	70,029	69,613	69,717
Adj. R^2	0.073	0.064	0.069	0.107	0.098	0.099

The size coefficient is positive and significant, indicating that both platforms and follow-ons should be of sufficient size in order to support the collection of the size premium. The interaction of size and profitability (*ROA*) indicates a positively moderating effect as expected.

Overall, the results support hypothesis H2 and provide evidence that targets that are bought in buy-and-build strategies should be in the money options. The potential operating improvements increase the follow-on option value (E/I increases), while the accumulation of assets by acquiring larger companies aids to the collection of

the potential size premium at exit (increase in V/M through an increase of V). A higher profitability, strengthened by size, allows larger consolidators to obtain more favorable lending conditions (or use internal capital) to finance acquisitions, since these companies are able to bear more leverage. As a result of these effects, the value of the exit option increases and successfully implementing the consolidation strategy becomes more probable.[29]

In column 1 of Table 2.7 we regress the number of buy-and-build acquisitions on the standard (inverted) Herfindahl-Hirschman Index (*herfindahl*) and on its squared term to capture any non-linearities. The coefficient of *herfindahl* is positive and significant, confirming the relation between fragmentation and buy-and-build deals. The results in columns 2-5 of Table 2.7, however, reveal are more complex relation. When differentiating between bottom and top fragmentation, we find that the coefficients of the two fragmentation measures have an opposite sign. First, a higher fragmentation among smaller firms is negatively related to the number of acquisitions, and that this effect is positively moderated by (bottom) market size. This suggests that indeed the pool of acquisition options should be sufficiently large, which is often estimated using the standard Herfindahl measure. However, when controlling for the bottom fragmentation, the top fragmentation is negatively related to more buy-and-build acquisitions. In order for the private equity investor to exit, the potential buyer needs to be large enough to be able to act as strategic buyer of the exit option.

Finally, according to Hypothesis 3, real options predicts a positive relation between buy-and-build strategies and industry volatility, measured as the volatility of the aggregated industry sales. Consistent with real option arguments, we observe that the *volatility* (of aggregated industry sales) is positively related to buy-and-build activity.[30] The consolidator will exercise its acquisition options only when the options are in the money. Industries with a higher volatility offer more upward potential of the option values, while the losses are still limited, since the consolidator

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[29]Since the sample consists of many controls and relatively few treated observations, we also rerun the analysis by randomly drawing one percent from the original control sample. Results are qualitatively similar.

[30]Note that since we use aggregated industry sales, the consolidation by the PE investor does not directly affect the volatility measure.

can decide not to exercise the option. In short, in volatile industries the compound option value is higher.

TABLE 2.7: Industry conditions and buy-and-build acquisitions.
The sample runs from 1998–2013. The dependent variable is the natural logarithm of the number of completed buy-and-build deals plus one in a country-industry-year cluster. *Fragmentation* is the natural logarithm of the inverted Herfindal of a country-industry-year observation. *Top fragmentation* and *Bottom fragmentation* are respectively the natural logarithms of the inverted Herfindahls for the market segments of the top and bottom tercile in a country-industry-year cluster. *Volatility* as the volatility of the natural logarithm industry sales of the last three years. Industries are defined on a NACE 4-digit level. Variables are lagged by one period. Fixed effects (FE) are included as indicated. P-values are provided in the parentheses. Standard errors are two-way clustered on an country-industry and year dimension.

	Number of B&B deals				
	(1)	(2)	(3)	(4)	(5)
Fragmentation	0.004				
	(0.003)				
Fragmentation squared	0.001				
	(0.120)				
Top fragmentation			0.005	-0.004	-0.003
			(0.003)	(0.022)	(0.064)
Bottom fragmentation		0.007		0.010	0.007
		(0.000)		(0.000)	(0.001)
Bottom market size (ln)					0.001
					(0.179)
Bottom frag.×Bottom MS					0.001
					(0.004)
Volatility	0.003	0.003	0.004	0.003	0.003
	(0.037)	(0.027)	(0.047)	(0.079)	(0.058)
Market size (ln)	0.004	0.001	0.004	0.001	0.001
	(0.000)	(0.016)	(0.000)	(0.027)	(0.120)
Market Growth	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.027)	(0.227)	(0.107)	(0.299)	(0.121)
Observations	58,008	58,008	54,986	54,986	46,426
Country×Year FE	✓	✓	✓	✓	✓
Adj. R^2	0.0304	0.0354	0.0309	0.0363	0.0375

Overall, the results provided in Table 2.7 indicate that buy-and-build strategies are more likely in *fragmented industries* in which *follow-ons* are present together with several readily available *exit opportunities*. These conditions increase the availability and moneyness of the follow-on and exit options, thereby enhancing the likelihood

of successful buy-and-build strategies.[31]

Industry conditions along the supply chain

Consolidation can increase the bargaining power towards suppliers and customers, especially when their industries are relatively fragmented. We create supplier and customer shares based on the use of intermediate inputs, using U.S. 4-digit industry input/output tables, to account for the relative importance of supplier or customer industry linkages (Javorcik, 2004). We then calculate weighted average customer and supplier fragmentation levels for each industry:

$$Customer\ fragmentation_i = \sum_k \alpha_{i,k} \times fragmentation_k$$
$$Supplier\ fragmentation_i = \sum_j \gamma_{j,i} \times fragmentation_j,$$

where $\alpha_{i,k}$ stands for the inputs from supplier industry i used by customer industry k divided by the total inputs supplied by industry i to all its customer industries, and where $\gamma_{j,i}$ stands for the inputs from supplier industry j used by customer industry i divided over the total inputs used by industry i.[32]

In Table 2.8, we present the results. The measure *customer fragmentation* indicates that as the weighted average fragmentation level of customer industries increases, it becomes more likely that a buy-and-build acquisition will be completed. Hence, the value of consolidating your own industry varies with the potential to increase bargaining power towards customers (M increases more strongly through consolidation). For suppliers we do not find a significant relationship.

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[31]The results are robust to using a dummy indicator as a dependent variable in a linear probability model, or taking the natural logarithm of platform deals as an indication for the number of strategies, and the inclusion of the 2-digit NACE industry index valuation and its volatility instead of the sales volatility. Finally, we run a cross-sectional analysis by taking country-industry averages and removing the time-series variation. We run the analysis with number of completed deals (or with the dummy indicator) in a country-industry cluster. Also here, the volatility of the industry index valuation is positive and significant, motivating our real options model. The results are available upon request.

[32]Javorcik (2004) uses a σ instead of a γ. However in real options σ indicates the volatility. To avoid confusion we use γ instead to indicate the importance of supplier industries.

TABLE 2.8: Customer and supplier fragmentation and buy-and-build acquisitions.

The sample runs from 1998–2013. The dependent variable is the natural logarithm of the number of buy-and-build deals within a country-industry-year cluster plus one. *Customer fragmentation* and *Supplier fragmentation* are respectively the weighted averages of a buy-and-build target's customer and supplier industry fragmentation. Other variables are defined as before. Variables are lagged by one period. Fixed effects (FE) are included as indicated. P-values are provided in the parentheses. Standard errors are two-way clustered on an country-industry and year dimension.

	Number of B&B deals				
	(1)	(2)	(3)	(4)	(5)
Customer fragmentation	0.002 (0.048)		0.002 (0.055)	0.002 (0.034)	0.003 (0.014)
Supplier fragmentation		0.022 (0.004)	0.015 (0.017)	0.009 (0.088)	-0.001 (0.754)
Fragmentation				0.003 (0.002)	
Fragmentation Squared				0.001 (0.184)	
Top Fragmentation					-0.004 (0.024)
Bottom Fragmentation					0.010 (0.000)
Volatility	0.004 (0.088)	0.004 (0.062)	0.004 (0.068)	0.005 (0.039)	0.005 (0.067)
Market Size	0.005 (0.000)	0.004 (0.000)	0.005 (0.000)	0.005 (0.000)	0.002 (0.005)
Market Growth	-0.000 (0.006)	-0.000 (0.018)	-0.000 (0.007)	-0.000 (0.014)	-0.000 (0.084)
Observations	52,528	53,939	52,528	52,528	50,341
Country×Year FE	✓	✓	✓	✓	✓
Adj. R^2	0.030	0.031	0.031	0.032	0.039

2.6   Conclusion

We aim to advance strategic management theory by offering a dynamic view on serial acquisitions based on real option theory. Real options theory can incorporate anticipation value due to inter-temporal dependencies between subsequent options. This study uses this anticipation argument to explain the underlying causal logic as to the conditions when serial acquisitions strategies occur and tests these insights empirically.

Modeling serial strategies

In the real options model, the value of the strategy is increasing with option parameters such as demand volatility and drivers of moneyness (ratio of the underlying value to exercise price) of the future real options, as well as the interactions between these options. By modeling the anticipation and interaction of follow-on and exit options we can formulate more nuanced hypothesis about conditions on how buy-and-build strategies unfold in private equity. For instance, the attractiveness of a platform in a buy-and-build strategy is not merely an increasing function of industry fragmentation, but a function that is increasing in fragmentation of the lower size segments and decreasing in fragmentation of the higher size segments driving the exit option value. Thus, the platform investment is driven by industry, company characteristics and financial conditions that drive the follow-on and exit option in the option portfolio. Although our model was simplified, the model's results do not depend critically on the functional form used for the stochastic process or the number of follow-on targets.

Empirical implications and research directions

Buy-and-build strategies by private equity investors showcase real options well. At the inception of the fund, the investors determine a fixed buy-and-build period (maturity), and the structure allows us to specify a buy-and-build strategy as an interrelated chain of options, that involves platform, follow-on, and exit options. By testing it on private equity data, we also isolate the more general effect of anticipation from other explanations that apply to listed firms. We provide evidence that financial market, company, and industry conditions plausibly drive platform buy-and-build investment, through the anticipation of follow-on and exit options.

Our study raises a number of theoretical and empirical issues that may be addressed in future research. One key issue for listed firms is, how future research more effectively can separate the predictions of the anticipation of a real options from alternative theories. The development of real options theory for M&A of listed firms could probably benefit from a further integration with learning, empire-building motives, overconfidence and mispricing, and agency theory. For listed firms, it is up

to empirical testing to verify the importance of the implications of the real options analysis. Some of the predictions for platform, follow-on, or exit real options may be testable since the growth option value of listed targets is embedded in stock prices. The premium paid for the anticipated growth option value can be inferred from market values after the announcement of the deal, using for example market-to-book ratios (Tong et al., 2008b; Folta and O'Brien, 2004).

The insights into the optimal conditions for buy-and-build strategies are important for strategic management scholars and for private equity investors to optimize their strategies. The real option view can help us to understand this emerging growth strategy, restructuring strategies, or divestitures (Capron et al., 2001), and can exist next to current explanations for serial acquisitions. To the M&A literature in general, real options can further develop the new element of *anticipation* of future option value beyond the focal acquisition.

Chapter 3

Private Equity Funds Acting as Strategic Buyers[1]

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[1]This chapter is based on the paper Bansraj et al. (2020).

3.1 Introduction

Two main types of buyers in the market for corporate control had traditionally pursued quite diverse strategies. Strategic buyers—the companies in a related type of business, such as competitors, suppliers, or customers—would integrate targets into their own business in order to realize long-term operational synergies and, thus, enhance their existing operations or market position. Financial buyers, such as private equity (PE) firms, are presumed to be more interested in the return from acquisition. The PE buyers typically use a large amount of debt to take over the undervalued targets with a potential to generate high cash flow, restructure them, and sell once exit opportunities become sufficiently appealing (Kaplan, 1989b; Kaplan and Strömberg, 2009). In this chapter, we challenge this prior distinction and study a hybrid buy-and-build acquisition strategy, in which PE firms promise to introduce operational improvements to their portfolio companies through add-on acquisitions.

The fierce competition for deals among private equity firms disrupts their traditional business model since traditional benefits of leveraged buyouts (LBO) have become "common goods" (Sensoy et al., 2014; Braun et al., 2017). PE firms hold companies longer, and a number of fund managers surveyed by Gompers et al. (2016) name growth as a key value driver, while cost cutting lost its importance.[2] By now, up to a half of all global PE deals involve acquisitions into buy-and-build strategy (see Bain & Company, 2018, and Figure 3.1 based on our European data). But the literature still lacks the systematic evidence on whether this strategy delivers on the stated goal of long-term growth. Or—as critics say—PE firms use these transactions to window dress their track records, raise more capital, or justify spending already committed capital, without operational improvements (Phalippou and Morris, 2019). The buy-and-build business model is defined by operating improvements, therefore, this study aims to investigate whether we would find operating improvements in the combined entities of buy-and-builds, leaving other potential sources of value beyond the scope of our study.

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[2]The financial press started to notice that buyout groups start to hold assets for way more than a decade, preparing their clients to a bit lower but stable and less risky returns (Espinoza, 2018). Some funds have an evergreen structure that allow them to follow the longer-term strategies.

Figure 3.1: Buy-and-build and standalone deals and over time.
This figure presents the deal count (left vertical axis) of standalone private equity deals (light-shaded area) and buy-and-build deals, including both platforms and follow-ons (dark-shaded area). The ratio (right vertical axis) presents the percentage of buy-and-build deals to the total private equity deal market, including standalone and buy-and-builds.
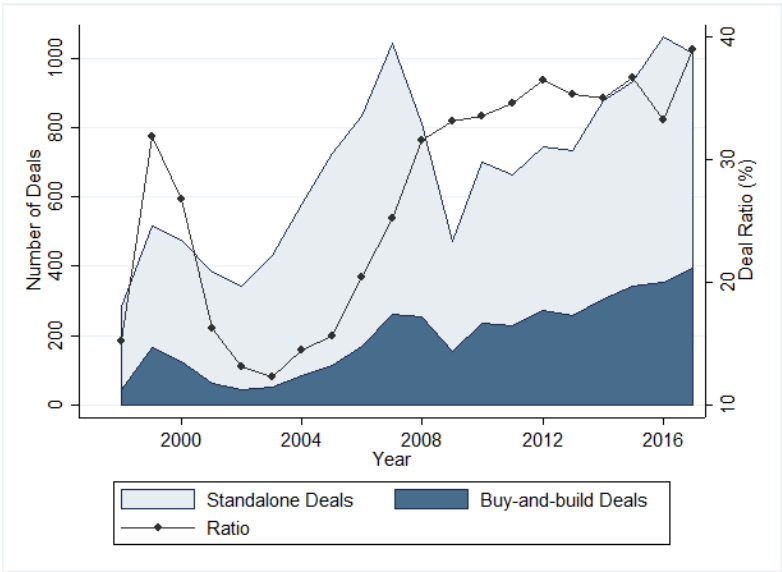
We define buy-and-build as a hybrid strategy in private equity that combines the deal structure of LBOs with the long-term synergy focus of serial acquisitions of strategic buyers. The strategy typically involves buying a "platform" company, building its scale and scope through purchases of the "follow-on" companies and organic growth, possibly integrating, and eventually exiting the combined entity. We find improvements of sales and profitability of these combined entities and argue that these improvements are consistent with the operating synergy interpretation and not the result of inorganic acquisitive growth. We provide extensive evidence to support our interpretation of this main result and the positive view that PE firms act similarly to strategic buyers by taking the long-term view and aiming for operating synergies.

In order to fix ideas, consider an example strategy in our sample. On 11 February 2011, the French PE firm Activa Capital has acquired a majority stake in Primavista, a provider of photographic services. In 2012, Primavista bought two French compa-

nies: Secret de Polichinelle, an online retailer and the manufacturer of invitations to marriage and birth celebrations, and Cadeaux Naissance, an online service provider for family planning and parenting. From the deal descriptions we learned that by building a combined entity from these three companies Activa hoped to achieve better operating results than what each of them obtain individually. The strategy fits our definition of buy-and-build, with Primavista considered the platform and the other two companies considered follow-ons, but this distinction is not important because our analysis is at the strategy level, which includes all three companies. Our goal is to measure the operating results of the combined entity, *in addition* to "inorganic" growth due to simply adding-up companies. In order to tease out this additional growth, we find a comparable company for each of these three companies using the propensity score matching techniques, construct an artificial entity ("placebo strategy") by adding-up the financials of these matched peers at the years of acquisitions by Activa, and compare the performance of the actual entity built by Activa to this artificial strategy past acquisition by the diff-in-diff regressions. We interpret these additional operating results as operating synergies, either positive or negative, because synergies are commonly understood as the relative performance of merged companies compared to non-acquired companies. Matching at the level of individual companies follows this conceptual definition and aims to mitigate the issue of non-random selection of targets into these strategies, while by constructing the placebo strategies we deal with the issue of absence of the comparison unit and account for inorganic acquisitive growth.[3] To the best of our knowledge, such quasi-experimental design at strategy level has not yet been applied in the M&A literature.

We collect our data using Zephyr and Orbis databases by Bureau van Dijk that have some attractive unique features for our research question.[4] We use Zephyr to

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[3]We acknowledge from the onset that we cannot unambiguously conclude that private equity firms cause the combined entities to increase revenues and profitability, since selection into buy-and-builds is not random. We follow the literature and use matching methods in an attempt to alleviate these concerns, although we do not rely on a clear source of exogenous variation for identification.

[4]Orbis is global nationally representative database on firms' financial and productive activities from balance sheets and income statements and detailed information on firms' domestic and international ownership structure for over 200 million public and private companies across the world, sourcing from the business registries and other sources. Zephyr is the database focusing on transactions, from the minority stake acquisitions to the majority take-overs, IPOs, etc., across the globe. The databases are described in and validated by Kalemli-Ozcan et al. (2015).

search for all add-on deals, where the PE acquirer explicitly claims to have a goal of the "long term synergetic growth"—this goal fits our conceptual definition of buy-and-build. And we forensically search through the elaborate ownership structure of the add-on companies in Orbis in order to find the platform company. Then we combine the platform with the related follow-on acquisitions into a single entity aiming to exploit some form of synergetic relationship. The result is 818 strategies, resulting from 818 platform and 1,346 follow-on acquisitions completed over the 1997–2016 in seven major European PE markets.[5] Finally, we use Orbis to collect the financials of this combined entity and use the universe of non-acquired companies to achieve the high-quality matching in order to ensure that our placebo strategies are as similar as possible to actual strategies.

Using our data we establish several new facts about buy-and-build strategies. First, an average holding period of the strategies in our sample of over five years, a longer time horizon than in a typical LBO, with large variation from one to more than ten years to exit. Second, there is a visible clustering of deals in service sector and manufacturing. Third, less than half of the deals in our dataset are in the same narrow industry, against the common perception that buy-and-build mostly consolidate industries by horizontal deals (see Bain & Company, 2018, pp. 31–36). The non-horizontal deals combine companies who are in supplier-customer relationship or even from unrelated industries (in product market sense). It looks like these strategies span various industries and strategy configurations, and our data have enough variation to investigate our research question in a comprehensive regression framework.

In the largest sample, buy-and-build strategies show significantly higher return on sales (ROS) compared to the placebo control strategies. This result supports the positive view that PE funds are acting similarly to strategic buyers that aim to realize operating synergies. The effect is economically meaningful. Compared to pre-deal mean, ROS of all strategies increases by, on average, 27 percent over the first five

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[5]The countries of our platforms and follow-ons are Denmark, Finland, France, Norway, Spain, Sweden, and the United Kingdom. The choice for the European market is driven by the availability of private company financials in this geography, due to the stringent company data filing requirements in these countries.

years (or exit if earlier).[6]

Having found evidence of improved profitability of the combined entities we build the case for synergies as a partial motivation for these strategies. First, if the notion of "success" of buy-and-build strategy includes operating synergies we should see operating improvements in, primarily, completed strategies. We find that strategies with known exit show improvements of profitability, while non-exited strategies underperform compared to control strategies. We realize that the exit decision is endogenous to the success of the strategy in, for example, maximizing internal rate of return. Our results mean that a buy-and-build strategy is likely motivated by synergies. We confirm this interpretation by using the duration analysis and showing that the probability of exit increases with time and measured operating synergies.

Second, realizing synergies is a difficult process and might take long. Could this be the motivation for generally longer holding periods in buy-and-build strategies? We categorize the completed strategies into two groups, split by the sample average time to exit, and find improved profitability and other outcomes in both groups. But the harder operational improvements (such as labor productivity) are indeed seen in the longer-held strategies, suggesting that some types of synergies take time to realize.

Third, we ask if there are larger operating improvements where the synergies are theoretically expected to be larger. For this, we introduce the triple interactions into our diff-in-diff regressions. We may expect synergies in capital intensive industries because these industries have generally a greater need for external funds, and financial intermediation is one source of value creation by PE firms (Ivashina and Kovner, 2011). The shorter-held capital-intensive strategies grow sales faster, compared to other shorter-held buy-and-build strategies, but without superior profitability. We find that the longer-held strategies with the above median capital intensity dispose of the redundant capacity and improve profitability more than in the other buy-and-build strategies with the same time to exit. These results may suggest that excess capacity in the capital intensive industries can be managed, redeployed, or disposed

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[6]The pre-treatment ROS has the mean of 0.056 percent with the standard deviation of 0.086. The estimate of the coefficient of ROS is 0.0154, significant at 5%.

of more easily, as in the assets redeployability hypothesis advanced by Williamson (1988) and Shleifer and Vishny (1992) and the corroborating evidence in Fidrmuc et al. (2012). In addition, we directly test whether operational benefits are brought by heavily publicized horizontal buy-and-builds, likely motivated by industry consolidation, or the benefits come from the acquisition of suppliers or customers in vertical acquisitions. Following the literature, we identify the relative position of a portfolio company in the production value chain using its 4-digit industry and a detailed input-output (I-O) table from the U.S.[7] Against the common belief, we do not find that horizontally related follow-ons significantly change the operating performance of the combined entity. In contrast, profitability, sales-to-assets, and labor productivity increase in strategies that combine vertically related companies. Zooming in on the configuration of vertical relationships, we discover that the latter results are mostly driven by the follow-ons from upstream (supplier) industries.

To further add credence to our analysis and interpretation we perform several robustness checks. In particular, we do not find the consistent evidence that the operating improvements materialize in uncompleted (non-exited) strategies in the settings where they are more likely to occur (the capital intensive and vertical strategies). Looking at the splits of the strategies by the overall size of the strategy and the relative size of the follow-ons to platform, we see that the largest operating improvements are realized in the strategies with relatively small follow-ons, consistent with the efficient transformation of smaller targets. In contrast, strategies with large follow-ons grow assets at the expense of profitability, confirming difficulty to transform and integrate larger companies. Finally, our results are robust to two alternative definitions of a buy-and-build strategy.

This chapter contributes to several bodies of literature. The literature on mergers and acquisitions has long named synergy as a key driver of M&As (see surveys

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[7]We consider the acquisitions of platforms and follow-ons in the same 4-digit NACE sector as horizontal. A close customer is the follow-on whose 4-digit industry sources from the industry of the platform according to the I-O table but is within the *same* 2-digit industry; the "other" customer is a sourcing company in a *different* 2-digit industry than the platform. We define the close or other suppliers of platforms similarly based on existing I-O supply relationship from the industry of follow-on to industry of the platform. Alternatively, we define close suppliers or customers based on the volume (the top quartile) of the I-O trade, with qualitatively similar results.

by Andrade et al., 2001; Betton et al., 2008; and evidence in Hoberg and Phillips, 2010; Bena and Li, 2014). At the same time, the danger of "empire building" in public markets is well-established (Masulis et al., 2007) and may be present in serial acquisitions (Fuller et al., 2002). In the PE context, agency problems manifest themselves as the "window-dressing" for fundraising, justification of spending the committed capital, and other issues (Phalippou and Morris, 2019).[8] We find that an increasingly popular serial buy-and-build acquisition strategy can successfully blend the traditional restructuring expertise of private equity and the long-term focus of strategic buyers, and deliver the stated goal of the long-term synergetic growth.

This chapter contributes to the somewhat limited literature on serial acquisition strategies by private equity. A large body of PE research focuses on the drivers of the operating improvements of individual portfolio companies but not at the level of strategies with multiple companies.[9] Our chapter is closely related to the studies by Boucly et al. (2011) and Gompers et al. (2016) by focus on the increased attention by PE firms on operating improvements and growth as the way to create value, and the paper of Acharya et al. (2013) by bringing attention to M&A-driven, "inorganic" strategies by PE.[10] We define buy-and-build as a series of buyout transactions that have a common stated goal of synergetic growth and we separate the transaction and

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[8]This behavior has been documented for the "pressured" purchases or sales in secondary LBOs (Arcot et al., 2015; Degeorge et al., 2016) or for younger funds that try to establish track record (Ljungqvist et al., 2020). The other examples range from inflated accounting valuations and sizeable and cryptic PE fees (Phalippou and Gottschalg, 2009; Robinson and Sensoy, 2013; Phalippou et al., 2018; G. W. Brown et al., 2019), to organizational diseconomies (Holmström and J. Roberts, 1998; Lopez-de-Silanes et al., 2015), to inequalities in the distribution of carried interest within the fund (Ivashina and Lerner, 2019).

[9]The non-exhaustive list of works on operating results of portfolio companies in LBOs includes Nikoskelainen and Wright (2007), Kaplan and Strömberg (2009), Boucly et al. (2011), Lerner et al. (2011), Cornelli et al. (2013), Guo et al. (2011), Cohn et al. (2014), Davis et al. (2014), Bharath et al. (2014), Harris et al. (2014), Bernstein and Sheen (2016), and Antoni et al. (2018). The related literature on private equity returns argues that private equity outperforms public equity markets even net of fees and after adjusting for risk (Kaplan, 1989a; Kaplan and Schoar, 2005; Sensoy et al., 2014; Robinson and Sensoy, 2016; Korteweg and Sorensen, 2017), sometimes using political connections (Faccio and Hsu, 2017) and favorable industry and debt market conditions (Gompers and Lerner, 2000; Y. Wang, 2012; Axelson et al., 2013; Jenkinson and Sousa, 2015).

[10]Acharya et al. (2013) focus is on the match between the PE partner background (financial or operating) and the nature of the deal in Western Europe (the deals with the M&A events during the private phase and "organic" deals without M&A event). Valkama et al. (2013) demonstrate that the inorganic transactions positively influence the internal rate of return in LBOs in the UK. Hammer et al. (2017) focus on factors explaining the probability of individual acquisitions undertaken by the the PE portfolio companies during the holding period.

synergetic growth using the replicated strategies constructed from matched peers of portfolio companies. We contribute to both literatures by finding the evidence of operating improvements in serial buy-and-build strategies by PE using the strategy-level analysis.

The third related literature is on asset complementarities in mergers (Rhodes-Kropf and Robinson, 2008). Fan and Goyal (2006) and Ahern and Harford (2014) demonstrate the importance of vertical firm relationships for M&A waves and merger outcomes. We show that similar motivations partially drive the serial acquisitions by private equity. Among all our strategies, even larger operational benefits accrue in capital-intensive strategies and in the strategies built along the production value chain, rather than in horizontal strategies. This reinforces our interpretation of these operating results as synergies.[11]

The rest of chapter is organized as follows. In section 3.2 and 3.3 we discuss the empirical methodology and the data. Section 3.4, 3.5 present the main analysis and robustness checks. Section 3.6 concludes.

3.2 Empirical Methodology

Our goal is to investigate whether buy-in-build strategy enhances operating results of consolidated entities built by a series of acquisitions, not the component parts. Before discussing our methodology, we would like to define some terms related to buy-and-builds. In this strategy, PE firms *buy* "follow-on" assets that are then added on to "platform" companies in order to *build* (consolidate) a larger entity, which is eventually exited. We define a platform as an entity whose core competencies or efficiencies can be transferred onto follow-on acquisitions and change the strategic position of the combined company. We define follow-ons (also known as "add-ons" or "bolt-ons") as other companies that can be merged with the platform to increase the overall value of the combined company. Platforms can be built from multiple small

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[11]If the goal of horizontal strategies in a narrow industry is to eliminate the small firm discount and sell the combined larger company at higher multiple we might not necessarily detect any meaningful operating changes. Studying the exit multiples of these strategies is beyond the scope of this study.

companies or acquired as an existing company. Our broad definition of this strategy encompasses a number of existing variations (Smit, 2001): quick roll-ups aiming to turn investments around in a shorter-term or sequential strategies with a longer planning horizon; horizontal buy-and-builds to consolidate industries or vertical buy-and-builds aiming at integration along the value chain. We follow these conceptual definitions to collect the data for buy-in-builds (see Section 3.3 and Appendix 3.A for more details).

To provide evidence consistent with causal effect of this strategy we have to confront a dual problem of non-random selection into this strategy and lack of the comparison unit (the counterfactual) at the strategy level. To alleviate these concerns we borrow the empirical methodology from the literature (see M. R. Roberts and Whited, 2013, for review) but adapt it for our strategy-level analysis. In a nutshell, we use a difference-in-differences estimation to compare the performance of acquired entities with the performance of the comparable non-acquired entities over time after the acquisition. In standard M&A context, the "entity" would refer to a single company, while in our context it is the *combined entity* including a platform and all related follow-ons. For this reason, we construct the comparable entity for diff-in-diff from the peers of buy-and-build companies, found by the propensity score matching techniques. Even though we go a great length in establishing causal effect, we recognize that matching methods do not rely on a clear source of exogenous variation for identification and does require knowledge and measurement of the relevant covariates that determine selection into the strategy. To the extent it is possible with our data we attempt to alleviate these concerns by using a large set of potential controls, matching on many pre-deal variables, controlling for various macro trends, and exploiting heterogeneity of our strategies.

Matching. The first issue is well-known in empirical research and, in our case, stems from the fact that "buy-in-build treatment" is not randomly assigned, either because the companies self-select into the acquisitions or because PE firms are professional investors who carefully select their acquisition targets. To mitigate (but not solve) this concern, we follow the literature and match each acquired platform and

follow-on company to similar non-acquired companies on pre-acquisition company-level observables. We use the entire population of non-acquired companies in Orbis from our sample countries as potential controls. We motivate the choice of this control group rather than, for instance, acquisitions of strategic buyers or other control groups as follows. First, conceptually, we measure whether the buy-and-build strategies create operating synergies in the first place, and not whether these strategies are doing better (or worse) than acquisitions by strategic buyers. Comparing to, for example, serial acquisitions by the strategic buyers is an interesting but different research question. Second, theoretically, W. Wang (2018) argues that the market cannot perfectly observe the probability of a firm acquiring or merging with another and learns more about the target fundamentals and re-evaluates its stand-alone value only after the M&A announcement. A priori, any stand-alone company can, therefore, be selected into buy-and-build. And third, from the practical viewpoint, to achieve good match we have to draw from a large pool of controls (the potential targets). Other controls, such as serial acquisitions by strategic buyers, are relatively rare that makes good matching infeasible.

Matching is done by estimating the probability (the "propensity score") of being acquired into a buy-and-build strategy and selecting a subset of acquired and non-acquired firms with similar probabilities. Based on the general advice of M. R. Roberts and Whited (2013), our probability (probit) model includes a number of pre-acquisition explanatory variables, to ensure the observational equivalence of the matched companies, and lagged values of the dependent variable, in order to hedge again the regressions spuriously picking up pre-existing trends with the acquisition variables. We match the firms based on this propensity score within the same country, two-digit industry, and year to account for the omitted third (macro) factors, such as country-level changes in economic policies or the business climate or the PE targeting some sectors across different markets. For each acquired company we keep five closest non-acquired neighbors, resulting in one-to-many match.[12]

Placebo strategies. The second issue with the lack of the comparison unit is

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[12]Appendix 3.B provides more details on the implementation of matching and its quality, in particular, the usual diagnostics of the covariates balancing and the parallel trends assumption.

crucial. We use the companies that we matched to our platforms and follow-ons and construct the portfolios that resemble (similar based on the financial variables that we use to match) our actual strategies. We randomly select one of the five matched peers of the companies within an observed strategy and combine the financials of these peers similarly to how we assign financials within the observed strategies (see details in Appendix 3.A). We refer to these artificial counterfactual strategies as "placebo strategies."[13] We repeat the process and construct five placebo strategies for each observed strategy.

Outcomes of interest and empirical specification. Our performance measures include the natural logarithm of sales and total assets, to verify whether the strategies grow faster; EBIT or EBITDA over total assets (return on assets, ROA) and EBIT or EBITDA over operating revenue (return on sales, ROS), to see whether the strategies show better profitability; and the operating leverage and cash holdings over assets to analyze the change in financial constraints (Erel et al., 2015). Finally, we test whether these strategies are associated with efficiency improvements, measured by revenue over total assets (the asset turnover ratio, ATR) and revenue over the number of employees (labor productivity). Using the sample of observed strategies (treated) and placebo strategies (controls), we estimate the following specification:

$$Y_{s,t} = \alpha + \beta_1 Post_{s,t} + \beta_2 Post_{s,t} \times BB_s + \eta_s + \eta_t + \epsilon_{s,t}, \qquad (1)$$

where $Y_{s,t}$ are different outcomes for a treated or control strategy s in the year t. For actual strategy s and its placebo strategies, the $Post_{s,t}$ is equal to one for the years

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[13]Hochberg and Fehder (2019) use an alternative quasi-experimental design based on the synthetic control method (Abadie et al., 2010) to study the spillover effects of seed accelerator programs for technology entrepreneurship activity in the U.S. metro areas. Their results from the synthetic control approach are similar to the results obtained using matching with the diff-in-diff techniques. In the synthetic control method one constructs a (synthetic) control unit as a convex combination of observed companies. The results are reported graphically as the plots and significance tests of the average observed outcomes of interest in treatment and synthetic control units in the pre- and post-treatment period. The method attempts to improve the match to the treated company and potentially account for the time-varying treatment effects at different time horizons. The latter properties are attractive but the method is difficult to apply for our purposes because we conduct the analysis at the level of strategies while the method computes the average lead-specific treatment effect and does not specify the existing non-acquired companies from which we can build the comparable strategies.

after the platform of s was acquired, and zero otherwise. It accounts for any common trend affecting both the treatment and control group. The BB_s is our treatment indicator, equal to one for the observed buy-and-build strategies. The β_2 is our main coefficient of interest, identified from the post-buyout performance of actual strategies compared to performance of observationally equivalent "artificial counterfactual" strategies, constructed by us. We control for unobserved *time-invariant* differences between strategies (actual or placebo) by strategy fixed effects η_s, and we include year fixed effects η_t to control for common time trends across countries.

Finally, we introduce the triple difference into our regressions by interacting the $Post_{i,t} \times BB_i$ term with several strategy characteristics that in theory should be conducive to higher synergies. If we find the positive significant interaction term this will be *consistent with* causal interpretation.

3.3   Data

At the time of writing, researchers have access to reasonably comprehensive and reliable data on net cash flows at the level of PE funds. But the data on operating performance of individual companies held by PE funds (referred to as deal-level data) is still a major challenge for research on private equity because in most countries outside of EU the level of disclosure is much lower than it is for quoted companies (e.g., in the U.S., Securities and Exchange Commission does not require private companies to file detailed financial records). We collect our data from several databases by the Bureau van Dijk (BvD) that have some attractive features for our purposes. The BvD *Zephyr* database focuses on ownership change and contains information on transactions from the minority stake acquisitions to the majority takeovers, IPOs, etc., across the globe. The BvD *Orbis* database provides information on firms' financing and real activities from financial statements, together with detailed information on firm ownership structure for over 200 million public and private companies across the world in a standardized and internationally comparable format. Deals in Zephyr can be merged to company information in Orbis by a common identifier. The

databases are validated against the official sources and described in Kalemli-Ozcan et al. (2015). We select the deals in seven advanced economies in Europe (Denmark, Finland, France, Norway, Spain, Sweden, and the UK) that represent the most active PE markets outside of the U.S. and, in contrast to North America, have the stringent requirements for data reporting.

Appendix 3.A describes our methodology to identify buy-and-build strategies from BvD databases and assign their financials in detail. The internal organization of the databases defines our data collection strategy. The key challenge is that no database identifies the buy-and-build strategies—only the potential follow-on deals.[14] In short, we start by selecting the follow-on deals from Zephyr, use detailed company ownership information to find the platforms and define strategies as a platform and all the relevant follow-ons. Then we assemble the financials of all companies in the identified strategies from Orbis financials as recommended in Kalemli-Ozcan et al. (2015) in order to reduce the survivorship bias present in direct Orbis downloads.[15] In total, we identify 818 strategies with unique platforms located in these seven European countries with a total of 1,346 follow-on acquisitions.

3.3.1 Characteristics of buy-and-build strategies

Table 3.1 presents some descriptive statistics of the sample. In panel A, we report the number of acquisitions by year. The number of platforms and strategies is the same because each strategy has a single platform. The number of completed buy-and-build acquisitions was relatively small up to 2004 but strongly increased in the second half of the 2000s, prior to the Global Financial Crisis in 2007-08. After a short set-back, the number of acquisitions returned to their pre-crisis levels in 2010, and the low

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[14]To our knowledge, the three other commercial databases that cover alternative investments, Preqin, Capital IQ, and Pitchbook, have recently introduced the flags broadly consistent with the follow-on deals. Capital IQ has the "consolidation/roll up," Pitchbook has the "add-on" and the "platform creation" but they do not seem to be for PE specifically. More generally, Preqin has investments by PE in a portfolio company, and by reading the profile details of the deal one can find the "add-on investments" by the company in which the PE firm invested.

[15]The online version of Orbis only contains the 10 most recent year of financials of a company. Older deals are more likely to be excluded due to missing financials. To overcome this problem, we follow Kalemli-Ozcan et al. (2015) and access the historic vintages of Orbis to collect financials for targets in these older deals.

numbers in the last two years are due to delays with the inclusion of later deals into the databases. Figure 3.1 presents this trend visually in absolute terms (dark shaded area, left axis) and relative to the total number of LBOs, including buy-and-builds (solid line, right axis). Together with the large volume of these transactions, the uninterrupted upward trend in the share of M&As into this strategy from 2003 onward shows their growing importance in the PE market.

TABLE 3.1: Characteristics of buy-and-build strategies in our sample.
This table provides an overview of the BB acquisitions over time. Each strategy is associated with a single platform, hence, their count is the same.

Panel A: Buy-and-build acquisitions by year			
Deal year	Strategies (Platforms)	Follow-ons	Total
1997	4	0	4
1998	10	4	14
1999	26	24	50
2000	22	30	52
2001	16	20	36
2002	11	10	21
2003	26	12	38
2004	36	26	62
2005	55	49	104
2006	92	55	147
2007	94	121	215
2008	74	136	210
2009	39	74	113
2010	79	121	200
2011	90	127	217
2012	69	174	243
2013	42	176	218
2014	29	187	216
2015–16	4	0	4
Total	818	1,346	2,164

TABLE 3.1 - *Continued*

Panel B: Composition of buy-and-build strategies

Number of follow-ons per strategy	Number of strategies	Percent	Cum.
0	37	4.5	4.5
1	486	59.4	63.9
2	204	24.9	88.9
3	47	5.8	94.6
4	15	1.8	96.5
5	10	1.2	97.7
6 and more	19	2.3	100
Total number of strategies	818		
Average number of follow-ons	1.7		
Maximum number of follow-ons	34		

Panel C: Status and length of buy-and-build strategies

Number of completed (exited) strategies	545
Number of strategies still active	240
Strategies without clear exit	33
Average strategy length (days)	1,987
Minimum length (days)	44
Maximum length (days)	5,369

In panel B, we report the number of follow-on acquisitions per buy-and-build strategy. Most strategies have acquired either 1 or 2 follow-on companies, with an average of 1.7 follow-ons. Noteworthy, a few buy-and-build strategies, while designated in deal descriptions as such, have not acquired any follow-on companies. buy-and-build strategies with 4 or more acquisitions are less common, although one strategy in our sample consists of an impressive 34 follow-on companies. Our unit of observation is a firm (a legal entity) and by examining our follow-ons we found that some included a large number of establishments, which might partially explain why our average number of follow-ons is lower than commonly thought about the buy-and-builds. We conduct a robustness analysis with two alternative definitions of the serial buyouts by PE, and confirm the general conclusions from our main approach (see Section 3.5.3 for details).

Panel C shows that out of our 818 strategies, 240 were still active (no exit) and 33 had unclear status as of August 2017. We consider the latter two types of strategies uncompleted because any PE strategy should, in principle, end in an exit. Of note, if our source explicitly mentions that the companies went bankrupt we consider it an exited strategy. The average length of the exited buy-and-build strategies in our sample is more than 5 years, confirming our expectation that buy-and-builds are indeed longer-term strategies. This is new, because a typical PE transaction takes 3-4 years to exit, while most of the research focuses on portfolio performance in the first three years post acquisition. Nevertheless, our sample also includes some "quick-flips" in which the strategy took less than a year to complete. On the other side of the spectrum, we also have strategies that took more than 10 years from the platform acquisition to exit. Finally, out 37 strategies with no follow-ons, two went bankrupt and a majority (29) exited without failure. We retain such "degenerate" strategies in our analysis that stacks cards against us finding the synergetic effects of serial acquisitions.

3.3.2 Sectoral Patterns

The PE industry and existing theoretical literature mentions industry consolidation in the local market as the primary goal of buy-and-build strategy (see Smit, 2001; Bain & Company, 2018). Through consolidation, the combined company could obtain economies of scale or a stronger market position towards suppliers and buyers, which has been shown for horizontal mergers in general (Singh and Montgomery, 1987; Bhattacharyya and Nain, 2011). If true, we would expect that most follow-on acquisitions are within the same industry. In Figure 3.2 we present the volume of acquisitions by the industry combination of the platform and their follow-ons, using the European 4-digit NACE classification. The sector of main activity of the platform are plotted on the vertical axis and the sector of its follow-ons on the horizontal axis, and the size of the circles represents the number of follow-ons in this industry combination. In panel A, we plot the deals where platform and follow-ons belong to the same 4-digit sector (or horizontally related) and in panel B the deals *out-*

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side the same 4-digit sector. The graph shows clustering of deal activity in certain industries. The horizontal acquisitions in panel A are especially visible in services industry (the industry numbers 6xxx and up). Panel B demonstrates that there are numerous strategies in which the follow-ons are active in a different industry than the platform, even a different 1-digit industry. Here, the deals cluster in services and manufacturing (between the dashed lines). Otherwise, the graph demonstrates that the PE not only seek to consolidate the industries, as is commonly believed, but also exploit other goals. Still, the majority of the deals in panel B are clustered around the 45-degree line, where close but not the same narrow sector combinations line-up.

Figure 3.2: Horizontal and other industry combinations.
This figure presents the deal activity by industry combinations. The number of 4-digit NACE revision 2 sector of the platform is on the vertical axis, and the number of the sector of the follow-on is on the horizontal axis. Points on the 45-degree line indicate that the platform and follow-on belong to the same industry. Dotted lines outline manufacturing sectors 10 to 33. The size of the ball is proportional to the deal count for that combination. In panel A, platform and follow-ons belong to the same 4-digit NACE sector; in panel B they belong to a different 4-digit sectors.
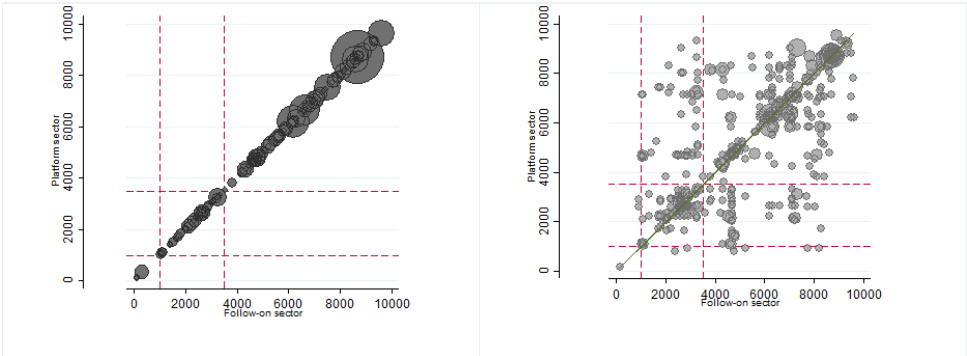
Panel A: Horizontal combination   Panel B: Vertical combinations

What could be the reason for non-horizontal deals depicted in panel B? The industrial organization literature has a long tradition investigating the so called "vertical linkages," where the companies might be related along the production value chain through the supplier-user linkages. Acquiring own suppliers could give the company more control on the speed of the production process and on the quality and reli-

Figure 3.3: Input-output relations of industry combinations in different sectors.
This figure presents supplier-customer relations according to the input-output table between the industry combinations that do not belong to the same 4-digit NACE sector. Dotted lines outline manufacturing sectors 10 to 33. Light-gray circles indicate that the platform and follow-on share a supplier-customer relation. Dark-grey circles indicate that the platform and follow-on do not share a customer-supplier relation. On the vertical axis and horizontal axis the 4-digit NACE code of respectively the platform and follow-on is presented. The 45-degree line indicates combinations in which the platform and follow-on belong to the same industry.
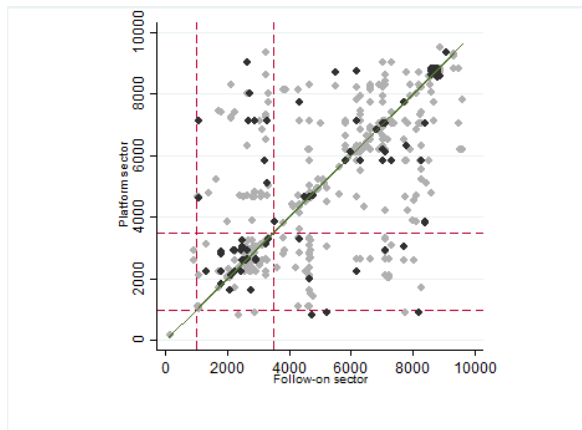
ability of the inputs (Barrot and Sauvagnat, 2016).[16] Acquirers can "learn" from their subsidiaries who are downstream customers (Javorcik, 2004) or have an easier access to business-relevant information in the economy, relative to specialized firm (Anjos and Fracassi, 2015).[17] The intensity of the supplier-customer linkages is typically measured by the coefficients from the input-output (I-O) tables that show the fraction of each sector output supplied to or sourced from all other sectors in an economy, either intermediate inputs or final products (see early work by Lemelin,

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[16]Barrot and Sauvagnat (2016) show that the firm-level supplier shocks from natural disasters propagate in production networks and impose substantial output losses leading to lower market share on their customers, especially when they produce specific inputs.

[17]Javorcik (2004) found the evidence of productivity spillovers from multinationals to domestic firms through customer-supplier relationships between domestic firms and their multinational downstream customers or upstream suppliers. Anjos and Fracassi (2015) provide evidence that vertically-integrated firms overcome the informational frictions and combine cross-industry knowledge better than specialized companies. Access to the internal capital markets within a conglomerate is well-established benefit of corporate diversification (Hubbard and Palia, 1999; Khanna and Tice, 2001). A newer work stresses the reallocation of workers, or the internal labor markets (Tate and Yang, 2015). Benefits from internal reallocation of capital or labor might also work for horizontal M&As.

1982; Caves and Bradburd, 1988; and in finance literature by Fan and L. H. P. Lang, 2000). We construct the I-O coefficients at the 4-digit industry level using the most detailed to date input-output table for the U.S. from 2007, compiled by the Bureau of Economic Analysis.[18] In Figure 3.3 the light-gray dots indicate the deals where the platform is a direct supplier to or consumer of the follow-on; the black circles indicate that there is no direct I-O relation. The figure shows that the majority of the deals do indeed have a direct I-O (product market) relation, however, there are numerous combinations in which the nature of relation between the platform and follow-on is unclear. Either type of non-horizontal acquisitions can potentially be motivated by the economies of scope. One potential source of value in the absence of the I-O links is technological relatedness and learning.[19] We exploit the relatedness of the companies in product space in the empirical analysis.

3.4 Results

3.4.1 Buy-and-builds and operating improvements

We begin our empirical analysis by estimating the model in Eq. (1) at the strategy level over up to five-year time horizon, clustering the standard errors two-ways, over the strategy and year. As the result, we include most of the longer-term exited strategies and non-exited strategies because the average length of our buy-and-build strategies, from the platform acquisition to exit, is slightly above three years. This

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[18]Statistics prepared at the 389-industry level of aggregation was available until very recently only for estimate year 2007, which is a mid-year of our sample. The table "Use Tables/After Redefinitions/Producer Value" is available at `https://www.bea.gov/industry/input-output-accounts-data` (accessed 21/3/2017). Recently the 2012 estimates were released. Using the U.S.-based measures implicitly assumes that the patterns of input flows in the advanced European countries of our sample are close to those of the United States. If the U.S. production and input structures are imperfect for European countries, we are introducing random error in the measurement of our regressors and, therefore, reducing the probability of finding statistically significant results. The alternative is the World Input-Output Database (WIOD) that provides time-series of I-O tables for forty countries but at the less detailed 2-digit industry level.

[19]Bloom et al. (2013) show that firms learn from the technological innovation of firms that are close in technology space. Acemoglu et al. (2016) argue that technological progress is not only a cumulative process, with new technologies building on existing knowledge, but also a process where innovation in one firm affects firms in technologically close fields. Fons-Rosen et al. (2017) show that positive knowledge spillovers from MNCs can happen without input-output linkages as long as the firms produce in technologically close sectors.

time horizon resonates with the arguments from the PE industry that buy-and-build is a long-run strategy because there are multiple companies in portfolio that need to be restructured and integrated. The after-event indicator *Post* takes the value of zero at t-1 and one for the period t+1 up to t+5 where t is the company acquisition year.[20] The coefficient of the interaction $Post \times BB$ shows the difference in the outcome between the observed strategies and the placebo control strategies during the years after the acquisition. A positive significant coefficient is consistent with the notion that this strategy brings the synergetic benefits. The results in Table 3.2 show that over five years buy-and-build strategies are associated with significantly higher return of sales but the rest of operating outcomes remain at the levels of the comparable artificial strategies. The coefficient of 0.0154 implies that the effect, if causal, is economically meaningful; compared to the pre-deal mean of 5.6 percent, ROS on average increases by 27 percent over the first five years (or exit if earlier).[21]

TABLE 3.2: Performance of the strategies relative to the placebo strategies over the long-run: All strategies.
This table shows the performance of buy-and-build strategies compared to placebo control strategies over the first five years following the platform acquisition. The sample includes strategies with known exit and non-exited strategies. *Post* is an indicator equal to zero for t-1 and one for the period t+1 up to t+5 (or exit, whichever is earlier), where t indicates the year of the acquisition of the strategy's platform. For the control sample, *Post* takes on the respective values of the treated company to which the control is matched. *BB* is an indicator for the treated sample. All specifications include firm and year fixed effects. Standard errors are clustered two-ways over the company and year dimension. *, **, and *** stand for a 10%, 5%, and 1% significance level, respectively.

	(1) ln Assets	(2) ln Sales	(3) ROA	(4) ROS	(5) ATR	(6) Leverage	(7) Cash/Assets
BB×Post	-0.114	0.073	0.007	0.015**	0.045	0.023	-0.009
	(-0.74)	(0.76)	(1.26)	(2.65)	(0.81)	(1.57)	(-1.21)
Post	-0.074	-0.114*	-0.004	-0.003	0.027	-0.019	-0.006
	(-1.38)	(-2.08)	(-0.84)	(-0.67)	(0.81)	(-1.65)	(-0.91)
Observations	4,534	4,511	4,531	4,503	4,526	4,131	4,348
Adj. R^2	0.880	0.870	0.594	0.576	0.827	0.721	0.664
Year FE	✓	✓	✓	✓	✓	✓	✓
Strategy FE	✓	✓	✓	✓	✓	✓	✓

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[20]If a strategy exits before the first five years the *Post* is equal to one up to and including its exit year.

[21]The standard deviation of the pre-deal mean is 8.6.

Exited and Non-exited Strategies. The large sample in Table 3.2 includes exited and non-exited strategies, and the former could be considered completed. If we see operating improvements concentrated in exited strategies this would provide evidence that the strategy is (partially) motivated by synergies. The other metrics of "success" could be maximizing internal rate of return (IRR), multiple arbitrage without operating improvements, or elimination of small firm discount. We split our sample into completed (exited) and uncompleted strategies and repeat the analysis, keeping the time period at five years since the portfolio acquisition. The results in Table 3.3 show improvements in sales and profitability in completed strategies, compared to the matched control strategies, while the strategies that are still private in our sample underperform, even over such a long period as five years.

Endogeneity of exit decision. The limited life of the PE partnership in general implies that the exit will happen at some point in the future—our sample simply does not span enough time in order to observe all exits. The combined entity would be an appealing target for a strategic buyer or would succeed with the IPO if it performs better than what the strategic buyer or the market can obtain itself. That is, the decision to exit might depend on realization of synergies and the observations for non-exited strategies in our sample may be considered right censored. We verify this conjecture by using the survival (or duration) analysis that is an appealing alternative to the common statistical methods in this context. We model the probability that an strategy will experience an exit at time t, knowing that it has not exited (or "survived to") up to t. With non-exited strategies, this probability (or the "hazard rate") is unobserved, and it reflects both the occurrence and the timing of the exit. In Table 3.4 we report the raw coefficients from several duration models where the dependent variable is the time to the exit, calculated as the time (in years) between the year of the acquisition of the strategy's platform. We condition on the total asset growth and the "abnormal" asset growth (the variable *Asset growth (abnormal)*), defined as the growth of the strategy assets minus the growth of the placebo control strategy assets. The latter is our proxy of the accumulated (growth) synergies. We also include the abnormal ROA and sales growth, defined similarly. We estimate the

TABLE 3.3: Performance of the strategies relative to the placebo strategies: Completed and uncompleted strategies.

Panel A shows the performance of buy-and-build strategies with known exit compared to placebo control strategies; this panel replicates Table 3.2 excluding the strategies which are still active or with unknown status. Panel B only includes the strategies which are still active or have unknown status. The *Post* is an indicator equal to zero for t-1 and one for the period t+1 up to t+5 (or exit, whichever is earlier), where t indicates the year of the acquisition of the strategy's platform. For the control sample, *Post* takes on the respective values of the treated company to which the control is matched. *BB* is an indicator for the treated sample. All specifications include firm and year fixed effects. Standard errors are clustered two-ways over the company and year dimension. *, **, and *** stand for a 10%, 5%, and 1% significance level, respectively.

	(1) ln Assets	(2) ln Sales	(3) ROA	(4) ROS	(5) ATR	(6) Leverage	(7) Cash/Assets
Panel A: Exited strategies, t-1 to t+5							
BB×Post	-0.056	0.196*	0.016**	0.023***	0.062	0.008	-0.001
	(-0.36)	(1.83)	(2.29)	(3.51)	(0.82)	(0.43)	(-0.16)
Post	-0.068	-0.117*	-0.009	-0.008*	0.009	-0.017	-0.007
	(-0.93)	(-1.83)	(-1.52)	(-1.85)	(0.23)	(-1.34)	(-0.76)
Observations	3,394	3,377	3,391	3,372	3,389	3,068	3,247
Adj. R^2	0.872	0.877	0.606	0.595	0.823	0.706	0.663
Panel B: Non-exited strategies, t-1 to t+5							
BB×Post	-0.267	-0.338**	-0.026*	-0.014	-0.021	0.069*	-0.035
	(-1.47)	(-2.40)	(-1.92)	(-1.25)	(-0.33)	(1.91)	(-1.71)
Post	-0.183	-0.183	0.016	0.016	0.102*	-0.028	-0.001
	(-0.89)	(-0.61)	(1.25)	(1.11)	(2.04)	(-1.44)	(-0.04)
Observations	1,137	1,131	1,137	1,128	1,134	1,062	1,098
Adj. R^2	0.901	0.841	0.554	0.526	0.833	0.766	0.664
Year FE	✓	✓	✓	✓	✓	✓	✓
Strategy FE	✓	✓	✓	✓	✓	✓	✓

"dynamic" models over the full panel structure and a "static" model where the time interval to the exit is fixed at the first 5 years from the platform acquisition and the explanatory variables are cumulated over the corresponding time interval. We adjust for unobserved heterogeneity (frailty) where the frailty parameter is significant. The results show that the probability of exit increases significantly with larger synergies, represented by abnormal return on assets and robust to specifications. We also see that the hazard shape parameter is above unity, with point estimates around 2.5, which implies that the probability of exit increases over time. These results are fully consistent with the results in Table 3.2 in that the PE seem to decide to exit when

TABLE 3.4: Operating performance and strategy exit rates: Duration analysis.
The table reports the raw coefficients from the duration models explaining the relationship between the probability that a buy-and-build strategy exits at time t having lasted up to time t and operating performance. The dependent variable is the time to the exit, calculated as the time (in years) from the year of the acquisition of the strategy's platform. Strategies which have not exited during the sample period are considered censored observations. The *Asset growth (total)* is the growth rate of total strategy assets (the platform and all follow-ons) from the year before the platform acquisition, while the *Asset growth (abnormal)* is the growth of the strategy assets minus the growth of the placebo control strategy assets. The variables *ROA (abnormal)* and *Sales growth (abnormal)* are defined similarly from the level of Return on Assets and growth of operating revenue. For the control sample, the variables take the respective values of the control companies to which the treated is matched. The models marked "Dynamic" use the full panel structure, while in the models marked "Static" the time interval to the exit (the failure) is fixed at the first 5 or 3 years from the platform acquisition (or exit, whichever is earlier) and the explanatory variables are cumulated over the corresponding time interval. The results are calculated using a parametric a Weibull survival-time model in columns (1)–(4) and (7), the exponential model with a more flexible baseline hazard parametrized with the duration dummies in column (5), and the non-paramentric Cox proportional hazards model in column (6). For static model in columns (7),we adjust for unobserved heterogeneity (frailty) assuming the inverse-Gaussian distribution of frailty; in the other models the frailty parameter is not significant. Standard errors are clustered at the year level. P-values are included in the brackets. *, **, and *** stand for a 10%, 5%, and 1% significance level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Estimation	Dynamic	Dynamic	Dynamic	Dynamic	Dynamic	Dynamic	Static 5 years
Asset growth (total)	0.229***	0.238*	0.114	0.105	0.214	0.083	-0.064
	(0.002)	(0.081)	(0.545)	(0.601)	(0.283)	(0.637)	(0.896)
Asset growth (abnormal)	-0.018	0.004	0.018	0.030	0.096	0.088	-0.050
	(0.857)	(0.975)	(0.895)	(0.846)	(0.530)	(0.638)	(0.395)
ROA (abnormal)	3.511***	3.380**	3.246**	3.345**	3.662***	2.941*	5.393***
	(0.009)	(0.017)	(0.020)	(0.013)	(0.002)	(0.052)	(0.000)
Sales growth (abnormal)				-0.005	-0.046	-0.097	0.067
				(0.967)	(0.684)	(0.485)	(0.568)
Model	Weibull	Weibull	Weibull	Weibull	Exp	Cox	Weibull
Hazard shape parameter p	2.469	2.469	2.469	2.478	-	-	2.395
Frailty	None	None	None	None	None	None	Inv. Gauss
Duration Dummies					✓		
Observations	503	503	503	493	493	493	93
Year FE	✓	✓	✓	✓	✓	✓	✓
Country FE		✓	✓	✓	✓	✓	✓
Industry FE			✓	✓	✓	✓	✓

it demonstrates some "success" realizing sufficient operating improvements over the comparable placebo portfolio.

Short-term and long-term strategies. The realization of synergies used to be the area where the strategic buyers would excel because the operating synergies might

be take time to realize and this requires the long-run focus, typically associated with strategic M&As. We categorize all the exited strategies into two groups, split by the sample average time to exit of three years (this cutoff coincidentally matches the time horizon to measure the performance of acquisitions by the M&A literature) and re-estimate the model for these sub-groups. We report the results for the short-term exited strategies in Table 3.5, panel A (at most four years to exit or less, three on average) and for the long-term exited strategies in panel B (at least five years to exit).[22] Remarkably, we find improved operations in both groups, which in our view suggests that synergies is an inherent part of even shorter-held strategies in our sample.[23]

Comparing panel A and B we find a difference in focus depending on the length of the strategy. In short-term exited strategies (panel A) the focus is on growing assets with some weak evidence of improvements in profitability, while the long-term exited strategies (panel B) achieve significantly higher profitability but the sales and assets are comparable to the outcomes of the control strategies. These effects are economically meaningful. The effects imply that an average short-term strategy shows close to 41 percent improvement of ROS over the average pre-acquisition ROS, while over five years the increase of the ROS of the long-term strategies is 55 percent.[24]

Employment and Labor Productivity. The impact of private equity on employment has been a topic of an intense debate among politicians and academics for a long time. The typical critique is to note that when private equity companies are focused on cost reduction cutting the labor force can be the easiest way to reduce the expenses. Davis et al. (2014) challenge this view. Using establishment level data from the U.S., they find that the net effect on employment is small but there is a sizable reallocation of

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[22]When implementing propensity score matching in the sample in panel A, we require our controls to have at least three years of data post-buyout, while in samples like panel B in Table 3.5 and in Table 3.2 and the other long-run specifications, we require our controls to have at least five (instead of three) years of data post-buyout.

[23]In unreported results where we observe the strategies until the actual time of exit (if available) we find improvements in sales, profitability (both return on assets and sales), and improvements in labour profitability and productivity.

[24]The average pre-treatment ROS in the sample of long-term strategies in Table 3.3 is about 6.2 percent with the standard deviation of 9.2 percent. For short-term strategies, the pre-treatment ROS has the mean of 5.6 percent with the standard deviation of 8.5.

TABLE 3.5: Performance of the strategies relative to the placebo strategies: Short- and Long-term completed strategies.

Panel A shows the performance of the BB strategies and includes exited strategies with up to 4 years to known exit (the short-term strategies). Panel B includes exited strategies with 5 years or more to known exit (the long-term strategies). In Panel A, the *Post-Short* is an indicator equal to zero for t-1 and one for the period t+1 up to t+3 (or exit, whichever is earlier), where t indicates the year of the acquisition of the strategy's platform. In Panel B, the *Post* is an indicator equal to zero for t-1 and one for the period t+1 up to t+5 (or exit, whichever is earlier). For the control sample, *Post* takes on the respective values of the treated company to which the control is matched. *BB* is an indicator for the treated sample. All specifications include firm and year fixed effects. Standard errors are clustered two-ways over the company and year dimension. *, **, and *** stand for a 10%, 5%, and 1% significance level, respectively.

	(1) ln Assets	(2) ln Sales	(3) ROA	(4) ROS	(5) ATR	(6) Leverage	(7) Cash/Assets
Panel A: Short-term exited strategies, t-1 to t+3							
BB×Post-Short	0.240**	0.139	0.017	0.022*	-0.166*	-0.025	0.011
	(2.38)	(1.14)	(1.46)	(2.11)	(-1.79)	(-1.27)	(0.56)
Post-Short	-0.076	-0.036	-0.025**	-0.019**	0.069	0.022	-0.033***
	(-0.81)	(-0.25)	(-2.75)	(-2.23)	(1.32)	(0.96)	(-3.33)
Observations	1,252	1,251	1,251	1,248	1,251	1,118	1,189
Adj. R^2	0.867	0.864	0.651	0.608	0.818	0.727	0.648
Panel B: Long-term exited strategies, t-1 to t+5							
BB×Post	-0.172	0.202	0.019**	0.023**	0.169	0.024	-0.015
	(-0.80)	(1.49)	(2.35)	(2.20)	(1.59)	(1.16)	(-1.02)
Post	-0.076	-0.117	-0.013*	-0.006	-0.034	-0.011	-0.013
	(-0.96)	(-1.01)	(-2.10)	(-1.05)	(-1.19)	(-0.87)	(-1.35)
Observations	2,434	2,389	2,431	2,385	2,401	2,157	2,330
Adj. R^2	0.850	0.849	0.611	0.631	0.803	0.701	0.663
Year FE	✓	✓	✓	✓	✓	✓	✓
Strategy FE	✓	✓	✓	✓	✓	✓	✓

labor between the establishments from within the firms and associated productivity gains. Antoni et al. (2018) find that PE buyouts in Germany are more negative for workers, resulting in lower overall employment, an increase in employee turnover, and earnings declines over five years, especially for older employees. Although they provide some evidence of growth in jobs with IT skills. In building the case that the performance improvements that we find in buy-and-builds are evidence of synergies we look at such "real outcomes" as employment and labor productivity. We report the results in Table 3.6. We do not see any changes in employment or gains in labor productivity in short-term completed strategies (panel A). Turning attention to the

long-term strategies in panel B we do not find any significant changes in employment but see the significant improvement in EBITDA/employment (column 2) and in labor productivity (column 3) throughout five years after acquisition. Together, the evidence of growth of sales and profitability, no changes in employment, and a higher labor productivity in long-term strategies is consistent with the mechanism of Davis et al. (2014) where PE achieves productivity gains by reallocating labor to the most productive use within the portfolio.

TABLE 3.6: Employment and labor productivity.
This table measures the impact on employment and labor productivity. Panel A shows the performance of the exited strategies with up to 4 years to known exit (the short-term strategies) over the first three years following the platform acquisition. Panel B includes exited strategies that took at least 5 years to exit (the long-term strategies) over the first five years following the platform acquisition. The *Post-Short* is an indicator equal to zero for t-1 and equal to one for the periods t+1 to t+3, where t indicates the year of the acquisition (or exit, whichever is earlier), where t indicates the year of the acquisition of the strategy's platform. The *Post* is an indicator equal to zero for t-1 and one for the period t+1 up to t+5 (or exit, whichever is earlier). For the control samples, *Post-Short* and *Post* take on the respective values of the treated company to which the control is matched. *BB* is an indicator for the treated sample. All specifications include firm and year fixed effects. Standard errors are clustered two-ways over the company and year dimension. *, **, and *** stand for a 10%, 5%, and 1% significance level, respectively.

	(1) ln Employment	(2) Return per Employee	(3) Sales per Employee
Panel A: Short-term exited strategies, t-1 to t+3			
BB×Post-Short	-0.001	0.001	-0.020
	(-0.01)	(0.14)	(-0.52)
Post-Short	0.197	-0.006*	-0.013
	(1.65)	(-2.06)	(-1.04)
Observations	1,059	1,033	1,033
Adj. R^2	0.822	0.685	0.844
Panel B: Long-term exited strategies, t-1 to t+5			
BB×Post	-0.012	0.037*	0.009***
	(-0.10)	(1.93)	(3.23)
Post	-0.091	-0.024	-0.002
	(-1.25)	(-1.54)	(-1.13)
Observations	2,073	2,043	2,044
Adj. R^2	0.874	0.621	0.794
Year FE	✓	✓	✓
Strategy FE	✓	✓	✓

3.4.2 Heterogeneity of buy-and-builds and channels of operating improvements

Our results so far show that the PE investors exit after having achieved significant operating results, compared to the comparable placebo strategy. But what is being done? In the previous section we show that the long-term strategies improve the productivity of labor, while the short-term strategies focus on sales growth. Figure 3.2 and Figure 3.3 revealed a great heterogeneity in the type of the companies entering the strategy as platforms or follow-ons. To reinforce the interpretation of results as the realisation of synergies by PE we ask whether we see even larger operational improvements in the strategies where the theory predicts the larger potential synergies. For this, we introduce the triple interactions into our diff-in-diff regressions in order to explore what kinds of company characteristics are likely to deliver the larger benefits compared to the baseline.

Capital-intensive strategies. One of the claimed sources of synergies in M&As is the economies of scale. Larger firms achieve operating efficiency by pooling resources together or become more competitive by capturing a larger market share. Most of our buy-and-build targets are clustered in manufacturing or services. From an operational point of view it is easier to realize the economies of scale in capital intensive industries, such as manufacturing. We could then expect that the PE could make a company more profitable by cutting redundant capacity when the returns to capital are decreasing in scale for very capital intensive companies. Firms in capital intensive industries are generally have greater need for external funds, and gains on the operating side may also result from PE firms relaxing their capital constraints as in Ivashina and Kovner (2011). Alternatively, Fidrmuc et al. (2012) show that in the U.S. over 1997-2006, the strategic buyers would typically buy listed targets with higher market-to-book ratios and more specific assets (firms with high R&D or intangible assets) while the PE buyers target firms with lower market-to-book ratios. They interpret this finding as evidence of Shleifer and Vishny (1992)'s theory who argue that it is strategic buyers who can put very specific assets to their best use while PE prefer more generic, or redeployable, assets that they can manage or

dispose of more easily.[25] Such interpretation implies that the PE buyers are industry outsiders who cannot put the assets to the best use and is against our hypothesis that the PE companies engaging in buy-and-build strategy *are* well-positioned to identify and exploit synergies and, therefore, close to the strategic buyers.

Either way, what we try to verify is whether the strategy performance depends on the degree of capital intensity of underlying companies. The results are reported in Table 3.7. The *K Intensity* is a dummy variable equal to one for the strategies in which the platform had the fixed assets to employees higher than the sample median in the pre-deal year.[26] For the short-term exited strategies in panel A, the interaction is not significant, except for sales and asset turnover. The short-term strategies in capital intensive industries grow sales more than the average short-term strategies.[27] For the long-term exited strategies in panel B, results in column 1-2 imply that the strategies with more capital intensive platforms cut back their assets and sales more than other buy-and-builds with the same time to exit. They also rely less on external debt, hold more cash, and cut the workforce, as shown in column 6-8. At the same time, these strategies show significant improvement in profitability in terms of ROA and ROS (column 3-4), efficiency measured by the assets turnover (column 5), and labor productivity (column 9). These findings are consistent with, but not prove, the assets redeployability hypothesis advanced by Shleifer and Vishny (1992). PE owners engaging into longer-term buy-and-build strategies in capital intensive industries dispose of the redundant capacity and improve profitability and labor productivity.

Horizontal and vertical strategies. A strategic buyer is buying the company in

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[25]This is also consistent with the transaction-cost theory in Williamson (1988), who argues that assets (or projects) with higher redeployability can be financed at better terms and with more debt, which makes them the attractive LBO targets. He also suggests that asset tangibility is not the same as redeployability but there is a positive correlation between the two. Gorbenko and Malenko (2014) show that strategic buyer tend to value research and development expenses and intangible assets such as growth options.

[26]We experimented with the definition of capital intensity based on the split below/above the median sales to assets ratio within either the treatment or control group in the pre-deal year and obtained qualitatively similar results.

[27]Notice that the coefficient to *BB×Post-Short* in column (4) for ROS is significant positive with point estimate comparable to the similar regression in column (4), panel C Table 3.3, as it should be.

TABLE 3.7: Performance of the exited strategies relative to the placebo strategies: Capital intensity.

This table shows the performance of the exited BB strategies compared to placebos, depending on the capital intensity. Panel A includes strategies with up to 4 years to known exit and *Post-Short* is an indicator equal to zero for t-1 and one for the period t+1 up to t+3. Panel B includes strategies with 5 years or more to known exit and *Post* is an indicator equal to zero for t-1 and one for the period t+1 up to t+5. t indicates the year of the platform acquisition. *Post-Short* and *Post* take on the respective values of the matched treated company for controls. *BB* indicates treatment. *K Intensity* is an indicator equal to one for strategies of which the platform had a fixed assets to employees ratio higher than the sample median in the pre-deal year. All specifications include firm and year fixed effects (not reported to save space). Standard errors are clustered two-ways over the company and year dimension. *, **, and *** stand for a 10%, 5%, and 1% significance level, respectively.

	(1) ln Assets	(2) ln Sales	(3) ROA	(4) ROS	(5) ATR	(6) Leverage	(7) Cash/Assets	(8) ln Empl.	(9) Sales/Empl.
Panel A: Short-term exited strategies, t-1 to t+3									
BB×Post-Short×K Intensity	-0.165	0.486*	0.024	-0.008	0.344*	-0.018	0.018	-0.176	0.025
	(-0.64)	(1.78)	(1.23)	(-0.36)	(1.95)	(-0.43)	(0.45)	(-0.42)	(0.43)
BB×Post-Short	0.330	-0.038	0.006	0.025*	-0.315*	-0.017	0.002	0.127	-0.029
	(1.67)	(-0.28)	(0.50)	(1.78)	(-2.11)	(-0.60)	(0.06)	(0.90)	(-0.95)
Post-Short×K Intensity	-0.101	-0.083	0.013	0.008	0.100	-0.025	0.022*	0.280*	-0.010
	(-1.23)	(-0.68)	(1.50)	(1.00)	(1.52)	(-1.46)	(1.81)	(2.10)	(-0.54)
Post-Short	-0.082	-0.027	-0.029**	-0.023**	0.043	0.035	-0.040***	-0.012	-0.009
	(-0.92)	(-0.18)	(-2.71)	(-2.15)	(0.67)	(1.39)	(-3.66)	(-0.09)	(-0.57)
Observations	1,239	1,238	1,238	1,235	1,238	1,104	1,180	1,045	1,021
Adj. R²	0.876	0.867	0.650	0.599	0.819	0.721	0.648	0.825	0.842
Panel B: Long-term exited strategies, t-1 to t+5									
BB×Post×K Intensity	-0.914**	-0.454*	0.056***	0.074***	0.307*	-0.095*	0.065**	-0.512***	0.122**
	(-2.67)	(-1.83)	(4.52)	(4.50)	(1.83)	(-2.12)	(2.23)	(-3.15)	(2.76)
BB×Post	0.290	0.392*	-0.008	-0.011	0.006	0.071***	-0.038	0.216	-0.016
	(1.54)	(2.08)	(-0.77)	(-0.99)	(0.04)	(3.53)	(-1.76)	(1.55)	(-0.75)
Post×K Intensity	-0.250***	-0.090	0.017***	-0.002	0.202***	-0.004	0.004	0.011	-0.028
	(-3.25)	(-1.21)	(3.67)	(-0.36)	(4.47)	(-0.24)	(0.57)	(0.13)	(-1.62)
Post	0.028	-0.084	-0.020***	-0.006	-0.121***	-0.009	-0.015	-0.098	-0.017
	(0.31)	(-0.73)	(-3.31)	(-0.91)	(-3.74)	(-0.83)	(-1.62)	(-1.07)	(-1.11)
Observations	2,434	2,389	2,432	2,385	2,401	2,156	2,330	2,071	2,042
Adj. R²	0.860	0.856	0.614	0.564	0.807	0.702	0.628	0.875	0.793

light of how it will enhance their existing operations by horizontal expansion (into new geographic markets or product lines) or the vertical merger (with the customer or supplier). By acquiring a rival the company increases its market share, which provides a stronger market position within the industry and towards customer and supplier industries. The vertical acquisitions could improve the quality of products or production efficiency.[28] Through these channels and by merely eliminating the duplicate functions the strategic buyers hope to realize synergistic benefits, and we examine whether the buy-and-build strategies with these kinds of relatedness between the platform and follow-on companies obtain significant operating improvements. We classify our strategies by the degree of relatedness between follow-ons and the platform in the product value chain. The acquisitions within the same 2-digit NACE (or comparable) sector are defined in the literature as horizontal; the vertical acquisitions would be outside of the acquirers own 2-digit sector, as long as one can identify the supplier or customer relatedness, typically with the input-output (I-O) tables. We prefer a more detailed 4-digit NACE codes in order to classify the company relatedness more precisely and enhance the definition using the I-O table from the U.S. for the benchmark year 2007 that is detailed enough to identify customer-supplier linkages on a 4-digit industry level.[29] Specifically, the variable *Horizontal* is the *proportion* of follow-ons in a given year in the same 4-digit NACE sector as the platform as the ratio of all follow-ons acquired as of this year. The variable *Vertical* is the proportion of follow-ons in a given year outside of the 4-digit NACE sector of the platform, but that have either a supplier or customer relation based on the I-O table, as the ratio of all follow-ons acquired as of this year. For the control samples, the relatedness measures are defined similarly. Because in our sample the follow-ons

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[28]The early paper which suggests that horizontal buy-and-build strategies may be motivated by industry consolidation is Smit (2001). The vertical M&As can be explained by the decreasing industry dependence, better control over the product quality, or by improving the negotiation position by learning about the market of the supplier (Porter, 1980).

[29]The input-output coefficients derived from the I-O table record the fraction of its own output that a given 4-digit sector $s4$ supplies to or sources from each given sector $\tilde{s}4$. To construct our measure at the four-digit level, we use the U.S. input-output table from the Bureau of Economic Analysis (BEA). Using the U.S.-based measures implicitly assumes that the patterns of input flows in the countries of our sample are close to those of the United States. If the U.S. production and input structures are imperfect for advanced European countries, we are introducing random error in the measurement of our regressors and, therefore, reducing the probability of finding statistically significant results.

are being acquired starting in the first year after the acquisition of the portfolio the coefficients of these proportions capture the development of the given outcome relative to the pre-acquisition year for treated and control observations, much like the shifter *Post* in all the previous regressions. Therefore, we do not include the *Post* and *BB×Post* in our regressions.[30]

The results are in Table 3.8. Contrary to expectations, we do not find that horizontally related follow-ons significantly change the operating performance of the strategies. Only the long-term horizontal strategies seem to secure higher leverage (column 6 in panel B). One possibility behind the lack of relationship between operating outcomes and the "horizontalness" measure is that horizontal buy-and-builds are focusing on the multiple expansion as a possible goal of serial acquisitions in the same narrow industry. If the key goal of the horizontal strategies to eliminate the small firm discount and sell the combined larger company at higher multiple *without meaningful operating changes* we will not capture this effect in our operating outcomes.[31] In contrast, profitability seem to increase in the long-term strategies that combine vertically related companies. The long-term vertical strategies are more efficient by increasing sales-to-assets and labor productivity. Finally, all vertical buy-and-build strategies are associated with higher leverage (column 6 in both panles).

We explore further what lies behind our results in Table 3.8 by measuring *closeness* of the I-O relations because the acquisitions of closely-related business could lead to more knowledge spillovers and more efficient integration. For that, we decompose the *Vertical* measure by exploring if i) the place in the value chain and ii) the degree of closeness of vertical relation matters for strategy performance. We define a close customer (or supplier) as a customer that has a trading relation with the platform and lies outside the same 4-digit industry, but within the same 2-digit industry. The idea is that in addition to sharing an input-output relation, such companies are closer in terms of product similarities. The "other" customers (or suppliers) are those who still have trade linkages but are outside of the platform's 2-digit NACE sector. To accommodate all these possibilities in our triple diff-in-diff regressions, we redefine

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[30]We verified that the results do not change on inclusion of these terms.

[31]Studying the exit multiples of these strategies is a possible extension of this paper.

TABLE 3.8: Performance of exited horizontal and vertical strategies.

This table shows the performance of the exited BB strategies compared to placebos, depending on product-market relatedness of companies. Panel A includes strategies with up to 4 years to known exit; Panel B includes strategies with 5 years or more to known exit. *BB* indicates treatment. *Horizontal* is the proportion of follow-ons in a given year in the same 4-digit NACE sector as the platform, as the ratio of all follow-ons acquired as of this year. *Vertical* is the proportion of non-horizontal follow-ons in a given year with an identified input-output relationship with the platform as the ratio of all follow-ons acquired as of this year. For controls, the relatedness measures take the respective values of the matched treated company. All specifications include firm and year fixed effects (left out to save space). Standard errors are clustered two-ways over the company and year dimension. *, **, and *** stand for a 10%, 5%, and 1% significance level, respectively.

	(1) ln Assets	(2) ln Sales	(3) ROA	(4) ROS	(5) ATR	(6) Leverage	(7) Cash/Assets	(8) ln Empl.	(9) Sales/Empl.
Panel A: Short-term exited strategies, t-1 to t+3									
BB×Horizontal	0.054	-0.160	-0.001	-0.009	-0.085	0.016	-0.036	0.054	-0.041
	(0.25)	(-0.80)	(-0.04)	(-0.45)	(-0.43)	(0.30)	(-1.05)	(0.25)	(-0.96)
BB×Vertical	0.137	-0.315	-0.006	-0.006	-0.299**	0.090**	0.005	0.137	-0.018
	(0.58)	(-0.98)	(-0.34)	(-0.30)	(-2.72)	(2.29)	(0.13)	(0.58)	(-0.43)
Horizontal	-0.006	-0.011	-0.021*	-0.020**	0.009	-0.007	-0.011	-0.006	-0.002
	(-0.04)	(-0.08)	(-2.11)	(-2.30)	(0.15)	(-0.51)	(-0.91)	(-0.04)	(-0.13)
Vertical	0.314*	0.292	0.007	0.005	0.070	0.022	-0.034*	0.314*	-0.023
	(2.10)	(1.54)	(0.55)	(0.69)	(0.80)	(1.03)	(-1.81)	(2.10)	(-0.67)
Observations	2,344	2,073	2,432	2,385	2,401	2,157	2,330	2,434	2,044
Adj. R²	0.825	0.877	0.612	0.563	0.805	0.704	0.630	0.855	0.793
Panel B: Long-term exited strategies, t-1 to t+5									
BB×Horizontal	-0.334	0.243	0.034	0.028	0.178	0.088**	0.003	0.020	-0.000
	(-0.97)	(1.00)	(1.58)	(1.09)	(0.84)	(2.25)	(0.06)	(0.11)	(-0.03)
BB×Vertical	-0.172	0.115	0.006	0.009**	0.106**	0.011*	0.002	-0.031	0.005**
	(-1.72)	(1.33)	(1.32)	(2.27)	(2.30)	(1.93)	(0.53)	(-0.64)	(2.46)
Horizontal	0.084	0.093	-0.012	-0.012	-0.051	-0.003	-0.009	0.034	-0.004*
	(1.00)	(1.06)	(-1.50)	(-1.49)	(-1.41)	(-0.21)	(-0.79)	(0.30)	(-1.80)
Vertical	0.018	-0.000	0.001	0.002	-0.011	-0.002	0.001	0.015	-0.000
	(0.63)	(-0.01)	(0.35)	(1.23)	(-0.71)	(-0.60)	(0.55)	(0.54)	(-0.38)
Observations	2,434	2,389	2,432	2,385	2,401	2,157	2,330	2,073	2,043
Adj. R²	0.852	0.850	0.613	0.562	0.805	0.702	0.630	0.874	0.624

TABLE 3.9: Product closeness and type of follow-on acquisition.

This table shows the performance of the exited BB strategies compared to placebos, depending on product-market relatedness of companies. Panel A includes strategies with up to 4 years to known exit; Panel B includes strategies with 5 years or more to known exit. *BB* indicates treatment. *Post* is an indicator equal to zero for t-1 and one for the period t+1 up to t+3 in Panel A and up to t+5 in Panel B, where t indicates the year of the platform acquisition. *Horizontal* is an indicator equal to one for the years when the strategy acquired an add-on in the same 4-digit NACE sector as the platform. *Close Customer* is an indicator equal to one for the years when the strategy acquired a non-horizontal add-on with customer relation within the 2-digit NACE sector. *Other Customer* is an indicator equal to one for the years when the strategy acquired a non-horizontal add-on with customer relation but outside of the 2-digit NACE sector of the platform. *Close Supplier* and *Other Supplier* dummies take the respective values of the matched treated company for controls. The variables non-interacted with *BB* are included but suppressed to save the space. All specifications include firm and year fixed effects. *Post* and relatedness dummies are defined similarly based on supplier relationships. Standard errors are clustered two-ways over the company and year dimension. *, **, and *** stand for a 10%, 5%, and 1% significance level, respectively.

	(1) In Assets	(2) In Sales	(3) ROA	(4) ROS	(5) ATR	(6) Leverage	(7) Cash/Assets	(8) In Empl.	(9) Sales/Empl.
Panel A: Short-term exited strategies, t-1 to t+3									
BB×Horizontal	-0.194	-0.261	-0.009	-0.023	0.066	0.022	-0.031	-0.194	-0.035
	(-0.79)	(-1.16)	(-0.58)	(-1.25)	(0.38)	(0.48)	(-1.27)	(-0.79)	(-0.76)
BB×Close Supplier	-0.224	-0.563	-0.031	-0.035	-0.349	0.141	0.016	-0.224	-0.089
	(-0.35)	(-0.95)	(-1.38)	(-0.91)	(-1.27)	(1.26)	(0.26)	(-0.35)	(-1.14)
BB×Close Customer	-0.260	-0.738*	-0.028	-0.026	-0.160	0.024	-0.004	-0.260	-0.020
	(-0.84)	(-1.83)	(-1.46)	(-1.01)	(-1.05)	(0.52)	(-0.09)	(-0.84)	(-0.38)
BB×Other Supplier	0.404	0.602**	-0.022	-0.047***	0.138	0.119***	-0.004	0.404	0.007
	(1.49)	(2.31)	(-1.50)	(-3.80)	(1.19)	(6.28)	(-0.18)	(1.49)	(0.16)
BB×Other Customer	0.126	0.110	-0.014	-0.009	0.036	0.051	0.006	0.126	-0.068
	(0.71)	(0.69)	(-0.47)	(-0.73)	(0.44)	(1.20)	(0.18)	(0.71)	(-0.90)
BB×Post	0.309**	0.277**	0.024*	0.032**	-0.158	-0.042	0.019	0.309**	-0.006
	(2.60)	(2.19)	(1.83)	(2.59)	(-1.63)	(-1.60)	(0.92)	(2.60)	(-0.13)
Observations	1,252	1,251	1,251	1,248	1,251	1,118	1,189	1,059	1,033
Adj. R²	0.909	0.905	0.754	0.722	0.869	0.808	0.749	0.876	0.893

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TABLE 3.9 - *Continued*

	(1) ln Assets	(2) ln Sales	(3) ROA	(4) ROS	(5) ATR	(6) Leverage	(7) Cash/Assets	(8) ln Empl.	(9) Sales/Empl.
Panel B: Long-term exited strategies, t-1 to t+5									
BB×Horizontal	-0.258	0.004	0.024	0.017	0.063	0.058*	-0.004	-0.003	0.031
	(-1.02)	(0.01)	(1.45)	(0.81)	(0.40)	(1.94)	(-0.14)	(-0.02)	(1.13)
BB×Close Supplier	-0.732	1.639***	0.121*	0.176***	1.199	-0.034	0.020	-0.339	0.438**
	(-0.93)	(3.95)	(2.09)	(8.63)	(1.27)	(-0.95)	(0.40)	(-1.56)	(2.95)
BB×Close Customer	0.096	1.115	-0.034	-0.031	0.112	0.078	0.060	0.063	0.052
	(0.17)	(1.08)	(-1.27)	(-1.30)	(0.39)	(1.42)	(1.66)	(0.28)	(1.25)
BB×Other Supplier	-1.165**	-0.657	0.034	0.027	0.307	-0.026	0.002	-0.588	0.036
	(-2.26)	(-1.28)	(1.06)	(0.97)	(1.44)	(-0.32)	(0.06)	(-1.54)	(1.08)
BB×Other Customer	-2.175*	-0.669	0.003	-0.010	1.174*	-0.069	0.073	-0.328	-0.049
	(-2.14)	(-0.95)	(0.15)	(-0.71)	(1.89)	(-0.54)	(1.70)	(-0.43)	(-0.53)
BB×Post	0.130	0.187	0.007	0.013	0.034	0.012	-0.022	0.077	0.010
	(0.86)	(1.20)	(1.07)	(1.37)	(0.33)	(0.50)	(-1.66)	(0.58)	(0.45)
Observations	2,434	2,389	2,432	2,385	2,401	2,157	2,330	2,073	2,044
Adj. R²	0.873	0.868	0.657	0.612	0.818	0.728	0.648	0.822	0.845
Non-interacted terms	✓	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Strategy FE	✓	✓	✓	✓	✓	✓	✓	✓	✓

the variables characterizing the type or relatedness between the companies in our strategies as the 0/1 indicators that take the value of one in the year when the strategy acquired a follow-on that is either a (close/other) supplier or customer of the platform based on I-O relationship, and remain one hence. We interact all these I-O indicators with our *BB* treatment indicator to represent the performance of buy-and-build strategies with particular type of relatedness relative to their placebos. The *BB×Post* is included in this specification and represents the relative performance of the strategies where platforms and follow-ons do not have any I-O relationship.

We report the results in Table 3.9, suppressing the terms not interacted with our treatment indicator *BB* to save space. We see the significant improvement in sales in the short-term strategies involving less related supplier (panel A, column 2) but at the expense of profitability on sales (column 4). Most of the positive results is seen in the strategies with companies that do not share any I-O relationship, consistent with insignificant results in Table 3.8. In long-term strategies (panel B), we find that strategies focusing on not so close suppliers of the platforms tend to reduce overall assets but acquiring *close* suppliers improves growth of sales and profitability of the strategy. In addition, such strategies improve labor productivity. Interactions with horizontal or customer dummies are not significant.

The overall conclusion from our triple diff-in-diff analysis is that longer-term completed strategies in capital-intensive industries and those exploiting vertical relationships show improvements in profitability and efficiency. Since these are the settings where one would expect operating synergies this reinforces our interpretation that buy-and-builds by PE do deliver operating synergies.

3.5 Robustness Checks

3.5.1 Non-exited strategies

We saw in the data that achieving the operational improvements is one of the determinants of the decision by PE to complete the strategy and exit. By the laws of formal logic, a conditional statement is true if, and only if, its contraposition is

true. In our context, we should see *no* consistent evidence of operational improvements while the strategies are *not* exited. We saw this in all non-exited strategies (Table 3.3). To check the robustness of that result, we verify the performance of uncompleted strategies in the settings considered in Section 3.4.2. As seen in Table 3.10 Panel A, the uncompleted strategies in capital intensive industries decrease sales more than the average uncompleted strategies, but that this is not accompanied by improvements in profitability. Strategies with horizontally related follow-ons only increase leverage (Panel B). Inspecting the type of follow-ons of unexited strategies more closely in Table 3.11, we find that the acquisition of close customers is followed by slashing assets, which benefits the asset profitability and sales efficiency (asset turnover). Employment goes down too. We cannot rationalize why the acquisition of other customers increases sales. The acquisition of suppliers does not show any positive effects. Combined, we cannot see these results as supportive of the operating synergy interpretation in the non-exited strategies; the evidence is in favor of the contrapositive statement. A caveat to this interpretation lies in the fact that these are the strategies that have yet to be completed and we cannot be sure on whether they are the strategies with most difficult potential synergies, other goals (e.g., multiple explanation), or truly poorly-performing strategies. In either case, we would need to observe the exit from these strategies to sort this out.

3.5.2 Size and the configuration of buy-and-build portfolios

So far we tried to understand the performance of buy-and-build strategies by focusing on the operational characteristics of the companies within the strategy or their relatedness in the input-output space. These "channels" of value creation directly relate to the conceptual notion of operational synergies we are after. Our previous results are consistent with the view that integration of the multiple companies is a difficult process since the operating improvements in more complicated strategies take time to realize and only seen in long-term buy-and-build strategies. But it is not obvious what *configuration* of a portfolio of a given size is more conducive to achieving larger operational improvements, either growing the business or improving

TABLE 3.10: Performance of the non-exited strategies relative to the placebo strategies: Channels I.

This table shows the performance of the strategies which are still active or have unknown status compared to placebos. *Post* is an indicator equal to zero for t-1 and one for the period t+1 up to t+5, where t indicates the year of the platform acquisition. *BB* indicates treatment. In Panel A, we look at the relative performance of capital intensive non-exited strategies. Panel B, reports the relative performance of non-exited strategies depending on product-market relatedness of companies. *K Intensity*, *Horizontal* and *Vertical* are defined as before. For controls, the *Post* dummies and relatedness measures take the respective values of the control company to which the treated is matched. Overall sample trends and non-interacted relatedness measures are included but not reported to save the space. All specifications include firm and year fixed effects. Standard errors are clustered two-ways over the company and year dimension. *, **, and *** stand for a 10%, 5%, and 1% significance level, respectively.

	(1) ln Assets	(2) ln Sales	(3) ROA	(4) ROS	(5) ATR	(6) Leverage	(7) Cash/Assets	(8) ln Empl.	(9) Sales/Empl.
Panel A: Non-exited capital intensive strategies, t-1 to t+5									
BB×Post×K Intensity	-0.412	-0.698*	0.005	-0.009	0.017	0.094	0.070*	-0.169	-0.117*
	(-1.44)	(-2.17)	(0.18)	(-0.30)	(0.10)	(1.77)	(2.04)	(-0.48)	(-1.91)
BB×Post	-0.025	0.029	-0.028	-0.006	-0.004	0.040	-0.063*	0.039	-0.013
	(-0.13)	(0.15)	(-1.10)	(-0.37)	(-0.04)	(1.18)	(-1.98)	(0.24)	(-0.62)
Observations	1,134	1,128	1,134	1,125	1,131	1,060	1,095	897	881
Adj. R^2	0.907	0.844	0.552	0.526	0.840	0.768	0.664	0.891	0.750
Panel B: Non-exited horizontal and vertical strategies, t-1 to t+5									
BB× Horizontal	-1.595	-1.386	-0.033	-0.032	0.024	0.065**	-0.018	-1.595	-0.191
	(-1.25)	(-1.43)	(-1.12)	(-1.00)	(0.10)	(2.96)	(-0.40)	(-1.25)	(-1.34)
BB× Vertical	-0.084	-0.038	-0.003	-0.000	0.048	-0.005	-0.011	-0.084	0.009
	(-0.94)	(-0.36)	(-0.65)	(-0.03)	(1.52)	(-0.20)	(-0.97)	(-0.94)	(1.25)
Observations	2,344	2,073	2,432	2,385	2,401	2,157	2,330	2,434	2,044
Adj. R^2	0.825	0.877	0.612	0.563	0.805	0.704	0.630	0.855	0.793
Non-interacted terms	✓	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Strategy FE	✓	✓	✓	✓	✓	✓	✓	✓	✓

TABLE 3.11: Performance of the non-exited strategies relative to the placebo strategies: Channels II.

This table shows the performance of the strategies which are still active or have unknown status compared to placebos. *BB* is an indicator for the treated sample. *Post* is an indicator equal to zero for t-1 and one for the period t+1 up to up to t+5, where t indicates the year of the acquisition of the strategy's platform. *Horizontal, Close Customer, Other Customer, Close Supplier* and *Other Supplier* dummies are defined as before. For controls, *Post* and relatedness dummies take the respective values of the matched treated company. The variables non-interacted with *BB* are included but suppressed to save the space. All specifications include firm and year fixed effects. Standard errors are clustered two-ways over the company and year dimension. *, **, and *** stand for a 10%, 5%, and 1% significance level, respectively.

	(1) ln Assets	(2) ln Sales	(3) ROA	(4) ROS	(5) ATR	(6) Leverage	(7) Cash/Assets	(8) ln Empl.	(9) Sales/Empl.
Non-exited strategies, t-1 to t+5									
BB×Horizontal	-1.020	-0.718	-0.018	-0.024	-0.003	0.024	0.033	-1.020	-0.055
	(-0.97)	(-0.87)	(-0.63)	(-1.18)	(-0.01)	(0.50)	(0.94)	(-0.97)	(-0.44)
BB×Close Supplier	1.170*	0.804	-0.065***	-0.068	0.134	0.037	-0.079	1.170*	0.100
	(1.95)	(1.27)	(-3.25)	(-1.77)	(0.97)	(0.58)	(-0.90)	(1.95)	(1.04)
BB×Close Customer	-1.255***	-0.218	0.093**	-0.001	1.278***	-0.444***	0.108***	-1.255***	0.117*
	(-6.70)	(-1.23)	(2.61)	(-0.05)	(11.30)	(-7.77)	(4.66)	(-6.70)	(2.19)
BB×Other Supplier	-3.452***	-3.207***	0.004	-0.010	0.156		0.043	-3.452***	-0.006
	(-12.48)	(-13.36)	(0.12)	(-0.52)	(0.97)		(1.38)	(-12.48)	(-0.09)
BB×Other Customer.	0.154	0.800**	-0.029	0.014	0.189	0.218***	-0.055	0.154	0.091
	(0.45)	(2.60)	(-0.40)	(0.14)	(0.93)	(3.42)	(-0.92)	(0.45)	(1.52)
BB× Post	0.007	-0.225	-0.019	-0.005	-0.098	0.062	-0.041	0.007	-0.083
	(0.03)	(-1.11)	(-0.91)	(-0.40)	(-1.23)	(1.43)	(-1.62)	(0.03)	(-1.52)
Observations	1,137	1,131	1,137	1,128	1,134	1,062	1,098	1,137	883
Adj. R²	0.906	0.848	0.562	0.538	0.835	0.775	0.665	0.906	0.751
Non-interacted terms	✓	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Strategy FE	✓	✓	✓	✓	✓	✓	✓	✓	✓

profitability: the one with many small acquisitions ("stringing beads") or the one with a few large targets. On the one hand, integration of many small targets may be difficult because they are organized and operate less professionally and efficiently (J. Mulherin and Boone, 2000; Fuller et al., 2002). For a PE acquirer, putting together a certain portfolio size, needed to generate synergies, from smaller companies would be more demanding on its human capital because more targets should be found, acquired, monitored, and integrated (see Lopez-de-Silanes et al., 2015, for the evidence on organizational diseconomies of scale in PE). On the other hand, the acquisition of larger targets is rare because it requires more skill and experience due to the higher integration costs (see Aktas et al., 2013, and references therein) or simply difficult to finance.

The *size of the overall strategy* may be important for operating outcomes too. Assembling a large portfolio of companies may lead to economies of scale (Stigler, 1958; Lambrecht, 2004) or, depending the distribution of firm sizes within an industry, may lead to market power.[32] For example, by bundling many small companies into a larger entity a consolidator may obtain (local) market power in highly fragmented markets, and thereby offset some of the negative implications of having to identify, complete, and integrate many targets.

We test whether the size *within* strategies and *of* the strategies matter for their operating performance by putting all the strategies into the two-by-two grid of the *relatively* small follow-ons (denoted "SmF-O") or the relatively large follow-ons ("LrgF-O"), assembled into either the small portfolios ("SmPrtf") or the large portfolios ("LrgPrtf"). The split is based on the sample medians of 1) the average assets of follow-ons relative to assets of their platform within a strategy and 2) the total assets of the strategy (platform and all follow-ons).[33] Then we interact our diff-in-diff estimator $Post \times BB$ with the indicator variables constructed as the combination of these two dimensions; for example the Str[SmF-O,SmPrtf] is equal to one for the strategies

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[32]In the model of Gorton et al. (2009), managers race to increase firm size through mergers in order to retain control (and private benefits) over firm, as long as the firm remains independent. Consolidation may be a response to shocks to the industry (see Mitchell and J. H. Mulherin, 1996; Harford, 2005) or to industry consolidation along the supply chain (Ahern and Harford, 2014).

[33]In a robustness analysis, we measure the size of the acquired portfolio as the sum of the total assets of follow-ons only. Results are similar.

with relatively small follow-ons and small total strategy size, and zero otherwise, and so on. In Table 3.12, we report the regression coefficients of our diff-in-diff estima-

TABLE 3.12: Strategy total size and composition by company size.
This table shows the performance of exited buy-and-build strategies, compared to placebo control strategies following the platform acquisition, depending on the size configuration of the companies within the strategy. We include strategies with at least one follow-on. The *Post* is an indicator equal to zero for t−1 and one for the period t+1 up to t+5 (or exit, whichever is earlier), where t indicates the year of the acquisition of the strategy's platform. For the control sample, *Post* takes on the respective values of the treated company to which the control is matched. *BB* is an indicator for the treated sample. The diff-in-diff estimator *Post×BB* is estimated for four strategy types, as the combination of two dimensions: 1) the *relatively* small follow-ons (denoted "SmF-O") or relatively large follow-ons ("LrgF-O"), using the sample median of the average assets of the follow-ons relatively to their platform, and 2) the small portfolio ("SmPrtf") or the large portfolio ("LrgPrtf"), using the sample median of the platform and follow-ons (total portfolio). The category with relatively small follow-ons and large total size ("SmF-O,LrgPrtf") is the the omitted group (its coefficients are in the row one). All specifications include firm and year fixed effects and other terms non-interacted with *BB* or *Post*. Standard errors are clustered two-ways over the company and year dimension. *, **, and *** stand for a 10%, 5%, and 1% significance level, respectively.

	(1) ln Assets	(2) ln Sales	(3) ROA	(4) ROS	(5) ATR	(6) ln Empl.	(7) Sales/Empl.
Baseline strategy type, SmF-O,LrgPrtf							
BB×Post	-0.640**	0.459	0.028**	0.024*	0.431***	0.030	0.058
	(-2.52)	(1.29)	(2.47)	(1.69)	(3.22)	(0.24)	(1.58)
Growth of the other strategy types, relative to the baseline							
BB×Post×Str[SmF-O,SmPrtf]	0.287	-0.536	-0.006	-0.007	-0.038	0.144	-0.091*
	(0.86)	(-0.96)	(-0.22)	(-0.28)	(-0.15)	(0.52)	(-1.73)
BB×Post×Str[LrgF-O,LrgPrtf]	0.747**	-0.689*	0.002	0.008	-0.520***	-0.492**	0.014
	(2.31)	(-1.72)	(0.12)	(0.36)	(-2.86)	(-2.44)	(0.31)
BB×Post×Str[LrgF-O,SmPrtf]	0.926***	-0.426	-0.049***	-0.034*	-0.696***	0.385	-0.162***
	(2.68)	(-0.88)	(-2.89)	(-1.71)	(-4.01)	(1.14)	(-2.92)
Post	-0.208**	-0.143	-0.010	0.003	0.006	-0.129	-0.014
	(-2.40)	(-1.51)	(-1.25)	(0.50)	(0.10)	(-1.26)	(-0.91)
Post×Str[SmF-O,SmPrtf]	-0.009	-0.089	-0.006	-0.011	0.072	-0.012	0.013
	(-0.08)	(-0.66)	(-0.62)	(-1.23)	(0.92)	(-0.08)	(0.64)
Post×Str[LrgF-O,LrgPrtf]	0.220*	0.208	-0.014	-0.022*	0.077	0.356***	-0.035*
	(1.71)	(1.60)	(-1.18)	(-1.84)	(1.10)	(3.07)	(-1.67)
Post×Str[LrgF-O,SmPrtf]	0.442***	0.195	-0.005	-0.013	-0.090	0.206*	-0.013
	(3.59)	(1.52)	(-0.58)	(-1.54)	(-1.36)	(1.72)	(-0.78)
Observations	2,748	2,733	2,746	2,729	2,743	2,364	2,353
Adj. R²	0.839	0.844	0.618	0.602	0.792	0.840	0.801
Group intercepts	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓
Strategy FE	✓	✓	✓	✓	✓	✓	✓

tor *Post×BB* and the trends for placebo strategies, interacted with the indicators of four strategy types, suppressing for brevity the other terms. The strategies with large

total size consisting of the relatively small follow-ons (the "SmF-O,LrgPrtf" in our notation) are the baseline category. They are the closest to the conceptual definition of a buy-and-build strategy, and we would like to compare other strategy configurations to these ones. Therefore, the coefficients in the first row show the outcomes for the base strategy "SmF-O,LrgPrtf" relative to the corresponding placebo strategy, as in the most of the paper. The coefficients in the next three rows show the differences in growth of a given strategy type (relative to its placebo) and growth of the baseline strategy "SmF-O,LrgPrtf" (relative to its placebo). Combining a large portfolio of relatively small follow-ons is associated with decrease in assets but increase in profitability (columns 3,4) and efficiency (column 5), relative to the placebo strategies. We saw similar profitability gains in Table 3.2 for all completed strategies, but here the better profitability coincides with downsizing relative to the placebo portfolios. Strategies in which the follow-ons are small and the total portfolio is small (row 2), do not show significantly different growth rates than the baseline strategies, except for somewhat inferior labor productivity. Since the trends for the two strategy types are not significantly different, row 1–2 imply that all strategies with relatively small follow-ons show profitability improvements over time. The strategies including large follow-ons have strong increase in assets relative to the baseline, regardless of the total strategy size (column 1 in row 3–4). Otherwise, the strategies in this sub-group that are overall large (row 3) underperform the baseline buy-and-build's in terms of growth of sales, growth of employment, and efficiency of sales, although the profitability is not significantly different than the baseline group. Finally, the small strategies acquiring relatively large follow-ons (row 4) perform worse than the baseline in all profitability and efficiency measures.

Overall, we conclude that buy-and-build strategies focusing on "stringing beads", in which the follow-ons are relatively small compared to the platform, improve profitability—consistent with efficient transformation of smaller targets and operating synergies interpretation. In contrast, strategies with large follow-ons show inefficient integration. At best, such strategies may result in an increase of market power due to larger assets, but our analysis cannot prove this conjecture.

3.5.3 Alternative definition of strategies

Recall, that we construct the buy-and-build sample by first, collecting the follow-ons using the deal tag "build-up" from Zephyr and, second, by using the ownership structure and deal description to find the platform associated this particular follow-on or follow-ons (see Appendix 3.A). The concern might be that we miss some follow-ons not captured by Zephyr, especially taking into account relatively small number of follow-ons in an *average* strategy (Table 3.1). Although the variation of the number of follow-on acquisitions per strategy is also large and our average number is comparable to what is reported by others, we address this concern in three ways.[34]

First, we remind the reader that the build-up tag is assigned to deals that matches the conceptual definition of buy-and-build, and we further scrutinize the textual information from deal description to make sure we collect all the companies that belong to a strategy with a common goal. We also prefer using consolidated financial statements, including all subsidiaries. Aware of the concerns of missing some follow-ons, we verified and confirmed that a given follow-on deal often consists of more than one firm or establishment. In this case, an acquisition of several operations from the news or the deal prospectus would be featured in Zephyr database as the acquisition of a single *legal* entity. For example, Zephyr reports a "build-up" deal from March 2006 where three PE companies, the Dutch Ackermans&van Haaren NV, and the Belgian Tikehau Capital Partners and Compagnie Nationale a Portefeuille SA, used their subsidiary GIB Group SA to acquire the Financiere Flo and the Groupe Flo SA, the western Paris-based restaurant chain. The GIB Group was bought by AvH and CNP in 2002 and used as the platform in the 2006 deal. In our data, the strategy consists of a platform and two follow-ons, but from the company websites we learned that the Groupe Flo is an leader in themed catering in France with 171 restaurants Hippopotamus, Grandes Brasseries, and Flo Concessions. So, in fact, the

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[34]A study by the Boston Consulting Group with HHL Leipzig Graduate School of Management reports that the average number of add-on acquisitions per deal grew from 1.3 in 2000 to 2.7 in 2012 in the sample of 800+ deals designated by them as buy-and-build from the U.S., Western Europe, and the UK (Brigl et al., 2016). The data needed to compute deals performance (internal rate of return) was only available for 48 deals.

deal involved a highly publicised acquisition of a large number of establishments.[35]

TABLE 3.13: Performance of the strategies relative to the placebo strategies: Alternative definitions of buy-and-build strategies.

This table replicates Table 3.2 using the alternative definitions of buy-and-build strategies, as detailed in Section 3.5.3. In Panel A, the sample uses the main sample from this paper plus the acquisitions by all the entities from the ownership structure of follow-ons from the main sample. In Panel B, the sample includes all PE-owned portfolio companies that make an acquisition within five years after becoming PE-owned. The *Post* is an indicator equal to zero for t-1 and one for the period t+1 up to t+5 (or exit, whichever is earlier), where t indicates the year of the acquisition of the strategy's platform. For the control sample, *Post* takes on the respective values of the treated company to which the control is matched. *BB* is an indicator for the treated sample. All specifications include firm and year fixed effects. Standard errors are clustered two-ways over the company and year dimension. *, **, and *** stand for a 10%, 5%, and 1% significance level, respectively.

	(1) ln Assets	(2) ln Sales	(3) ROA	(4) ROS	(5) ATR	(6) Leverage	(7) Cash/Assets
Panel A: Acquisitions by all entities from the ownership structure of the main sample							
BB×Post	0.221***	0.205*	0.004	0.012*	-0.054	0.033**	-0.014
	(2.67)	(1.82)	(0.68)	(1.72)	(-1.09)	(2.33)	(-1.58)
Post	-0.075	-0.079	-0.005	-0.004	0.018	-0.021**	-0.003
	(-1.34)	(-1.41)	(-0.92)	(-0.64)	(0.53)	(-2.22)	(-0.40)
Observations	4,101	4,086	4,101	4,086	4,101	3,763	3,921
Adj. R^2	0.930	0.904	0.621	0.592	0.847	0.720	0.669
Panel B: All PE-owned acquirers							
BB×Post	0.176***	0.106	0.015***	0.014**	-0.058	0.019	-0.019
	(3.08)	(1.38)	(3.15)	(2.79)	(-1.21)	(1.36)	(-1.60)
Post	-0.064	-0.088	-0.016***	-0.008	-0.027	-0.003	-0.003
	(-1.42)	(-1.37)	(-3.87)	(-1.71)	(-1.27)	(-0.40)	(-0.52)
Observations	5,428	5,416	5,428	5,416	5,428	4,694	5,157
Adj. R^2	0.939	0.907	0.566	0.583	0.811	0.707	0.673
Year FE	✓	✓	✓	✓	✓	✓	✓
Strategy FE	✓	✓	✓	✓	✓	✓	✓

Second, we use an alternative definition of buy-and-build strategies, supplementing the sample from our main analysis with additional acquisitions by the entities from the ownership structure of follow-ons shown schematically in Figure 3.A.1. Specifically, in our main sample of the platform and follow-on deals we check whether *any* company from their ownership structure—up to, but excluding, the private eq-

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[35]Likewise, we find in Zephyr that on October 14, 2010 the Brdigepoint and Apax Partners acquired Histoire d'Or and Marc Orian, two French jewelry retailers, "that will be merged together to form a single entity led by Histoire d'Or's management team." In our data, the strategy consists of one platform and one follow-on (we did not find any other platform deal and judge that one of these companies was used as platform). Further investigation revealed that at the time of the deal Marc Orian had 105 jewelers throughout France and Histoire d'Or had 207 outlets, partially acquired through previous M&As, including 22 in Italy and 15 in Belgium.

uity fund—is identified by Zephyr as an acquirer. Most of these intermediate companies are acquisition vehicles or the platform company itself. As the result, we include the deals related to our buy-and-build sample via the ownership structure, but the descriptions of these acquisitions do not explicitly specify the operating synergies, growth, or other motivations characteristic of buy-and-builds. If they would, they would make to our main sample. We reconstruct the placebo strategies for these new portfolios. In Panel A of Table 3.13, we present the results for this definition for the sample of completed and non-completed strategies, as in Table 3.2. The extended buy-and-build sample displays some improvement in return on sales—consistent with the results in Table 3.2. In contrast to our main sample, the sample with "other acquisitions" by their newco's and holding companies shows higher growth in assets and sales and higher leverage. The result for leverage is not surprising because the PE funds often push some of the debt down into the portfolio companies. The strong result for assets may, on one hand, be due to reallocation of assets from the follow-ons we identify in main sample to those other entities we add to this sample. On the other hand, we cannot rule out the synergetic growth in case our data source does not capture all follow-ons with the "add-on" tag we use. Since we cannot know for sure, we lean toward our main definition of buy-and-builds.

Third, we follow the approach of Hammer et al. (2017) and include all acquisitions by all PE-held companies during their private stage—regardless of the deal rationale. The results in Panel B of Table 3.13 show positive and highly significant asset growth but not sales growth. Profitability improves regardless of the measure. This sample is likely to be a mixture of more traditional private equity investments and buy-and-build strategies, which may explain why profitability is strongly increasing, but results on sales growth are weaker. All in all, the key result of our paper regarding positive operating results of serial acquisition strategies by private equity is robust to various ways to construct the investment portfolios.

3.6   Conclusion

We analyze the operating performance of buy-and-builds, a serial hybrid strategy that combines the long-term focus of strategic buyers and of the traditional value drivers of LBOs in private equity. Using matching techniques to construct a counterfactual and difference-in-difference analysis at the strategy level we find evidence that this increasingly popular investment strategy indeed realizes operational improvements, compared to observationally similar strategies constructed by us. We interpret this additional effect as operational synergies, and we support this interpretation by exploiting the heterogeneity within this strategy along several dimensions and by numerous robustness checks. With the limitations of the methodology in mind, the findings of this paper provide a positive view on private equity. It appears that in order to succeed in a modern highly-competitive market environment, PE firms need to target longer-term investment opportunities and carefully select the types of companies in their portfolio, taking into account the entire production value chain.

The scope of this study points to the directions for future research. First, we focus on operating improvements in these strategies. Our evidence suggests that operating synergies is one of the valid "selling points" of buy-and-build strategy. Further research would need to look at whether these operating improvements deliver positive returns to investors, net of fees, and what other factors contribute to investment returns and their persistence (for example, pure multiple arbitrage, elimination of small firm discount, characteristics of the PE firm, corporate governance issues, and so on). Second, our operating results are based on revenues and profitability in monetary terms and can be due to changes in physical output or to changes in prices resulting from higher market power, rivalry restraint, or cost efficiencies of the combined entities. Using a more disaggregated product-level data and matching products to firms may help to uncover the contribution of volume changes and price markups to measured revenue changes.[36] Third, in interpreting our results, we adopt a broad

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[36]Fracassi et al. (2020) focus on a competitive consumer goods industry in the U.S., using price and sales data, and show that the manufacturers of consumer goods acquired by PE firms increase sales 50 percent more than matched control firms but prices on existing products increase by mere 1

view of operating synergies, defining them as *any* statistically significant difference in operating results of strategies, over time, relative to artificial strategies. To the extent it is possible with our data we identify several channels of how these improvements are achieved. A fruitful direction of further inquiry would use survey or case-based data on changes implemented by PE within these strategies.[37] Advancing in these directions should further improve our understanding on how modern-day private equity firms affect their portfolio companies through operational changes.

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percent. The revenues are mostly driven by the launch of new products and geographic expansion.

[37]Examples of this emerging research are Bernstein and Sheen (2016) who document operational changes in restaurant chain buyouts using comprehensive health inspection records and Eaton et al. (2019) who show that takeovers of independent privately owned schools by PE lead to better financial performance but worse student outcomes. More generally, Eliason et al. (2019) show that independent dialysis facilities acquired by large chains increase their revenue or decrease their operating costs but reduce quality of care.

3.A   Identification of Strategies and Assigning Financials

This appendix provides the details on how we identify buy-and-build strategies and assign their financials using Zephyr and Orbis databases by the Bureau Van Dijk and other sources.

Identification of strategies

We identify buy-and-build strategies from our data sources by first, looking for follow-on companies and second, finding the earlier acquisition of the company under the common ownership structure (considered as the platform), making sure that all these companies are purchased to exploit some form of synergetic relationship according to deal descriptions. This procedure allows us to create a unique dataset of unique buy-and-build strategies consisting of the platform and related follow-ons. We also identify the strategy exits because the strategy is competed when the larger portfolio is disposed of by the PE. We follow two main steps.

Step 1: Collecting follow-ons. There is no direct identifier of buy-and-build strategy or the platform deals in Zephyr—only the follow-on deals are flagged and defined as the deal "when a Private Equity company builds up the company it owns by acquiring other companies to amalgamate into the larger firm, thus increasing the total value of its investments *through synergies between the acquired*" (our italics). This definition fits nicely the conceptual difference between buy-and-builds, which have a clear pre-determined goal, and other inorganic acquisitions by PE. Zephyr uses the sub-deal type "build-up" to refer to the follow-on deals. Therefore, we begin by collecting all follow-on deals from Zephyr, requiring that the deal is a majority stake acquisition, from less than 50% of the target's equity before the deal to more than 50% after. The average acquired stake in our sample is 97% which is common in the PE market. The time period for the deals is between 1999 (when Zephyr has a relatively good coverage) and 2014. Even though we had a more recent deals (up to 2016 at the time we began the data collection) we stop in 2014 in order to observe

the operating performance of the acquired companies for several years after the deal.

Step 2: Identifying individual strategies. Having a sample of follow-ons, we use rich information in the historic vintages of Orbis Ownership database, deal description in Zephyr, and various external sources, such as the websites of PE firms, in order to find the portfolio companies and combine them with relevant follow-ons into unique strategies. This is not trivial because the ownership structure associated with buy-and-build strategy is complex. Several frequently found ownership structures are presented schematically in Figure 3.A.1. The "acquirer" of many follow-on deals mentioned by Zephyr is not necessarily the platform company or the private equity firm, but a different entity that lies somewhere between the follow-on company and private equity firm in the ownership structure. Conversely, the PE firm may be mentioned as the acquirer by Zephyr but the deal is structured such that a separate entity (or multiple entities) is established to allocate the controlling stake in the target but is itself controlled by the PE firm. We refer to these intermediate companies as the "holding companies."[38]

Using Orbis Ownership database, we trace the controlling shareholder of every follow-on found in Zephyr and, sequentially, every other entity in the ownership structure that lies between the follow-on and the private equity firm that initiates the deal. These entities are potential platforms or holding companies.

Then we use the names and identifiers of these potential platforms and search *all* the Zephyr deals in the previous years that are *not* identified as "build-up" but in which the target is (similar to) the potential platform found in the previous step. We use the time window of 4–5 years for searching these earlier transactions because it matches the average time to exit of these strategies in our sample. To ensure that we have a unique and relevant platform, we verify whether these earlier transactions were

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[38]In PE industry, these entities are called "bidco," "midco," or "topco" reflecting their place in ownership structure between the target and the PE acquirer. Holding companies offer several advantages. First, holding companies can be used as acquisition vehicles to allocate the debt raised for acquisitions. Second, holding companies can be used to create structures with tax benefits. Third, by creating layers of ownership the ultimate owner (the private equity firm) alters the relation between the control (voting) rights and cash flow rights in its favor. Fourth, keeping the companies as a separate legal entities the PE firm ensures that a possible distress of individual companies does not directly influence the other portfolio companies as would be the case were the companies integrated. Furthermore, the exit is streamlined because the sale can be discussed at a single holding company level with less parties involved.

Figure 3.A.1: Ownership structures. This figure provides an overview of several examples of ownership structures in buy-and-build strategies in our sample. Case A shows a simple ownership structure in which it is easy to identify the platform from the follow-ons. Cases B–D show more complex structures. The "holding companies" are additional entities which may be created by PE companies as acquisition vehicles for platforms, follow-ons or both.

Case A

Private Equity Firm

Holding Company

Platform Company

Follow-on 1   Follow-on 2

Case B

Private Equity Firm

Holding Company

Platform   Follow-on 1   Follow-on 2

Case C

Private Equity Firm

Holding Company 1

Platform   Holding Company 2

Follow-on 1   Follow-on 2

Case D

Private Equity Firm

Holding Company 1

Holding Company 2

Holding Company 3

Platform

...
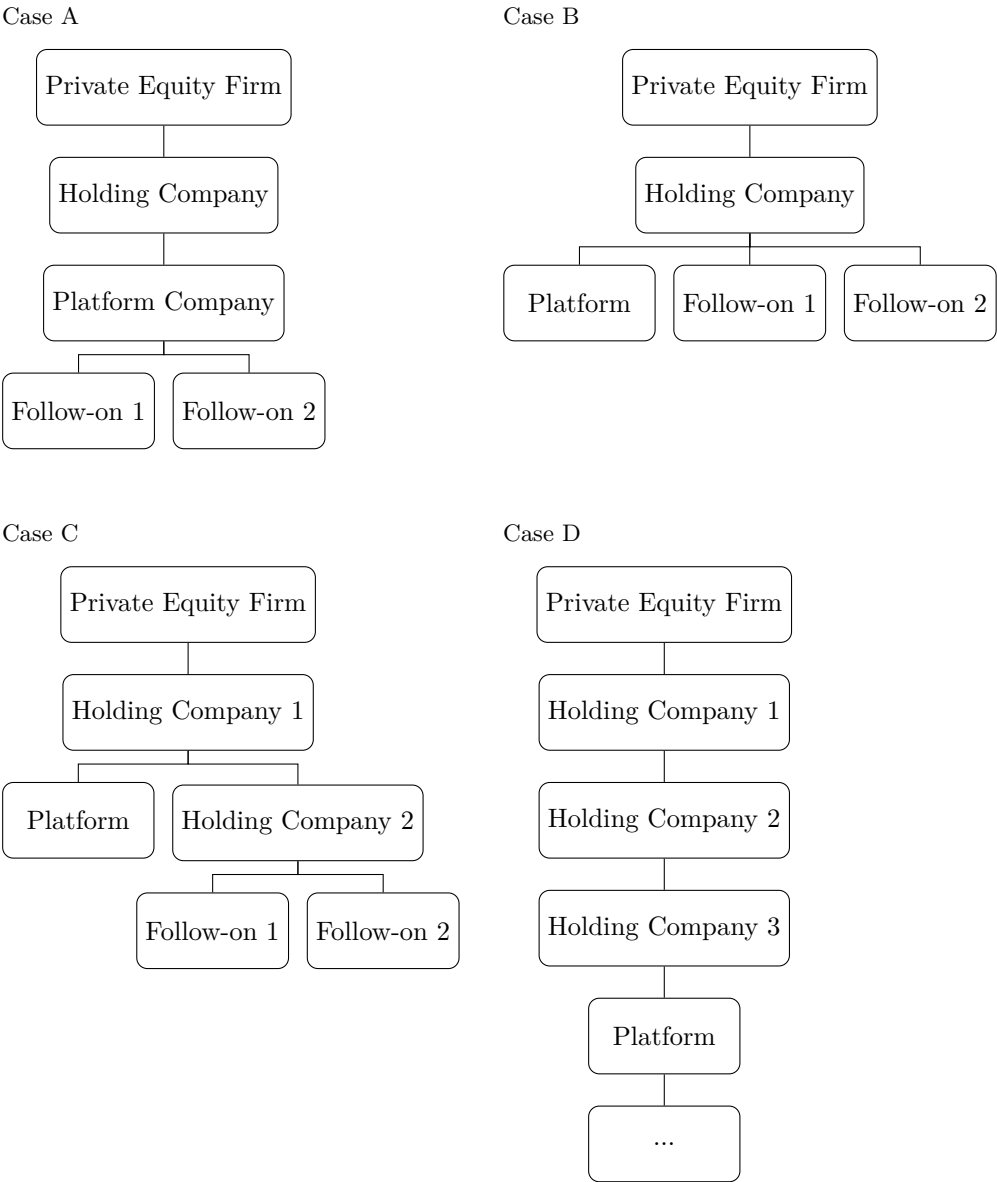
executed by the same PE firm and whether the ownership structure of the potential platforms can be traced to the same PE firm or holding company of the follow-on deal in question. When we are not able to identify platforms or exits solely on the ownership structure, we use additional information from deal comments in Zephyr, news sources, and company websites (of the PE firm and of the potential platform) to identify the platform deal in Zephyr.

Assigning strategy financials from the individual company data

Timing of financials in strategies. Figure 3.A.2 demonstrates how we assign financials to time periods using a hypothetical strategy with a single platform and a follow-on. The platform was acquired in 2006 ($t=0$ in our notation everywhere) and the follow-on in 2007. The "pre-deal" financials, denoted in italic font, are taken as of two years before the entity was acquired. We use the financials from the year following the acquisition year as the post-deal outcomes because the deals are spread out throughout the acquisiton year and we want to analyze the full years of economic activity; these values are denoted by black regular font. The numbers from the acquisition years (marked with "X") are, thus, excluded from the analysis. The financials of strategies pre-deal and in all years up to and including the year when the follow-on was acquired (here, 2007) coincide with the financials of platforms. In the years following the acquisition of a follow-on the strategy financials include the financials of the platform and the follow-on (115+45=160 in 2008, and so on, in the example). We add the financials of subsequent follow-ons similarly.

Choice of the companies and company financial statements. We need to make judgement on what entities in the structures created for a given buy-and-build strategy should contribute to the strategy-level financials. In addition, the individual companies in Orbis may report unconsolidated and consolidated financial statements (the latter include operations of subsidiaries). We need to decide what type of statements to choose in order to correctly reflect the changes in outcomes of strategies and avoid double-counting.

Figure 3.A.2: Timing of company financials for strategy-level analysis.
This figure presents a hypothetical strategy with one platform and one follow-on. The entries represent the unconsolidated financial data of the platform and follow-on over time. The values in italics represent pre-deal financials. The consolidated data at strategy level is reported in the third row. Pre-deal, the consolidated financials of the strategy consist of only the financials the platform; the financials of the follow-on are added to the strategy post follow-on acquisition. Under "Placebo Str." we report the financials of the hypothetical placebo strategies, constructed from the matched peers of the platform and follow-on in actual strategy. The acquisition year (the observations marked by "X") is excluded in the analysis.

Platform	*90*	*100*	105^X	110	115	120	130	140
Follow-on		*35*	38^X	40^X	45	45	50	60
Strategy	*90*	*100*	105^X	110	160	165	180	200
Placebo Str.	*90*	*100*	104^X	111	158	165	182	201
Year	2004	2005	2006	2007	2008	2009	2010	2011
t=	−2	−1	0	1	2	3	4	5
			PL Acq.	*FO Acq.*				

For individual companies, we rely on the numbers from unconsolidated statements, unless consolidated statements are available. If acquired follow-on companies become the subsidiaries of a platform one could identify financials of the strategy using the consolidated accounts of the platform in the years following the follow-on acquisition. Platform and follow-on companies are often the same level subsidiaries of a separate holding company (Case B in Figure 3.A.1) or a separate holding company is used to acquire follow-ons (Case C). In such cases, using the consolidated data of the platform will overlook the financials of the follow-ons because the real activity of the strategy would be reflected in the financials of the holding company. Our ownership data allows differentiating these various ownership structures. By tracing the ownership relationships from each acquisition target to the ultimate acquirer (the PE company) we collect the correct financials and aggregate them in the way avoiding double-counting but accounting the activity of the relevant platforms and follow-ons. With this forensic bottom-up approach we are able to measure the real and financial performance of these strategies more comprehensively than when the data comes from the PE side. The latter data is typically limited to the reported portfolio performance and scant company information.

3.B Matching Procedure

One-to-many matching at company level. We match the individual companies that are part of the strategy with non-acquired companies in the same country, industry, and acquisition year to control for the common trends in fundamentals. Our controls are non-acquired firms, as motivated in the main text. We require the relevant financials of control companies to be available in Orbis in the two pre-treatment years, where the treatment year refers to the year when the treated company was acquired. Since we study the performance of the strategies over two time horizons (three or five years), we also require that the controls have financial data at least three or five years after the treatment year.

The nature of the traditional LBOs by the PE and the postulated difference between LBOs and buy-and-builds guides our choice of the matching variables. While PE companies traditionally look at firm profitability when selecting the targets, recent claims from the industry suggest that buy-and-build strategy is primarily aimed at sales growth over the long-run, perhaps, at the expense of near-term results. In addition, M. R. Roberts and Whited (2013) recommend to include lagged growth rates of outcome of interest to ensure similarity of pre-treatment trends and consistency of the diff-in-diff estimator. Consequently, we match on the return on assets, the return on sales, log of total assets, log of total sales, the squares of both, the growth of sales and of assets, and the changes in return on assets and return on sales, using the *pre-treatment* values to reduce the possibility that the matching variables are affected by the treatment. We use two lags of level and one lag of growth of outcomes, relative to the acquisition year. We winsorize our variables before the matching: assets and sales at 1% and 99% and the profitability measures at 10% and 90% levels. The data coverage in pre-deal years is limited, and matching on the earlier lags of pre-deal growth would seriously decrease the sample size, which is prohibitive to the quality of match.

We use the Stata's psmatch2 command written by E. Leuven and B. Sianesi. We match with replacement and make sure that the probability of selection into a strategy of the matched peer differs by at most twenty percentage points (a 0.2

caliper of the propensity score) and drop acquired firms for which the propensity score is higher than the maximum or less than the minimum propensity score of the non-acquired firms (the common support condition). For each treated company we keep the five closest matched controls to balance the accuracy of matching with the precision of the resulting estimates. We match with replacement to have a better match but at the expense of worse power, which is a lesser concern in our large sample. The matched control sample for follow-ons is formed by a similar procedure, using the year when the follow-on was acquired as the deal year but using a less stringent caliper of 0.5. This is because we have many more follow-ons than platforms finding matches for each of them is more difficult.

Matching quality evaluation. In Table 3.B.1 we present the means of financial variables from the matched treated and control group for the pre-deal year, together with the results of the test of difference of means, for platforms (panel A) and follow-ons (panel B). The company size (log Total Assets) is somewhat larger for acquired platforms while the asset turnover is lower, but only at 10% significance level. These differences in level variables, if persistent, would be absorbed in the regression analysis by firm fixed effects. In addition, the magnitude of the difference in log-assets is about 1.5 percent which is economically small. The difference in means of the other matching variables are insignificant at conventional levels. In our case, the parallel trends assumption means that without acquisition the average change in company performance would have been the same for both treated and control firms. As seen, the changes in outcomes are not significantly different between treated and matched controls. Figure 3.B.1 demonstrates that in our largest matched sample of panel A of Table 3.B.1, the "parallel trends" condition is satisfied: in the pre-treatment year, there is no significant differences in growth of key outcomes between treated (acquired into buy-and-build strategy) and control (non-acquired) platform companies. Levels and trends for follow-ons reported in panel B are not significantly different for between treated and matched controls. As a robustness check, we match on just the pre-treatment log of total assets, total sales, the squares of both, return on assets and return on sales. This requires only one year of pre-buyout data and expands the

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sample by about 12 percent. This modest increase in sample size does not, in our view, justify the risk of affecting our results due to divergent pre-treatment trends.

TABLE 3.B.1: Company statistics in pre-deal year in matched sample (Matching on changes of outcomes). This table presents the means of the outcome variables in the pre-deal year and their difference between the treated and matched controls. We match on the return on assets, the return on sales, log of total assets, log of total sales, the squares of both, the growth of sales and of assets, and the changes in return on assets and return on sales, using the pre-treatment values of outcomes (two lags for levels, one lag for growth rates). Panel A presents the data for the platforms; panel B – for the follow-ons. (ln) indicates the logarithmic transformation. *, ** and *** stand for a 10%, 5% and 1% significance level, respectively.

	Treated	Controls	Difference	(T-stat)
Panel A: Platforms				
Matching variables				
ln Assets	17.129	16.889	0.240*	(1.92)
ln Sales	16.567	16.766	-0.198	(-1.39)
Return on Assets	0.087	0.083	0.004	(0.50)
Return on Sales	0.055	0.056	-0.001	(-0.12)
Change in assets	0.073	0.072	0.001	(0.09)
Change in sales	0.080	0.087	-0.007	(-0.48)
Change in ROA	0.003	0.002	0.001	(0.20)
Change in ROS	-0.000	0.001	-0.002	(-0.40)
Other outcomes				
Asset Turnover	1.223	1.345	-0.122*	(-1.77)
Leverage	0.169	0.154	0.015	(0.99)
Cash over Assets	0.113	0.123	-0.010	(-0.95)
Panel B: Follow-ons				
Matching variables				
ln Assets	15.746	15.714	0.031	(0.28)
ln Sales	16.068	16.049	0.018	(0.16)
Return on Assets	0.096	0.089	0.007	(0.93)
Return on Sales	0.064	0.058	0.006	(1.10)
Change in assets	0.045	0.051	-0.006	(-0.46)
Change in sales	0.036	0.043	-0.006	(-0.49)
Change in ROA	-0.003	-0.002	-0.001	(-0.23)
Change in ROS	0.001	0.002	-0.001	(-0.25)
Other outcomes				
Asset Turnover	1.781	1.793	-0.012	(-0.17)
Leverage	0.165	0.163	0.003	(0.18)
Cash over Assets	0.144	0.152	-0.008	(-0.65)

Figure 3.B.1: Growth of selected outcomes in matched sample of acquired platforms vs. non-acquired companies. This figure reports differences of growth rate of selected outcomes between acquired platforms in buy-and-build strategies and matched non-acquired companies, corresponding to the sample in Panel A, Table 3.B.1. See Section 3.B for the matching details. The figure displays the estimated β_t–coefficients from the regression.

$$\Delta Y_{i,t} = \alpha + \sum_{\substack{t=-1 \\ t \neq 0}}^{3} \beta_t (Acq_{i,t} \times BB_i) + \eta_t + \epsilon_{i,t},$$

where $\Delta Y_{i,t}$ are changes in outcomes for a company i in the year t and $t = 0$ represents the year when the platform was acquired, the $Acq_{i,t}$ are dummy variables equal to one for the observations (treated or controls) in year t and zero otherwise, the BB_i is our treatment indicator, equal to one for targets in BB strategies, and η_t are year fixed effects. The β_t significantly different from zero at a 10%, 5% and 1% significance level are marked by *, **, and ***, respectively.
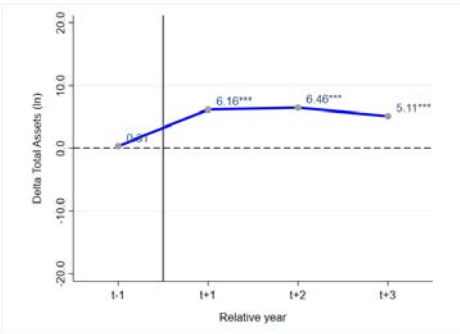
Panel A: Growth in Total assets
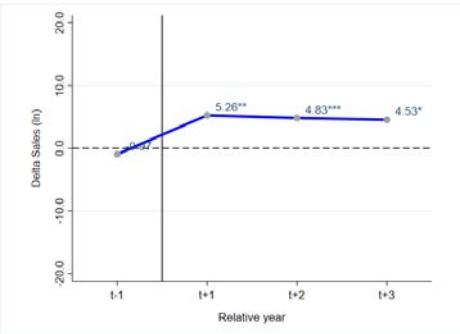
Panel B: Growth in Sales
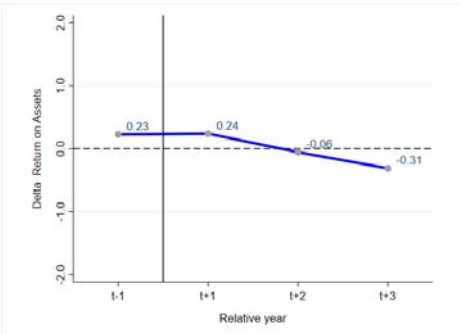
Panel C: Changes in Return on assets
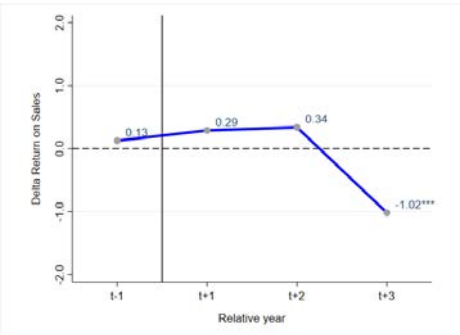
Panel D: Changes in Return on sales

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Chapter 4

Acquisitions under Private Equity Ownership[1]

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[1]This chapter is based on the paper Bansraj (2020) unpublished.

4.1 Introduction

This chapter is motivated by a new empirical observation that companies, previously owned by private equity (PE), realize higher organic growth in their strategic acquisitions than companies that were never PE-owned.[2] This finding can either be driven by PE firms selecting companies with strong acquisition characteristics or by PE ownership improving the acquisition skills of these companies. In this chapter, I examine whether PE ownership provides companies with superior skill in identifying and exploiting operating improvements from strategic acquisitions.[3] I find evidence that it does.

In general terms, this study addresses whether the ownership structure of a company matters for the acquisition activities and post-acquisition performance, where I differentiate between PE-owned and non-PE-owned companies. Although acquisitions are generally believed to be important for the development of companies, the literature does not provide a clear expectation on the relation between the PE ownership structure and acquisition performance. On the one hand, the literature on mergers and acquisitions (M&A) frequently associates acquisitions with failure of delivering the expected operating improvements from the acquisitions. The PE ownership structure may enhance this effect, since for example the limited lifetime of most PE funds may be ill-suited for developing longer-term operating improvements from acquisitions.[4] On the other hand, the literature on private equity, positively relates PE ownership to operating improvements. So it is a question whether the acquisition performance is different under PE ownership, and if so, why.[5]

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[2]By strategic acquisitions, I mean acquisitions in which a non-financial buyer acquires another company to exploit some form of synergies.

[3]Since Jensen (1989), scholars have identified various ways in which PE ownership influences the operating performance of companies in (leveraged) buyouts. But recent debates center around the costs and benefits of PE investments; from an investor's perspective, there exists a risk that fees charged by PE firms will be exuberant (Phalippou et al., 2018). To contribute to these discussions, I examine how PE ownership adds value to the portfolio company when it completes strategic acquisitions.

[4]Sceptics of private equity also argue that actions by PE firms, including acquisitions by PE-owned companies, may be driven by market timing, undervaluation of the target, or multiple expansion through inorganic growth. Then no operating improvements are needed to generate returns for PE investors.

[5]We still know little about how PE ownership impacts the acquisition performance, despite the fact that acquisitions under PE ownership are becoming more prevalent. Based on my sample, A)

To address my research question, I consider all companies that make acquisitions in seven European countries between 1997–2018 and differentiate the acquirers by the identity of the controlling owner (PE vs. non-PE). In total, I collect over 2,500 acquisitions made by almost 1,200 PE-owned companies and more than 50,000 acquisitions made by over 33,000 non-PE-owned companies. To measure the operating improvements, I combine propensity score matching with a difference-in-differences framework.

The identification of the impact of PE ownership on the realization of operating improvements is confronted by two selection challenges.[6] First, PE firms carefully choose their investments, and as a result, acquisitions by PE-owned and non-PE-owned companies may differ in company characteristics and deal timing, precisely, because the acquisition skill of the target company, which is an unobserved latent variable, may be one of the criteria PE firms use to select their targets. A direct comparison of the developments in operating performance between the two ownership structures may therefore reflect the skills of PE firm to select and time their investments instead of the effect of PE ownership on operating improvements. Second, companies involved in acquisitions – which may be either an acquirer or target and may be PE-owned or not – do not represent a random subset of the population. Thus, to get a correct estimate of the operating performance, we have to think carefully about the right counterfactual. To identify an appropriate control group, I follow a matching methodology similar to those used in Boucly et al. (2011), Bansraj et al. (2020), Davis et al. (2014), and Davis et al. (2019). I identify controls by matching the acquirers and targets of both PE-owned companies and non-PE-owned companies to industrial peers that are not active in acquisitions. These carefully chosen controls serve as a benchmark for the operating performance.

The object of this study is to analyze whether PE ownership affects the operating performance of an acquirer *combined* with its targets, i.e., the performance of a single

the share of acquisitions by PE-owned companies in the M&A market has more than doubled over the last fifteen years. B) one-fifth of the PE-owned companies conducted at least one acquisition, and C) 40% of the current PE deal market consist of acquisitions by PE-owned portfolio companies.

[6]One would preferably exploit some source of exogenous variation in acquisitions and private equity investments, but in private equity research, no suitable source has yet been identified for company level investments.

"portfolio" consisting of the financial statements of the acquirer and targets. Any measurement on such a portfolio level needs to take into account that the addition of the target's financials may lead to *inorganic adjustments* in the portfolio's statement. For example, the growth in one portfolio may seem higher simply because its targets are larger. To control for this "acquisitive" effect, I follow Bansraj et al. (2020) and use the matched industry peers to decompose the operating performance of the acquiring portfolios and tease out the *organic changes*. The controls (referred to as placebo strategies) include hypothetical acquisitions of matched industry peers of the targets, which mimic the actual acquisitions in deal timing and in target company characteristics and thereby control for the inorganic adjustments. While the actual acquisitions may lead to synergies on the portfolio level, these hypothetical acquisitions cannot develop synergies (nor destroy value), since the acquirer and target in the placebo strategy remain standalone entities in reality and are only combined in the data. Then, the difference between a treated group and its respective placebo strategy, can be interpreted as the organic operating changes. Subsequently, I compare the organic changes between the two ownership structures by introducing a triple interaction term that identifies the role of PE ownership on acquisition performance.

I establish several novel findings. My main finding is that PE-owned acquirers display significantly higher organic growth on the portfolio level than non-PE-owned acquirers.[7] But, while the negative growth found in acquisitions by non-PE-owned companies may be driven by the removal of redundant assets, I do not find any significant differences in profitability.

A natural concern is whether PE ownership causes these improvements or whether PE firms non-randomly select companies with attractive characteristics such as strong acquisition skills ("cherry picking"). To partially alleviate these concerns, I analyze acquisitions by PE-owned companies before they became PE-owned. If to-be PE-owned companies represent strong acquirers, then they can already realize higher

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[7]A concern may be that this result is driven by target companies that are unidentified in my data, either due to missing data or because they are completed outside one of the seven countries. I re-run the analysis, using only single acquisitions with complete information, and find similar results. The negative growth synergies in the acquisitions by non-PE-owned companies also drive the results for the full sample. Relative to placebo acquisitions, real acquisitions are on average related to negative synergies in terms of growth.

operating improvements from acquisitions before becoming PE-owned compared to other non-PE-owned companies, but I do not find that this is the case. In addition, I run several robustness checks to further verify potential selection and timing issues by PE firms, but none of the results indicate that selection or timing is completely able to explain the results. Thus, the higher organic growth does not seem to be merely driven by PE firms selecting companies with stronger acquisition skills (or other acquirer characteristics conducive to higher synergies), but rather, are more in line with PE ownership making companies better acquirers.[8]

However, it is not obvious whether this improved organic growth represents structural changes in the acquisition process of PE-owned companies. It may be that PE firms control (or guide) the acquisition decisions instead. If so, then the improved organic growth is only attainable during the PE ownership phase. In contrast, if companies "learn" from PE ownership – for example, the governance structure is optimized for acquisitions or acquisition knowledge is transferred from the PE firm to the portfolio company – then companies exited by the PE firm would continue to outperform in acquisitions. Therefore, I analyze the operating performance in acquisitions by previously PE-owned acquirers. The results support the claim that the benefits from PE ownership seem to "stick" with the company after the PE firm has exited.

Next, I explore why the PE ownership structure may lead improved acquisition performance. In the context of acquisitions, two unique features characterize the PE ownership structure: A) the governance structure of the PE-owned company[9], and B) the acquisition knowledge of an active owner, which is the PE firm. I study the proposed channel of knowledge more closely.[10] First, by reallocating assets to more

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[8]The analysis does not preclude whether PE firms are able to identify structural changes on a company level that enables the company to realize higher operating improvements. To exclude this alternative explanation, one needs a source of exogenous variation of PE ownership on a company level. However, the longer-term effects from PE ownership documented in this chapter, make it less likely that the results are entirely driven by this ability of PE firms.

[9]This notion is supported by the observation of higher leverage and larger management equity stakes in PE-owned companies, which may reduce agency frictions (Jensen, 1986; Jensen, 1989; Denis et al., 1997).

[10]The distinction between governance restructuring and knowledge is not always clear. For example, replacing management is both part of governance and part of knowledge – PE firms are well connected through previous investments and know who can become the new management. In my definition, executive compensation and leverage belong to governance, since they are related to the

efficient users, acquisitions can improve the operating performance of companies.[11] Empirical evidence suggests that the knowledge of the acquirer, which is built from past deals, may strengthen the extent to which these improvements can be realized in future acquisitions (Haleblian and Finkelstein, 1999; Hayward, 2002; Laamanen and Keil, 2008; Aktas et al., 2013). Second, PE firms are often experienced acquirers and may therefore be knowledgeable (Acharya et al., 2013; Degeorge et al., 2016; Humphery-Jenner et al., 2017). Combining these two views leads to the expectation that PE-owned companies may benefit from the knowledge of the PE firm and as a result, realize higher operating improvements from acquisitions.

The sample is large enough to cover different companies before, during, and after the PE ownership stage. I exploit this variation to compare how, under these three regimes, the deal-making experience develops over time and thereby determine whether knowledge transfers from the PE firm to the PE-owned company. To estimate the accumulated experience and experience building, I follow Aktas et al. (2013) and measure learning (indicating experience building) as the relation between acquisition speed and deal sequence. The argument goes as follow. First, companies gain experience from making acquisitions and experience increases the value of future acquisitions. Second, if PE firms are knowledgeable and the PE-owned company benefits from this knowledge, then PE ownership could substitute for experience building through deal making by the PE-owned company itself. I find that before becoming PE-owned, the acquisition pattern (indicating both accumulated experience and learning) is indistinguishable from other non-PE-owned companies. In contrast, PE-owned companies without prior acquisition experience have a high acquisition speed (indicating accumulated experience) and display a learning curve similar to "experienced" non-PE-owned counterparts. Previously-PE owned companies continue to show a more experienced learning curve, suggesting that knowledge is at least partially retained. These results are more difficult to reconcile with gover-

agency theory by Jensen (1989) – good management under wrong incentives may still misbehave. But knowing who may be good management, or having the ability to attract good management is part of the unique skill set of PE firms.

[11]See for example Jovanovic and Rousseau (2002) and Maksimovic and Phillips (2001). In a more recent work, Levine (2017) models acquisitions as a way to reallocate investment opportunities in which acquirers buy target companies with quality projects.

nance restructuring and more plausibly support the notion that knowledge transfers take place under PE ownership.

So far, I have established that PE ownership is related to improved acquisition performance and have identified knowledge transfers as one of the active channels. But how does PE ownership actually affect the decisions in the acquisition process? To address this question, I analyze several deal characteristics. First, whether the previous acquisition experience of the PE firm is relevant and influences the realization of synergies in strategic acquisitions depends on similarities of past and future deals (Haleblian and Finkelstein, 1999). Although, PE firms are experienced in a wide range of deals, it is questionable whether the prior acquisition experience of the PE firm produces relevant (and superior) knowledge, since financial buyers, such as PE firms, generally derive their value in acquisitions from different sources than strategic buyers (Gorbenko and Malenko, 2014).[12] To understand the scope of the benefits from PE ownership, I differentiate between international, domestic, non-horizontal, and horizontal acquisitions. In all four deal types, acquisitions by PE-owned companies outperform acquisitions by non-PE-owned companies, but PE ownership does not seem to have a stronger effect in one of the four deal types.

Second, the potential operating improvements from acquisitions may reflect the initial quality of the deal and the integration skills of the acquirer. PE ownership and the transfer of acquisition knowledge may then have two implications: A) it improves the self-selection into becoming an acquirer, target selection, and industry-year timing. As a result, the deals by PE-owned companies represent higher quality deals with higher expected operating improvements. And B) even when controlling for these skills, the additional knowledge may positively affect the integration and thus the operating performance. To identify whether PE-owned companies complete better deals, I analyze the distinguishing cross-sectional characteristics of the PE-owned sample. The sample statistics indicate that compared to non-PE-owned

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[12]In their paper, Gorbenko and Malenko (2014) show that strategic buyers tend to value a typical target higher than financial buyers, which can be explained by the potential synergies between the strategic buyer and the target. However, private equity firms may value companies higher, if the target represents a poorly performing companies that has a potential to increase cash flows through restructuring.

acquirers, PE-owned acquirers are on average larger, but acquire relatively smaller targets. Then by splitting the non-PE-owned sample based on these two dimensions, I find that indeed the deals in which larger acquirers buy relative smaller targets outperform in terms of growth in assets, sales, and employees, suggesting that acquisitions by PE-owned companies represent higher quality deals. However, I do not find evidence that PE-owned companies have superior capabilities to time the market.

Third, to analyze the effect of PE ownership on integration skills, I control for these observable deal characteristics in different sub-samples. In all sample splits, arguably with similar deal quality within the split, there exists a positive effect from PE ownership. However, these effects seem to be more prevalent in smaller acquirers that acquire relatively large targets. This finding may be explained by the lack of (access to) acquisition knowledge that small acquirers encounter. A company's collective acquisition knowledge may come from several sources that include a management's own experience (Custódio and Metzger, 2013), the ownership structure, or other external sources such as advisors. Smaller companies may find it difficult to hire experienced management or external advisors since these are too expensive. More so, especially in larger deals, experience is important for successfully integrating the target (Laamanen and Keil, 2008; Aktas et al., 2013). Thus, the additional knowledge from PE ownership seems to be most pertinent in deals where the access to acquisition knowledge is most limited (small acquirers), yet where the knowledge is also especially valuable (completing relatively large deals). Overall, these findings suggest that the PE ownership structure affects both the acquisition decisions towards higher quality deals and the integration process to achieve higher organic growth.

Finally, I close the analysis by showing that acquisition likelihoods are higher under PE ownership, on average by a factor of ten. Using a duration model, I show that the acquisition rate of PE-owned companies decreases with time, but continues to be higher than that of non-PE-owned companies. After the PE firm has exited, the acquisition likelihood drops, but remains higher than the likelihood of companies that were never PE-owned. This result may suggest that PE ownership increases the

expected value from acquisitions. Together, the findings in this chapter advocate the view that PE ownership is an alternative route for obtaining acquisition experience, which positively affects the operating improvements from acquisitions.

This chapter relates to three strands of literature. First, it relates to the literature on the general motives for mergers and acquisitions, such as efficient asset reallocation (Maksimovic and Phillips, 2001; Jovanovic and Rousseau, 2002; Levine, 2017), asset complementary (Grossman and Hart, 1986; Singh and Montgomery, 1987), economies of scale (Devos et al., 2008; Bhattacharyya and Nain, 2011), and serial acquisitions (Fuller et al., 2002; Laamanen and Keil, 2008; Aktas et al., 2013). Levine (2017) shows that, after an acquisition, the profitability of the acquirer may drop, even though the shareholder returns are positive. In this chapter, the control group mimics the acquired portfolio, enabling me to measure the organic improvements after having made an acquisition and confirm that profitability indeed decreases.

Second, the literature on private equity discusses several ways in which PE firms add value to their portfolio companies (Kaplan, 1989a; Kaplan and Strömberg, 2009), such as better management practices (Bloom et al., 2015), human capital adjustments (Davis et al., 2014; Antoni et al., 2018), relaxing financing constraints (Boucly et al., 2011), improved business practices (Bernstein and Sheen, 2016), and R&D refocusing (Lerner et al., 2011). Lerner et al. (2011) use firm-level patent data to show that PE firms do not sacrifice long-term investments. I also explore a long-term implication of PE ownership, but working through a different channel, namely acquisitions. My contribution to this literature is to identify the impact of PE ownership on the acquisition performance. This chapter builds on the work of Bansraj et al. (2020), who show that serial buy-and-build strategies by PE firms are not related to window-dressing motives. My finding is that PE ownership positively impacts the realization of operating improvements when making acquisitions. I identify knowledge transfers from the PE firm to the PE-owned company as an explanation for why PE ownership is beneficial for acquisition performance. Obtaining acquisition knowledge through PE ownership may be especially valuable when it is expensive to complete acquisition in order to gain experience.

Third, this chapter contributes to the literature on the relation between acquisition performance and knowledge from previous experiences (Haleblian and Finkelstein, 1999; Hayward, 2002; Laamanen and Keil, 2008; Aktas et al., 2013; Custódio and Metzger, 2013), by considering acquisitions from PE-owned and non-PE-owned companies, which differ in the acquisition knowledge of the controlling owner.[13] Private equity provides an interesting setting to analyze the implications of knowledge for acquisition performance, since experience can be measured on the level of the PE firm and as a result does not need data on serial acquirers, which may represent a distinct group of acquirers. My findings are in line with the notion that knowledge can transfer via ownership and thereby benefit the operating performance of the acquiring company. Closely related is the work by Acharya et al. (2013), who exploit variation within PE firms and relate the deal-partner backgrounds to abnormal operating performance; Custódio and Metzger (2013) who show that industry expertise of the CEO positively affects announcement returns. In this chapter, I explore the difference in acquisition knowledge between PE firms and strategic buyers. The findings can help us understand how PE ownership and the associated acquisition knowledge may benefit all acquiring companies.

The rest of chapter is organized as follows. In section 4.2, I discuss the conceptual issues related to performance measurement in acquisitions. In sections 4.3 and 4.4, I discuss the data and the empirical methodology. Section 4.5 presents the results of the chapter. Section 4.6 concludes.

4.2   Expected Synergies in Acquisitions

Neoclassical theories motivate acquisitions from an efficiency perspective, where the reallocation of assets to a more efficient user enhances profitability (Jovanovic and Rousseau, 2002; Maksimovic and Phillips, 2002). This view is supported by Maksimovic and Phillips (2001), who find that the firms engaging in the market for

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[13]The relation between private equity skills and performance is not new, but most papers have focused on the variation within PE firms. Korteweg and Sorensen (2017) and Cavagnaro et al. (2017) find persistence in fund returns for top performing PE funds.

corporate assets behave in line with profit maximizing goals by reallocation assets to improve efficiencies. In a more recent work, Levine (2017) models acquisitions as a way to reallocate investment opportunities, where profitable acquirers buy targets with quality projects, but with low profitability.

The consensus in studies based on returns, is that the expected value creation from acquisitions is indeed positive, as is indicated by a positive sum of acquirer and target shareholder returns, although the value is mostly appropriated by the sellers' shareholders. But the variation in these returns is high and depends on deal and company characteristics (Travlos, 1987; Andrade et al., 2001; Moeller et al., 2005; Masulis et al., 2007).[14] Studies using operating measures, on the other hand, are inconclusive (Healy et al., 1992; Maksimovic and Phillips, 2001; Heron and Lie, 2002; Devos et al., 2008). While Healy et al. (1992) find that acquiring companies outperform industry benchmarks, Devos et al. (2008), using matched peers as a benchmark, do not find that they outperform.

To better understand the economic value creation, I set-up a conceptual framework similar to Shleifer and Vishny (2003):

$$V(Y_i) = S(X_i Y_i),$$

where S indicates the expected synergies and measures the economic value creation in an acquisition of target Y_i by acquirer X_i. The realization of expected synergies depends on both target selection and post-acquisition integration (Barkema and Schijven, 2008). Arguments such as efficient asset reallocation are positively related to the expected synergies (Maksimovic and Phillips, 2001) and these effects can be strengthened by the previously accumulated acquisition experience of the acquirer (Haleblian and Finkelstein, 1999; Hayward, 2002; Acharya et al., 2013; Aktas et al., 2013; Custódio and Metzger, 2013). The parameter is generally negatively related to acquisitions that are motivated by agency incentives that go against shareholder value (e.g., empire building).[15] The agency conflict is illustrated by studies on the

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[14]E.g., the method of payment, whether the target is public or private, or the governance of the acquirer.

[15]Other research has related acquisitions (and merger waves) to industry shocks and restructuring

merger waves in the 1980s in which scholars have related diversifying acquisitions to agency problems and subsequent negative bidder returns (L. H. Lang and Stulz, 1994; Kaplan and Weisbach, 1992; Morck et al., 1990). These perverse incentives of management to engage in value-destroying diversifying acquisitions can be reduced through management equity stakes Jensen (1986) and Denis et al. (1997).

In standard leveraged buyouts, PE firms take controlling stakes in companies for a fixed period during which restructuring activities take place that may improve operating performance (Kaplan and Strömberg, 2009). However, acquiring companies to realize synergies is becoming increasingly important in private equity and has long been a game played by strategic buyers only.[16] Several benefits unique to the PE ownership structure may positively impact the realization of synergies.[17] First, specific to acquisitions, PE firms are likely to be experienced deal makers and thus might be better at completing acquisitions. PE ownership may therefore bring benefits such as acquisition capabilities, which were built via the PE firm's previous acquisition experiences, for example, skills related to target identification, deal negotiation, and general improved processes for acquisitions (Acharya et al., 2013; Bloom et al., 2015; Gompers et al., 2016).[18]

Second, PE firms can provide access to capital by facilitating debt financing through their banking relations. That way, when raising the required capital, better loan terms can be negotiated and financing constraints can be relaxed to boost further growth (Demiroglu and James, 2010; Ivashina and Kovner, 2011; Boucly et al., 2011; Erel et al., 2015).[19]

Third, the PE ownership structure is characterized by higher leverage and in-

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need, or to pricing in financial markets (Shleifer and Vishny, 2003; Mitchell and J. H. Mulherin, 1996; Ahern and Harford, 2014; Rhodes–Kropf and Viswanathan, 2004). In acquisitions motivated by empire building, CEOs select targets which do not necessarily provide positive synergies, and can even be costly due to integration difficulties post-acquisition.

[16]In specific strategies, called buy-and-build, a PE firm acts as an industry consolidator and acquires a portfolio company (platform) and intends to grow it via further acquisitions (follow-ons), integrating them into one larger (more efficient) entity (Smit, 2001; Bansraj et al., 2020).

[17]Either via target selection or post-acquisition integration. For example, managers of PE-owned companies are less likely to engage in empire building since their more aligned incentives.

[18]Nikoskelainen and Wright (2007) show that there exists a relation between acquisitions that are conducted during the holding period and returns.

[19]In the light of acquisitions, receiving bank financing is critical but susceptible to information asymmetries and Lemon's problems (Akerlof, 1978). Through repeated previous interactions with banks, PE firms reduces this information asymmetry by building a reputation.

creased management equity stakes. The alignment of incentives between management and shareholders may lead to less value-destroying acquisitions (Jensen, 1989).

PE ownership thus provides clear benefits, but disadvantages may exist as well. First, it is questionable whether the acquisition experience of the PE firm is relevant for realizing synergies and whether this experiences transfers to the portfolio company. The former is unclear because leveraged buyouts generally differ from strategic acquisitions in their strategic and economic motives (Gorbenko and Malenko, 2014). Second, acquisitions have long-term implications for the operations of a company and the limited lifetime of private equity funds may restrict longer-term value creation. Third, PE firms have been criticized for maximizing their own returns (and fees).[20] Thus, it is unclear how PE ownership influences acquisition performance, and the question becomes an empirical one.

4.3   Data

4.3.1   Acquisitions by PE-owned companies

I use the Zephyr database to collect majority-stake private equity investments in portfolio companies.[21] Deals are completed between 1997 and 2018, and the target (portfolio company) must be located in Denmark, Finland, France, Norway, Spain, Sweden, or the United Kingdom.[22] Next, I identify deals in Zephyr in which the

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[20]This maximization may not correspond to the maximization of economic value creation, for example, when capturing a size premium without improving the operating performance, or when PE firms are under pressure to invest (Arcot et al., 2015). Generally, buyouts are completed during the investment phase of the fund. During the subsequent phase of portfolio management and exiting, additional PE investments may be restricted by the limited partnership agreement. In several funds, acquisitions by PE-owned companies are exempt, since they are a part of the restructuring activities (portfolio management).

[21]The deal is either identified as an 'institutional buyout' by Zephyr or it is identified as an 'acquisition' and included 'private equity' or 'leveraged buyout' as *deal financing*. Zephyr identifies a deal as an institutional buyout when a PE firm acquires a majority stake. This excludes management buyouts in which the management takes the controlling stake and the PE firm only contributes a minority stake. I define a majority stake acquisition as a deal in which the acquirer owns less than 50% of the target's equity before the deal and more than 50% after. The average acquired stake is above 90%.

[22]Netter et al. (2011) show the importance of sample screening in acquisition studies. For acquisitions by PE-owned companies, the analysis is further complicated, since data availability is challenging (Harris et al., 2014; Braun et al., 2017). Therefore, I use acquisitions from one of these seven European countries, where reporting requirements for private companies are generally high.

portfolio company has been identified as the acquirer. For these deals, I use the same requirements. For the main analyses, I retain acquisitions that are completed within the first five years after the private equity investment, corresponding to the average holding period in many private equity investments. This leads to a sample of 1,907 acquisitions by PE-owned companies.

This initial deal sample is supplemented using a second approach. I collect acquisitions by PE-owned companies from Zephyr using the build-up deal tag, again requiring that the deal is a completed majority stake acquisition within one of the seven countries. The time period for these deals is between 1999 and 2014. Then, by manually mapping the ownership structures, I identify the initial private equity investment in the portfolio company. Mapping these ownership structures is crucial to control for the incorporation of acquisition vehicles by PE firms (see Bansraj et al. (2020) for an elaborate discussion on the collection of the ownership information). This approach contributes another 731 acquisitions. Together, the two samples represent the completed acquisitions by PE-owned companies. In total, I identify 1,175 private equity investments and 2,638 acquisitions completed by PE-owned companies.

Panel A of Table 4.1 provides the distribution of private equity investments in portfolio companies and their acquisitions over time. The number of PE investments in the early years of the sample is relatively low, which likely reflects two characteristics of the sample. First, the coverage of the deal market by Zephyr might be low in the early years. Second, private equity investments in which the portfolio company subsequently performs acquisitions have become more popular over time. In the last year, the number of investments has been low, since many of the companies that became PE-owned in the last part of the sample still need to make acquisitions. In the empirical analyses, I exclude these early years and the last year to make sure that the coverage does not influence the results.

Panel B presents private-equity-related deals by geography of the portfolio company and their targets. Around 50% of the deals are located in the United Kingdom, which is known to have a well-developed private equity market, with France also contributing many deals. In Finland and Sweden, the share of acquisitions by PE-owned

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companies relative to private equity investments is the highest.

Panel C shows the investments classified by NACE Main sectors. There is a strong variation in private equity activities between industries. A big share of the private equity investments are in *manufacturing* industries, while in *human health and social work activities*, many acquisitions are completed by PE-owned companies.

Panel D displays the deal distribution of acquisitions by PE-owned companies for a 10-year window around the private equity buyout. In the years before the buyout, the number of acquisitions is relatively stable. Then, in the first year after the buyout, more than twice as many deals are completed. Given that many acquisitions are completed in the first year after the buyout and that completing deals takes time, this finding is in line with the suggestion by Acharya et al. (2013) that PE firms plan their acquisitions in advance.[23] The number of acquisitions under PE ownership decreases with time. Partially this may be a result of truncation at the end of the sample period. However, it may also reflect private equity planning and completing the acquisitions early, after which there is still reasonable time for integrating the companies and exiting the investment.

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[23]While one may argue that PE firms solely select companies in industries that are ready for consolidation, it seems unlikely that the increase in deals is wholly attributable to this selection mechanism. The above average deal activity continues in year two and three after the initial investment, which is less likely to be explained by private equity anticipating that the portfolio planned to do acquisitions. Another explanation might be that private equity times the investment at the beginning of a consolidation wave (within the industry).

TABLE 4.1: Private equity deal sample.

Distribution of the deal sample across years, countries, industries, and relative years in Panel A-D respectively. The sample consists of PE investment in companies that made acquisitions between 1997–2018. Industries are categorized by NACE Main sectors.

		Panel A: Deals by Year	
		Acquisitions	
	PE Investments	PE-owned	non-PE-owned
1997	4	-	716
1998	13	6	969
1999	21	14	789
2000	26	19	845
2001	20	21	1,153
2002	18	33	1,677
2003	50	36	1,845
2004	69	59	1,210
2005	78	97	2,648
2006	95	143	3,102
2007	98	236	3,358
2008	69	222	2,970
2009	41	126	2,383
2010	93	172	2,493
2011	86	184	2,752
2012	80	198	3,624
2013	76	226	4,212
2014	77	231	4,054
2015	55	170	4,189
2016	63	151	3,307
2017	40	163	3,096
2018	3	131	2,319
Total	1,175	2,638	53,711

Panel B: Private Equity Deals by Country			
	PE Investments	Acquisitions	Ratio
Denmark	62	102	1.6x
Finland	87	289	3.3x
France	282	526	1.9x
Norway	43	82	1.9x
Spain	101	216	2.1x
Sweden	43	157	3.7x
United Kingdom	557	1,266	2.3x
Total	1,175	2,638	2.2x

Table 1 - *Continued*

Panel C: Private Equity Deals by Industry

	PE Investments	Acquisitions	Ratio
Agriculture, forestry and fishing	5	5	1.0x
Mining and quarrying	7	5	0.7x
Manufacturing	282	462	1.6x
Electricity, gas, steam and air conditioning supply	9	11	1.2x
Water supply; sewerage, waste management andremediation activities	16	42	2.6x
Construction	40	114	2.9x
Wholesale and retail trade; repair of motor vehicles and motorcycles	134	267	2.0x
Transportation and storage	46	90	2.0x
Accommodation and food service activities	28	63	2.3x
Information and communication	184	400	2.2x
Financial and insurance activities	65	173	2.7x
Real estate activities	16	49	3.1x
Professional, scientific and technical activities	104	264	2.5x
Administrative and support service activities	110	226	2.1x
Public administration and defence; compulsory social security	1	6	6.0x
Education	15	49	3.3x
Human health and social work activities	83	340	4.1x
Arts, entertainment and recreation	23	43	1.9x
Other service activities	7	29	4.1x
Total	1,175	2,638	2.2x

Panel D: Acquisitions by PE-owned companies relative to investment year (t)

	Acquisitions
t-5	247
t-4,	291
t-3,	363
t-2	404
t-1	319
t+1	806
t+2	695
t+3	551
t+4	363
t+5	223

The observed increase in completed acquisitions by PE-owned companies either means that more acquisitions are completed per company or that more companies initiate acquisitions when becoming PE owned. When considering the number of completed acquisitions per company, it seems that PE ownership is related to the initiation of acquisitions, which increases the aggregate of completed acquisitions,

but not so much to an increase of the completed acquisitions per company. This suggests that PE ownership increases the likelihood of acquisitions.

4.3.2 Acquisitions by non-PE-owned companies

Next, I collect acquisitions conducted by companies that are not private equity owned. I use the same restrictions as before. This results in 53,711 acquisitions conducted by 33,058 unique acquirers. In Figure 4.1, the development of the acquisition market is displayed. Over time, the share of acquisitions by PE-owned companies increases relative to the M&A market, indicating the increasing importance of acquisitions by PE-owned companies.

Figure 4.1: Percentage of deals over time.
Share of acquisitions completed by PE-owned companies relative to the total M&A market between 1998–2017.
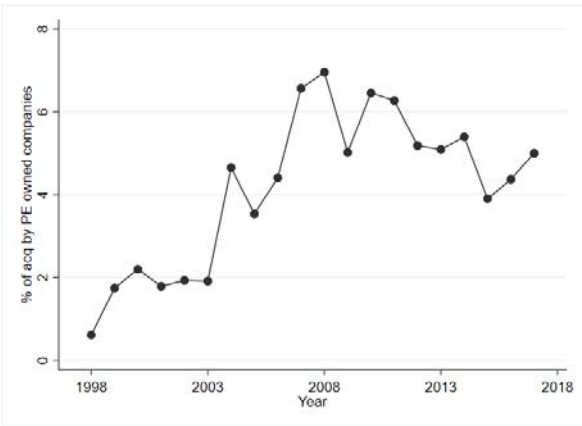
4.3.3 Company financials

Financial data of the acquiring and target companies is collected from the Orbis database.[24] I collect relevant information on the size and operating performance of the companies involved in acquisitions. In Table 4.2, I provide acquirer company

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[24]The online version of Orbis only contains the 10 most recent year of financials of a company. Older deals are more likely to be excluded due to missing financials. To tackle this problem, I follow Kalemli-Ozcan et al. (2015) and access the historic vintages of Orbis to collect financials for targets in these older deals.

characteristics of PE-owned and non-PE-owned companies of the year before they complete their first acquisition, and I provide target company characteristics of the year before the target is purchased. Overall, PE-owned companies and their targets are slightly larger and more profitable than companies in non-PE-owned related acquisitions.

TABLE 4.2: Pre-deal company characteristics of companies involved in acquisitions.

The deal sample runs from 2001–2014.

	N	Mean	Std. Dev	Median	Min	Max
Non-PE-owned acquirers						
Total assets (ln)	10,516	15.64	2.50	15.70	4.25	20.92
Sales (ln)	8,189	15.84	2.30	16.04	9.06	20.46
Return on Assets	8,909	0.05	0.11	0.04	-0.19	0.27
Return on Sales	8,057	0.03	0.13	0.04	-0.26	0.25
Non-PE targets						
Total assets (ln)	19,355	14.45	2.16	14.52	4.25	20.92
Sales (ln)	13,998	15.09	1.89	15.18	9.06	20.46
Return on Assets	15,070	0.05	0.14	0.05	-0.19	0.27
Return on Sales	13,648	0.03	0.14	0.03	-0.26	0.25
PE-owned acquirers						
Total assets (ln)	506	16.54	2.00	16.55	4.25	20.92
Sales (ln)	423	16.65	1.79	16.86	9.06	20.46
Return on Assets	464	0.09	0.13	0.09	-0.19	0.27
Return on Sales	418	0.05	0.14	0.07	-0.26	0.25
PE targets						
Total assets (ln)	1,235	14.77	2.09	14.79	4.25	20.92
Sales (ln)	876	15.63	1.67	15.67	9.06	20.46
Return on Assets	920	0.10	0.14	0.10	-0.19	0.27
Return on Sales	856	0.06	0.12	0.06	-0.26	0.25

4.4 Methodology and Identification

4.4.1 Methodology

Private equity firms do not randomly select companies, and companies involved in acquisitions may represent a subset of the population of companies with distinguishing characteristics.

Therefore, to compare the organic operating changes in PE-owned and non-PE-

owned companies after having made an acquisition, I must resolve two selection challenges. To deal with the former, one would preferably randomly allocate PE ownership to acquiring companies, exploit a setting in which there exists some exogenous variation in PE ownership, or find an instrumental variable related to PE ownership but exogenous to acquisition performance. However, private equity research has found it difficult to identify a useful setting. A more feasible method would be to match PE-owned acquirers to non-PE-owned acquirers on important characteristics. By comparing the post-acquisition performance of PE-owned companies with equivalent non-PE-owned companies, one can identify whether PE ownership affects the realization of synergies. Taken one step further, if we also control for target characteristics, we can identify whether the organic changes are driven by better target company selection or by improved post-acquisition integration. However, differences in acquisition timing and company characteristics complicate the identification, since there is insufficient overlap to directly match the acquisitions of the two groups within too narrow clusters. Therefore, I employ propensity score matching to find industrial peers that are not active in acquisitions for acquirers and targets in both acquisitions by PE-owned and non-PE-owned companies. These industry peers are then used to calculate placebo strategies and serve as a benchmark to estimate the organic operating performance. Subsequently, I compare the organic changes between both ownership structures.

A. Matching procedure: Control group

The goal of propensity score matching is to find industrial peers for the companies involved in acquisitions such that the only difference between the treated and control group is whether one group received the treatment. This helps to reduce selection bias, and if the treatment affects the outcome, this can potentially be interpreted as causal. Nonetheless, the interpretation requires caution, since the methodology does not exploit exogenous variation in receiving the treatment and cannot control for unobservables.

I follow the matching procedure in Bansraj et al. (2020) and employ propensity score matching, keeping a maximum of the closest 5 matches (with replacement)

within a caliper of 0.2 of the propensity score.[25] The initial control sample consists of all industry peers of companies involved in acquisitions with sufficient financials. I match on observable characteristics that are important determinants for selecting targets: total assets, operating revenue, squared terms of total assets and operating revenue, return on assets, return on sales, and the one-year pre-deal trends of these four characteristics. For acquirers, I match on the pre-deal characteristics of the first deal, while for targets, I match in the year before they are acquired.

In Table 4.B.1 of the Appendix, I present the pre-deal means of the matching variables of the matched companies. PE-owned companies do not significantly differ from their matched peers in the level variables and, more importantly, not in the trend variables. Non-PE-owned companies are larger than their controls, but this difference, if persistent, will be absorbed in the regression analysis by including company fixed effects. The table further suggests that the pre-deal growth trends are different between the non-PE-owned companies and their matched controls. However, these differences may not be a big concern. First, if the trends are indicative of future growth, the difference goes against finding a positive effect from PE ownership, since the performance of non-PE-owned acquirers is overestimated. Second, given the size of this difference, it is unlikely that the results are (fully) affected by it. Nevertheless, to make sure that this difference does not drive the results, I employ other matching procedures as well (see the Appendix for details on the robustness of the matching procedure).

B. Measuring the organic changes

To understand how PE ownership affects the acquisition performance, we need to use operating measures, since returns, which are often used in the M&A literature, are infrequently available.[26] Measuring the organic changes is not straightforward

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[25]The decision on the number of neighbours is based on a trade-off between greater precision (more neighbours) and less bias (less neighbours). I follow recent literature that uses five neighbours in their main analyses, but I check whether these results are robust by testing the sensitivity to different number of matches.

[26]Returns are partially driven be expected synergies and by a re-evaluation of the acquirer and target firm valuation (Fuller et al., 2002; W. Wang, 2018). Operating measures can capture whether these synergies are realized. A complication in studies on returns is that they rely on acquisitions by listed acquirers (and targets), which is a fraction of the M&A market (Netter et al., 2011).

and remains a challenge in M&A research for several reasons. First, if companies are integrated, target financials may become unavailable. Second, the acquisition of a target may affect the operating measures on a portfolio level (i.e., the combination of acquirer and targets) in two ways. First, the addition of the target financial statements to the portfolio directly changes accounting items (acquisitive effect). For measuring total growth, this is not an issue, but the acquisitive effect distorts the measurement of the organic changes. Second, indirectly, acquisitions affect the organic changes as a result of synergies. In this chapter, I am interested in the organic changes and identify it by mimicking the actual acquisitions in the control group (placebo strategies). This controls for the acquisitive effect. These *placebo* strategies consist of hypothetical acquisitions between matched industry peers of the acquirer and target. Specifically, for each acquirer and target, I randomly draw a company from the five matched controls and assign this matched company to a single placebo strategy. I then aggregate financials of individual companies to form (placebo) strategy financials similarly to actual strategies.

In Figure 4.A.2 of the Appendix, an example is provided of how financials of the acquirer and target are used to calculate strategy level financials. Performance is measured on acquirer level before the first acquisition, and on a consolidated level after (summation of acquirer and target financials).[27] In a similar manner, we can add up the financials of the matched industry peers of both the acquirer and target. Provided that these are similar in characteristics, the left-over difference between the treated and controls are the organic changes that are created in the treated group, but that do not exist within the controls. I estimate these organic changes in acquisition by PE-owned and non-PE-owned acquirers. Then the last step is to compare the organic changes between both ownership structures.

C. DiD Framework

The difference-in-differences (DiD) framework is well suited to measure treatment

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Operating performance, such as growth and profitability based on accounting items, is in that sense a broader measure since it can be used for privately owned firms as well (Healy et al., 1992).

[27]The addition of target financials post-deal is necessary when acquirers make several acquisitions spread across different years. For a subsample of acquirers that only made one acquisition, I validate my method by adding up the financials of the target pre-deal as well and find similar results.

effects. To estimate and compare the organic changes in acquisitions by PE-owned and non-PE-owned companies, I set up the following regression specification:

$$Y_{it} = \alpha_c + \beta_1 Post_{it} + \beta_2 Post_{it} \times PE_{it} + \beta_3 Post_{it} \times Acq_{it}$$
$$+ \beta_4 Post_{it} \times Acq_{it} \times PE_{it} + \eta_i + \eta_t + \epsilon_{it}, \tag{1}$$

where i and t denote respectively the company and the year. Y_{it} are the main outcome variables, which are the natural logarithm of sales and total assets to verify whether acquisition strategies realize organic growth. $Post_{it}$ equals one for company-year observations after the deal and otherwise zero, and takes on the same values for the matched controls. Acq_{it} is a treatment indicator for acquirers, while PE_{it} indicates the PE sample consisting of PE-owned acquirers and their matched controls. β_3 estimates the organic changes in acquisitions by non-PE-owned companies relative to their placebo strategies. β_4 is my coefficient of interest and identifies whether the organic changes in acquisitions by PE-owned companies differ from those in acquisitions by non-PE-owned companies. The specification further includes firm- and time fixed effects, η_i and η_t.

4.4.2 Identification

Companies self-select into acquisitions, and PE firms do not randomly acquire companies. This makes the measuring of acquisition and private equity performance susceptible to endogeneity concerns. The chosen methodology in this chapter does not take advantage of exogenous variation; however, I take several steps in this chapter to alleviate concerns.

The DiD framework requires common trends, i.e., the treated groups would "behave" similar to the control groups if there had been no treatment. The common trend assumption cannot be tested due to the lack of observable counterfactuals, but propensity score matching is used to match on pre-deal trends, which makes it more likely that the assumption holds. I match on one-year pre-deal trends of size and profitability proxies. Including more lags favors the robustness of the common trend assumption, however for many smaller private targets, data before two years of the

deal is hardly available. This leads to a trade-off between the representativeness of the sample and controlling for relevant observables.[28] The DiD framework is susceptible to more general threats to validity, such as omitted variable bias and selection effects. To minimize selection risks, I match on several observable characteristics. However, if unobservables drive the selection and positively influence the outcome variables, the estimates will overestimate the true effect.[29] While this is a general endogeneity problem, the inclusion of firm fixed effects controls for any time-invariant unobservables.

If, conditional on the matching criteria, the treatment is exogenous, we can establish causality using the DiD framework (under its given assumptions). Therefore, the results in this chapter will be interpreted given the limitations.

4.5 Results

4.5.1 Acquisition performance and ownership structures

A. Total growth

To fully understand the impact of acquisitions, I first estimate the total growth compared to the matched industry peers of the acquirer. In Figure 4.2, I plot regression coefficients for PE-owned and non-PE-owned acquirers in the first four years after their first acquisition. Both groups display significant growth. Estimates range from an increase of 20% up to almost 30% for non-PE-owned acquirers, while PE-owned acquirers grow even as much as 25% up to 35%. This growth consists of both acquisitive growth and organic growth.

B. Organic growth under private equity ownership

To measure organic growth, I run a regression analysis with placebo strategies as the control group. I start by analyzing the general implications for the full spectrum of acquisitions. The results in Table 4.3 show that, compared to their respective

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[28]The DiD framework additionally requires that the measured treatment effects are not caused by changes in the underlying composition of the treated and control groups (attrition).

[29]For example, better management may increase the likelihood of a private equity investment and increase operating performance.

Figure 4.2: Total growth from acquisitions.
Regression coefficients indicating the total growth from acquisitions by PE-owned companies (Panel A) and by non-PE-owned companies (Panel B). The control group consists of matched industry peers. The sample consists of acquisitions between 2000–2013. t indicates the year of the acquisition.
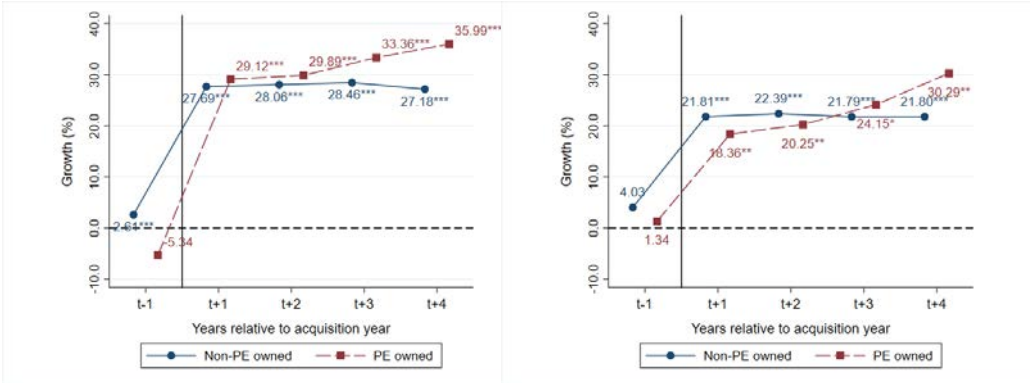
Panel A: Total Assets   Panel B: Sales
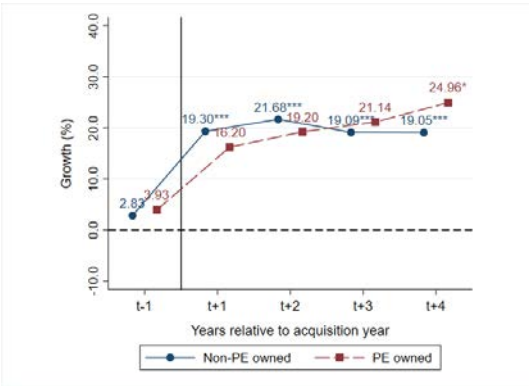
Panel C: Employees

control groups, real acquisitions are negatively related to organic growth. Validating the concerns that acquisitions are value-destroying, since acquisitive behavior may come at the expense of organic changes.

However, when differentiating between non-PE- and PE-owned companies in Table 4.4, I find that acquisitions by PE-owned companies realize significantly higher organic growth, and these are actually positive.[30] To test whether private equity

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[30]These results are not driven by prior acquisition experience of PE-owned companies. Those with

firms forsake long-term performance to boost short-term performance, I split the sample into the first two years (short) and last two years (long) post-acquisition. No evidence is found that the positive effects in acquisitions by PE-owned companies reverse over time. In fact, the long-term dummy indicates that acquisitions by PE-owned companies realize even higher organic growth in the long run in terms of assets, sales, and employees.[31]

TABLE 4.3: Realization of synergies in acquisitions.
Performance of acquisitions compared to placebo controls over the first four years following the first acquisition (t). *Post* is a dummy indicator equal to zero for t-1 and one for the period t+1 up to t+4. For the control sample, *Post* takes on the respective values of the treated company to which the control is matched. *Acq* is a dummy indicator for non-PE-owned and PE-owned companies. All specifications include company and year fixed effects. T-statistics (in brackets) are calculated using two-way clustered standard errors over the company and year dimension. *, **, and *** represents the 10%, 5%, and 1% significance levels, respectively.

	(1) ln Assets	(2) ln Sales	(3) Employees
Post	0.290***	0.364***	0.319***
	(11.90)	(17.41)	(16.10)
Acq×Post	-0.060***	-0.188***	-0.122***
	(-3.29)	(-5.94)	(-4.77)
Observations	67,324	67,213	59,425
Adj. R^2	0.939	0.918	0.896
Year FE	✓	✓	✓
Company FE	✓	✓	✓

C. Performance before private equity ownership

The stronger performance of the private equity sample may not necessarily be induced by private equity. If these companies already performed strongly before becoming private equity owned, then this suggests that private equity firms just select better performing acquirers ("cherry-picking"), e.g., those with better management or governance practices. Therefore, I measure the organic growth in acquisitions that are conducted before a company becomes private equity owned. I compare this

prior experience do improve profitability more, both in acquisitions completed during PE ownership and before, indicating some selection. Those without experience realize organic growth under PE ownership.

[31] The results are robust to simplifying the analysis to a cross-section where the dependent variable is calculated as: $Y_{t+4} - Y_{t-1}$.

TABLE 4.4: Realization of synergies by identity of controlling owner.
Performance of acquisitions by non-PE- and PE-owned companies compared to placebo
controls over the first four years following the first acquisition (t). *Post* is a dummy indicator
equal to zero for t-1 and one for the period t+1 up to t+4. For the control sample, *Post*
takes on the respective values of the treated company to which the control is matched. *Long*
is a dummy equal to one for t+3 and t+4 and otherwise zero. *Acq* is a dummy indicator for
acquirers. *PE* indicates PE ownership. All specifications include company and year fixed
effects. T-statistics (in brackets) are calculated using two-way clustered standard errors
over the company and year dimension. *, **, and *** represents the 10%, 5%, and 1%
significance levels, respectively.

	(1) ln Assets	(2) ln Sales	(3) Employees
Panel A: Non-PE vs PE			
Acq×Post	-0.072***	-0.196***	-0.126***
	(-3.75)	(-5.88)	(-4.68)
PE×Acq×Post	0.224***	0.135	0.095
	(3.45)	(1.54)	(1.16)
Observations	67,324	67,213	59,425
Adj. R^2	0.939	0.918	0.896
Panel B: Short and Long-term			
Acq×Post	-0.059***	-0.179***	-0.115***
	(-3.52)	(-5.48)	(-4.84)
PE×Acq×Post	0.184**	0.089	0.045
	(3.00)	(1.02)	(0.56)
Acq×Long	-0.031**	-0.037**	-0.027
	(-2.81)	(-2.42)	(-1.51)
PE×Acq×Long	0.086**	0.106*	0.108*
	(2.19)	(2.03)	(2.08)
Observations	67,324	67,213	59,425
Adj. R^2	0.939	0.918	0.896
Year FE	✓	✓	✓
Company FE	✓	✓	✓

performance with acquisitions by non-PE-owned companies in Panel A of Table 4.5.

No evidence is found that the positive organic growth in acquisitions by PE-owned
companies are driven by PE firms selecting stronger acquirers. Organic asset growth
among companies before they become PE-owned is worse compared to acquisitions
by non-PE-owned companies. Only in the short run, employment growth is higher
in acquisitions by companies before they become private equity owned.[32]

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[32]In untabulated results I find that in acquisitions completed by companies before they become
private equity owned are related to lower organic growth compared to acquisitions that occur during
the PE ownership phase. This indicates that the higher organic growth is indeed driven by PE

D. Performance after private equity ownership

PE ownership may improve organic growth in two non-exclusive ways: control and benefit transfers. First, the PE firm is experienced and controls the acquisition decisions, i.e., the PE firm chooses which companies to acquire on behalf of the PE-owned company. This only leads to outperformance in organic performance when a company is PE-owned. Second, benefits from the PE ownership structure, such as governance restructuring and acquisition experience from the PE firm, may transfer to the PE-owned company, which enables the company to realize higher organic growth, even after the PE firm has exited. To disentangle these two approaches, I estimate the organic changes in acquisitions after the PE firm has exited. In these acquisitions, the PE firm has no control anymore, but if benefits transfer, the previously PE-owned company may continue to generate higher organic growth. The results in Panel B of Table 4.5 provide evidence for the latter. Even after the PE firm has exited, the organic growth continues to be higher in the long run, providing evidence of benefit transfers under PE ownership.

E. Profitability

(Excessive) growth in acquisitions may come at the expense of profitability because of decreasing economies of scale (Levine, 2017).[33] Although, reducing redundant assets after an acquisition – which manifests as negative organic growth – may result in higher profitability. Table 4.A.1 of the Appendix presents the results. Acquisitions by non-PE-owned companies are related to a decrease in profitability, but acquisitions by PE-owned companies do not perform significantly different. The overall decrease in profitability after an acquisition, raises questions about the motivation for acquisitions. The results suggest that there exists a trade-off between the (total) growth of a company and its profitability, where PE-owned companies perform better than non-PE-owned companies in this trade-off – realizing positive organic growth, but without worse profitability.

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ownership.

[33]For example the consolidated value may increase with size, since size is related to higher multiples (size premium) that may result from a reduction in firm risk. Such a valuation increase may outweigh the loss in value from a reduction in profitability.

TABLE 4.5: Acquisition performance before and after PE ownership.
Performance of acquisitions by companies before they became PE-owned and by previously PE-owned companies compared to placebo controls over the first four years following the first acquisition (t). *Post* is a dummy indicator equal to zero for t-1 and one for the period t+1 up to t+4. For the control sample, *Post* takes on the respective values of the treated company to which the control is matched. *Long* is a dummy equal to one for t+3 and t+4 and otherwise zero. *Acq* is a dummy indicator for acquirers. *PE* indicates PE ownership. *Before-PE* is a dummy indicator for deals completed by a company before it became PE-owned. *Prev* is a dummy indicator for deals completed by a previously PE-owned company. All specifications include company and year fixed effects. T-statistics (in brackets) are calculated using two-way clustered standard errors over the company and year dimension. *, **, and *** represents the 10%, 5%, and 1% significance levels, respectively.

	(1) ln Assets	(2) ln Sales	(3) Employees
Panel A: Before-PE vs Non-PE			
Acq ×Post	-0.059***	-0.180***	-0.114***
	(-3.09)	(-5.45)	(-4.59)
Acq×Before-PE×Post	0.076	0.061	0.258**
	(1.23)	(0.43)	(2.90)
Acq×Long	-0.031**	-0.037**	-0.027
	(-2.74)	(-2.39)	(-1.49)
Acq×Before-PE×Long	-0.161*	0.008	0.056
	(-2.17)	(0.11)	(0.66)
Observations	64,822	64,723	57,243
Adj. R^2	0.939	0.918	0.896
Panel B: Prev-PE vs Non-PE			
Acq ×Post	-0.047***	-0.165***	-0.117***
	(-3.09)	(-5.88)	(-5.03)
Acq×Prev-PE×Post	0.007	-0.014	0.091
	(0.06)	(-0.15)	(1.13)
Acq×Long	-0.026**	-0.032*	-0.020
	(-2.58)	(-2.17)	(-1.15)
Acq×Prev-PE×Long	0.096*	0.095*	0.056
	(2.05)	(1.87)	(0.83)
Observations	72,612	72,470	62,858
Adj. R^2	0.940	0.921	0.898
Year FE	✓	✓	✓
Company FE	✓	✓	✓

4.5.2 Development of acquisition experience

My results so far show that PE ownership is related to improved acquisition performance. But what is unique to the PE ownership structure and may explain these improvements? One often cited benefit from PE ownership is that the governance

structure of a company improves, which may lead to less acquisitions driven by perverse agency incentives. However, another less frequently cited benefit, is the acquisition experience of the PE firm. To explore this second benefit in more detail, I analyze the development of acquisition experience of a PE-owned company across the three stages of PE ownership: before, during, and after the PE holding period.

We cannot directly observe whether knowledge transfers from the PE firm to the PE-owned company. Therefore, I follow previous literature in which the optimal time to complete a deal depends on the net benefits of an acquisition and in which learning from past deals positively impacts the net benefits of future deals.[34] Then, to estimate learning (experience building), one can use the relation between the time between subsequent deals and the deal sequence, a count variable that identifies the order of a deal in such a sequence (Hayward, 2002; Barkema and Schijven, 2008; Aktas et al., 2013).[35] If knowledge transfers from the PE firm to the PE-owned company, we may expect that PE ownership affects the acquisition speed (indicating the accumulated experience) and the learning curve – where PE-owned companies without prior experience would display an acquisition speed and learning curve more similar to that of an experienced non-PE-owned acquirers. That is, under PE ownership, the acquisition speed increases and the learning curve becomes flatter. Such changes are less likely to be explained by governance restructurings. If companies are badly governed before becoming PE-owned, it is more likely that they make sub optimal acquisition decisions (i.e., too many acquisitions driven by for example empire building) and decrease their acquisition activities when the governance structure improves. Conversely, even if governance restructuring increases the value

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[34]The net benefits of an acquisition incorporates the effects of deal making and post-acquisition integration capabilities. Then, if experience building is positively related to the deal sequence (experience accumulates), the time between two consecutive deals will be negatively related to the deal sequence. If the experience gains are negatively related to deal completion, we will actually see an increase in elapsed time. This split is driven by the memory loss and experience building effects. In the full sample of Aktas et al. (2013) the results are driven by the experience building effects (or short time between deals).

[35]Different from Aktas et al. (2013), I measure the time between two subsequent deals based on the completion date of the acquisitions instead of the difference between the completion date of the previous deal and the announcement date of the current deal. In their paper, they argue that the abnormal time between deals can better deal with M&A waves on an aggregate or industry level. Therefore, I also abnormalize the time between deals based on the median industry-year time between deals.

of an acquisition and thus leads to increase the acquisition speed under PE owner-
ship, governance restructuring has different expectations than knowledge transfers
regarding the change in the learning curve. Initial bad corporate governance may
limit learning from past deals and thus show a flatter learning curve. Improving the
governance structure would then allow for more efficient learning and thus strengthen
the learning curve. Thus governance improvements may either lead to a decrease or
increase in acquisition speed, but lead to a steeper learning curve in expectation.[36]

Panel A of Figure 4.3 plots the abnormal time between deals for PE-owned com-
panies over the years relative to the private equity investment. Immediately after
the PE firm enters, the time between deals considerably decreases. Although we do
see some reversal with time, the time between deals remains lower throughout.[37]

Panel B of Figure 4.3 plots the abnormal time between deals on the deal se-
quence (for the first nine deals). I differentiate between PE-owned companies and
non-PE-owned companies that stay non-PE-owned or become PE-owned during the
sample period (*Before PE-owned*). On average, PE-owned companies need 281 days
to complete a subsequent deal, while non-PE-owned companies take 697 days. The
trends in the figure suggest that, as more deals are completed, non-PE-owned com-
panies become more experienced and are able to complete deals faster. Comparing
those that will become PE-owned with those that stay non-PE-owned, reveals that
PE firms select fast learners. On the other hand, PE-owned companies are immedi-
ately able to complete subsequent deals quickly and behave similarly to experienced
non-PE-owned companies. To control for PE firms selecting fast learners, I exclude

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[36]In the model by Aktas et al. (2013), CEOs behave in the best interest of shareholders. Therefore
the optimal time to complete the next deal depends on the value for the acquiring company and
is not driven by the utility function of the CEO. An opposite effect in the learning curve may
be true when managers overestimate their learning under bad corporate governance (i.e., increase
in net benefits of the next deals are consistently overestimated). Then, governance improvements
will provide managers with an insight that they actually learn slower (they need more time) than
that they thought, thus leading to a decrease in the curve. However, this scenario must be in
combination with the case where governance restructurings still improves the net benefits, and not
with bad corporate governance, perhaps driven by empire building, leading to too fast acquisitions
in order to have similar expectations as the knowledge channel.

[37]One reason could be that when the consolidation activities of the PE-owned company has
reached an optimal number of acquisitions in an early stage, a decrease in the acquisition speed is
a logical consequence. Or when PE firms exit, some knowledge is lost, since the knowledge of PE
firms does not fully spillover.

Figure 4.3: Abnormal time between deals over the deal sequence.
Time between deals for PE-owned companies before and after the initial private equity investment in Panel A. Relation between the time between deals and deal sequence for different ownership groups in Panel B. The sample runs from 1997–2018.
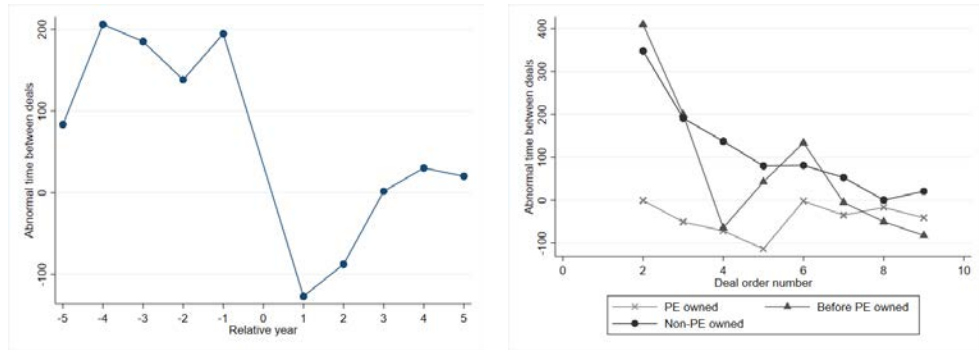
Panel A: TBD relative to PE investment   Panel B: Learning and PE ownership

PE-owned companies with prior acquisition experience from the next regressions.[38]

In Table 4.6, I regress the time between deals on the deal sequence for different groups. The coefficient of *Don* is negative for non-PE-owned companies and companies that will become PE-owned, indicating steep learning curves (specifications 2–3). On the other hand, I find that, for PE-owned companies, there still exists a positive learning effect, but this effect is significantly smaller than for non-PE-owned companies (specifications 4 and 6).[39] Even after the PE firm exits, the learning curve remains relatively flat (specification 5). Visual inspection of specifications 2–5 in Figure 4.4 shows that the acquisition speed (accumulated experience) is indeed higher both within PE-owned companies and companies that have been exited by PE compared to non-PE-owned companies, while the learning curve (experience building) is flatter. Furthermore, the learning curve of inexperienced PE-owned companies is

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[38]PE-owned companies with prior acquisition experience show a similar acquisition speed under PE ownership to those without any acquisition experience.

[39]In the main specification I only look at the first nine deals, since as the deal count increases, the curves becomes more dependent on a few acquirers. I test the robustness of this result by also running the regressions up to the first 20 or 60 deals, or all deals. Furthermore, I re-scale the *Don* measure for the control group to explicitly compare experienced non-PE-owned companies with inexperienced PE-owned companies. The learning curves become insignificantly different when non-PE-owned companies already completed 3 acquisitions, but the acquisition speed continues to be higher under PE ownership. Similarly, within continued strategies (at least two deals before and during PE ownership) PE ownership still increases the acquisition speed.

actually similar to the learning curve of experienced non-PE-owned companies. If the results were fully driven by the PE firm controlling the acquisition decisions during PE ownership, and thus the PE-owned company would not gain any acquisition experience, then the acquisition pattern of previously PE-owned companies should revert back to the level of inexperienced non-PE-owned companies, but this is not what I find. These findings indicate that the learning hypothesis does not fully apply to (previously-)PE-owned companies, since they benefit from the knowledge that transfers from the PE firm to the company through PE ownership.

TABLE 4.6: Learning under private equity ownership.
Relation between the abnormal time between deals and deal sequence (Don) up to the first nine deals for PE-owned and non-PE-owned companies. The sample consists of acquirers that completed at least two acquisitions between 2000 and 2018. The abnormal time between deals is calculated as the difference between the time between deals and the median industry-year time between deals. PE is an indicator variable for PE ownership. All specifications include company and deal year fixed effects. T-statistics (in brackets) are calculated using two-way clustered standard errors over the company and year dimension. *, **, and *** represents the 10%, 5%, and 1% significance levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
			Abormal time between deals			
	All	Non-PE	Before-PE	PE-owned	Prev-PE	Non-PE vs PE
Don	-433***	-459***	-472***	-139**	-266***	-459***
	(-14.29)	(-13.21)	(-6.24)	(-2.64)	(-3.13)	(-13.20)
Don sq	25***	27***	34***	10**	18**	27***
	(12.97)	(12.35)	(4.98)	(2.18)	(2.91)	(12.32)
PE×Don						317***
						(5.50)
PE×Don sq						-17***
						(-3.73)
Observations	11,895	11,268	403	245	96	11,513
Adj. R^2	0.237	0.240	0.172	0.180	0.405	0.239
Year FE	✓	✓	✓	✓	✓	✓
Company FE	✓	✓	✓	✓	✓	✓

4.5.3   PE ownership and the acquisition process

So far, I have shown that PE-owned acquirers display higher organic growth compared to non-PE-owned acquirers and that the acquisition experience of the PE firm is one of the benefits that PE ownership brings. It is therefore possible that the PE

Figure 4.4: Estimated time between deals,
Estimated learning curves for PE-owned and non-PE-owned companies.
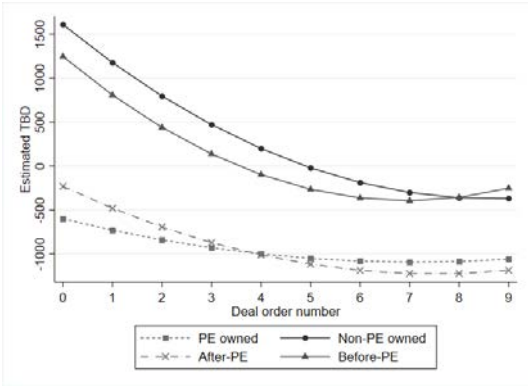
ownership model alters the acquisition decisions of the PE-owned company, since the acquisition experience of the PE firm may help understand which acquisitions are more valuable than others. For example, PE-owned companies may decide to follow more international strategies that offer more growth opportunities or target larger companies with the support and knowledge of the PE firm. Through this lens, I analyze how the PE ownership structure may affect the acquisition decisions.

A. Effect of PE ownership across deal types

Aktas et al. (2013) show that the learning curve is stronger when subsequent deals are more homogeneous – for example when buying companies in the same industry – since previous experience does not necessarily translate into relevant experience for future deals (Haleblian and Finkelstein, 1999; Acharya et al., 2013). PE ownership, with its diverse acquisition experience, may be relevant for a wide range of deal types. I consider four different type of acquisitions: cross-border, domestic, non-horizontal, and horizontal deals. In cross-border acquisitions cultural differences can negatively impact the organic changes. Additionally, for a nationally operating company, identifying the benefits in cross-border deal, and obtaining the necessary funding can be more difficult, suggesting sourcing and funding constraints that may

be relieved by private equity (Humphery-Jenner et al., 2017). Non-horizontal deals (or diversifying deals) require knowledge about an industry in which the acquirer has (almost) no experience. A lack of understanding of the industry can lead to overestimating the potential benefits.

I set up dummy variables that indicate whether at least one cross-border (non-horizontal) deal or only domestic (horizontal) acquisition have been completed. Both ownership types complete a similar number of non-horizontal deals, but PE-owned companies do complete more cross-border deals. In both PE-owned- and non-PE-owned companies around 60% of the acquisitions are outside the same 4-digit NACE code (47% based on 2-digit NACE codes). Additionally, around 13% of the acquisitions by PE-owned companies are cross-border, while only 9% of the acquisitions by non-PE-owned companies are cross-border.

For this analysis, I directly focus on the change in performance between t-1 and t+4. The results are presented in Table 4.7. Across all deal types, PE ownership is related to a higher organic growth compared to companies without PE ownership.[40] With the exception of cross-border deals, acquisitions by non-PE-owned companies continue to be related to negative organic changes.

B. Effect of PE ownership on selection and timing

The potential for operating improvements from acquisitions may come from two aspects of the deal, namely the initial quality of the deal and the integration skills of the acquirer. In this context, the experience of the PE firm may have two effects. First, it may affect (self-)selection of deal characteristics such as acquirer and target characteristics and industry-year timing. As a result, the deals under PE ownership may offer more potential for operating improvements and thus represent higher quality deals. Second, after controlling for the selection on these observables, additional knowledge may still improve the realization of operating improvements, since an experienced acquirer is able to integrate companies better. Here, I analyze the first

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[40]I also check whether the organic changes generally differs between deal types. Overall, cross-border and horizontal deals are related to higher asset growth, while non-horizontal deals are related to a decrease in profitability. The benefits of PE ownership does not seem to be significantly more prominent in a particular category.

TABLE 4.7: Realization of synergies across deal types.

$Post_{t=4}$ is a dummy indicator equal to zero for t-1 and one for t+4, where t indicates the year of the first acquisition. For the control sample, $Post_{t=4}$ takes on the respective values of the treated company to which it is matched. *Acq* is a dummy indicator for acquirers and *PE* indicates PE ownership. All specifications include company and year fixed effects. T-statistics (in brackets) are calculated using two-way clustered standard errors over the company and year dimension. *, **, and *** represents the 10%, 5%, and 1% significance levels, respectively.

	(1) ln Assets	(2) ln Sales	(3) Employees	(4) ln Assets	(5) ln Sales	(6) Employees
	International			Domestic		
Acq×Post$_{t=4}$	0.055	-0.175	-0.128	-0.130***	-0.230***	-0.167***
	(0.69)	(-1.30)	(-0.70)	(-4.03)	(-5.64)	(-4.29)
PE×Acq×Post$_{t=4}$	0.304	0.936*	0.044	0.306***	0.128	0.291**
	(1.34)	(1.90)	(0.17)	(3.50)	(1.62)	(2.42)
Observations	2,244	2,238	1,888	22,695	22,639	18,360
Adj. R^2	0.912	0.883	0.857	0.912	0.883	0.857
	Non-horizontal			Horizontal		
Acq×Post$_{t=4}$	-0.138***	-0.266***	-0.214***	-0.087**	-0.178***	-0.103*
	(-3.71)	(-5.51)	(-5.32)	(-2.72)	(-3.90)	(-1.90)
PE×Acq×Post$_{t=4}$	0.273**	0.381**	0.326**	0.393**	0.108	0.181
	(2.64)	(2.38)	(2.80)	(3.00)	(1.07)	(0.90)
Observations	12,764	12,730	10,284	12,236	12,208	9,962
Adj. R^2	0.871	0.827	0.812	0.880	0.847	0.805
Year FE	✓	✓	✓	✓	✓	✓
Company FE	✓	✓	✓	✓	✓	✓

effect, whether acquisitions by PE-owned companies represent higher quality deals based on observables.

If the PE sample on average represents higher quality deals, then the distinguishing characteristics of the PE-owned sample compared to the non-PE-owned sample should be indicators of important selection criteria. In the non-PE-owned sample, there is no private equity effect, however, the sample does cover a wide range of deals with different company characteristics. Therefore, the non-PE-owned sample offers an opportunity to analyze whether these selection criteria indeed lead to higher operating improvements, and thus may be indicative for deal quality.

First, when comparing the PE-owned and non-PE-owned sample statistics, it becomes clear that the PE-owned sample represents larger and more profitable ac-

quirers. Therefore, I split the non-PE-owned sample into large and small acquirers based on the sample median. Larger acquirers may have better access to acquisition experience by hiring consultants or investment bankers, while smaller acquirers will find this difficult, since the costs of hiring these professionals is relatively expensive. Panel A of Table 4.8 shows the results for acquirer characteristics. Generally, larger acquirers indeed perform better and show higher organic growth than smaller acquirers, while the development of profitability is not significantly different. Acquirer size thus seem to be relevant for acquisition performance.

Previous research has indicated that target characteristics may matter as well. I explore the relative size of the target (RLT) with respect to the acquirer, since larger targets may be more difficult to integrate. I now split the non-PE-owned sample based on the median relative target size, calculated as the size of the total assets of the target divided by the total assets of the acquirer. The results are presented in Panel B of Table 4.8. I find that the acquisition of a relatively large target company is associated with negative organic growth.

To further explore these company selection criteria, I analyze the intersections of acquirer and target size by splitting the sample into four groups, based on whether the deal has a large/small acquirer (LA/SA) or relatively large/small target (RLT/RST). The results presented in Panel C of Table 4.8, indicate that on average, larger acquirers that buy smaller target companies oganically grow the combined entity. Relative to this benchmark category, other combinations underperform, especially small acquirers that make relatively large acquisitions.

TABLE 4.8: Selection and timing within non-PE-owned sample.

Performance of acquisitions by non-PE-owned companies by acquirer, relative target size, and industry-year timing. In Panel A and B, the non-PE-owned sample is split by acquirer size and relative target size, respectively. In Panel C, the sample is split based on the four intersections of acquirer size and relative target size. In Panel D, the sample is split based on whether the deal happens in the same industry-year cluster as a deal by a PE-owned company. *Post* is a dummy indicator equal to zero for t-1 and one for the period t+1 up to t+4. For the control sample, *Post* takes on the respective values of the treated company to which the control is matched. *Acq* is a dummy indicator for acquirers. *Large* is a dummy equal to one for acquirers that are above the median size in the pre-deal year. *RLT* is a dummy equal to one for deals in which the ratio of target to acquirer size is above the median relative size in the pre-deal year. *Affected* indicates non-PE-owned deals that were completed in the same industry-year cluster as a PE-owned deal. All specifications include company and year fixed effects. (Non-)interacted are suppressed to save the space. T-statistics (in brackets) are calculated using two-way clustered standard errors over the company and year dimension. *, **, and *** represents the 10%, 5%, and 1% significance levels, respectively.

	(1) ln Assets	(2) ln Sales	(3) Employees	(4) ROA	(5) ROS	(6) Labour Prof.
Panel A: Between Acquirers						
Acq×Post	-0.106***	-0.327***	-0.196***	-0.015***	-0.008***	-0.003***
	(-3.73)	(-5.92)	(-4.96)	(-3.94)	(-3.43)	(-4.84)
Large×Acq×Post	0.130***	0.306***	0.163***	0.008	0.004	0.002
	(4.51)	(5.71)	(3.60)	(1.74)	(1.16)	(1.52)
Acq×Long	-0.035**	-0.021	-0.027	-0.001	-0.001	-0.000
	(-2.45)	(-0.97)	(-1.04)	(-0.48)	(-0.44)	(-0.02)
Large×Acq×Long	0.023	-0.013	0.016	-0.001	-0.002	-0.001
	(1.33)	(-0.45)	(0.50)	(-0.46)	(-0.74)	(-1.57)
Observations	67,324	67,213	59,425	67,324	67,218	58,897
Adj. R^2	0.941	0.920	0.898	0.528	0.542	0.593
Panel B: Between Targets						
Acq×Post	-0.039**	-0.085***	-0.079**	-0.010***	-0.008***	-0.003***
	(-1.97)	(-2.73)	(-2.31)	(-3.71)	(-3.80)	(-3.68)
RLT×Acq ×Post	-0.176***	-0.411***	-0.259***	-0.004	0.002	0.001
	(-4.10)	(-7.90)	(-4.90)	(-1.07)	(0.62)	(0.67)
Acq×Long	-0.014	-0.022	0.000	-0.004*	-0.003*	-0.001*
	(-0.99)	(-1.00)	(0.02)	(-1.69)	(-1.70)	(-1.67)
RLT×Acq×Long	-0.032	-0.012	-0.037	0.001	0.002	0.000
	(-1.34)	(-0.36)	(-1.14)	(0.34)	(0.66)	(0.44)
Observations	49,992	49,936	45,134	49,992	49,938	44,741
Adj. R^2	0.936	0.913	0.887	0.525	0.532	0.579

TABLE 4.8 - *Continued*

	(1) ln Assets	(2) ln Sales	(3) Employees	(4) ROA	(5) ROS	(6) Labour Prof.
Panel C: Performance per intersection						
Acq×Post×[LA,RST]	0.117***	0.070*	0.108***	-0.009***	-0.005*	-0.002**
	(4.11)	(1.83)	(2.83)	(-2.95)	(-1.87)	(-2.51)
Acq×Post×[LA,RLT]	-0.142***	-0.140***	-0.187***	-0.001	-0.005	-0.001
	(-3.96)	(-2.64)	(-3.40)	(-0.35)	(-1.35)	(-1.00)
Acq×Post×[SA,RST]	-0.292***	-0.424***	-0.394***	-0.002	-0.002	0.000
	(-5.10)	(-5.65)	(-4.79)	(-0.33)	(-0.29)	(0.13)
Acq×Post×[SA,RLT]	-0.369***	-0.641***	-0.485***	-0.008	-0.002	-0.001
	(-6.59)	(-9.96)	(-7.59)	(-1.58)	(-0.52)	(-0.43)
Observations	67,173	67,062	59,329	67,173	67,067	58,801
Adj. R^2	0.944	0.923	0.901	0.528	0.542	0.593
Panel D: Industry-year timing						
Acq×Post	-0.067***	-0.189***	-0.128***	-0.011***	-0.006***	-0.002***
	(-3.01)	(-7.32)	(-4.82)	(-5.42)	(-3.58)	(-3.47)
Affected×Acq×Post	0.064	0.078	0.102	-0.002	-0.002	-0.001
	(1.32)	(1.55)	(1.57)	(-0.34)	(-0.39)	(-0.95)
Acq×Long	-0.026**	-0.035**	-0.022	-0.002	-0.003*	-0.001*
	(-2.16)	(-2.08)	(-1.29)	(-1.14)	(-1.68)	(-1.72)
Affected×Acq×Long	-0.047	-0.022	-0.035	0.005	0.006	0.001
	(-1.51)	(-0.55)	(-0.80)	(1.02)	(1.54)	(1.05)
Observations	63,437	63,339	56,135	63,437	63,343	55,627
Adj. R^2	0.939	0.918	0.896	0.525	0.539	0.590
Year FE	✓	✓	✓	✓	✓	✓
Company FE	✓	✓	✓	✓	✓	✓

In Panel D, I show the results on industry selection and timing of acquisitions. If PE firms indeed have superior information on industries and optimally time acquisitions, then acquisitions by non-PE-owned companies that happen in the same industry-year cluster as acquisitions by PE-owned companies should also show higher organic improvements. I compare the performance of these "affected" deals with other acquisitions by non-PE-owned companies. However, no evidence is found that the main results are driven by superior industry selection and timing by private equity.

C. Effect of PE ownership on integration

Next, I explore the second potential effect of increased acquisition knowledge, where even after controlling for the selection and timing skills, PE ownership may

positively affect the integration and thereby the organic growth. To do so, I split the deal sample based on the pre-deal size of the acquirer and the relative size of the target, and then I analyze the PE effect within the different sub samples. Since larger acquirers may already have access to (external) sources of acquisition knowledge (e.g., experienced management or external advisors), it is likely that PE ownership is more valuable for the smaller acquirers, where PE ownership can act as an alternative way to access acquisition knowledge. The results are presented in Table 4.9.

TABLE 4.9: Private equity effect across company characteristics.
The effect of private equity ownership on large acquirers (Panel A) and small acquirers (Panel B), and on large targets (Panel C) and small targets (Panel D). *Post* is a dummy indicator equal to zero for t-1 and one for the period t+1 up to t+4. For the control sample, *Post* takes on the respective values of the treated company to which the control is matched. *Acq* is a dummy indicator for acquirers. All specifications include company and year fixed effects. Non-interacted are suppressed to save the space. T-statistics (in brackets) are calculated using two-way clustered standard errors over the company and year dimension. *, **, and *** represents the 10%, 5%, and 1% significance levels, respectively.

	(1) ln Assets	(2) ln Sales	(3) Employees	(4) ROA	(5) ROS	(6) Labour Prof.
Panel A: Large Acquirers						
Acq×Post	0.021*	-0.028	-0.031	-0.008***	-0.005*	-0.001
	(1.88)	(-1.22)	(-1.21)	(-4.15)	(-2.09)	(-1.51)
Acq×PE×Post	0.046	0.085	-0.022	0.013**	0.014**	0.000
	(1.28)	(0.73)	(-0.31)	(2.29)	(2.38)	(0.18)
Acq×Long	-0.014	-0.041*	-0.015	-0.001	-0.002	-0.001*
	(-1.15)	(-1.94)	(-0.65)	(-0.82)	(-1.15)	(-2.03)
Acq×PE×Long	0.031	0.083	0.062	-0.011*	-0.007	0.001
	(0.79)	(1.19)	(0.97)	(-1.89)	(-0.99)	(0.31)
Observations	34,126	34,077	31,365	34,126	34,082	31,176
Adj. R^2	0.916	0.895	0.890	0.575	0.584	0.617
Panel B: Small Acquirers						
Acq×Post	-0.121***	-0.325***	-0.200***	-0.014***	-0.008**	-0.003
	(-4.13)	(-5.57)	(-4.27)	(-3.53)	(-2.90)	(-4.22)
Acq×PE×Post	0.403**	-0.056	0.152	-0.015	-0.008	-0.004
	(2.60)	(-0.37)	(0.73)	(-1.10)	(-0.69)	(-1.18)
Acq×Long	-0.044**	-0.028	-0.035	-0.001	-0.002	-0.000
	(-2.73)	(-1.18)	(-1.25)	(-0.67)	(-0.73)	(-0.05)
Acq×PE×Long	0.208*	0.165	0.235***	0.010	0.017	0.001
	(2.17)	(1.73)	(4.37)	(0.77)	(1.68)	(0.24)
Observations	33,198	33,136	28,060	33,198	33,136	27,721
Adj. R^2	0.845	0.851	0.811	0.490	0.499	0.546

TABLE 4.9 - *Continued*

	(1) ln Assets	(2) ln Sales	(3) Employees	(4) ROA	(5) ROS	(6) Labour Prof.
Panel C: Large Targets						
Acq×Post	-0.228***	-0.511***	-0.341***	-0.014***	-0.006**	-0.002**
	(-5.57)	(-11.40)	(-7.97)	(-4.24)	(-2.03)	(-2.07)
Acq×PE×Post	0.214	0.247**	0.057	0.007	0.001	-0.001
	(1.52)	(2.07)	(0.40)	(0.55)	(0.08)	(-0.19)
Acq×Long	-0.054***	-0.045*	-0.038	-0.003	-0.002	-0.001
	(-2.66)	(-1.77)	(-1.58)	(-0.93)	(-0.56)	(-1.00)
Acq×PE×Long	0.129*	0.175***	0.042	0.004	0.007	0.004
	(1.68)	(2.59)	(0.36)	(0.37)	(0.79)	(1.40)
Observations	25,055	25,011	22,207	25,055	25,013	21,943
Adj. R^2	0.909	0.886	0.852	0.500	0.503	0.552
Panel D: Small Targets						
Acq×Post	-0.047**	-0.089***	-0.081**	-0.010***	-0.010***	-0.003***
	(-2.36)	(-2.93)	(-2.33)	(-3.82)	(-4.20)	(-3.66)
Acq×PE×Post	0.136	0.042	0.002	0.010	0.020*	0.001
	(1.61)	(0.19)	(0.01)	(0.93)	(1.72)	(0.37)
Acq×Long	-0.018	-0.031	-0.005	-0.004	-0.004*	-0.001*
	(-1.23)	(-1.37)	(-0.24)	(-1.63)	(-1.74)	(-1.79)
Acq×PE×Long	0.064	0.144	0.115*	0.000	0.002	0.002
	(1.25)	(1.32)	(1.70)	(0.03)	(0.24)	(0.84)
Observations	24,907	24,895	22,886	24,907	24,895	22,757
Adj. R^2	0.952	0.927	0.904	0.554	0.565	0.604
Year FE	✓	✓	✓	✓	✓	✓
Company FE	✓	✓	✓	✓	✓	✓

In Panel A and B, I show the effect of PE ownership for larger and smaller acquirers. The positive effects of PE ownership are indeed mostly located in the smaller acquirers that under PE ownership show higher organic growth in terms of assets and employment on a portfolio level than the non-PE-owned acquirers. In the larger acquirers, there only seems to exist a marginal benefit of PE ownership on profitability.

In Panel C and D, I present the results on the PE effect for different target sizes. PE ownership is related to a decrease in the negative growth which is found in larger acquisitions done by non-PE-owned acquirers, while only a marginal benefit can be found in the acquisition of smaller targets. This finding may be explained by two issues that are common in large deals and which can at least partially be resolved by

PE ownership. First, an improved governance structure may lead to less acquisitions that are too large and driven by empire building. Second, experienced acquirers are likely to be better equipped to successfully complete and integrate large acquisitions.

From the results thus far, it seems that PE ownership is useful to counteract the sub-optimal acquisitions by smaller acquirers and the acquisitions of too large companies. To understand the effect of PE ownership on the intersections of acquirer and target size, I reclassify the deals based on different acquirer-target combinations. The findings in Table 4.10 are in line with the view that PE ownership is especially valuable for smaller acquirers that acquire too large targets. Although, PE ownership is positively related to one or more outcomes in the other combinations as well.

While within the non-PE-owned sample, there is no indication that PE firms have superior timing capabilities, it may still be that the positive effects from PE ownership come from deals that happen within industry-year clusters for which no non-PE-owned deal exists. If so, then the previous results may still be driven by PE-owned companies better timing when to invest in which industry. In Table 4.11, I therefore analyze, whether within industry-year clusters, PE ownership is still related to higher organic growth. The results confirm that it is. This also reconfirms that the effect of PE ownership is not purely driven by superior timing capabilities of the PE firm.

Finally, I analyze the effect of PE ownership when controlling for both acquirer characteristics and industry-year timing. I directly match PE-owned acquirers to non-PE-owned acquirers based on their size and profitability and require that they complete a deal within the same industry-year cluster.[41] In Panel A of Table 4.12, I analyze the performance of the matched PE-owned and non-PE-owned companies via their previously matched control groups, which is able to better control for any target company differences. In Panel B, I directly compare the organic changes between the two groups. The results from both sets of analyses indicate that, even while controlling for selection on acquiring company characteristics and industry-year

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[41]The matching success is presented in 4.B.3. The sample strongly decreases due to the matching requirements. On average, the matched sample is more strongly populated by the larger acquirers of both samples. Overall, the PE-owned and non-PE-owned companies are not significantly different. I do not match on target characteristics because of insufficient overlap.

timing, PE ownership is related to higher revenue growth in the long run, although other effects become insignificant.

TABLE 4.10: Private equity effect across acquirer-target combinations.
The effect of private equity ownership on acquirer-target combinations. Panel A and B consist of large acquirers acquiring relatively small and large targets respectively. Panel C and D consist of small acquirers acquiring relatively small and large targets respectively. Panel E shows the additional PE effect within small acquirers buying relatively large targets (TP). *Post* is a dummy indicator equal to zero for t-1 and one for the period t+1 up to t+4. *Long* is a dummy equal to one for t+3 and t+4 and otherwise zero. For the control sample, *Post* and *Long* takes on the respective values of the treated company to which the control is matched. *Acq* is a dummy indicator for acquirers. All specifications include company and year fixed effects. Non-interacted are suppressed to save the space. T-statistics (in brackets) are calculated using two-way clustered standard errors over the company and year dimension. *, **, and *** represents the 10%, 5%, and 1% significance levels, respectively.

	(1) ln Assets	(2) ln Sales	(3) Employees	(4) ROA	(5) ROS	(6) Labour Prof.
Panel A: Large acquirers, relatively small targets						
Acq×Post	0.105***	0.074**	0.107***	-0.009***	-0.004	-0.002**
	(4.14)	(2.11)	(2.90)	(-2.84)	(-1.56)	(-2.17)
Acq×PE×Post	0.419**	0.113	0.223	-0.005	0.002	-0.004
	(2.44)	(0.89)	(1.24)	(-0.28)	(0.20)	(-0.94)
Acq×Long	-0.023	-0.029	-0.034	0.002	-0.001	0.000
	(-1.17)	(-1.07)	(-1.07)	(0.55)	(-0.31)	(0.33)
Acq×PE×Long	0.075	-0.040	0.151**	-0.023*	-0.013	-0.007***
	(0.93)	(-0.51)	(2.36)	(-1.77)	(-1.00)	(-2.79)
Observations	23,432	23,374	19,667	23,432	23,377	19,490
Adj. R^2	0.958	0.938	0.930	0.528	0.552	0.617
Panel B: Large acquirers, relatively large targets						
Acq×Post	-0.026	-0.057*	-0.086**	-0.010***	-0.010***	-0.003***
	(-1.24)	(-1.87)	(-2.17)	(-3.51)	(-3.78)	(-3.07)
Acq×PE×Post	0.038**	0.021	-0.015	-0.003	0.001	0.001
	(2.02)	(0.78)	(-0.26)	(-0.72)	(0.20)	(0.79)
Acq×Long	-0.007	-0.035	0.007	-0.004	-0.003	-0.002*
	(-0.44)	(-1.33)	(0.28)	(-1.47)	(-1.45)	(-1.96)
Acq×PE×Long	0.046	0.146	0.104	-0.001	0.001	0.003
	(0.82)	(1.23)	(1.39)	(-0.21)	(0.12)	(1.08)
Observations	18,621	18,612	17,373	18,621	18,612	17,284
Adj. R^2	0.934	0.905	0.893	0.573	0.584	0.616

TABLE 4.10 - *Continued*

	(1) ln Assets	(2) ln Sales	(3) Employees	(4) ROA	(5) ROS	(6) Labour Prof.
Panel C: Small acquirers, relatively small targets						
Acq×Post	-0.162***	-0.350***	-0.254***	-0.014***	-0.007	-0.002
	(-3.19)	(-5.24)	(-3.40)	(-3.00)	(-1.50)	(-1.11)
Acq×PE×Post	0.127	0.216	0.012	0.037**	0.014	0.003
	(0.98)	(1.62)	(0.07)	(2.16)	(0.90)	(0.65)
Acq×Long	-0.055	-0.073	-0.081*	0.000	-0.000	-0.000
	(-1.56)	(-1.49)	(-1.90)	(0.07)	(-0.02)	(-0.08)
Acq×PE×Long	0.044	0.124	-0.036	-0.009	-0.004	0.001
	(0.41)	(1.32)	(-0.20)	(-0.63)	(-0.36)	(0.36)
Observations	7,353	7,341	6,738	7,353	7,343	6,688
Adj. R^2	0.904	0.872	0.854	0.546	0.520	0.567
Panel D: Small acquirers, relatively large targets						
Acq×Post	-0.246***	-0.573***	-0.377***	-0.015***	-0.006	-0.002*
	(-4.92)	(-10.52)	(-7.42)	(-3.41)	(-1.55)	(-1.77)
Acq×PE×Post	0.271	0.217	0.096	-0.017	-0.009	-0.004
	(1.27)	(1.23)	(0.51)	(-1.01)	(-0.63)	(-0.80)
Acq×Long	-0.050**	-0.028	-0.015	-0.004	-0.002	-0.001
	(-2.18)	(-0.98)	(-0.52)	(-1.07)	(-0.66)	(-1.24)
Acq×PE×Long	0.234**	0.230**	0.186*	0.013	0.014	0.006*
	(2.49)	(2.31)	(1.88)	(0.78)	(1.23)	(1.68)
Observations	17,700	17,668	15,466	17,700	17,668	15,252
Adj. R^2	0.860	0.847	0.806	0.480	0.496	0.542
Panel E: Additional PE effect in small acquirers and large targets						
Acq×Post	0.088**	0.058	0.066	-0.009**	-0.007*	-0.002*
	(2.31)	(1.05)	(1.16)	(-2.22)	(-1.95)	(-1.79)
Acq×PE×Post	0.482**	0.006	0.506**	-0.034*	-0.016	-0.013**
	(2.15)	(0.03)	(2.24)	(-1.84)	(-1.06)	(-2.44)
Acq×Post×TP	-0.413***	-0.629***	-0.439***	-0.008	-0.000	-0.000
	(-5.90)	(-7.38)	(-5.05)	(-1.17)	(-0.04)	(-0.09)
Acq×PE×Post×TP	0.181	0.513*	-0.217	0.046*	0.034	0.019**
	(0.58)	(1.73)	(-0.61)	(1.71)	(1.48)	(2.17)
Observations	16,073	16,025	12,566	16,073	16,025	12,214
Adj. R^2	0.849	0.818	0.793	0.368	0.376	0.448
Year FE	✓	✓	✓	✓	✓	✓
Company FE	✓	✓	✓	✓	✓	✓

4.5.4 Acquisition likelihood

Up to now, the results have mainly focused on the effect of PE ownership on the operating outcomes after completing an acquisition and on the acquisition knowledge of the PE firm. PE ownership seems to be important for both the acquisition decisions, such as target size, and for the integration success. The operating outcomes, how-

TABLE 4.11: Private equity effect within industry-year clusters.
The effect of private equity ownership using a sample of treated and control observations within overlapping industry-year clusters. *Post* is a dummy indicator equal to zero for t-1 and one for the period t+1 up to t+4. *Long* is a dummy equal to one for t+3 and t+4 and otherwise zero. For the control sample, *Post* and *Long* takes on the respective values of the treated company to which the control is matched. *Acq* is a dummy indicator for acquirers. All specifications include company and year fixed effects. Non-interacted are suppressed to save the space. T-statistics (in brackets) are calculated using two-way clustered standard errors over the company and year dimension. *, **, and *** represents the 10%, 5%, and 1% significance levels, respectively.

	(1) ln Assets	(2) ln Sales	(3) Employees	(4) ROA	(5) ROS	(6) Labour Prof.
Acq×Post	-0.003	-0.112**	-0.030	-0.013***	-0.008**	-0.003***
	(-0.07)	(-2.47)	(-0.52)	(-2.74)	(-2.02)	(-2.63)
PE×Acq×Post	0.123	0.063	0.048	-0.000	0.008	-0.000
	(1.43)	(0.49)	(0.46)	(-0.01)	(1.04)	(-0.05)
Acq×Long	-0.073**	-0.058	-0.059	0.003	0.003	0.001
	(-2.44)	(-1.57)	(-1.49)	(0.66)	(0.95)	(0.48)
PE×Acq×Long	0.147***	0.184***	0.191***	-0.008	-0.003	-0.002
	(2.81)	(2.87)	(3.47)	(-0.98)	(-0.34)	(-0.84)
Observations	10,940	10,927	9,482	10,940	10,928	9,404
Adj. R^2	0.950	0.932	0.913	0.557	0.574	0.610
Year FE	✓	✓	✓	✓	✓	✓
Company FE	✓	✓	✓	✓	✓	✓

ever, are ex-post measures of performance. To further built the case for the positive effect of PE ownership on acquisition performance, I analyze the likelihood of an acquisition under PE ownership, since this analysis offers a better view on the ex-ante expectations. According to recent literature, an acquisition depends on the expected benefits. If benefits increase, the acquisition likelihood increases. So, if it is true that PE ownership positively impacts acquisition performance (thus the benefits), then we should see that PE-owned companies have a higher acquisition likelihood.

I measure the acquisition likelihood at a given time (acquisition rate) similar to a hazard rate. A simple regression framework is insufficient to capture acquisition rates, since it cannot account for censored observations, e.g., companies that did not complete any acquisitions yet and for which no estimate about the acquisition rate (duration) can be made, even though they may still complete an acquisition in the future. This motivates the use of a duration model. I extend the data by

TABLE 4.12: Directly matched: Results.
The effect of private equity ownership on acquisition performance within a directly matched sample. PE-owned acquirers are directly matched to non-PE-owned acquirers within country-industry-year clusters. Panel A compares the performance of the matched PE-owned and non-PE-owned compared relative to their respective placebo strategies. Panel B directly compares the performance between matched PE-owned and non-PE-owned acquirers. *Post* is a dummy indicator equal to zero for t-1 and one for the period t+1 up to t+4. *Long* is a dummy equal to one for t+3 and t+4 and otherwise zero. For the control sample, *Post* and *Long* takes on the respective values of the treated company to which the control is matched. *Acq* is a dummy indicator for acquirers. All specifications include company and year fixed effects. Non-interacted are suppressed to save the space. T-statistics (in brackets) are calculated using two-way clustered standard errors over the company and year dimension. *, **, and *** represents the 10%, 5%, and 1% significance levels, respectively.

	(1) ln Assets	(2) ln Sales	(3) Employees
Panel A: Via IP			
Acq×Post	0.041	-0.116	-0.114
	(0.50)	(-1.01)	(-1.03)
PE×Acq×Post	0.089	0.076	0.276
	(0.43)	(0.32)	(0.83)
Acq×Long	-0.032	-0.024	0.093
	(-0.64)	(-0.48)	(1.44)
PE×Acq×Long	0.189	0.164**	0.081
	(1.09)	(2.52)	(0.35)
Observations	4,212	4,198	3,789
Adj. R^2	0.762	0.739	0.657
Panel B: Without IP			
Post	0.224*	0.150	0.136
	(2.02)	(1.51)	(1.00)
PE×Post	0.046	0.030	0.053
	(0.53)	(0.29)	(0.66)
Long	-0.098	-0.052	-0.029
	(-1.60)	(-1.35)	(-0.52)
PE×Long	0.115	0.117*	0.080
	(1.75)	(2.04)	(1.52)
Observations	614	614	552
Adj. R^2	0.937	0.920	0.949
Year FE	✓	✓	✓
Company FE	✓	✓	✓

collecting all majority private equity investments, including PE-owned companies that did not complete any acquisitions. In this part, I allow PE-owned companies to complete acquisitions beyond five years after the initial private equity investment.

Then, for PE-owned companies, I identify all non-PE-owned companies in the same 2-digit industry in the year of the PE investment.[42] The final sample consists of 1,679 PE-owned companies of which 350 (20%) completed at least one acquisition, and 206,760 non-PE-owned companies of which 3,104 (2%) companies completed at least one acquisition. PE-owned acquirers on average take 3.2 years to complete their first deal after becoming PE owned, while non-PE-owned acquirers on average take around 6.7 years.

The results in Table 4.13, columns 1–3, confirm the expectation that the acquisition rate of PE-owned companies is higher than that of non-PE-owned companies.[43] The results further indicate that, under PE ownership, the profitability of the acquirer is more important to become an acquirer, while for both groups, the size of the acquirer matters.[44] In columns 4–6, I run a similar analysis but I replace PE-owned companies with previously PE-owned companies and their industry peers. Compared to PE-owned companies, previously PE-owned companies show a much lower acquisition likelihood, but they are still more likely to make an acquisition than other non-PE-owned companies.[45]

Finally, I separately estimate the acquisition rates for the four ownership structures to allow for different functional forms of the hazard rates (columns 2-3 and 5-6). In Figure 4.5, I plot these hazard rates. The hazard rate for the PE-owned companies is monotonically decreasing with time but does not cross the hazard rate

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[42]I exclude non-PE-owned companies that differ too much in size (total assets) or profitability (ROA), more specifically companies that are 50% bigger (smaller) or 50% more (less) profitable than the largest (smallest) or most (least) profitable PE-owned company.

[43]See Hammer et al. (2017) for an analysis on which deal and PE firm characteristics of private equity investments are related to the likelihood of add-on acquisitions. Here, I focus on whether PE ownership is related to a higher acquisition rate compared to non-PE-owned companies.

[44]The models, strata, and frailties are chosen based on Cox-Snell residuals. In Table 4.A.2, I use time-varying measures of total assets and return. If hazard rates are of the proportional hazard type we can run a non-parametric Cox model, without making assumptions about the form of the baseline hazard. I run a stratified cox model – with time varying covariates since size is not proportional in the non-PE-owned sample – in specification 4–6 of Table 4.A.2. The results hold across the different models. Several limitations still exist. First, convergence could not always be achieved when correcting for unobserved heterogeneity. Second, the current models assume flow samples and do not control for acquisitions before the sample starts. Finally, the models do not control for competing risks (e.g., PE exits).

[45]In the most conservative estimate – as shown in column 4 of Table 4.13 – previously PE-owned companies have a higher likelihood at exactly a 10% significance level. In all other robustness specifications, the likelihood is significantly higher.

TABLE 4.13: Acquisition rates under private equity ownership.
Relation between PE ownership and the hazard rate (acquisition rate) using a duration model. The dependent variable is the time to failure, calculated as the time (in years) between a private equity investment and the first acquisition of the PE-owned company. For controls (non-PE-owned companies) the starting year equals the year of the private equity investment in the same country-industry cluster. Observations are 'censored' if the company never completes an acquisition during the sample period. The results are calculated using a parametric (frailty) model. Specification 1-2 and 3-6 respectively use a Weibull and exponential survival distribution. Specification 4-6 allow for a more flexible baseline hazard via duration dummies. Adjustments for unobserved heterogeneity (frailty) are included as indicated. *PE* is a dummy indicator for PE ownership. Other variables are defined as before. All specifications include year, country, and industry fixed effects. Standard errors are adjusted on a country-industry cluster level. P-values are included in the brackets. *, **, and *** represents the 10%, 5%, and 1% significance levels, respectively.

	(1) PE vs Non-PE	(2) PE	(3) Non-PE	(4) Prev-PE vs Non-Prev-PE	(5) Prev-PE	(6) Non-Prev-PE
PE	2.593***			0.723		
	(0.000)			(0.100)		
Total Assets (ln)	0.937***	0.464***	0.748***	0.700***	0.591***	0.672***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ROA	0.710	1.447**	0.252	0.601	1.442	0.046
	(0.115)	(0.034)	(0.488)	(0.181)	(0.202)	(0.925)
Model	Weibull	Weibull	Exp.	Weibull	Weibull	Weibull
Observations	208,156	1,622	206,534	90,591	854	89,737
Year FE	✓	✓	✓	✓	✓	✓
Country FE	✓	✓	✓	✓	✓	✓
Industry FE	✓	✓	✓	✓	✓	✓

for non-PE-owned companies. Instead, it continues to be much higher, even beyond the general lifetime of a private equity fund, implying long-term consequences of PE ownership on the company.[46] This notion is strengthened by the hazard rate of previously PE-owned companies, which is higher than the hazard rate of other non-PE-owned companies.

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[46]Only when imposing country-industry fixed effects and clustering we find that the hazard rates cross around year 10. This is still beyond the average holding period. A drawback of this model, however, is that there only a few clusters with multiple observations within the private equity sample. This complicates the measurements and this is also evident from the Cox-Snell residuals, which indicate that this model fits the data worse. Therefore, less weight is placed on these results.

Figure 4.5: Hazard rate.
This figure plots the hazard rate for PE-owned and non-PE-owned companies from specification 2 and 3 in Table 4.13.
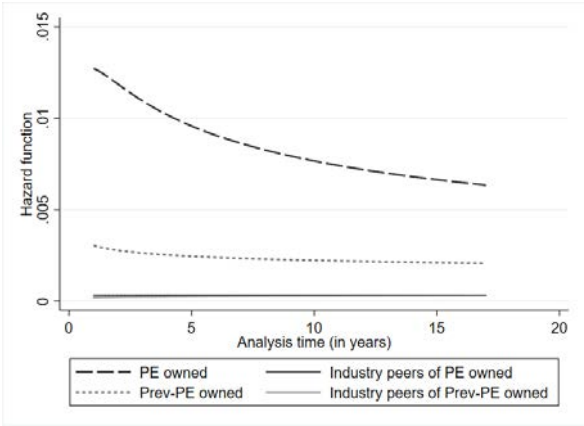
4.6 Conclusion

In this chapter, I examine acquisitions completed by PE-owned companies and compare them to acquisitions performed by non-PE-owned companies. This analysis sheds light on the importance of the ownership structure of an acquirer for the development of operating improvements when making acquisitions. It further helps us understand how the unique characteristics of the private equity model may give PE-owned companies an edge in the highly competitive acquisition market. The performance in acquisitions depends on the skill of an acquirer to select and integrate targets, but these skills are not easy to develop and can either be built by doing deals or by accessing external sources. PE ownership may act as an alternative way to obtain this knowledge and can therefore positively impact the acquisition performance.

I analyze 2,638 and 53,711 acquisitions made by PE-owned and non-PE-owned companies, respectively, between 1997 and 2018. I find that acquisitions by PE-owned companies display higher organic growth relative to acquisitions by non-PE-owned companies, while there is no additional decrease in profitability. By analyzing the

acquisition patterns, I find evidence that suggests that PE-owned companies benefit from the acquisition knowledge of the PE firm and that PE ownership is a substitute for doing deals to gain experience. Because PE ownership increases the expected benefits from acquisitions, PE-owned companies become more likely to complete an acquisition.

The relation between PE ownership and acquisition performance provides several interesting questions that may be addressed in future research. First, one may want to analyze the mechanisms behind the operating improvements during the integration phase, which would require a more case-like study. Particularly interesting is how PE-owned acquires and targets are restructured after an acquisition relative to non-PE-owned entities, since we may expect that PE firms are less inclined to keep the original structure intact if that limits value creation. Other characteristics of the PE ownership structure are not explored in great detail in this chapter but could still matter. Governance restructuring may affect the acquisition decisions on other dimensions than those explored in this chapter as well (Kaplan et al., 2009; Bloom et al., 2013). For example, under PE ownership, the role of management may be different, where the PE firm identifies and completes the acquisition, while management specializes in post-acquisition integration.

Second, acquisitions are not random events. Future research may analyze in greater detail when PE firms choose to grow their portfolio companies organically and inorganically, i.e., through acquisitions. Attention may be given to the contribution of acquisitive and organic growth to private equity returns or acquisition returns in general (Guo et al., 2011; Nikoskelainen and Wright, 2007; Acharya et al., 2013). Such an analysis may be particularly productive, since the findings in this chapter indicate that, while organic growth is on average negative in acquisitions, the total growth of acquiring companies is positive when including the acquisitive growth.

Third, it shows that acquisition experience matters and can be transferred through ownership. This finding has a more general implication within the M&A market in which experience is not solely built on a CEO-company level, but can be transferred through ownership structures. Therefore, we need to think carefully about how we

measure experience and how it may impact acquisition performance. The finding further highlights the importance of the ownership structure of a company in the context of acquisitions, since particular ownership model, of which the PE model is an example, may provide the acquirer with enhanced acquisition capabilities. The findings in this chapter may therefore also explain why so many acquisitions do not realize the expected operating benefits, since many acquiring companies may have insufficient (access to) acquisition knowledge.

Finally, this chapter identifies that PE ownership increases the acquisition likelihood and acquisition speed. The enhanced acquisitive activities of PE-owned companies may impact premiums and the division of returns to shareholders in general M&A activities. The findings in this paper support this view. PE ownership is associated with improved operating performance when making acquisitions. It may then be that the value of these operating improvements can partially be found in the acquisition premium that is paid when acquiring the PE-owned entity or when the PE-owned entity completes a follow-on acquisition. Then, financial buyers may also be able to outbid strategic buyers in strategic acquisitions. This finding may have larger-scale implications, where PE ownership affects the intensity of acquisition waves or where acquisitions by PE-owned companies might even initiate waves. Thus, the findings in this chapter relate to broader implications for industrial organization.

4.A   Additional Figures and Tables

Figure 4.A.1: Research setting and ownership structures. Overview of the ownership structures in this research setting. Case A describes the acquisition by PE-owned portfolio companies. Case A is similar in nature to Case B, but now the acquiring company is not owned by private equity.
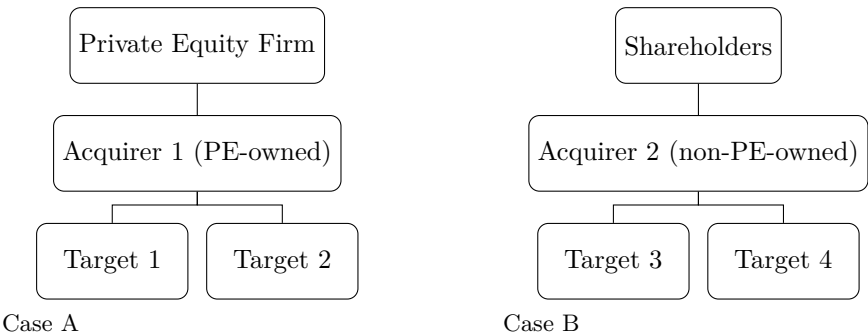

Case A

Case B

Figure 4.A.2: Timing of company financials for strategy-level analysis. A stylized example for calculating strategy-level financials with one acquirer and one target. The entries represent the unconsolidated financial data of both over time. The values in t-2 and t-1 (red italics) represent pre-deal financials. The consolidated data at strategy level is reported in the third row. Pre-deal, the financials of the strategy consist only of the financials the acquirer; the financials of the target are added to the strategy after the completion of the acquisition.

Acquirer	*90*	*95*	100^X	110	120	130	140
Target	*30*	*32*	34^X	38	42	46	50
Strategy	*90*	*95*	134^X	148	162	176	190
	2004	2005	2006	2007	2008	2009	2010
	$t-2$	$t-1$	$t=0$	$t+1$	$t+2$	$t+3$	$t+4$

Acquisition

Acquirer IP	*90*	*95*	100^X	105	110	115	120
Target IP	*30*	*32*	34^X	36	38	40	42
Placebo	*90*	*95*	134^X	141	148	155	162
Strategy	*90*	*95*	134^X	148	162	176	190
Placebo	*90*	*95*	134^X	141	148	155	162
Synergies	*0*	*0*	0^X	7	14	21	28

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TABLE 4.A.1: Realization of synergies: Profitability. Development of profitability in acquisitions compared to placebo control strategies over the first four years following the first acquisition (t). *Post* is a dummy indicator equal to zero for t-1 and one for the period t+1 up to t+4. For the control sample, *Post* takes on the respective values of the treated company to which the control is matched. *Long* is a dummy equal to one for t+3 and t+4 and otherwise zero. *Acq* is a dummy indicator for acquirers. *PE* indicates PE ownership. All specifications include company and year fixed effects. T-statistics (in brackets) are calculated using two-way clustered standard errors over the company and year dimension. *, **, and *** represents the 10%, 5%, and 1% significance levels, respectively.

	(1) ROA	(2) ROS	(3) Lab. prof.
Panel A: Overall			
Post	0.000	-0.001	0.000
	(0.08)	(-0.54)	(0.07)
Acq×Post	-0.012***	-0.007***	-0.002***
	(-6.05)	(-5.38)	(-4.64)
Observations	67,324	67,218	58,897
Adj. R²	0.528	0.542	0.593
Panel B: Non-PE vs PE			
Acq×Post	-0.012***	-0.007***	-0.002***
	(-5.99)	(-4.98)	(-4.18)
PE×Acq×Post	0.004	0.009	-0.000
	(0.61)	(1.58)	(-0.15)
Observations	67,324	67,218	58,897
Adj. R²	0.529	0.543	0.593
Panel C: Short and Long-term			
Acq×Post	-0.011***	-0.006***	-0.002***
	(-5.48)	(-4.22)	(-3.70)
PE×Acq×Post	0.006	0.008	-0.000
	(0.91)	(1.56)	(-0.25)
Acq×Long	-0.001	-0.002	-0.001
	(-1.04)	(-1.19)	(-1.42)
PE×Acq×Long	-0.005	0.001	0.000
	(-0.74)	(0.09)	(0.31)
Observations	67,324	67,218	58,897
Adj. R²	0.529	0.543	0.593
Year FE	✓	✓	✓
Company FE	✓	✓	✓

TABLE 4.A.2: Acquisition rate robustness. Relation between PE ownership and the hazard rate (acquisition rate) using a duration model. The dependent variable is the time to failure, calculated as the time (in years) between a private equity investment and the first acquisition of the PE-owned company. For controls (non-PE-owned companies) the starting year equals the year of the private equity investment in the same country-industry cluster. Observations are 'censored' if the company never completes an acquisition during the sample period. Specifications 1-3 allow for a more flexible baseline hazard via duration dummies and include time varying controls. Specifications 4-6 uses a non-parametric stratified Cox model, where strata are defined as the country, industry, and deal year. *PE* is a dummy indicator for PE ownership. Other variables are defined as before. All specifications include year, country, and industry fixed effects. Standard errors are adjusted on a country-industry cluster level. P-values are included in the brackets. *, **, and *** represents the 10%, 5%, and 1% significance levels, respectively.

| | (1) | (2) | (3) | (4) | (5) | (6) |
| | Piecewise constant | | | Stratified Cox | | |
	All	PE	Non-PE	All	PE	Non-PE
PE	1.445***			2.036***		
	(0.000)			(0.000)		
Total Assets (ln)	0.729***	0.326***	0.834***	0.776***	0.377***	0.852***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ROA	0.001***	0.001	-0.149	0.001***	0.784***	-0.189***
	(0.000)	(0.108)	(0.231)	(0.000)	(0.001)	(0.000)
Observations	603,882	9,194	594,688	603,882	9,194	594,688
Year FE	✓	✓	✓	✓	✓	✓
Country FE	✓	✓	✓	✓	✓	✓
Industry FE	✓	✓	✓	✓	✓	✓
Duration dummies	✓	✓	✓			

4.B Matching Procedure

TABLE 4.B.1: Matching deals to industry peers. Means of outcome variables in the pre-deal year and their difference between the treated and matched controls. The matching is performed on the pre-deal log of total assets, log of total sales, the squares of both, growth of sales, growth of assets, the return on assets, return on sales and changes in return on assets and the return on sales. Panel A presents the data for PE-owned companies and Panel B for non-PE-owned companies. (ln) indicates the logarithmic transformation. *, ** and *** stand for a 10%, 5% and 1% significance level, respectively.

Matching variables	Treated	Controls	Difference	(T-stat)
Panel A: PE-owned				
Total assets (ln)	16.945	16.855	0.090	(0.61)
Sales	16.931	16.987	-0.056	(-0.37)
Return on Assets	0.102	0.104	-0.002	(-0.23)
Return on Sales	0.070	0.073	-0.003	(-0.48)
Delta Assets	0.088	0.093	0.003	(0.17)
Delta Sales	0.104	0.086	0.011	(0.75)
Delta ROA	0.015	0.015	-0.000	(-0.07)
Delta ROS	0.012	0.009	0.003	(0.83)
Panel B: non-PE-owned				
Total assets (ln)	16.547	16.428	0.119***	(2.80)
Sales	16.623	16.581	0.042	(0.94)
Return on Assets	0.065	0.064	0.001	(0.70)
Return on Sales	0.046	0.047	-0.001	(-0.45)
Delta Assets	0.086	0.072	0.009**	(2.16)
Delta Sales	0.082	0.078	0.009**	(2.30)
Delta ROA	0.000	0.000	0.000	(0.18)
Delta ROS	0.002	0.002	0.000	(0.08)

TABLE 4.B.2: Matching and unmatched sample. Means of the matching variables in the pre-deal year of the matched and unmatched acquirers and targets in acquisitions by PE-owned companies. Panel A presents the data for PE-owned companies and Panel B for their targets. (ln) indicates the logarithmic transformation. *, ** and *** stand for a 10%, 5% and 1% significance level, respectively.

Matching variables	Matched	N	Unmatched	N	Difference	(T-stat)
Panel A: PE-owned acquirers						
Total assets (ln)	17.24	144	17.13	66	0.108	(0.40)
Sales (ln)	17.11	144	16.29	43	0.819**	(2.51)
Return on Assets	0.10	144	0.06	66	0.038**	(2.25)
Return on Sales	0.07	144	0.06	43	0.010	(0.47)
Delta Assets	0.08	143	0.09	23	-0.018	(-0.41)
Delta Sales	0.08	143	0.07	5	0.006	(0.07)
Delta ROA	0.01	143	0.02	23	-0.010	(-0.77)
Delta ROS	0.01	143	0.02	5	-0.010	(-0.50)
Panel B: Targets						
Total assets (ln)	15.62	336	15.26	86	0.366*	(1.75)
Sales (ln)	15.99	336	15.42	51	0.570**	(2.41)
Return on Assets	0.12	336	0.09	86	0.034**	(2.11)
Return on Sales	0.07	336	0.06	51	0.017	(1.28)
Delta Assets	0.04	330	0.06	29	-0.020	(-0.53)
Delta Sales	0.06	330	0.00	3	0.058	(0.67)
Delta ROA	0.01	330	-0.01	29	0.016	(0.99)
Delta ROS	0.00	330	-0.04	3	0.041	(1.28)

TABLE 4.B.3: Direct matching statistics. This table shows the matching statistics of directly matching PE-owned acquirers to non-PE-owned acquirers. Acquirers are matched within country-industry-year clusters on the pre-deal size and profitability of the acquirer. Panel A provides statistics on the difference between treated and controls within ownership structures. Panel A provides statistics on the difference between ownership structures within treated and controls. (ln) indicates the logarithmic transformation. *, ** and *** stand for a 10%, 5% and 1% significance level, respectively.

Matching variables	Treated	Controls	Difference	(T-stat)
Panel A: PE-owned				
Total assets (ln)	17.114	16.98	0.134	(0.70)
Sales	17.172	17.227	-0.055	(-0.27)
Return on Assets	0.099	0.091	0.008	(0.80)
Return on Sales	0.071	0.063	0.008	(1.01)
Delta Assets	0.123	0.102	0.026	(0.31)
Delta Sales	0.065	0.097	-0.038	(-0.47)
Delta ROA	0.015	-0.003	0.018	(1.57)
Delta ROS	0.017	-0.001	0.018**	(2.03)
Panel B: Non-PE-owned				
Total assets (ln)	16.917	16.98	-0.063	(-0.30)
Sales	17.198	17.183	0.015	(0.08)
Return on Assets	0.093	0.089	0.004	(0.41)
Return on Sales	0.068	0.065	0.003	(0.42)
Delta Assets	0.098	0.078	-0.036	(-0.86)
Delta Sales	0.086	0.133	0.008	(0.23)
Delta ROA	0.001	0.002	-0.001	(-0.12)
Delta ROS	0.008	0.011	-0.002	(-0.36)

Matching variables	PE	Non-PE	Difference	(T-stat)
Panel C: Treated				
Total assets (ln)	17.114	16.917	0.196	(0.77)
Sales	17.172	17.198	-0.026	(-0.11)
Return on Assets	0.099	0.093	0.006	(0.42)
Return on Sales	0.071	0.068	0.003	(0.25)
Delta Assets	0.123	0.098	0.025	(0.29)
Delta Sales	0.065	0.086	-0.022	(-0.27)
Delta ROA	0.015	0.001	0.014	(1.06)
Delta ROS	0.017	0.008	0.009	(0.91)
Panel D: Controls				
Total assets (ln)	16.98	16.98	-0.000	(-0.00)
Sales	17.227	17.183	0.044	(0.36)
Return on Assets	0.091	0.089	0.002	(0.30)
Return on Sales	0.063	0.065	-0.002	(-0.44)
Delta Assets	0.102	0.078	-0.037	(-0.91)
Delta Sales	0.097	0.133	0.024	(0.65)
Delta ROA	-0.003	0.002	-0.005	(-0.86)
Delta ROS	-0.001	0.011	-0.011**	(-2.44)

4.C   Relaxing Financing Constraints

This section relates the operating growth from the main results to the knowledge and experience of the PE firm to obtain debt financing. The argument is based on the idea that acquisitions can reduce the financing constraints of the target, and maybe the portfolio as whole, and therefore access dormant investment opportunities (Erel et al., 2015). PE ownership may strengthen this effect. Because PE firms are frequently active on the deal market and depend strongly on debt to finance their transactions, they develop a reputation and relationships with banks. PE-owned acquirers may benefit from the experience of the PE firm, enabling them to borrow under more favourable terms (Ivashina and Kovner, 2011).

In Table 4.C.1, I measure whether PE-owned companies relax the financing constraints more than non-PE-owned companies. The dependent variables are the operating leverage and the cash holdings scaled by total assets. An increase in operating leverage indicates the capabilities of a company to obtain debt financing (Ivashina and Kovner, 2011; Boucly et al., 2011). Meanwhile, companies that find it difficult to obtain financing for future projects will hold more cash to internally finance these future projects (Erel et al., 2015). So after private equity entry, we expect that operating leverage goes up, while cash holdings go down. The results in the table indeed suggest that, compared to non-PE-owned companies, PE ownership seems to affect the operating leverage significantly in the long run. These findings are constent with the findings of Boucly et al. (2011), who also relate the growth in PE portfolio companies to favourable financing terms. Before a company becomes PE-owned, it does not have superior capabilities to obtain debt financing. Even after the PE firm has exited, the capabilities to obtain debt financing stay with the company However, the results on cash do not provide a clear picture. In the short run, previously PE-owned companies increase their cash holdings, suggesting the expectation that obtaining financing for future projects has become more difficult. Overall, the results suggest that most benefits materialize in leverage and come from the banking relations of the PE firm.

TABLE 4.C.1: Private equity ownership and financing constraints.
Development of financing constraints after an acquisition by PE-owned- or non-PE-owned companies. *Post* is a dummy indicator equal to zero for t-1 and one for the period t+1 up to t+4, where t indicates the year of the first acquisition. For the control sample, *Post* takes on the respective values of the treated company to which it is matched. *Long* is a dummy equal to one for t+3 and t+4 and otherwise zero. *Acq* is a dummy indicator for acquirers, and *PE* indicates companies before they become PE-owned (1–2), PE ownership (3–4), or companies that were previously owned by PE (5–6). All specifications include company and year fixed effects. T-statistics (in brackets) are calculated using two-way clustered standard errors over the company and year dimension. *, **, and *** represents the 10%, 5%, and 1% significance levels, respectively.

	(1) Leverage	(2) Cash over Assets	(3) Leverage	(4) Cash over Assets	(5) Leverage	(6) Cash over Assets
	Before PE vs Non-PE		PE-owned vs Non-PE		Prev-PE vs Non-PE	
Acq×Post	0.024***	-0.014***	0.024***	-0.014***	0.023***	-0.014***
	(5.53)	(-4.66)	(6.25)	(-4.80)	(6.44)	(-5.52)
PE×Acq×Post	-0.013	-0.028**	0.020	-0.010	0.004	0.023*
	(-0.63)	(-2.27)	(1.15)	(-1.02)	(0.16)	(1.92)
Acq×Long	-0.007**	0.001	-0.007**	0.001	-0.007**	0.000
	(-2.32)	(0.57)	(-2.31)	(0.55)	(-2.46)	(0.17)
PE×Acq×Long	-0.007	0.024	0.031**	-0.000	0.050*	-0.005
	(-0.35)	(1.55)	(2.59)	(-0.04)	(2.17)	(-0.75)
Observations	57,423	62,593	59,670	64,999	62,945	70,197
Adj. R^2	0.760	0.678	0.760	0.679	0.763	0.684
Year FE	✓	✓	✓	✓	✓	✓
Company FE	✓	✓	✓	✓	✓	✓

Chapter 5

Summary and Conclusion

This final chapter reviews the main ideas and key findings from this dissertation on private equity ownership and acquisitions by their portfolio companies. The chapter closes with a discussion of directions for future research.

The private equity market is maturing and an increasingly greater proportion of the capital that is raised, is now being invested in subsequent acquisitions by PE-owned portfolio companies. Despite these recent, but material, developments, we still know little about how private equity ownership is related to acquisition activities and acquisition performance.

In Chapter 2, we introduced a real options framework that models a serial acquisition strategy as a portfolio of interrelated real options. This framework can be used to explain the emergence of the buy-and-build strategy in private equity. We developed a motive for serial acquisitions that builds its arguments based on the anticipation of future growth option value. The new element of *anticipation* of future option value beyond the focal deal can exist next to existing explanations for serial acquisitions (e.g., empire building, CEO hubris, desperation for growth, and learning) and can be applied more broadly to general acquisition strategies.

Based on the anticipation argument, we show that the investors select and time the platform acquisition in conditions where they anticipate potential value creation from follow-on and exit options that goes beyond the focal deal itself. The optimal

financial, company and industry conditions for serial deals that follow from the theory is supported by empirical evidence. We used buy-and-build strategies by private equity as a showcase, since it provides a natural test setting. At the inception of the fund, the investors determine a fixed buy-and-build period (maturity), and the structure allows us to specify a buy-and-build strategy as an interrelated chain of options, that involves platform, follow-on, and exit options. We also isolate the more general effect of anticipation from other explanations that apply to listed firms.

The chapter therefore advances strategic management theory by offering a dynamic view on serial acquisitions based on real option theory. The insights into the inter-temporal dependencies and optimal conditions that we find are important for scholars and for private equity investors to optimize their strategies.

In Chapter 3, we analyzed the operational performance of buy-and-build strategies by private equity investors. Private equity fund managers more frequently turn to growth as an important value driver, potentially due to the fierce competition for deals. Through buy-and-build strategies, the PE investors can do just that; combine the long-term focus of strategic buyers with the financial value drivers of LBOs in private equity. However, the strategy has been viewed with healthy skepticism.

We showed that, in buy-and-build strategies, private equity investors are able to improve the profitability of the combined entity compared to the control group that consists of placebo strategies. Digging deeper into the motivation of private equity, and classifying strategies into more successful and less successful strategies, we show that an important driver of the exit decision is related to the organic operating improvements. This is in line with the notion that realizing operating synergies are indeed one of the metrics of "success" of this strategy.

The study exploited the heterogeneity of the strategies. First, we differentiated between the length and types of industries to understand what type of organic improvements may develop, and whether these organic improvements are related to potential synergetic benefits between the platform and follow-on companies. Overall, operating improvements are found precisely where the synergies are theoretically expected to be larger and the complexity of the developed synergies seems to be related

to the strategy characteristics. Second, to determine whether the benefits primarily stem from consolidation acts or not, we analyzed the performance of horizontally- and vertically related strategies. It appears that in order to succeed in a modern highly-competitive market environment private equity firms need to target longer-term investment opportunities and carefully select the types of companies in their portfolio taking into account the entire production value chain.

In the chapter, we advanced the measurement of operational performance for acquisition strategies, where the challenge comes from the fact that acquisitions themselves may distort the measurement. To control this "acquisitive" effect, we created a benchmark that includes hypothetical acquisitions that mimic the actual acquisitions and thereby established the correct comparison group at the strategy level. Where the real acquisitions can develop synergies, the control group cannot, but both experience a change in the company's financials as a result of the (hypothetical) acquisition. Neglecting to account for this acquisitive effect may lead to obvious mismeasurements such as overestimating the organic growth or inappropriately associate acquisitions with changes in profitability where there are none (or vice-versa). The methodology that we proposed can easily be extended to other types of acquisition or divestiture activities.

Overall, the findings in this chapter provided a positive view on private equity in which private equity is able to improve the operational performance of its portfolio companies through buy-and-build strategies.

Finally, in Chapter 4, I generalize the relation between private equity ownership and acquisition activities and performance. Going back to Jensen (1989), companies under private equity ownership may operate differently from their public peers as a result of better aligned incentives between the principal and the agent. One of the key developments in the private equity market is that a progressively increasing share of PE-owned companies now completes acquisitions, adding up to five percent of the acquisitions in the M&A market in recent years. In this context, the chapter addressed the question whether the private ownership structure also mattered for the acquisition activities and performance, and which elements of this ownership

structure may explain any differences.

The analyses covered over 55,000 acquisitions by PE-owned and non-PE-owned companies. We found that acquisitions by PE-owned companies display higher organic growth relative to acquisitions by non-PE-owned companies, while there is no additional decrease in profitability, and that private equity ownership is related to a higher acquisition likelihood.

While several channels may be active, the chapter zooms in on the role of acquisition experience. The private equity firm is an experienced acquirer and this experience may benefit and transfer to the portfolio company. By exploiting ownership structures before, during, and post the private equity holding period, and bench marking them to never-PE-owned companies, the study was able to provide insights into the development of acquisition experience across the three different stages of private equity ownership. Before becoming PE-owned, no significant differences were identified, but at the moment a company becomes PE-owned, its acquisition pattern is similar to experienced non-PE-owned companies. While the pattern weakens when the private equity firm exits, knowledge seems to have partially spilled over to the portfolio company, enabling them to continue to outperform in terms of organic growth in the long term.

The analysis of acquisitions by PE-owned companies sheds light on the unique characteristics of the private equity model that impact the development of operating performance when making acquisitions, one of which is the acquisition experience. Experience is a complex factor to measure, however its importance should not be overlooked. The findings in this chapter therefore provided new insights on experience that may help us to understand how economic value is created in acquisitions. These findings may also explain why so many acquisitions do not realize the expected benefits, since many acquiring companies may have insufficient (access to) acquisition knowledge.

Future research

This section proposes directions for future research, revolving around further development of theory and extensions for empirical verification.

The anticipation argument we propose is applicable beyond the private equity deal market. However, for listed firms, one key issue is, how can future research more effectively separate the anticipation of a real options predictions from those of alternative theories? The development of real options theory for M&A of listed firms could probably benefit from a further integration with learning, empire-building motives, overconfidence and mispricing, and agency theory. Listed firms also offer new opportunities for empirical verification. For example, through announcement returns and deducting (the change) in the present value of growth options from market values, one could measure how the uncertainties and option values develop over the course of the strategy.

In this dissertation, we showed that private equity firms do develop organic operating improvements in buy-and-build strategies. Future research could identify the relation between buy-and-build strategies and PE returns and to what extent multiple arbitrage matters, which may be driven by a reduction in risk or by an improvement of growth opportunities in BB strategies. Attention may be given to the contribution of acquisitive and organic growth to general or private equity returns.

Linking private equity returns to buy-and-build strategies, also opens up the question how buy-and-build returns compare to traditional private equity investments. If competition drove private equity firms to buy-and-build strategies, it is not immediately clear whether this is indeed a optimal strategy for all. Especially interesting would be to understand how the buy-and-build performance compared to traditional strategies, is related to private equity firm characteristics. It may be that buy-and-build strategies, which are by nature more complex, represent a more excludable strategy.

Finally, in this dissertation, I showed a relation between PE ownership and an increase in the acquisition likelihood and acquisition speed. This finding may have larger-scale implications, where PE ownership affects the intensity of acquisition waves or where acquisitions by PE-owned companies might even initiate waves. Thus, the findings in this dissertation may relate to broader implications for industrial organization.

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Chapter 6

Samenvatting

Dit laatste hoofdstuk bespreekt de belangrijkste ideeën en bevindingen uit dit proefschrift over *private equity* eigendomsstructuren en overnames door hun portfolio bedrijven. Het hoofdstuk sluit af met een discussie over toekomstige onderzoeksrichtingen.

In hoofdstuk 2 van dit proefschrift beschouwen we seriële overnamestrategieën als een portefeuille van interacterende reële opties. Aan de hand van deze reële optie benadering zijn we in staat de toename van *buy-and-build* strategieën in de private equity markt te verklaren. Het motief achter seriële overnamestrategieën is gebaseerd op de anticipatie van toekomstige groei optiewaarde. Dit nieuwe element van *anticipatie* ontleent haar waarde aan mogelijkheden die voorbij de huidige overname liggen, maar die wel door de huidige overname beschikbaar worden. Anticipatie kan als verklaring bestaan voor seriële overnames naast al bekende motivaties (waaronder machtsuitbreidingen, CEO–hoogmoed, groei als laatste redmiddel en het verwerven van kennis) en kan ook worden toegepast op overnamestrategieën buiten private equity.

Gebaseerd op het anticipatie argument, laten we zien dat private equity investeerders hun *platform* overname selecteren en timen wanneer de condities in de markt aantrekkelijk zijn. Namelijk, deze overnames vinden plaats wanneer de geanticipeerde mogelijke waardecreatie van *follow-on* groeiopties en verkoopopties hoog

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is. In het theoretische kader differentiëren wij tussen financiële, bedrijfsspecifieke en industriële condities die van belang zijn voor de waarde van de seriële overnamestrategie en vinden ondersteund bewijs voor deze condities in onze empirische analyse. Buy-and-build strategieën door private equity firms kunnen als een testgrond worden gebruikt om ons hypothese omtrent anticipatie te testen vanwege enkele aantrekkelijke karakteristieken. Namelijk bij de oprichting van het private equity fonds wordt een vaste levensduur bepaald (de vervaldatum van de opties) en de structuur van de seriële buy-and-build strategie stelt ons in staat om de reeks van interacterende platform, follow-on en verkoopmogelijkheden als reële opties te specificeren. Hierdoor kunnen we het anticipatie effect isoleren van andere verklaringen voor seriële strategieën die bijvoorbeeld gelden voor beursgenoteerde bedrijven.

De dynamische inzichten op basis van reële optie theorie voor seriële overname strategieën in dit hoofdstuk dragen bij aan de stategische management literatuur. De inzichten in de afhankelijkheden tussen de reële opties en de ideale condities kunnen door academici en private equity investeerders worden gebruikt om hun strategieën te optimaliseren.

Hoofdstuk 3 analyseert het operationele functioneren van buy-and-build strategieën door private equity investeerders. Steeds vaker wordt groei als een belangrijke drijver van waarde aangemerkt door private equity fonds managers. Een potentiele verklaring kan worden gevonden in de competitie voor investeringen die is ontstaan in de private equity markt. Via buy-and-build strategieën zijn private equity investeerders in staat om deze groei te verwezenlijken en de lange termijn visie van strategische kopers te combineren met de financiële waardecreatie in traditionele *leveraged buyouts*. Echter bestaat er enige twijfel over de toegevoegde waarde van deze strategieën.

We laten zien dat private equity investeerders via buy-and-build strategieën de winstgevendheid van de samengevoegde entiteit verhogen ten opzichte van een vergelijkbare controle groep die bestaat uit een placebo strategie. Om de drijfveer van private equity achter deze strategie beter te begrijpen, splitsen we de observaties in voltooide en niet voltooide strategieën. De keuze voor private equity om de

samengevoegde entiteit te verkopen hangt sterk samen met de organische operationele verbeteringen, welke wij interpreteren als synergiën. Deze bevinding is in lijn met de gedachte dat het realiseren van synergiën een belangrijke graadmeter is voor het "succes" van de strategie.

In de studie analyseren wij de heterogeniteit van de strategieën om onze synergie interpretatie te ondersteunen. Ten eerste, de type synergiën of hun complexiteit, kunnen afhankelijk zijn van de lengte van de strategie en de type industrie waarin is geïnvesteerd. Wij laten bijvoorbeeld zien dat de type synergiën die complex zijn en meer tijd kosten om te ontwikkelen alleen plaatsvinden in de strategieën die langer duren. De analyses laten over het algemeen zien dat de operationele verbeteringen precies plaatsvinden daar waar de (type) synergiën tussen platforms en follow-ons theoretisch mogen worden verwacht. Ten tweede, een bekende notie is dat buy-and-build strategieën waarde creëren door middel van horizontale overnames of consolidatie. Echter, veel van de overnames in onze dataset zijn niet horizontaal. Sterker nog, de resultaten laten zien dat private equity investeerders voornamelijk operationele verbeteringen realiseren door de waardeketen in acht te nemen.

Een contributie van het hoofdstuk is de meetmethode die is gebruikt om het operationele functioneren van overname strategieën te analyseren. De voornaamste uitdaging komt voort uit het feit dat de overnames kunnen leiden tot een verstoring van de meting. Om voor dit "overname" effect te controleren, maken wij gebruik van een specifieke controlegroep waarin hypothetische overnames zijn toegevoegd. Deze hypothetische overnames lijken op de echte overnames en stellen ons in staat om de juiste controlegroep te ontwikkelen op het niveau van de strategieën. Waar de echte overnames kunnen leiden tot synergiën in de buy-and-build strategieën, kunnen de hypothetische overnames dit niet in de controlegroep, terwijl beide groepen wel een vergelijkbare verstoring ondervinden in hun financiële rapportage door de overname. Het negeren van het overname effect kan leiden tot het verkeerd meten van de operationele prestaties zoals een overschatting van organische groei of het kan leiden tot het onjuist associëren van overnames met veranderingen in winstgevendheid terwijl er geen is (of vice versa). De methodologie die wij aanraden kan echter ook

makkelijk worden toegepast op andere type overnames of afsplitsingen.

Concluderend, de bevindingen in dit hoofdstuk belichten een positieve kant van private equity investeringen. Namelijk door buy-and-build strategieën zijn private equity investeerders in staat de operationele prestaties van hun portfolio bedrijven te verbeteren.

Tenslotte in hoofdstuk 4, generaliseer ik de relatie tussen private equity eigendomsstructuren en overname activiteiten en - prestaties. In de handen van private equity investeerders, worden de belangen tussen de principaal en agent efficiënter georganiseerd, waardoor de operationele prestaties beter kan zijn dan in beursgenoteerde bedrijven (Jensen, 1989). Een van de huidige ontwikkelingen in de private equity markt is dat een toenemende fractie van de PE–portfolio bedrijven overnames doen. In de overname markt zijn ongeveer vijf procent van de overnames gedaan door PE–portfolio bedrijven. In deze context, probeert dit hoofdstuk de vraag te beantwoorden of de private equity eigendomsstructuur belangrijk is voor de overnamefrequentie en –prestaties. Vervolgens bespreekt het hoofdstuk welke karakteristieken van deze eigendomsstructuur de mogelijke verschillen kunnen verklaren.

In dit hoofdstuk worden meer dan 50.000 overnames door PE–portfolio bedrijven en door niet–PE–portfolio bedrijven geanalyseerd. Ik vind bewijs dat overnames door PE–portfolio bedrijven hogere organische groei laten zien ten opzichte van de overige overnames, echter is er geen eenduidig bewijs dat dit deze additionele groei ten koste van de winstgevendheid van de bedrijven gaat. Verder vind ik dat de private equity eigendomsstructuur gerelateerd is aan een hogere overnamefrequentie.

Het hoofdstuk belicht verder het belang van ervaring in het doen van overnames. Gegeven dat een private equity investeerder deze ervaring heeft, dan is het mogelijk dat de portfolio bedrijven van private equity voordeel halen uit deze ervaring en mogelijk zelfs een deel van die kennis of ervaring eigen maken. Om dit vraagstuk te beantwoorden, maak ik gebruik van de drie fases van PE–portfolio bedrijven: voordat ze gekocht worden, wanneer ze eigendom van private equity zijn en nadat ze door de private equity investeerder verkocht heeft. Vervolgens vergelijk ik de prestaties gedurende deze drie periodes met bedrijven die nooit zijn gekocht door private equity

om zo inzichten te verkrijgen in de ontwikkeling van overnamekennis en -ervaring in portfolio bedrijven. Voordat een bedrijf wordt overgenomen door private equity gedragen ze zich niet anders dan andere onervaren kopers. Echter op het moment dat ze in de handen komen van private equity, laten ze een overnamepatroon zien dat vergelijkbaar is met ervaren kopers. Na de verkoop, lijkt de ervaring enigszins verloren te gaan, echter blijven deze voormalige PE–portfolio bedrijven zich ervarener gedragen. Dit suggereert dat de kennis van de private equity investeerder gedeeltelijk eigen wordt gemaakt door het portfolio bedrijf waardoor het in staat blijft om na een overname hogere organische groei te verwezenlijken op de lange termijn.

De analyse van overnames door PE–portfolio bedrijven laat zien dat de private equity eigendomsstructuur enkele unieke karakteristieken bezit die van invloed zijn op de operationele prestaties wanneer een bedrijf overnames doet. Een van deze karakteristieken is ervaring in overnames. Ervaring is een complex begrip, desondanks moeten we het belang van ervaring niet onderschatten. De bevindingen in dit hoofdstuk geven ons nieuwe inzichten in dit belang en kan ons helpen te begrijpen hoe economische waarde gecreëerd kan worden in overnames. De bevindingen kunnen mogelijk ook verklaren waarom zoveel overnames niet in staat zijn om de verwachte waarde te realiseren, omdat veel bedrijven geen of niet voldoende kennis hebben om overnames succesvol te laten verlopen.

Toekomstig onderzoek

Deze sectie doet enkele suggesties voor toekomstig onderzoek, voornamelijk gericht op het verder ontwikkelen van de theorie en mogelijke extensies voor empirische testen.

De toepasbaarheid van het anticipatie argument dat wij voorstellen is breder dan de private equity markt. Voor beursgenoteerde bedrijven is er een belangrijke uitdaging om de verwachtingen van het anticipatie effect van toekomstige reële opties te onderscheiden van alternatieve theorieën. De ontwikkeling van reële optie theorie voor overnames door beursgenoteerde bedrijven kan mogelijk profiteren van verdere integratie van verwerving van kennis, machtsuitbreidingen, hoogmoed, miswaarderingen en principaal-agenttheorie. Het analyseren van beursgenoteerde bedrijven biedt

echter ook nieuwe mogelijkheden voor empirische testen. Bijvoorbeeld, op basis van aankondigingsrendementen en het aftrekken van de (verandering in de) verdiscon-teerde waarde van groei opties van de marktwaarde, is het mogelijk om te meten hoe onzekerheden en optiewaarde zich ontwikkelt over het verloop van de seriële overnamestrategie.

In dit proefschrift, hebben wij aangetoond dat private equity investeerders via buy-and-build strategieën organische verbeteringen bewerkstelligen in de bedrijfsvo-ering. Toekomstig onderzoek zou de relatie tussen deze buy-and-build strategieën en de rendementen van private equity analyseren. Hierdoor kunnen we inzichten ver-schaffen over het belang van *multiple arbitrage* op basis van een reductie in onzeker-heid of een toename in groeimogelijkheden. Verdere aandacht kan worden geschonken aan het belang van opgekochte groei en organische groei voor rendementen in over-names.

Naast de implicaties voor private equity rendementen, is het mogelijk interes-sant om buy-and-build strategieën te vergelijken met meer traditionele private eq-uity investeringen. Indien competitie in de private equity markt inderdaad een dri-jfveer is achter de toename van buy-and-build strategieën, dan is het nog niet geheel duidelijk of buy-and-build strategieën altijd de dominante keus is. Het zou daarom bijvoorbeeld interessant zijn om te begrijpen hoe buy-and-build strategieën en tra-ditionele investeringen afhankelijk zijn van de karakteristieken van de private equity investeerder. Het is mogelijk dat buy-and-build strategieën vanwege hun complexiteit alleen voor enkele private equity investeerders een aantrekkelijke optie is.

Tot slot, in dit proefschrift laat ik zien dat private equity eigendomsstructuren gerelateerd zijn aan een toename in overnameverwachtingen en overname snelheid. Deze bevinding heeft mogelijk grotere implicaties, omdat private equity daardoor de intensiteit van overnamegolven kan beïnvloeden. De bevindingen tonen dus aan dat private equity mogelijk implicaties heeft voor de industriële organisatie.

About the Author

Dyaran Selwin Bansraj was born on 14 January 1991 in Losser, The Netherlands. He holds a Bachelor's degree in Economics and Business Economics and a Master degree (cum laude) in Financial Economics from Erasmus School of Economics, Erasmus University Rotterdam. While studying Financial Economics, he simultaneously completed a Master degree in Financial Law from Erasmus School of Law and took part in the ESE Research Traineeship program. Subsequently, he joined the Finance group at the Department of Business Economics of Erasmus School of Economics to pursue a PhD.

His main research interests lie at the intersection of corporate finance, private equity, mergers and acquisitions, and industrial organization. His research has been presented at multiple international conferences, among which the Real Options Conference (2017), Private Capital Conference (2018), FMA Europe (2018), PERC Symposium (2019), and at several other events, including invited brown bag seminars at top schools. In the Fall of 2018, he was a visiting scholar at Stockholm School of Economics.

Besides his research, Dyaran has devoted considerable time to education. He supervised bachelor and master theses, gave plenary sessions and tutorials in the graduate course Advanced Corporate Finance and Strategy, and was part of the Erasmus Data Service Centre that was awarded the ERIM Research School Service

Award in 2016. As part of the intensification and digitization goals of the Erasmus School of Economics, he took part in a project that developed a new online course and tutorials, and integrated these developments into an existing course. These efforts were awarded with the ESE Faculty Educational Award in 2019.

Currently, he continues his academic career as a Lecturer in Finance at Cass Business School, City, University of London.

Portfolio

Research papers in this dissertation

[1] How Does Private Equity Ownership Affect Acquisition Performance?

[2] Can Private Equity Funds Act as Strategic Buyers? Evidence from Buy-and-Build Strategies with Han T.J. Smit and Vadym Volosovych

[3] Anticipation of Real Options Value in Serial Acquisitions: Evidence from Private Equity with Han T.J. Smit

Conference presentations

2019	Private Equity Research Consortium Symposium (Chapel Hill), Finance, Risk and Accounting Perspectives Conference (Helsinki), Corporate Finance Day (Groningen), Annual Congress of the European Economic Association (Manchester), European Financial Management Association (Ponta Delgada), Global Finance Conference (Zagreb), Financial Management Association Europe (Dublin) Association Europe (Dublin), Private Capital Conference (Montreux)
2018	Portuguese Finance Network (Lisbon)
2017	Real Options Conference (Boston)

PhD courses

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Applied Microeconometrics I: Basic Techniques	3
Executive Compensation and other Managerial Incentives	3
Applied Microeconometrics II: Empirical Treatment Evaluation	3
Behavioural Decision Theory	5
Seminar Corporate Finance 1	5
Seminar Corporate Finance 2	5
Applied Econometrics	5
Empirical Corporate Finance	4
English	4
Scientific Integrity	1
Publishing Strategy	1
Corporate Governance	3
Panel Data Econometrics: Theory and Practice	3
Econometrics I	4
Statistical and Methodological Myths and Urban Legends	2

Teaching

[1] Advanced Corporate Finance & Strategy *2015 - 2020*
Teaching a plenary session on real options and serial acquisition strategies, developing and teaching of tutorial sessions, holding office hours, providing exam preparation, and grading exams. This course is part of the Financial Economics program of the MSc Economics and Business at Erasmus School of Economics.

[2] Advanced Valuation and Strategy - M&A, PE, and VC *2018 - 2020*
Project manager and co-developer of this massive open online course (MOOC). Responsibilities included daily coordinating the project, developing material, integrating the MOOC into a graduate course, and moderating.

[3] Bachelor and Master thesis *2016 - 2020*
Supervising bachelor (1) and master (24) students in writing their thesis.

[4] Erasmus Data Service Centre *2016 - 2017*
Supporting faculty and students in data collection through individual sessions and workshops.

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This dissertation analyzes a key development in the private equity market. Up to half of the current private equity deal market consists of follow-on acquisitions by private equity-owned portfolio companies. Yet, we know very little about how the private equity ownership structure matters for these acquisitions.

On the one hand we may expect that the private equity ownership model is better equipped to handle acquisitions, for example due to better aligned incentives. On the other hand, acquisitions in general are frequently associated with the inability to deliver the expected synergies and especially serial acquisitions have been related to agency problems. This dissertation therefore aims to answer several questions related to this topic. Which initial conditions motivate private equity firms to pursue serial acquisition strategies? Do private equity firms realize operating synergies through buy-and-build strategies? What role does private equity ownership play in the acquisition activities of their portfolio companies and which characteristics of the ownership structure may affect the post-acquisition performance?

Overall, the findings in this dissertation provide a positive view on private equity and show that private equity ownership is related to elevated acquisition activities and enhanced post-acquisition operating performance, which can partially be explained by the previously accumulated experience in acquisitions of the private equity firm.

The principles of private equity revolve around the core attributes of private equity ownership and the role of private equity firms as active deal makers. These principles may therefore explain why the new era of private equity is marked by follow-on acquisitions.

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