Norwegian School of Economics

Bergen, Spring 2018

Why Do Private Equity Firms Perform Buy-and-Builds?

An Empirical Analysis of Nordic Platform Companies

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Abstract

This thesis seeks to expand the knowledge of why private equity firms are performing buy-and-build as a strategy in the portfolio companies they invest in[†]. More specifically, we examine characteristics of buy-and-build strategies through in-depth analysis of Private Equity transactions across the Nordic region, and test whether Private Equity firms conduct this strategy in order to 1) increase market power, 2) exploit multiple arbitrage, 3) achieve operating synergies, or 4) reduce financing costs. Currently, relevant research on the topic is lacking, which may be explained by the strategy being relatively new in the Private Equity market. The findings of this thesis will be helpful in understanding how buy-and-build strategies affect portfolio companies, and what Private Equity firms aim at achieving when investing in a portfolio company.

The underlying data consists of 176 platform companies and 775 add-on acquisitions. The control group consists of 1,667 companies owned by Private Equity firms that have made zero acquisitions during their holding period. The findings showed that portfolio companies with a large size relative to other portfolio companies, were more likely to be utilized in buy-and-build strategy. Further, the analyses showed no evidence that Private Equity firms perform buy-and-builds in order to exploit multiple arbitrage, nor to consolidate a market. In direct contrast with the hypothesis, the analyses showed that buy-and-builds increase their financing costs during the holding period, thus indicating that the hypothesis of reduced financing costs is untrue. Lastly, the findings suggest that buy-and-builds reduce their relative cost-level during the holding period, which supports the hypothesis of operational synergies as a motivation for applying this strategy.

Keywords: Private Equity, Buy-and-Builds, Inorganic Growth, Nordics

[†]This thesis has taken form in great collaboration with supervisor Associate Professor Carsten Bienz, to whom we owe a large thank you. His initiation on this thesis' focus topic and considerable support throughout the process is highly appreciated. We were given the opportunity to explore a topic of which we had great interest, but limited knowledge, which was academically challenging and exciting to work on.

Preface

This thesis concludes our Master of Science in Finance at the Norwegian School of Economics, Department of Finance.

With a background in finance studies, we wanted to expand our knowledge on Private Equity and the use of buy-and-build strategies. Hence, an empirical analysis on why Private Equity firms perform buy-and-builds suited us well. With help from our supervisor, Associate Professor Carsten Bienz, we identified and tested several hypotheses explaining why Private Equity firms perform buy-and-builds through econometric methodology.

The work on this thesis has been both challenging and frustrating at times, yet highly educational and exiting. Throughout the work we have focused on learning and gaining knowledge on the topic of Private Equity. We have gathered a great amount of data for our research study which we hope can be included in the Argentum Center for Private Equity database. Executing the study has required a great deal of experience in Stata, Excel and MATLAB, all in which we have improved our previous skills.

We would like to express our sincere gratitude to our supervisor Associate Professor Carsten Bienz for valuable discussions and constructive feedback. Your willingness to review and engage in our work has been an important contribution to the final result, and your input has been highly valued.

Oslo, 2018-19-06

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Abbreviations

ACPE	=	Argentum Center for Private Equity
Add-ons	=	Add-on acquisitions
BB	=	Buy-and-build
BVCA	=	British Private Equity and Venture Capital Association
EBITDA	=	Earnings before interest, taxes, depreciation and amortization
HHI	=	Herfindahl - Hirschman Index
HP	=	Holding period
IAS	=	International Accounting Standard
IRR	=	Increased rate of return
PE	=	Private Equity
PIMS	=	Profit Impact of Market Strategies
PIPE	=	Private investment in public equity
PSM	=	Propensity Score Matching
ROI	=	Return on investment
SG&A	=	Sales, general and administrative expenses
SME	=	Small- and medium enterprises
WRDS	=	Wharton Research Data Services

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Chapter 1

Introduction

In recent years, buy-and-build has grown to become one of the most frequently employed strategies by PE fund managers (Hammer et al., 2016). The strategy aims at growing a portfolio company by performing acquisitions and integrating these with the initial portfolio company, henceforth called a platform company[1] (MacDougall, 2017). The strategy's new-found popularity gives rise to the question: Why do Private Equity firms perform buy-and-build strategies?

Current research on inorganic growth strategies in PE show evidence that platform companies executing add-on acquisitions outperform comparable portfolio companies in terms of higher returns; results that have been identified by Wright and Nikoskelainen (2007), Valkama et al. (2013) and Hammer et al. (2016). However, previous studies have mainly focused on specific PE markets such as the UK or U.S., or the entire global market. Therefore, we lack insight into buy-and-build activity across the Nordic region[2], which may differ greatly from other countries due to cultural, political and economic differences (Spliid, 2013). As the Nordic region has become increasingly attractive for PE firms to invest in (BVCA, 2016), researching PE firms' motivation for deploying this strategy will broaden our insight in the current Nordic PE market, and may serve as a foundation for further research on the region.

The buy-and-build phenomenon in the Nordics is yet to be explored in current research studies,

[1] Hereafter, the portfolio company subject to a buy-and-build strategy will exclusively be denoted as the platform company.

[2] Limited to the countries Denmark, Finland, Norway and Sweden, for the purpose of this thesis.

and the results of and motivations behind this strategy are unknown in current literature. To uncover the characteristics of Nordic platform companies, the first part of the analysis focus on investigating *how* platform companies chosen for a buy-and-build strategy differ from other portfolio companies subject to traditional value creation levers[3]. This provides an understanding of the characteristics shared across platform companies in the Nordic region and form a foundation for further analyzing the research question.

Following this, we wished to gain insight into *why* PE firms perform buy-and-build strategies. We formulated four hypotheses to answer this research question, and the first hypothesis explored, is: *PE firms perform buy-and-builds in order to grow the platform company and achieve multiple arbitrage exploitation*. As platform companies are likely to increase in size when executing add-ons, multiple arbitrage exploitation may explain why PE firms are conducting buy-and-builds. Multiple arbitrage exploitation is the market anomaly where investors are willing to pay a premium for the associated safety of a larger firm (Dijk, 2011), and is a firm-specific effect.

Further, the effect of a buy-and-build may additionally cause changes to the level of competition in an industry, and is an industry-specific effect. If a portfolio company acquires competitors and increases its market power, this may affect the industry's level of competition and the portfolio company's performance. Therefore, the second hypothesis is; *PE firms perform buy-and-builds to consolidate the market and increase its market power*. According to Fraunhoffer et al. (2013), market consolidation is associated with reduced competition and increased purchasing and pricing power. This may positively influence the value of a company, and may be an objective for PE firms when conducting buy-and-builds.

There are additionally two firm-specific effects that could explain why PE firms perform buy-and-builds; operational and financial synergies. Operational synergies arise when companies merge and achieve increased efficiency in production, and/or administration (Chatterjee, 1986). Therefore, platform companies that perform add-on acquisitions are expected to gain operational synergies that increase the valuation of the combined entity. Thus, the third hypothesis is: *PE firms perform buy-and-builds to obtain operational synergies that increase the portfolio*

[3]Traditional value creation levers are commonly referred to as leverage reduction (Axelson et al., 2013), operational improvements (Guo et al., 2011) and improved governance (Cumming et al., 2007).

companies' valuation upon exit.

Lastly, financial synergies are synergies that causes reductions in the cost of capital, as a result of a merger (Chatterjee, 1986). These reductions can be obtained if risk of bankruptcy decreases with the merger, a result shown by Hamza et al. (2016). Buy-and-builds are projected to benefit from financial synergies by performing add-on acquisitions. Therefore, the final hypothesis is: *PE firms perform buy-and-builds to reduce the financing cost of the portfolio company, which increases the company's valuation upon exit.*

To investigate why PE firms perform buy-and-builds, we compiled a novel data set[4] of 403 portfolio companies with an initial majority investment by the PE firm between the years of 1993 and 2016, located in Denmark, Finland, Norway and Sweden[5]. By manually evaluating each portfolio company's transaction activity, we found that 176 of these companies had performed at least one add-on acquisition during the holding period, and were thus classified as platform companies[6] subject to the buy-and-build strategy. By deploying a data set from ACPE containing Nordic portfolio companies, we obtained a control group of 1,667 portfolio companies subject to any PE strategy other than buy-and-build, located within the Nordics and with PE entry between 1993 and 2016. The sample and control group were adjusted through propensity score matching for all regressions exploring the hypotheses, to reduce the selection bias introduced by the selection process of PE firms.

Utilizing this data, the first part of the analysis evaluates the difference in characteristics between platform companies and the control group. By deploying a probit regression with the likelihood of a transaction being buy-and-build as the dependent variable, the results indicate that PE firms choose larger portfolio companies with higher EBITDA in relatively consolidated markets for buy-and-build strategies. However, when controlling for all variables, only size of the portfolio company seemed to have a significant effect on the decision to execute a buy-and-build strategy. Hence, the analysis showed evidence that the size of portfolio companies is the only significant factor when the PE firm chooses platform companies.

The second part of the analysis aims at evaluating the four different hypotheses on why PE firms

[4]Data extracted from Bureau van Dijk's databases Orbis and Zephyr.

[5]As the Private Equity activity in Iceland is negligible, we will only consider portfolio companies located in Norway, Sweden, Denmark or Finland.

[6]In this thesis.

perform buy-and-builds. The analysis of the first hypothesis, that *PE firms perform buy-and-builds in order to grow the platform company and achieve multiple arbitrage exploitation*, gave inconclusive results. The analysis indicated that the number of add-on acquisitions performed *decreased* the change in size of the portfolio company, and the duration of the holding period was shown to cause a positive change in size. However, the buy-and-build variable was negative and insignificant, and the results provide no validity to the hypothesis that PE firms perform buy-and-builds to obtain multiple arbitrage exploitation.

The analysis of the second hypothesis, *PE firms perform buy-and-builds to consolidate the market and increase its market power*, indicates a positive relationship between the change in the industry's level of competition and buy-and-build transactions. However, the buy-and-build variable is insignificant, and the analysis show no indication that the hypothesis investigated is neither correct nor incorrect.

The analysis of the third hypothesis, *PE firms perform buy-and-builds to obtain operational synergies*, showed evidence of a negative and significant relationship between the change in the relative cost level and the buy-and-build variable. This indicates that buy-and-builds experience a larger reduction in the relative cost level compared to other portfolio companies. Further, holding period was shown to have a positive influence on the dependent variable, suggesting that longer holding periods are associated with an increase in the relative cost level. Although this result was in contrast with our expectations, the analysis in total suggests that PE firms perform buy-and-builds to obtain operational synergies.

Lastly, the fourth hypothesis that *PE firms perform buy-and-builds to reduce the financing cost of the portfolio company*, suggest a positive and significant relationship between the change in financing costs and buy-and-build transactions. This indicates that the financing costs of a buy-and-build *increases* during the holding period, compared to other portfolio companies. Additionally, a positive and significant effect was shown between the dependent variable and the change in size of the portfolio company. The result suggest that portfolio companies *increase* their financing cost when their size increase. To conclude, the results are diametrically different from the hypothesis, thus providing evidence for the invalidity of the hypothesis.

In total, the analyses indicated that hypothesis 3 may be valid, hypothesis 4 is likely incorrect,

and no statistical evidence showed that hypotheses 1 and 2 are neither correct nor incorrect. However, there are several limitations to the data deployed and analyses performed that may cause these conclusions to be erroneous[7].

By analyzing the characteristics of buy-and-builds across the Nordic region, this thesis contributes to existing research as the literature on the strategy in this region is currently absent. The analyses of the four hypotheses explaining the potential motives of PE firms when performing buy-and-builds, provide insights into what characteristics PE firms look for when investing in platform companies and outline how PE firms create value through this strategy.

The remaining parts of the thesis is structured as follows. The next chapter will present the four different hypotheses, explain economic theories supporting the hypotheses, and include brief explanations as to how the hypotheses will be tested. Chapter 3 will present related literature on the Nordic PE market and inorganic growth strategies, and explain what a buy-and-build strategy is. Chapter 4 will describe the focus data and the comparison group, and Chapter 5 contains an empirical analyses of the characteristics of buy-and-build transactions, and why PE funds perform buy-and-builds. Chapter 6 will reflect the work and its limitations, whilst Chapter 7 will provide a conclusion along with suggestions for further research.

[7] Any limitations to the data set can be found in Chapter 6, and analysis-specific limitations are provided in the discussion of each analysis' results.

Chapter 2

Hypotheses

The motivation for this thesis is to explain why PE firms choose to execute buy-and-build strategies. The motivations for buy-and-build outlined in the table below provide us with an overview of the hypotheses that will be tested statistically in this thesis. Throughout this section, we will explain the hypotheses in detail and provide an underlying economic rationale, as well as provide a short introduction to how the hypotheses will be tested statistically.

Hypothesis		*Explanation*
i.	Multiple Arbitrage Exploitation	Buy-and-builds grow *more* than other portfolio companies.
ii.	Market Consolidation	Buy-and-builds affect the level of competition within an industry *more* than other portfolio companies.
iii.	Operational Synergies	Buy-and-builds reduce their relative cost level *more* than other portfolio companies.
iv.	Financial Synergies	The financing costs of buy-and-builds decrease *more* than that of other portfolio companies.

2.1 Multiple Arbitrage Exploitation

The first hypothesis we seek to test, is that PE firms perform buy-and-builds in order to achieve multiple arbitrage exploitation. Multiple arbitrage exploitation, also referred to as a size pre-

mium, suggest that investors are willing to pay a price premium for the associated safety of a larger company (Dijk, 2011). This upward market adjustment of the value multiples of a company is caused purely by the nature of its size and cannot be attributed to any other firm-specific factors.

Following previous studies, this thesis seeks to investigate if there is any difference in the change in size during the PE holding period between platform companies and other portfolio companies. The hypothesis is that PE firms perform buy-and-build because this strategy grows the portfolio company *more* than other strategies, largely due to the assumed contribution of growth in size by add-on acquisitions. The common measure for size in relation with multiple arbitrage exploitation, is the EV/EBITDA multiple. However, as these measures are lacking in most of the observations, operating revenue will be used as a proxy for size. By deploying multiple regression, we can test this hypothesis by regressing change in size during the holding period on the number of add-on acquisitions performed. By controlling for a binary variable equal to one if a portfolio company is a buy-and-build, we determine if there are any other effects of the buy-and-build strategy on the change in size of the portfolio company, besides add-on acquisitions. If PE firms perform buy-and-builds in order to obtain multiple arbitrage exploitation, both variables should be positive and significant, indicating that buy-and-builds grow *more* than other portfolio companies, and that each add-on acquisition performed contributes positively to the change in size during the holding period.

2.2 Market Consolidation

The second hypothesis is that PE firms perform buy-and-builds in order to consolidate an industry. Consolidation of an industry is caused by a reduction in the number of competing firms, and/or increased market power[1] of one or more companies (Bhattacharyya and Nain, 2011). Previous studies have found that consolidation is associated with reduced competition and increased purchasing and pricing power, which may positively influence the valuation of a company (Fraunhoffer et al., 2013). Further, it is easier to consolidate a market with a higher

[1] Also referred to as market share throughout the literature.

level of competition, due to both regulatory and operational constraints of merging larger companies with substantial market shares in concentrated markets (Legal Director of the Norwegian Competition Authority, 2015).

Following the previous studies outlined, this thesis aims at researching if PE firms' motivation behind executing buy-and-build strategies is to consolidate the industry that the portfolio company operates within, as consolidated industries tend to generate higher returns than fragmented industries. The hypothesis to be investigated, is that buy-and-builds consolidate its industry by acquiring its competitors, thus increasing its market share and reduce the level of competitors. By deploying multiple regression, we regress the change in the level of competition within the industry[2] during the holding period, on the change in the portfolio companies' market shares. If the hypothesis is correct, the analysis should show a positive relationship between the dependent variable and the independent variable. By controlling for the binary variable buy-and-build, any differences between platform companies and other portfolio companies will be revealed. A positive relationship is expected between change in HHI and buy-and-build transactions, and by including a variable for the number of add-on acquisitions, we can separate the effects stemming from a portfolio company being buy-and-build, and those effects caused by the number of add-on acquisitions performed. Any positive effect of the binary variable will thus show that the buy-and-build causes consolidation of the industry to a larger extent than other portfolio companies.

2.3 Synergies

The last two hypotheses concern synergies that arise when merging companies[3]. When two firms are combined into one entity, synergy is the difference in value between the combined entity and the combined value of the two individual firms prior to the merger. Synergies are commonly referred to as the motivation behind mergers and acquisitions, and according to Chatterjee (1986), synergies can be divided into operational, financial and collusive synergies.

[2]Measured by HHI (Herfindahl-Hirschman Index), which is a widely used index that measures the level of competition within an industry based on the number of competing firms and their respective market shares.

[3]Mergers and acquisitions will be viewed as having the same effects in regards to synergies.

This thesis will focus solely on operational and financial synergies.

2.3.1 Operational Synergies

Operational synergies are synergies that arise when companies merge and achieve increased efficiency in production, and/or administration (Chatterjee, 1986). Through external growth, operational synergies can be both revenue- and cost-based (Loukianova et al., 2017). This thesis only reviews cost-based synergies, which refers to the opportunity of the combined company to reduce costs more than the individual companies would manage separately. Through improvements such as elimination of redundant activities, inefficient management practices (Jensen and Ruback, 1983), increased purchasing volumes and better utilization of resources, synergies can be obtained in a merger (Nowak and Nyman, 2007).

With previous studies as basis, this thesis seeks to investigate the hypothesis that PE firms perform buy-and-builds in order to achieve operational synergies, and more specifically cost-based synergies. By deploying multiple regression, this hypothesis will be tested by regressing the portfolio companies' change in relative cost level during the holding period on the binary variable of buy-and-build transactions. As the hypothesis expects buy-and-builds to generate *more* cost synergies than other portfolio companies, the relationship between the dependent variable and the buy-and-build binary variable is expected to be negative[4]. By including add-ons as an explanatory variable, we can review if acquiring more companies reap additional synergies beyond being a buy-and-build. If such a relationship is uncovered, it would support the hypothesis that PE firms perform buy-and-builds to achieve operational synergies.

2.3.2 Financial Synergies

The final hypothesis examined is that PE firms perform buy-and-builds in order to obtain financial synergies. Financial synergies are reductions in the cost of capital[5], as a result of a merger

[4]Other factors such as the duration of the holding period will be controlled for, as the realization of synergies is a timely process, as outlined above.

[5]For the scope of this thesis, we will only analyze changes to the cost of debt.

between two or more companies (Chatterjee, 1986).

Following the discussion above, this thesis aims at investigating the hypothesis that PE firms perform buy-and-builds in order to reduce the portfolio companies' cost of debt. The rationale behind this hypothesis is that PE firms may achieve higher valuations for companies where they have succeeded in reducing the cost of debt, as this is associated with a higher future cash flow, and a consequently higher value of the company. To test this hypothesis, we regress the change in cost of debt during the PE holding period on the binary variable denoting a buy-and-build transaction when equal to one. The cost of debt is approximated by calculating the interest-to-debt ratio of the platform company, which is used as the dependent variable. A negative relationship between the dependent and independent variable would show that platform companies experience a *decrease* in the financing cost, which is larger than that of other portfolio companies. Additionally, we regress the dependent variable on the change in size of the portfolio companies, as literature on the topic indicates that larger companies are commonly viewed as more stable and less likely to liquidate, resulting in a lower cost of debt in many cases (Hamza et al., 2016). If we observe a negative relationship between the buy-and-build transaction and the cost of debt, this would support the hypothesis that PE firms perform buy-and-builds in order to reduce the cost of debt.

Chapter 3

Related Literature On Private Equity

In this section, we elaborate on the existing literature on private equity, buy-and-build strategies and other related literature to help form an understanding of current knowledge as grounds for the research question. As the buy-and-build strategy is relatively new, the literature available on the subject is limited.

3.1 Private Equity

According to BVCA (2016)[1], a private equity investment is medium to long-term financing provided to a portfolio company in return for an equity stake. When referring to private equity, one usually refers to venture capital or buyouts. Kaplan and Strömberg (2009) refer to venture capital as the activity of investing in young enterprises, where the entrepreneur usually maintains majority control of the company. Buyouts refer to investments in more mature firms, where the private equity firm normally acquires majority control of the company.

Existing academic literature on private equity explores its key sources to value creation. Both fund-level and firm-level data on U.S. companies from the '90s and early 2000s have frequently been used to expand the knowledge on private equity. Existing academic studies have shown a positive impact of private equity, on several aspects of the individual portfolio company's per-

[1] British Private Equity & Venture Capital Association

formance. Kaplan (1989), Muscarella and Vetsuypens (1990), Lichtenberg and Siegel (1990), Guo et al. (2011) and Wilson et al. (2012) are some of the research studies that provide evidence for improvement in profitability and productivity in PE-backed companies.

By analyzing several profitability ratios, in example return on assets, Wilson et al. (2012) found evidence that portfolio companies backed by PE funds achieved superior financial performance relative to their peer companies both before and during the economic recession in 2008. The mentioned study concluded that being owned by a PE firm has showed to boost company performance, even when exposed to significantly negative market conditions.

However, there is a challenge related to the lack of available data when researching private equity. PE investments have historically been largely exempt from public disclosure requirements (Kaplan and Schoar, 2005), which has resulted in most studies focusing on larger economies, such as the U.S. This leaves us short of profound research on smaller private equity markets, like the Nordic, which is a less mature PE market than the U.S. (Spliid, 2013).

3.1.1 The Nordic Private Equity Market

According to BVCA (2016), the Nordic PE market is one of the most successful and active in Europe, which has made the region attractive for PE-investments. Since the beginning of the industry in the '90s, Nordic PE funds have raised increasingly large amounts of capital, both from foreign and regional investors (Spliid, 2013). Spliid (2013) found that the Nordic countries, defined here as Denmark, Finland, Norway and Sweden, share many similarities, like a highly educated workforce and a high-tax regime. The Nordic countries are relatively similar with respect to government and institutions, hence it is reasonable to review the region as one PE market. Further, Spliid (2013) discussed that regional PE-funds invest in companies across the region, and showed that investors view cross-border investments within the region as *less* risky than investing in countries outside the region.

3.2 Inorganic Growth

Studies on inorganic growth strategies provided by Wright and Nikoskelainen (2007), Valkama et al. (2013) and Hammer et al. (2016), show consistently that portfolio companies that execute add-on acquisitions outperform other portfolio companies, in terms of higher IRR. Acharya et al. (2013) additionally show evidence of out-performance in transactions with consecutive add-on acquisitions in terms of margins. These studies provide thorough evidence that inorganic growth strategies are attractive to enhance performance in the portfolio company and create value for the private equity firm. However, these studies look at the global PE market and conclusions reached may not apply to smaller, less developed PE markets. Thus, we want to bridge this gap by looking into the Nordic PE-market.

3.2.1 Buy-and-Build

A buy-and-build strategy is a PE firm's alternative to organic growth, in which PE fund managers actively develop a growing platform company through acquisitions (MacDougall, 2017). The PE firm conducts an initial buyout of a portfolio company, before executing one or more add-on acquisitions. Within the five years of a typical holding period, the PE firm conducts the buyout, completes one or more add-on acquisitions, integrates those acquisitions into the platform company and exits its position (Caselli, 2010).

Traditionally, de-leveraging of highly indebted portfolio companies and operational enhancements have been popular PE strategies to deliver returns to investors. However, research conducted by Kaplan (1997) and Axelson et al. (2013) suggest that these value creation levers are under growing pressure, and that other strategies is increasingly deployed. A paper by Hammer et al. (2016) suggests that buy-and-build has become an important strategy in the PE industry. They investigate buy-and-build strategies performed by 788 platform companies and identify empirical evidence on common features of the strategy. They discovered that it is a common practice to focus on quantity rather than complexity when executing add-ons and that this is due to the limited time span of a PE investment. However, we lack an understanding of *how* this strategy affects the portfolio companies and why PE fund managers are more frequently turning

to this strategy.

3.3 Related Literature on the Hypotheses

There are several ways in which a buy-and-build strategy can create value for the PE firm. In the following, we will review related literature on the four hypotheses that we believe can be the motivation behind PE firms' investments in platform companies.

3.3.1 Multiple Arbitrage Exploitation

Multiple arbitrage exploitation, also referred to as a size premium, suggest that investors are willing to pay a premium for the associated safety of a larger company (Dijk, 2011). This upward market adjustment of the value multiples of a company is caused purely by the nature of its size and cannot be attributed to other factors within the company. Over the course of the last 50 years, efforts have been put forth to explain the size anomaly effect on returns in the stock market. Early studies on the firm size effect by Banz (1981) and Reinganum (1982) provide statistical evidence for smaller companies achieving higher average returns than larger firms, even when adjusting for risk in the CAPM[2]. In contrast, Merton (1973) and Fama and French (1992) have showed that historically, small- and mid-cap companies have faced greater risks than large-cap businesses, a risk investors have been rewarded for through higher returns. Ibbotson (2005) found significant evidence of this relationship when measuring the small stock premium using data dated back to 1926. Other studies with shorter time periods of examination have concluded with similar results, such as Gabrowksi and King (1995). However, in the last 30 years since these original papers discovered the size effect, this anomaly has diminished (Schwert, 2002). The firm size effect is often referred to as an anomaly because there is no theoretical reason why firm size should have any explanatory power in differences in asset returns, when controlling for risks (Chan, 1985). Further, Fink (2014) found that multiple arbitrage can be obtained through add-on acquisitions.

[2]Capital Asset Pricing Model.

3.3.2 Market Consolidation

Consolidation of an industry is caused by a reduction in the number of competing firms, and/or increased market share of one or more companies (Bhattacharyya and Nain, 2011). Previous studies have found that consolidation is associated with reduced competition and increased purchasing and pricing power, which may positively influence the valuation of a company (Fraunhoffer et al., 2013). Dating back to the early '70s, studies on PIMS[3], lead by The Marketing Science Institute (1972) and Buzzell et al. (1975), have tried to explain a causal relationship between profit performance and market share. One conclusion, recognized also by Peltzman (1977), was that market structures such as the number and relative size of competitors will affect the profit level of companies. The studies conclude with a positive relationship between ROI[4] and market share. *Why* an increased market share leads to an increased ROI however, is widely discussed. Schoeffler et al. (1974), supported by Buzzell et al. (1975), suggests that economies of scale, such as above-average rate of investment turnover and a lower ratio of marketing expense to sales, market power and quality of management are the main drivers of increased profitability resulting from increased market share. Market power, which is a firm's ability to negotiate vertically in the value chain (Khemani and Shapiro, 2002), is recognized to *increase* as a result of increased market share (Bykowsky et al., 2018).

3.3.3 Synergies

Operational Synergies

Operational synergies are synergies that arise when companies merge and achieve increased efficiency in production, and/or administration (Chatterjee, 1986), and Devos et al. (2009) estimated that operating synergies accounted for 8.38 percent of the gains in mergers. Through external growth, operational synergies can be both revenue- and cost-based (Loukianova et al., 2017). Revenue-based synergies enables the firm to generate higher sales than the two com-

[3]Profit Impact of Market Strategies.
[4]Return on Investment.

panies would manage separately and can be caused by access to new markets, quickly gained expertise and enhanced innovation capability, among others. Cost-based synergies, on the other hand, refers to the opportunity of the combined company to reduce costs more than the individual companies would manage separately, through improvements such as elimination of redundant activities and inefficient management practices (Jensen and Ruback, 1983), increased purchasing volumes and better utilization of resources (Nowak and Nyman, 2007). These operational synergies all require different implementation times, as some, such as merging production units and eliminating company department duplicates, will require a profound and thorough integration process.

Financial Synergies

Financial synergies are synergies that cause reductions in the cost of capital[5], as a result of a merger between two or more companies (Chatterjee, 1986). Financial synergies are argued by Lewellen (1971) to positively influence the value of a merger, whilst Leland (2007) argue that financial synergies may also deter value in a merger. The studies argue that financial synergies may arise when imperfectly correlated cash flows of two firms are combined into one entity. The researchers suggest that growth through merger reduces risk of bankruptcy, as well as increasing the tolerance for leverage, which is commonly increased when PE firms invest in a portfolio company. As large companies are commonly viewed as more stable and less likely to liquidate, this may translate into a lower cost of debt when portfolio companies grow (Hamza et al., 2016). A lower cost of debt will reduce the company's weighted average cost of capital, and may increase the value of the company, especially if the company is highly leveraged. According to Lubatkin (1983), the acquirer in an acquisition reaps the financial benefits, indicating that a platform company performing add-on acquisitions will achieve financial benefits.

[5]For the scope of this thesis, we will only analyze changes to the cost of debt.

Chapter 4

Description of Data

This section will describe the data deployed, in three parts. Firstly, a description of the treatment group, the platform companies and their subsequent add-on acquisitions, is presented. The next part will describe the control group, and the third part will compare the characteristics of the treatment group with that of the control group.

To perform the analyses, two main data sets are constructed. The first data set contains all Nordic buy-and-build platform companies and the add-on acquisitions they have performed, with information on geographical location, financial measures and the PE firm owning the company, in addition to other relevant information. The second data set is provided by ACPE and contains all their registered Nordic portfolio companies, excluding those classified as buy-and-build platform companies and those that are recorded with PE entry prior to 1993. This data set includes equivalent information as the former, and constitutes the control group.

4.1 Buy-and-Build in the Nordics

4.1.1 Platform Companies

Selecting Platform Companies

Initially, we extracted a list from Bureau van Dijk's database 'Orbis', containing all Nordic companies that currently are or have previously been linked to a PE firm after 1993. Subsidiary companies of the portfolio companies were excluded in order to avoid duplicates in our data. Further, we selected only companies that had any record of M&A activity. Consequently, only portfolio companies that had completed an acquisition, merger or any other private equity transaction were included. This left a list of 403 portfolio companies, all located in either Denmark, Finland, Norway or Sweden.

Thereafter, all portfolio companies that did not execute any add-on acquisitions were removed. It is important to note that all PIPE[1] investments were discarded, meaning that any company that is owned partially by a PE company while being a public company, have been excluded from the sample selection. This delimitation was made due to the definition of private equity as private ownership in private companies. Additionally, it is important to note that portfolio companies that are or have been owned by a PE firm whilst making acquisitions, have been considered as a platform company even if they concurrently have been making divestments of their business.

After evaluating each of the 403 companies individually, we obtained a list of 176 entries of portfolio companies that had made acquisitions during PE ownership, hence classified as platform companies in this thesis. Some platform companies have performed add-on acquisitions under the ownership of different PE firms at different points in time, which causes them to have multiple entries in our list. When controlling for duplicates, our list contains 163 unique platform companies[2]. The list of platform companies contains information on which country the company is located in, which industry it primarily operates within, which PE firm held, or cur-

[1] Private Investment in Public Equity.
[2] Duplicates are included in the analyses and treated as if separate platform companies.

rently holds, ownership in the company and in what time period, as well as financial information about the platform company at PE entry and exit.

Descriptive Statistics

In table 4.1, descriptive statistics on the platform companies are reported. In our sample, Sweden is the country where most platform companies are located, which is consistent with theory suggesting that Sweden is the most mature PE market within the Nordics (Næss-Schmidt et al., 2017). Operational revenue is used as a proxy for size throughout the thesis, and we note that the median operating revenue differs among the countries, with Danish companies having a substantially larger median its peers. Further, we observe that the mean duration of holding period is low and varies from just above one year, to just above two years. The reason why the holding periods appearing in the sample differs from that of globally reported holding periods (Preqin, 2014), is that all platform companies where the PE firm has not yet exited, are registered with a holding period equal to zero. This distorts the mean, and the metric does therefore provide no insight into the real holding period of an average company[3].

Surprisingly, the average change in operational revenue from entry to exit is negative for all countries except Sweden, indicating that platform companies in Denmark, Finland and Norway *decreases* in size from PE entry to exit. The next line depicts the percentage of platform companies located within a country that is owned by a PE firm located in any other country than itself. Denmark and Sweden have a relatively large percentage of foreign ownership, indicating that these companies attracts foreign investors to a larger extent than the other countries. Lastly, we observe variation among the industries in which platform companies most frequently operate, with *manufacturing* being the most frequent in Denmark and Finland, and *information and communication* and *wholesale and retail trade* being the most frequent in Norway and Sweden, respectively.

With regards to the 775 add-on acquisitions performed by the platform companies, we observe that the median number of acquired companies is two for all countries except Denmark, as well

[3]In comparison, if the mean is calculated only for platform companies with a holding period larger than zero, the mean duration of the holding period would be equal to 5 years for the sample in total.

as for the sample in total. Danish platform companies perform the highest percentage of cross-border acquisitions, and Finnish platform companies perform less cross-border acquisitions than any other country. Further, 55 percent of the total add-on deals is domestic, meaning that the add-on acquisition is situated in the same country as the platform company. Finland is clearly the Nordic country performing the most domestic transactions, with 83 percent of all add-on transactions being domestic. Sweden and Norway have a more balanced ratio between domestic and cross-border acquisitions, and Denmark perform by far the largest share of cross-border transactions. Finally, we observe that it is common to acquire companies that belong to the same primary industry as the platform company.

In total, the table presents a variety in activity level and deal characteristics between the Nordic countries. However, when viewed upon as one market, the platform companies have a median size[4] of approximately 20 million euros, are normally owned for two years by a PE firm and performs two add-on acquisitions, one domestic and one cross-boarder.

Table 4.1: Descriptive statistics of platform companies and their add-on acquisitions

	Denmark	Finland	Norway	Sweden	Total
Portfolio companies					
Number of portfolio companies	25	39	33	79	176
In %	14%	22%	19%	45%	100%
Median operational revenue at entry	61,984.87	28,201.00	21,345.42	19,951.15	19,951.15
Mean duration of holding period	1.36	2.05	2.03	2.09	1.97
Mean change in operational revenue during holding period	-26,639.76	-27,569.06	-12.868.62	51,837.19	10,961.85
% owned by foreign PE firms	56%	28%	39%	47%	43%
Most frequent industry for platform companies	Manufacturing	Manufacturing	Information and communication	Wholesale and retail trade	Manufacturing
Add-on acquisitions					
Median number of add-on acquisitions	1	2	2	2	2
% cross-border acquisitions	72%	17%	58%	50%	45%
% of within-industry acquisitions	60.46%	78.71%	50.93%	74.14%	70.58%

[4]Measured by operating revenue.

4.1.2 Comparison Group

The comparison group[5] is a collection of companies that have been or are currently owned by a PE firm, but does not classify as buy-and-build. This sample consists of portfolio companies following all other PE strategies than buy-and-build.

Selecting Comparison Group

To obtain a comparison group, we used a database provided by the ACPE. We removed all portfolio companies that have performed add-on acquisitions or were located outside the region of interest, and retained a list of 3,891 Nordic portfolio companies. Then, all portfolio companies with no recorded investment date were removed, in addition to those with PE entry prior to the year of 1993. Further, all companies without a registered country code where discarded, resulting in a database with 1,667 portfolio companies that have been or are currently owned by a PE firm, and have not been used as buy-and-build platforms.

Next, we used WRDS to download entries of accounting data on the platform companies. By matching[6] the organization numbers from the ACPE database and the information retrieved from WRDS, measures such as operating revenue and EBITDA from the last year prior to PE entry and for the accounting year of PE exit, were obtained.

Descriptive Statistics

Table 4.2 provides an overview of the comparison group in the sample, according to location of the portfolio company. Sweden has a high number of the portfolio companies in the sample, but Norway is the most represented country for portfolio companies in our sample. Further, the average holding period is approximately one year, with some variation between the countries. Additionally, more than half of all Norwegian portfolio companies are owned by PE firms located in other countries than Norway, a measure that is in contrast with the observed metric

[5]Control group.

[6]The matching was carried out manually, and with the help of tools such as Excel and MATLAB.

for Finland. Noteworthy is also the large difference in portfolio company size across the Nordic countries. This is explained by the availability of data[7]. The table also provides information on which industries that are most frequent in the sample, which is *manufacturing* for both Norway and Denmark. For the sample in total, *professional, scientific and technical activities* is the most frequent industry.

As with the platform companies, there are varieties between the characteristics of the portfolio companies within the Nordic region. When considered as one market, we note that the average portfolio company has a size[8] of about 1.7 million euros and is held by a PE firm for approximately one year.

Table 4.2: Descriptive statistics of the comparison group.
The sample of 1,667 portfolio companies contains 279 realized investments. The calculations in this table is based on a holding period equal to zero if the PE firm has not exited the portfolio company. If we remove the 1,388 unrecorded holding periods and analyze the holding period on the remaining 17 percent data, we obtain an average holding period of five years and five months.

Comparison group	Denmark	Finland	Norway	Sweden	Total
Number of portfolio companies	172	206	765	524	1,667
In %	10.32%	12.36%	45.89%	31.43%	100.00%
Mean operational revenue at entry	0	2,378.12	1,862.26	1,878.14	1,738.85
Mean change in operational revenue during holding period	0	3,050.70	564.83	1,279.74	1,038.47
Mean duration of holding period	1.05	1.89	0.40	1.20	0.90
% owned by foreign PE firms	33.72%	13.59%	51.76%	38.17%	40.91%
Most frequent industry for portfolio companies	Manufacturing	Information and communication	Manufacturing	Professional, scientific and technical activities	Professional, scientific and technical activities

4.2 Buy-and-Builds Compared to Other PE Strategies

Table 4.3, 4.4 and 4.5 provide descriptive statistics of the treatment group and the comparison group.

[7] More on this in Chapter 6.
[8] Measured by operating revenue.

Table 4.3 shows that buy-and-builds are, on average, owned for a longer holding period than the other portfolio companies. A potential reason could be that the integration process of add-on acquisitions is time-consuming compared to other operational or financial improvements made by PE. With respect to the sample investigated, it is however more likely that the deviation is caused by the large amount of holding periods equal to zero in the comparison group.

Table 4.3: Holding period in platform companies and comparison group.

Holding period	*Observations*	*Mean value*	*Median value*
Buy-and-builds	*176*	1.97	0
	(59)	*(6)*	*(6)*
Comparison group	*1,667*	0.90	0
	(279)	*(5)*	*(5)*
Total sample	*1,843*	1.00	0
	(338)	*(5.37)*	*(5)*

Figures that are based solely on realized investments are reported in parentheses.

Table 4.4 and 4.5 presents the mean and median values for each of the variables that are included in the sample and that will be utilized in the analyses presented in the next chapter. As missing observations are registered as zero in the sample, this distorts both the mean and median.

Table 4.4 displays mean and median operating revenue, EBITDA and costs in the two samples. There is a large difference in the values of operating revenue and EBITDA between the treatment and the control group[9]. As for cost levels, the two groups seem to differ less. Another comparative trait between buy-and-build portfolio companies and other PE owned companies is their location spread within the Nordics. The greater part of the portfolio companies performing buy-and-build are located in Sweden, with a Swedish presence of more than 44 percent of the total portfolio group. In our comparison group, Swedish portfolio companies constitute a lesser part of the total, while Norwegian portfolio companies have a strong presence with a share of more than 45 percent.

[9]Causes of deviations between the two sample groups are further explained in Chapter 6.

Table 4.4: Descriptive statistics of platform companies and comparison group.

	Observations		Mean value		Median value	
	Entry	Exit	Entry	Exit	Entry	Exit
Operating revenue						
Buy-and-builds	176	176	47,729.62	58,691.47	6,811.5	0
	(120)	*(49)*	*(70,003.44)*	*(210,810.18)*	*(20,508.20)*	*(45,541.0)*
Comparison group	*1,667*	*1,667*	1,738.85	14,645.56	0	0
	(254)	*(744)*	*(11,412.09)*	*(32,814.72)*	*(953.98)*	*(3,909.33)*
Total sample	*1,843*	*1,843*	6,130.81	18,851.79	*0*	*0*
	(374)	*(793)*	*(30,211.45)*	*(43,813.18)*	*(3,720.59)*	*(4,532.74)*
EBITDA						
Buy-and-builds	176	176	11,135.81	14,264.93	0	1,684
	(104)	*(144)*	*(18,845.22)*	*(1,7434.92)*	*(2,992.54)*	*(3,051.50)*
Comparison group	1,667	1,667	106.60	2,651.69	*0*	*0*
	(209)	*(711)*	*(850.24)*	*(6,217.11)*	*(-2.16)*	*(231.46)*
Total sample	*1,843*	*1,843*	1,159.85	3,760.71	*0*	*0*
	(313)	*(855)*	*(6,829.40)*	*(8,106.42)*	*(177.99)*	*(419)*
Costs						
Buy-and-builds	176	176	2,169.14	669.47	0	0.56
	(25)	*(92)*	*(15,270.74)*	*(1,280.72)*	*(3,684.87)*	*(229.13)*
Comparison group	1,667	1,667	300.67	2,905.95	0	0
	(24)	*(153)*	*(20,884.14)*	*(31,661.57)*	*(8,227.31)*	*(10,316.86)*
Total sample	*1,843*	*1,843*	479.10	2,692.4	*0*	*0*
	(49)	*(245)*	*(180,020.17)*	*(20,253.25)*	*(7,702.1)*	*(1,696.71)*

Non-missing observations are reported in parentheses.

In table 4.5, the discrepancy between the two groups appears evident also for the enterprise value variable. However, as there are nearly no observations in this variable, the figures are poor at providing any indication of true enterprise values. Further, there is an evident spread between the interest-to-debt ratio between the two groups. The last variable presented is the level of competition in the market of which the firms operates, presented by the HHI. From the descriptive statistics, the mean level of competition is high for both groups and somewhat higher for the comparison group[10].

[10]Levels are affected by missing observations. See Chapter 6.

Table 4.5: Descriptive statistics of platform companies and comparison group continues.
Non-missing observations are reported in parentheses.

	Observations		*Mean value*		*Median value*	
	Entry	*Exit*	*Entry*	*Exit*	*Entry*	*Exit*
Enterprise value						
Buy-and-builds	176	176	1,052.50	31,042.82	0	0
	(1)	*(6)*	*(185,240.45)*	*(910,589.43)*	*(185,240.45)*	*(645,357.93)*
Comparison group	1,667	1,667	43.79	1,524.53	0	0
	(1)	*(20)*	*(73,000.41)*	*(127,069.45)*	*(73,000.41)*	*(56,699.27)*
Total sample	*1843*	*1843*	140.12	4,343.42	*0*	*0*
	(2)	*(26)*	*(129,120.40)*	*(307,881.80)*	*(129,120.40)*	*(127,579.85)*
Interest-to-debt ratio						
Buy-and-builds	176	176	0.12	0.09	0	0
	(50)	*(50)*	*(0.42)*	*(0.33)*	*(0.087)*	*(0.12)*
Comparison group	1.667	1.667	0.02	0.05	0	0
	(120)	*(250)*	*(0.03)*	*(0.32)*	*(0.08)*	*(0.09)*
Total sample	1,843	1,843	0.031	0.05	0	0
	(170)	*(300)*	*(0.34)*	*(0.31)*	*(0.09)*	*(0.07)*
HHI[11]						
Buy-and-builds	176	176	950.81	965.24	340.12	373.81
	(127)	*(127)*	*(1,317.66)*	*(1,337.65)*	*(704.81)*	*(800.81)*
Comparison group	1.667	1.667	349.53	232.68	0	0
	(346)	*(346)*	*(1,687.88)*	*(1,121.05)*	*(886.90)*	*(766.34)*
Total sample	*1,843*	*1,843*	406.87	302.64	*0*	*0*
	(473)	*(473)*	*(1,585.32)*	*(1,179.21)*	*(834.27)*	*(800.81)*

Another difference between the groups is the trend in activity levels[12], depicted in **??** and **??**. The entries in portfolio companies dedicated to other PE strategies boomed in the early 2000s, see figure 4.2. Lack of registered portfolio companies after 2013 in the ACPE data is evident in the activity overview[13] For buy-and-builds however, this booming effect appears later. Buy-and-build activity has increased rapidly in the last decade, reaching peak levels in 2014. In our thesis, portfolio companies are not considered buy-and-build before at least one add-on transaction is executed. Low activity levels in 2017 and 2018 are therefore likely caused by the

[11] It is important to note that HHI is only registered for companies with PE entry after the year of 2008, due to restrictions in the available data.
[12] The number of PE entries.
[13] Further description in Chapter 6.

lack of data on portfolio companies that are acquired by a PE firm, but have not performed any add-ons to this date.

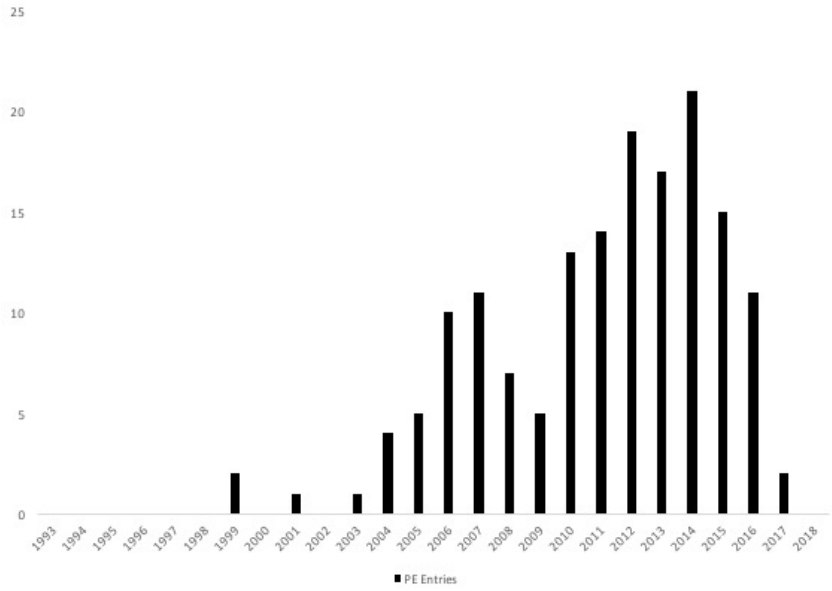

Figure 4.1: PE entry activity buy-and-builds

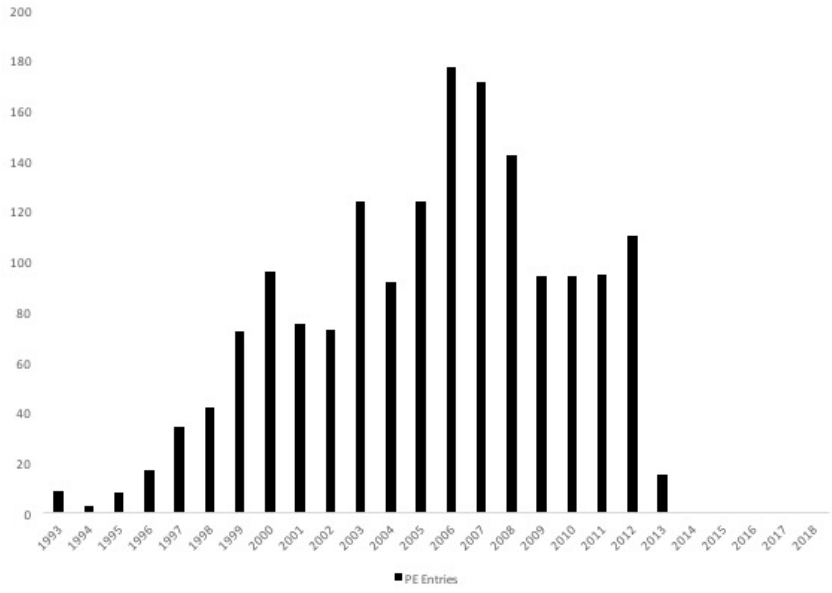

Figure 4.2: PE entry activity comparison group

4.3 Selection Bias

In the descriptive statistics presented above, it is evident that there is a substantial variation between the sample and the comparison group. When comparing the two groups, we encounter a case of selection bias. This bias originate in the selection process PE firms are likely to have performed when deciding which companies to invest in for a buy-and-build strategy. These companies have been evaluated thoroughly in a due diligence process carried out by the PE firm. One would assume that certain traits of the company, such as size, industry factors, management team, PE firm's industry knowledge or any private information crucial for future performance, would impact whether or not the company was chosen for buy-and-build. The platform companies chosen for buy-and-build are therefore likely to deviate to some extent from average PE-backed companies, in ways we cannot control for.

In an attempt to mitigate the selection bias in the model[14], Propensity Score Matching[15] is used to obtain balance between the sample and the comparison group.

4.3.1 Propensity Score Matching

The PSM is a statistical matching technique that attempts to estimate the effect of a treatment, which in this case is being chosen for buy-and-build (Rubin and Rosenbaum, 1985). An Average Treatment effect on the Treated[16] variable compares the average outcome of the platform companies that has performed buy-and-build, with that of other portfolio companies. This method presuppose that the effect of buy-and-build can be analyzed by observing the platform companies in the same industries and in the same period of time as the portfolio companies. However, this scenario is not achievable, as the buy-and-build strategy is a dichotomous variable. The optimal solution to this issue is to identify portfolio companies with similar traits as the platform companies, with the only distinction that they are not a subject to the buy-and-build strategy. By utilizing PSM, the control group that is obtained is a sufficient proxy for the changes found in the platform companies, given the scenario that they were not chosen for this strategy.

[14] After observations prior to 1993 and portfolio companies located outside the Nordics were removed.
[15] Abbreviated to PSM.
[16] ATT

PSM is applied when testing the four hypotheses to why PE firms perform buy-and-builds. The reduction of bias in the covariates and tests confirming the quality of the matching method is outlined in the Appendix, for all four hypotheses.

Chapter 5

Empirical Analysis

In this part of the thesis, we aim at answering the research question: *Why do PE firms perform buy-and-builds?* In order to answer this question, the empirical analysis is divided into two parts. The first part will review whether it is possible to predict which companies that are chosen for buy-and-builds. This analysis will provide an understanding of the characteristics a PE firm looks for when choosing portfolio companies for buy-and-build. The second part will analyze the effects of buy-and-build on the portfolio companies. In this part, we have formulated four hypotheses as to why PE firms perform buy-and-builds. Consecutively, we will analyze and discuss the results of the tests. All variables used throughout the analyses are explained in detail in Appendix A.

5.1 Predicting Platform Companies

To predict which portfolio companies PE firms choose for buy-and-builds, we analyze the effect of different variables on the likelihood of a buy-and-build through a probit regression.

The dependent variable is the probability of a transaction being a buy-and-build. This variable can only obtain values between 0 and 1, and will present the likelihood. The explanatory variables presented in the regression are selected on the basis of their assumed effect on the probability of a buy-and-build. The assumption is that a given change in these variables will re-

sult in a significant change in the probability of a buy-and-build, depending on the initial value of the variable.

The dependent variable, $P(BB_{ij})$, is the probability that portfolio company *i* is used for a buy-and-build strategy by PE firm *j*. The first explanatory variable, HHI_entry_i, is a measure for the level of competition within the industry at the time of PE entry. A lower HHI, implying a more competitive market, is expected to increase the probability of a buy-and-build. This is due to competition laws making it easier to perform acquisitions in markets characterized by a high degree of competition. The next variable, $Costs_i$, is a measure for the costs of the portfolio company prior to PE entry. Through potential operational synergies, costs are expected to affect the probability of a buy-and-build being executed. If costs are high, this might attract the PE firm to invest in the company, as cost improvements may be easier to obtain when costs are high. Higher costs are therefore expected to be associated with an increased probability. The following variable, PC_size_i, is a measure for portfolio company *i*'s size at the time of PE entry, measured in operating revenue. We expect a company of smaller size to have a higher likelihood of being used for buy-and-build, as small companies will grow faster when performing add-on acquisitions. A positive relationship is therefore expected. The portfolio companies' EBITDA, PC_EBITDA_i, at the time of PE entry is expected to be negatively correlated with the likelihood of buy-an-build, as operational improvements are more likely to be beneficial in companies with lower EBITDA. Further, binary variables for industry[1], location of the platform company and the PE firm, and the year of PE entry, respectively $D_1industry_i$, $D_2PC\_country_j$, $D_3PE\_country_j$ and $D_4entry\_year_j$, are included as control variables. The model used to predict buy-and-builds is the following probit regression:

$$P(BB_{ij}) = f(HHI\_entry_i, costs_i, PC\_size_i, PC\_EBITDA_i, \\ D_1industry_i, D_2PC\_country_i, D_3PE\_country_j, D_4entry\_year_i,) \quad (5.1)$$

As a probit regression is nonlinear, the effect on the likelihood of a change in an explanatory variable depends on the level of the explanatory variable. In the calculations of the regression,

[1]NACE level 1, Rev. 2 Primary code

STATA chooses a default level for each variable, which is the mean value. The marginal effects of each variable will therefore reflect any changes made to an independent variable from that initial mean value. Marginal effects of the probit are reported in table 5.1 below.

Table 5.1: **Probit regression of the log-likelihood of a transaction being buy-and-build**
This table reports the results from the probit regression estimation with the dependent variable buy-and-build being equal to one if the PE strategy used on the portfolio company is a buy-and-build and zero otherwise. Marginal effects are reported for each variable. Significance at the 1%, 5%, and 10% level are denoted by asterisks ***, **, and *, respectively. Standard errors are reported in parentheses. Mean values are reported in italics. For binary independent variables, the marginal effect is the descrete change from 0 to 1. STATA deliberately omits independent variables that predicts failure or success perfectly, which reduces the overall number of included observations in the report below.

	Binary dependent variable: Likelihood of buy-and-build			
Independent variable	*(1)*	*(2)*	*(3)*	*(4)*
Portfolio company size	2.35e-06***	2.66e-06***	1.18e-06***	9.25e-07***
	(0.00)	*(1e-05)*	*(0.00)*	*(0.00)*
	6,111.78	*7,660.99*	*7,681.18*	*8,021.05*
EBITDA	1.3e-05***	2.3e-05***	1.1e-05***	5.10e-06
	(0.00)	*(1e-05)*	*(0.00)*	*(0.00)*
	1,160.04	*1,454.66*	*1,460.22*	*1,524.83*
HHI at entry	2.3e-05***	2.68e-05***	1.16e-05***	1.53e-06
	(0.00)	*(0.00)*	*(0.00)*	*(0.00)*
	407.21	*497.64*	*493.94*	*515.79*
Costs at entry	1.19e-08	-2.46e-07	-3.02e-07	-6.53e-07
	(0.00)	*(0.00)*	*(0.00)*	*(0.00)*
	479.89	*617.39*	*623.50*	*651.09*
Location of portfolio company	-	*Controlled for*	*Controlled for*	*Controlled for*
Location of PE firm	-	*Controlled for*	*Controlled for*	*Controlled for*
Industry	-	-	*Controlled for*	*Controlled for*
Year of PE entry	-	-	-	*Controlled for*
P(BB)	0.09	0.12	0.06	0.05
Observations	1,840	1,430	1,416	1,356
Pseudo - R^2	0.16	0.20	0.31	0.46

5.1.1 Results

Table 5.1 reports the results of the probit regression. The regression in column (1) depicts a positive and statistically significant relationship between the binary dependent variable and three of the variables[2]. This result indicates that an increase in one of the variables, all else equal, increases the likelihood of a transaction in the sample being buy-and-build. This is in contrast with our assumption that PE firms choose portfolio companies of a smaller size with lower EBITDA within markets with a high degree of competition to be used for buy-and-build. Costs of the portfolio company at the time of PE entry are insignificant, and there is no evidence that the costs affect the likelihood of a buy-and-build.

In column (2), binary control variables for the location of portfolio companies and of PE firms are included. None of the included variables undergo a change in neither their significance, nor the direction of the coefficients. In other words, the same effects as in column (1) persist. The same indifference is observed in column (3), where binary variables for the industry of the portfolio companies are controlled for.

In the final column (4), the year of PE entry is controlled for through binary variables. The introduction of this control variable causes EBITDA and HHI at entry to turn insignificant. The size of the portfolio company is the only variable that has a significant influence on the likelihood of a buy-and-build.

To summarize, the results of the probit regressions contradict the expected relationships. The results indicate that the probability of a buy-and-build increases with increasing portfolio size and EBITDA, and with increasing HHI. However, only the size of the portfolio company have a statistically significant relationship with the likelihood of buy-and-build when all variables are controlled for. In sum, the formulated model indicates that size is the only relevant factor when PE firms choose portfolio companies for buy-and-builds.

Discussion of Regression Design

The nature of the business of PE limits the availability of data. Although we have obtained a

[2]Portfolio company size, EBITDA and HHI, all recorded at the year prior to PE entry.

large number of observations[3], the lack of complete information for each company limits the opportunity to perform fitting regressions. Further, it is likely that there are qualitative measures of characteristics in the portfolio company that is decisive when PE choose to engage in a buy-and-build, which are not included in this analysis. One can therefore question whether the above variables are adequate in explaining the underlying reasons for choosing a particular portfolio company to become a platform company.

5.2 The Effect of Buy-and-Builds on Portfolio Companies

To review why PE firms perform buy-and-build, we will deploy different regression analyses to test each of the four hypotheses outlined in Chapter 2. In the following, we will elaborate on each of the analyses and report the result of the regressions.

5.2.1 Do Buy-and-Builds Grow More Than Other Portfolio Companies?

This section will investigate if there is any evidence that buy-and-builds grow more than other portfolio companies, seeking to find support for the hypothesis of multiple arbitrage exploitation.

To test the change in size of portfolio companies, the companies' operating revenue is used as the dependent variable[4]. The first explanatory variable included is holding period, HP_i, which is a measure of the number of years a portfolio company *i* has been owned by a PE firm *j*. Growing a company's size is a comprehensive and timely process, and it is likely that the duration of the holding period affects size. For example, it might be that companies with a longer holding period infer a higher level of growth compared to other portfolio companies, simply because the PE firm have had a longer time to grow the company. Therefore, a positive relationship between the holding period and the size of the portfolio company is expected. The second variable

[3] More than 1,800 observations.

[4] As discussed in Section 2.1, the ideal measure for size is the EV/EBITDA multiple. However, this measure is not available for most of the portfolio companies in the sample, and operating revenue is used as a proxy for size.

included is a binary variable for whether a portfolio company is a buy-and-build or not, D_1BB_i, to analyze if it is possible to distinguish growth in the portfolio companies' size between the two groups. A third variable, $add - ons_i$, representing the number of add-on acquisitions performed during the holding period is also included. The number of add-ons are expected to directly affect the size of the portfolio companies when the add-ons are integrated[5]. Lastly, a variable representing the degree of competition within an industry is included, namely HHI. Theory presented in Section 2.2 suggests that it is easier to grow a company's size in fragmented industries to increase the value of the company. A negative relationship is therefore expected between the change in size of the portfolio company and the level of HHI at entry by the PE firm. Additionally, we have controlled for factors such as the location of the portfolio company and PE firm, the industry in which the company operates, and the year of entry by the PE firm, respectively , $D_2PC\_country_j$, $D_3PE\_country_j$ $D_4industry_i$ and $D_5entry\_year_j$. The rationale behind including these variables is that there might be country- or industry-specific differences in the change in operating revenue. Additionally, there might exist differences in the dependent variable that rise from the year of entry. This variable is included to capture differences in the economical environment between the different periods of time. Controlling for these variables reduces problems with endogeneity.

The regression deployed for the analysis is depicted below in model 5.2.

$$\Delta PC\_size_{ij} = f(HP_i, D_1BB_i, add - ons_i, HHI\_at\_entry, D_2PC\_country_j, D_3PE\_country_j, D_4industry_i, D_5entry\_year_j) \quad (5.2)$$

The result of the analysis is reported in table 5.2.

[5] As we expected that there might be a positive relationship between the number of add-on acquisitions and the holding period, we investigated this in Appendix A. As the correlation between the two variables are low, we do not have a problem with multicollinearity in the model.

Table 5.2: **OLS regression of change in portfolio companies' size during PE holding period**
The results of the OLS regression is reported below. The dependent variable is change in portfolio company size, measured by change in operating revenue during the holding period. Operating revenues are fiscal year-end figures from the last year before PE entry and the year of PE exit, obtained from Orbis' database Bureau von Dijk. Significance at the 1%, 5%, and 10% level are denoted by asterisks ***, **, and *, respectively. Standard errors are reported in parentheses.

	Dependent variable: Δ Size of portfolio company			
Independent variable	*(1)*	*(2)*	*(3)*	*(4)*
Holding period	8,796.88***	7,288.16***	6,574.95**	9,922.68**
	(2,426.44)	*(2,472.53)*	*(2,986.86)*	*(3,813.42)*
Buy-and-build transactions	7,759.14	7,258.16	5,228.97	-2,861.67
	(7,333.18)	*(8,138.39)*	*(8,296.77)*	*(17,469.02)*
Add-ons acquisitions	-2,124.91**	-1,583.59*	-702.70	-2,583.278
	(807.08)	*(905.75)*	*(1,266.76)*	*(4,466.46)*
HHI at entry	0.52	-0.61	-1.01	-1.45
	(2.93)	*(3.22)*	*(3.97)*	*(4.13)*
Location of portfolio company	-	*Controlled for*	*Controlled for*	*Controlled for*
Location of PE firm	-	*Controlled for*	*Controlled for*	*Controlled for*
Industry	-	-	*Controlled for*	*Controlled for*
Year of PE entry	-	-	-	*Controlled for*
Constant	-383.93	-3,9641.62	-72,144.15	-71,796.94
	(5,716.05)	*(2,6179.04)*	*(66,524.46)*	*(8,6847.58)*
Observations	56	56	56	56
R^2	0.21	0.41	0.65	0.72

The regression in column (1) shows that the change in size of the portfolio company increases significantly with the length of the holding period and the number of add-on acquisitions performed. This indicates that there is a positive relationship between the two variables and the size of the company, as anticipated. Further, the binary variable that indicates whether a portfolio company is a buy-and-build transaction or not, is positive, but insignificant. The add-on variable has a negative significant coefficient, which implies that an increased number of add-ons actually *decreases* the size of the portfolio company. This opposes the hypothesis. As the results of the regression are conflicting, the regression is inconclusive with respect to the hypothesis[6].

[6]HHI at entry suggest a positive relationship with change in size, but is insignificant and does not provide any

The constant is insignificant and remains as such in the following regressions.

The effects from column (1) remain in column (2), where geographical location is controlled for and no changes to the inference of the model occurs as a result, as HHI, buy-and-build and the constant remain insignificant. Nevertheless, the coefficient of HHI at entry changes from positive to negative, which is in line with the expected direction of effect by this variable[7]. This result is not significant, and we are unable to draw any conclusions with regards to HHI at entry. Binary variables for industry are controlled for in column (3), which causes the add-on variable to lose its significance. This effect remains in the subsequent regression.

Column (4) additionally controls for the year of entry by the PE firm. The regression again indicates that there is a positive relationship between the change in size of portfolio companies and the duration of the holding period. This shows some support for the hypothesis, as buy-and-builds are associated with having a longer holding period than other portfolio companies. Nevertheless, the buy-and-build variable is negative and insignificant, which is in contrast with the hypothesis.

In total, the results from the regression in table 5.2 are inconclusive. The regression showed indication that the number of add-on acquisitions and the duration of the holding period had opposite directions of influence on the change in size of the portfolio company, which inhibits us from confirming the hypothesis. Therefore, no evidence is found that buy-and-build portfolio companies grow *more* than other portfolio companies, measured by size. The hypothesis that PE firms grow platform companies in order to exploit multiple arbitrage, is neither confirmed nor denied by this analysis.

Discussion of Regression Design

There are several limitations to the former analysis that could cause an erroneous conclusion. Firstly, it is likely that change in operating revenue is a poor proxy for change in size. Most researchers employ the EV/EBITDA multiple as a measure for size. Due to the lack of available information on both enterprise value and EBITDA for most portfolio companies, we were

further insight.

[7] If HHI increases, the industry becomes less competitive, thus more difficult to consolidate. A negative coefficient may therefore suggest that portfolio companies that operate in industries that are less competitive, grow less during the holding period compared to companies that operate in industries that are more competitive.

not able to calculate this measure from our sample. Operating revenue is also subject to many short-term fluctuations in the market, and may therefore not reflect the true size of the company. Secondly, there might be several factors that influence change in operating revenue, that are not controlled for. This could cause the model to poorly estimate the effects of changes in the independent variables on the dependent variable. Further, the small sample size affects the predictability of the model.

5.2.2 Do Buy-and-Builds Affect the Level of Competition Within an Industry?

This section will investigate if there is any evidence that buy-and-builds affect the level of competition in an industry *more* than other portfolio companies. In other words, the analysis seeks to investigate the validity of the market consolidation hypothesis.

To test the above mentioned hypothesis, the level of competition within industry *k* in which the portfolio companies operate, will be used as the dependent variable. As a measure for the change in the level of competition within an industry, the change in HHI during the holding period will be utilized. The HHI measures the competition in an industry on a scale of 1 to 10,000, where 1 denotes a market with complete competition, and 10,000 denotes a monopoly market. As the difference is calculated by subtracting the HHI at entry from the HHI at exit, a positive change in HHI indicates that the market has become *less* competitive.

To explain any changes in HHI during the holding period, several explanatory variables are included in the regression. First of all, the change in market share of portfolio company *i*, $\Delta Market\ share_i$, is included. This is a measure of the change in the approximate market share[8] of portfolio company *i* during the holding period. With respect to the hypothesis, a positive relationship is expected between the change in HHI of industry *k* and the change in approximate market share of portfolio company *i*. If a positive relationship is uncovered, this would indicate that increased market share of portfolio company *i* causes a consolidation of

[8]The measure is considered as the change in approximate market share, as the variable is calculated as the change in operating revenue of the portfolio company *i*, divided by the change in sales of the industry *k* in which portfolio company *i* operates within.

industry *k*. Further, a binary variable equal to one if a portfolio company is a buy-and-build, D_1BB_i, is included. The variable is included to uncover any differences between platform and portfolio companies. In line with the hypothesis, the relationship is expected to be positive. Further, the holding period, HP_i, of portfolio company *i* is included, as it is likely that longer holding periods allow for larger changes in the market. Next, the number of add-on acquisitions performed by each portfolio company, $add - ons_i$, is included. A positive relationship between add-ons and the dependent variable is expected, insinuating that an increased number of add-ons will result in a more consolidated market. Lastly, binary variables on the location of portfolio companies and PE firms, in addition to the year of PE entry, are included to control for any country- or time-specific differences. These variables are denoted as $D_2PC\_country_i$, $D_3PE\_country_j, D_4PE\_entry\_year_j$, respectively.

The regression deployed for the analysis, is:

$$\Delta HHI_{ij} = f(\Delta Market\ share_i, HP_i, add - ons_i, D_1BB_i, D_2PC\_country_i, D_3PE\_country_j, D_4PE\_Entry_j) \quad (5.3)$$

Table 5.3 illustrates the results of the regressions performed.

Table 5.3: **OLS regression of change in HHI during PE holding period**
The table reports the results of an OLS regression on the change in HHI during the PE holding period. HHI at entry is calculated based on fiscal year-end figures in the last recorded fiscal year before PE entry. HHI at exit is calculated based on the fiscal year-end figures in the year of PE exit. Significance at the 1%, 5% and 10% level are denoted by asterisks ***, ** and *, respectively. Standard errors are reported in parentheses.

	Dependent variable: Δ HHI			
Independent variable	*(1)*	*(2)*	*(3)*	*(4)*
Holding period	42.28	18.86	22.1	11.12
	(58.68)	*(57.61)*	*(71.01)*	*(84.33)*
Buy-and-build transactions	181.91	145.66	249.12	92.16
	(177.39)	*(183.79)*	*(215.37)*	*(316.34)*
Add-ons acquisitions	0.16	-4.62	-6.94	4.43
	(15.24)	*(15.14)*	*(18.79)*	*(22.90)*
Δ Market share	-3.3	-0.11	15.79	7.15
	(16.59)	*(16.0)*	*(20.56)*	*(22.18)*
Location of portfolio company	-	*Controlled for*	*Controlled for*	*Controlled for*
Location of PE firm	-	*Controlled for*	*Controlled for*	*Controlled for*
Industry	-	-	*Controlled for*	*Controlled for*
Year of PE entry	-	-	-	*Controlled for*
Constant	-362.97***	-337.65	-1108.77	198.80
	(115.36)	*(510.43)*	*(1061.55)*	*(1444.99)*
Observations	68	68	68	68
R^2	0.04	0.29	0.42	0.48

From column (1) we note that the constant is negative and statistically significant at the 1 percent level. This is the only significant coefficient in the regression analysis, and it provide insufficient insight on how the HHI is impacted by different factors. The regressions performed above failed to provide any statistical inference. No statistically supported relationships were uncovered by the regressions and there is no apparent evidence that the market consolidation hypothesis holds. No significant effects of the variables on the change in the level of competition in the market exists.

Discussion of Regression Design

As the regressions could not find statistical evidence that there exists a relationship between the variables and the level of competition within an industry, it is debatable whether the variables included in the regression are expedient in uncovering the effects on HHI. For instance, the market share is a measure based on the relative growth of a portfolio company's size to the industry, which may be effected by the level of concentration in the industry itself. Additionally, the Nordic countries are considered as one market, which may affect the outcome. However, by controlling for different locations of the portfolio companies, the risk of retrieving a result that is caused by differences in geographic, unaccounted for factors this mitigates. The lack of statistical relationships indicates that there are some other factors that influence the market concentration, that we have not been able to cover by these regressions.

5.2.3 Do Buy-and-Builds Reduce Their Relative Cost Level Compared to Other Portfolio Companies?

This section will investigate the hypothesis that PE firms perform buy-and-builds in order to realize operational synergies. Therefore, the analysis will investigate if it is possible to uncover a difference in the level of operational synergies, realized between platform companies and other portfolio companies.

To test if operational synergies are larger for platform companies compared to other portfolio companies, the companies' change in relative cost level during the holding period, $\Delta Cost\_level_i$, is deployed as the dependent variable. The variable is calculated as the difference in operational costs in the year of PE exit divided on operating revenue in the same year, and the operational costs in the year prior to PE entry, divided by the operating revenue of the company in the same year. The first independent variable included is holding period of portfolio company *i*, HP_i. As realization of synergies can be a time-consuming and difficult process, it is likely that the duration of the holding period might influence the level of synergies realized. Therefore, it is expected that there will be a positive relationship between the holding period and the change in relative cost level. Further, a variable representing the number of add-on acquisitions

performed by portfolio company *i*, $add - ons_i$, is included. Economic theory on operational synergies suggest that synergies may be obtained when companies merge or acquire other companies. If PE firms perform buy-and-builds in order to realize operational synergies, the analysis should show a positive relationship between the number of acquisitions performed and the level of operational synergies realized[9]. A binary variable on whether the portfolio company *i* is a buy-and-build or not, D_1BB_i, is also included to distinguish any differences between platform companies and other portfolio companies. The hypothesis regarding operational synergies focus on the reduction of overhead costs that might be obtained when combining two or more entities. We expect the effect of operational synergies to be larger for platform companies compared to other portfolio companies. Lastly, binary control variables for location of the portfolio company *i* and PE firm *j*, the industry in which the portfolio company *i* operates and the period where the PE firm *j* invested in the portfolio company are included. Respectively, $D_2industry_i$, $D_3PC\_country_i$, $D_4andPE\_country_j$. These factors are included to control for any effects stemming from differences in geographical location, industry and period of time.

The regression deployed to analyze this hypothesis, is:

$$\Delta Cost\_level_i = f(\Delta PC\_size_i, HP_i, add - ons_i, D_1BB_i, D_2industry_i, \\ D_3PC\_country_i, D_4PE\_country_j, D_5PE\_entry_j) \quad (5.4)$$

The results are presented in table 5.4.

[9]If a positive relationship is not shown, this could also be caused by the difficulty in realizing operational revenues when companies merge.

Table 5.4: **OLS regression of change in portfolio companies' relative cost level during PE holding period.**
The results of the regression are reported in this table. The dependent variable is the change in portfolio companies' cost level during the holding period, and the coefficients describe the different independent variables' effect on the cost level. Cost levels are the difference between fiscal year-end aggregated costs in the year of PE exit and the last year before PE entry, collected from WRDS's database Orbis, by matching organization numbers. Significance at the 1%, 5%, and 10% level are denoted by asterisks ***, ** and * respectively. Standard errors are reported in parentheses.

	Dependent variable: Δ Relative cost level			
Independent variable	*(1)*	*(2)*	*(3)*	*(4)*
Buy-and-build transactions	-0.53**	-0.37*	-0.51**	-1.02***
	(0.24)	*(0.19)*	*(0.25)*	*(0.37)*
Holding period	0.01	0.06	0.10*	0.13*
	(0.05)	*(0.04)*	*(.06)*	*(.07)*
Add-ons acquisitions	0.00	-0.01	-0.01	-0.01
	(.02)	*(0.015)*	*(.02)*	*(0.02)*
Location of portfolio company	-	*Controlled for*	*Controlled for*	*Controlled for*
Location of PE firm	-	*Controlled for*	*Controlled for*	*Controlled for*
Industry	-	-	*Controlled for*	*Controlled for*
Year of PE entry	-	-	-	*Controlled for*
Constant	0.44***	-1.95***	-1.23	-0.28
	(0.15)	*(0.65)*	*(1.01)*	*(0.94)*
Observations	60	60	60	60
R^2	0.09	0.56	0.66	0.70

From regression (1), it is evident that the binary variable of a buy-and-build transaction have a negative coefficient significant at 5 percent level, in compliance with what we expected with regards to the hypothesis. Further, we observe that holding period and the number of add-on acquisitions executed have positive coefficients, suggesting that operational synergies increase with longer PE-ownership, and when performing more add-on acquisitions. However, *neither* of these variables showed to be statistically significant, and this conclusion is therefore not statistically supported. The constant is positive and significant at 1 percent level.

In column (2) we control for the location of the portfolio company and the PE firm. The effects

remain, with the buy-and-build binary variable still showing statistical evidence in support of the operational synergies hypothesis. Further, by adding the geographical control variables, the constant's coefficient turns negative and remains significant at the 1 percent level. Also noted is the holding period's coefficient turning negative, but remaining insignificant.

In the next regression, column (3), industry of the portfolio company is additionally controlled for. The holding period's positive direction of the coefficient remains, but the impact of the industry control variable turns the coefficient significant at the 10 percent level. This effect opposes the initial theory that a longer holding period allows for more cost-based operational synergies to be obtained. However, as the buy-and-build coefficient remains negative and significant at the 5 percent level, there are still evidence that the hypothesis holds.

In regression (4), when also controlling for the year of PE entry, the effects from column (3) remains, and the variables directional and statistical impact on the change in cost level is therefore not affected.

The statistical inference of this regression is therefore that there are signs of a negative relationship between buy-and-builds on the changing cost level, which supports the hypothesis of operational synergies. On the other hand, a significant positive relationship between the holding period and the change in cost level appears, which induces uncertainty in the inference. To conclude, the model shows evidence of support for cost-based operational synergies as motivation for buy-and-build.

Discussion of Regression Design

There are several explanations as to why the depicted result may be incorrect. Primarily, it is possible that the relative cost level does not capture the effect of operational synergies. Missing or incomplete data from which the sample is obtained, may cause the aggregated costs to exclude costs that are typically reduced when realizing synergies, such as SG&A[10]. Indeed, another problem could be that the aggregated costs include costs that are typically not reduced when realizing operational synergies, in example costs connected to maintenance of machinery. This may cause difficulties in uncovering a causal relationship between the dependent and inde-

[10]Selling, General and Administrative expenses.

pendent variables. Finally, it is possible that the model is sufficient at capturing any operational synergies, but that the result stems from the fact that the PE firms are unsuccessful at realizing synergies.

5.2.4 Do the Financing Costs in Buy-and-Builds Decrease During the Holding Period?

This section is devoted to testing whether there is statistical evidence indicating that the financing costs of buy-and-builds decrease *more* than that of other portfolio companies. In other words, the analysis seek to find support for the hypothesis of financial synergies.

The dependent variable, $\Delta Financing\_costs_i$, is the change in interest-to-debt ratio from entry to exit. The variable is calculated as the difference in interest paid divided on long-term debt at exit and entry, functioning as an approximation of the change in cost of debt during the holding period. The first explanatory variable, ΔPC_size_i, is the change in portfolio company size, measured by operating revenue. As discussed in chapter 2, larger companies are viewed as more stable and less likely to liquidate, which means they often face lower financing costs. A positive relationship between the change in operating size and the dependent variable, where an increase in size *reduces* the approximate cost of debt is therefore anticipated. Next, holding period, HP_i, is also included in the regression. As we expect the PE firms' involvement in the portfolio company to influence financing costs, we assume that longer holding periods will enable the PE firm to reduce the financing cost level more than that of shorter holding periods. Add-on acquisitions, $add-ons_i$, are included due to the expectation that a larger number of add-ons will increase the size of the portfolio company and the company's ability to access reduced financing costs. Next, a binary variable for buy-and-builds, D_1BB_i, is added. This variable is added to identify any deviant effect on the change in financing cost between buy-and-builds and other portfolio companies. The hypothesis of financial synergies as motivation for buy-and-build causes the assumption to be a negative relationship between the binary variable and the change in interest-to-debt ratio, indicating that buy-and-builds have a larger *reduction* in financing costs compared to other portfolio companies. Lastly, the industry of the portfolio company, location of the portfolio company, location of the PE firm, and year of PE entry are controlled for,

respectively $D_2 industry_{k,i}$, $D_3 PC\_country_i$, $D_4 PE\_country_j$ and $D_5 PE\_entry_{i,j}$.

The regression deployed to analyze this hypothesis, is:

$$\Delta Financing\_costs_i = f(\Delta PC\_size_i, HP_i, add-ons_i, D_1 BB_i, D_2 industry_{k,i}, D_3 PC\_country_i, D_4 PE\_country_j, D_5 PE\_entry_j) \quad (5.5)$$

The results from the regression are reported in table 5.5 below.

Table 5.5: **OLS regression of change in portfolio companies' interest-to-debt ratio during PE holding period.**
The results of the regression are reported in this table. The dependent variable is the portfolio companies' interest-to-debt ratio and the coefficients describe the different independent variables' effect on this ratio. Interest and debt are the fiscal year-end interest cost and long-term debt in the last year before PE entry and the fiscal year-end interest cost and long-term debt in the year of PE exit - as reported in WRDS[11]. Significance at the 1%, 5%, and 10% level are denoted by asterisks ***, ** and * respectively. Standard errors are reported in parentheses.

	Dependent variable: Δ Interest-to-debt ratio			
Independent variable	*(1)*	*(2)*	*(3)*	*(4)*
Holding period	-0.03	-0.01	-0.01	-0.02
	(0.06)	*(0.06)*	*(0.07)*	*(0.08)*
Buy-and-build transactions	0.10	0.08	0.07	0.60*
	(0.21)	*(0.21)*	*(0.25)*	*(0.35)*
Number of add-on acquisitions	-0.01	-0.02	-0.01	-0.01
	(0.02)	*(0.02)*	*(0.02)*	*(0.02)*
Δ Size of the portfolio company	1.15e-05**	1.04e-05*	1.77e-05**	1.77e-05***
	(5.59e-06)	*(5.69e-06)*	*(6.95e-06)*	*(6.95e-06)*
Location of portfolio company	-	*Controlled for*	*Controlled for*	*Controlled for*
Location of PE firm	-	*Controlled for*	*Controlled for*	*Controlled for*
Industry	-	-	*Controlled for*	*Controlled for*
Year of PE entry	-	-	-	*Controlled for*
Constant	0.15	0.39	0.26	-0.11
	(0.13)	*(0.58)*	*(1.10)*	*(1.17)*
Observations	72	72	72	72
R^2	0.07	0.21	0.31	0.41

Column (1) shows a negative coefficient for holding period and number of add-on acquisitions, implying that these variables causes a reduction in the interest-to-debt ratio. This is consistent with the hypothesis, as buy-and-builds are associated with longer holding periods and add-on acquisitions. The regression shows a positive relationship between buy-and-builds and the dependent variable, which would contradict the hypothesis that buy-and-builds reduce their financing costs *more* than other portfolio companies. However, none of these variables are significant. The change in size of the portfolio company is the only significant variable, and it indicates a positive relationship between the change in the interest-to-debt ratio and the change in size of the portfolio company. This is in contrast with theory outlined in Section 2.3.2 on lower financing costs for larger companies. Therefore, we find no support for the hypothesis that buy-and-builds reduce their financing costs relative to other portfolio companies. The same effects prevail in column (2) and (3).

In column (3), the buy-and-build variable is significant at the 10 percent level, with a positive coefficient. This result indicate that buy-and-builds *increase* their interest-to-debt ratio during the holding period, strictly opposite from the hypothesis. Holding period and add-on acquisitions remain insignificant, and the change in size of the portfolio company is positive and significant at the 1 percent level. Regression (4) show no support for the financing cost hypothesis.

In total, statistical evidence that buy-and-builds *increase* their financing cost during the holding period is shown. Additionally, changes in the size of portfolio companies seem to have a positive effect on the interest-to-debt ratio, indicating that larger companies face larger financing costs. The results are diametrically opposite to economic theory and the hypothesis tested. Conclusively, the results indicate that the hypothesis is false and should be rejected.

Discussion of Regression Design

Firstly, the way in which the interest-to-debt ratio is calculated may not capture the cost of debt of the portfolio companies. This may prevent us from discovering a causal relationship between the interest-to-debt ratio and buy-and-build transactions. Missing or incomplete data from which the sample is obtained may cause the interest paid to deviate from the financing cost of long-term debt. Finally, it is possible that the model is sufficient at capturing any financial synergies, but that the result stems from the PE firms being unsuccessful at realizing synergies.

Chapter 6

Discussion

The related literature presented in this thesis provided support for the topics chosen to be explored. Evidence of abnormal value creation in private equity by Kaplan (1989) and statistically increased rate of return on add-on acquisitions by Valkama et al. (2013), lay the foundation of the empirical analyses performed. Enlarged value multiples for larger sized firms by Dijk (2011), enhanced profitability through market consolidation by Buzzell et al. (1975), and synergies arising in mergers and acquisitions by Chatterjee (1986) induced investigation of the hypotheses. Through profound data collection, research on this topic was enabled. In the empirical analyses, indications of cost-based operational synergies as motivation for buy-and-build was uncovered, in addition to the result that buy-and-builds increase their financing costs, in direct contrast with the analyzed hypothesis. The remaining analyses did not provide sufficient results for statistical inference. The results and the generalization of these are limited due to the authors choice of thesis design and research method.

6.1 Limitations and Delimitations

6.1.1 Data Collection

To enable research on the hypotheses[1], a substantial amount of data has been collected from the Bureau van Dijk databases Orbis and Zephyr, both through WRDS's access to the databases and by directly utilizing the databases. Further, ACPE's database of Nordic portfolio companies has been used to identify a comparison group. Through extensive use of Excel, STATA and MATLAB, more than 50 individual data points were collected on more than 1,800 companies, all located in Nordic countries and which have received PE-backing after the year of 1993. These delimitations were set to restrain the scope of the research. The collection has been performed in a combination of manual retrieving and digital matching.

The most profound limitation that arose was the restricted availability of data. Neither Bureau van Dijk nor ACPE's database offered complete information on the portfolio companies, ergo the data set in total contains numerous missing observations. Additionally, in 2013, Denmark[2] published a new accounting standard based on the IAS[3] for SMEs[4]. This restricts access to accounting data prior to this replacement. Furthermore, the data provided by ACPE does not contain accounting information beyond the year of 2013. This introduces further bias in the results. The last five years are viewed upon as defining years for the buy-and-build strategy, and the shortcomings of the ACPE data set largely impacts the outcome and credibility of the research. Additionally, HHI is only registered from the year of 2009, due to the measure not being obtainable from Orbis prior to this year. This may influence the results where HHI is used as a dependent or independent variable. The overall unavailability of data impose constraints on the ability to uncover statistically significant and causal relationships. Further, when data collected from Bureau van Dijk is missing true observations, the service reports calculated estimations. Estimated information was gathered and treated by the authors as if accurate. In-

[1] See Chapter 2.
[2] Accounting Technical Committee of FSR - Danish Auditors
[3] International Accounting Standard
[4] Small and Medium-sized Entities

correct or imprecise information may therefore exist in the underlying data applied. Lastly, the partially manual gathering of data was subject to human inaccuracy. As a result, data may have been reported erroneously. In sum, the data set that formed the basis of this thesis contains missing and possibly inaccurate information, and the design of the research is likely to have affected the results generated.

6.1.2 Data Treatment

In the treatment of the data set, several challenges were encountered. Firstly, the substantial amount of missing observations constituted a large part of the collection. As observed in Subsection 4.3.1, this problem was mitigated by performing PSM to obtain balance between the sample and the control group. By this, zero values were largely omitted by the implementation of the method. This improved the accuracy of the results, but as a substantial amount of the observations lack data on several variables, the size of the total sample was small compared to the initial size of 1,843 portfolio companies. This limits the ability to conclude with any results being significant beyond the sample, as the predictability of the models are lower.

Further, the definitions employed in this thesis may have restricted the outcome. The Nordic region was viewed as one market, discarding any country specific differences. If there exist large, unaccounted for, differences across the region, this may have influenced the results[5]. Buy-and-build was defined as 'any PE-backed portfolio company that has executed one or more acquisition', which excluded the possibility that portfolio companies performing acquisitions were in line with other PE strategies. Both definitions restricted the thesis.

6.1.3 Selection Bias

The selection process in which the PE firms choose which companies to execute a buy-and-build strategy, is a source of selection bias in the performed analyses. The bias resulting from

[5]This risk is mitigated by controlling for countries in the regressions.

the selection process of PE firms is mitigated by applying PSM to obtain balance between the sample and the control group, as explained in Subsection 4.3.1. The results of PSM are reported for the regressions of the four hypotheses in the Appendix A.3. However, PSM is not sufficient at eliminating the selection bias completely, accordingly there exist bias in the results of the analyses.

To summarize, the sample is not properly randomized and any results are likely inaccurate and not representative for the entire population. As a consequence, conclusions drawn from the empirical analyses cannot be generalized beyond the sample deployed. Lastly, the hypotheses are not necessarily mutually exclusive. As many of the variables are likely to be correlated, the possibility that more than one of the hypotheses appear simultaneously could cause difficulties in separating the individual effects from one another.

Chapter 7

Conclusion and Further Research Suggestions

This thesis examines the effects of buy-and-build strategies on Nordic portfolio companies. It seeks to broaden the understanding of how platform companies used for buy-and-builds differ from other portfolio companies, and why PE firms execute this strategy. While most academic literature focus on PE in the U.S., research is missing for smaller regions such as the Nordic. There are studies that focus somewhat on inorganic growth, but in-depth research of the buy-and-build strategy is nearly non-existing. With a sample of 1,843 portfolio companies, acquired by a PE firm in full or by majority stake, between 1993 and 2017, this thesis provides an overview of Nordic portfolio companies. Accounting data is restricted up to the year of 2016, and market concentration data is not available prior to 2009. Further, availability of accounting data and other firm-specific information is strictly limited due to the nature of the private equity market, which have set restrictions on the analyses included in this thesis.

For the first part of the analysis, we unveil common features of portfolio companies being used for buy-and-build strategies. The probit regression on the likeliness of buy-and-build showed that larger companies with higher EBITDA in more fragmented markets are more likely to be used for buy-and-build than other portfolio companies.

The second part of the analysis aims at explaining why PE firms choose this strategy in particular. The Propensity Score Matching method was utilized on the total control group to achieve balance between the sample and the control group. Through the empirical analyses, we studied

the effects of different variables on four main measures to uncover whether there are statistical grounds for inference of the hypotheses.

Evidence was not found that the change in size of the portfolio company, nor the change in the level of competition in the market differ between platform companies and portfolio companies, as their respective hypotheses supposes. In direct contrast with the hypothesis, the analyses showed that buy-and-builds *increase* their financing costs during the holding period, indicating that the hypothesis of reduced financing costs is untrue. Additionally, buy-and-builds showed to statistically *decrease* the relative cost-level of the portfolio companies, a result in line with the tested hypothesis. This finding supports the hypothesis that PE firms perform buy-and-builds to obtain operational synergies.

The results of this thesis are based on an immense effort to capture all buy-and-build activity across the Nordics. However, the lack of available data prevents us from uncovering all causal relationships affecting PE firms to execute buy-and-builds. Further research on the topic would benefit from obtaining a broader sample in time span and number of observations. Additionally, identifying a more closely-matched control group than the one applied in this thesis would further reduce the bias introduced by the PE firms' selection process. If these actions are taken in future studies, it would increase the likelihood of discovering causal relationships underlying the implementation of buy-and-build.

The research undertaken by this thesis has addressed some of the topics of which current literature is lacking. Although this research has provided insightful analyses, many aspects of the buy-and-build strategy remain unanswered. Specifically, there is a lack of qualitative studies on motivations behind buy-and-build execution, which provides an interesting foundation for further quantitative and qualitative studies. Further, there are three additional hypotheses to why PE firms perform buy-and-builds that unavailability of data prevented this thesis from investigating. The hypotheses are that PE firms perform buy-and-builds in the Nordics to 1) increase carried interest collected by the PE firm, 2) obtain superior returns compared to other strategies, and 3) allocate excess capital in a competitive investing environment. Analyses of these hypotheses may provide a broader understanding of why PE firms perform buy-and-builds, and would be interesting to research.

Bibliography

Acharya, V. V., Gottschalg, O. F., Hahn, M., Kehoe, C., 2013. Corporate Governance and Value Creation: Evidence From Private Equity. The Review of Financial Studies 26 (2), 368–402.

Axelson, U., Jenkinson, T., Strömberg, P., Weisbach, M. S., 2013. Borrow Cheap, Buy High? The Determinants of Leverage and Pricing Buyouts. Journal of Finance 68 (6), 2223–2267.

Banz, R. W., 1981. The Relationship between Return and Market Value of Common Stocks . Journal of Financial Economics 9.

Bhattacharyya, S., Nain, A., 2011. Horizontal acquisitions and buying power: A product market analysis. Journal of Financial Economics 99, 97–115.

Buzzell, R. D., Gale, B. T., Sultan, R. G., 1975. Market Share—a Key to Profitability. Harvard Business Review.

BVCA, 2016. BVCA Guide to PE and VC in the Nordics. BVCA Research Reports 12.

Bykowsky, M., Kwasnica, A., W.Sharkey, W., 2018. Buyer Size and Bargaining Power: An Experimental Analysis.

Caselli, S., 2010. Private Equity and Venture Capital in Europe 333.

Chan, K., 1985. An Explanatory Investigation of the Firm Size Effect. University of Chicago Ohio State University.

Chatterjee, S., 1986. Types of Synergy and Economic Value: The Impact of Acquisitions on Merging and Rival Firms. Strategic Management Journal 7 (2), 119–139.

Cumming, D., Siegel, D. S., Wright, M., 2007. Private equity, leveraged buyouts and governance. Journal of Corporate Finance 13 (4), 439–460.

Devos, E., Kadapakkam, P.-R., Krishnamurthy, S., 2009. How Do Mergers Create Value? A Comparison of Taxes, Market Power, and Efficiency as Explanations for Synergies. The Review of Financial Studies 22 (3), 1179–1211.

Dijk, M. A. V., 2011. Is size dead? A review of the size effect in equity returns. Journal of Banking Finance, 12.

Fama, E. F., French, K. R., 1992. The Cross-Section of Expected Stock Returns. The Journal of Finance.

Fink, B., 2014. Multiple Arbitrage: What Does it Really Mean?

Fraunhoffer, R., Freytag, A., Schiereck, D., 2013. Market power consolidation and MA success: A study of US-American and German utility takeovers. Journal of Economic Financial Studies 1, 29–43.

Gabrowksi, R., King, D., 1995. The Size Effect and Equity Returns. Business Valuation Review 14, 69–74.

Guo, S., Hotchkiss, E., Song, W., 2011. Do Buyouts (Still) Create Value? Journal of Finance 66, 479–517.

Hammer, B., Hinrichs, H., Schweizer, D., 2016. Buy and Build Strategies in Private Equity: Boost or Transformation?, 1–26.

Hamza, T., Sghaier, A., Thraya, M. F., 2016. How do takeovers create synergies? Evidence from France. Studies in Business and Economics 1 (11), 54.

Ibbotson, R., 2005. Valuation Edition. Yearbook.

Institute, T. M. S., 1972. Profit Impacting of Marketing Strategies.

Jensen, M. C., Ruback, R. S., 1983. The Market for Corporate Control: The Scientific Evidence. Journal of Financial Economics 11, 5–50.

Kaplan, S. N., 1989. The Effects of Management Buyouts on Operating Performance and Value. Journal of Financial Economics 24, 217–254.

Kaplan, S. N., 1997. The Evolution of U.S. Corporate Governance: We Are All Henry Kravis Now. Journal of Private Equity 1, 7–14.

Kaplan, S. N., Schoar, A., 2005. Private Equity Performance: Returns, Persistance and Capital Flows. Journal of Finance 60, 1791–1823.

Kaplan, S. N., Strömberg, P., 2009. Leveraged Buyouts and Private Equity. Journal of Economic Perspectives 23 (1), 121–46.

Khemani, R. S., Shapiro, D. M., 2002. Glossary of Industrial Organisation Economics and Competition Law. Secretary General, Organization for Economic Co-operation and Development, 24–25.

Legal Director of the Norwegian Competition Authority, 2015. Norwegian Competition Act 2014.

Leland, H. E., 2007. Financial Synergies and the Optimal Scope of the Firm: Implications for Mergers, Spinoffs, and Structured Finance. The Journal of Finance 62 (2), 765–807.

Lewellen, W. G., 1971. A Pure Financial Rationale for the Conglomerate Merger. The Journal of Finance 26 (2), 521–537.

Lichtenberg, F., Siegel, D., 1990. The Effects of Leveraged Buyouts On Productivity and Related Aspects of Firm Behavior. Journal of Financial Economics 27, 165–194.

Loukianova, A., Nikulin, E., Vedernikov, A., 2017. Valuing synergies in strategic mergers and acquisitions using the real options approach. Investment Management and Financial Innovations 14, 236–247.

Lubatkin, M., 1983. Mergers and the Performance of the Acquiring Firm. The Academy of Management Review 8 (2), 218–225.

MacDougall, N., 2017. European Buy and Build in 2017. Silverfleet Capital Buy and Build

Monitor.

Merton, R. C., 1973. An Intertemporal Capital Asset Pricing Model. Econometrica 41.

Muscarella, C. J., Vetsuypens, M. R., 1990. Efficiency and Organizational Structure: A Study of Reverse LBOs. Journal of Finance 45, 1389–1413.

Nowak, D., Nyman, R., 2007. Cost synergies in MA.

Næss-Schmidt, S., Heebøll, C., Karlsson, H., 2017. The Swedish Private Equity Market - A Footprint Analysis. Copenhagen Economics, 1–77.

Peltzman, S., 1977. The Gains and Losses from Industrial Concentration. Journal of Law and Economics 20.

Preqin, 2014. . Preqin Global Private Equity and Venture Capital Report 10 (5).

Reinganum, M. R., 1982. A Direct Test of Roll's Conjecture on the Firm Size Effect. Journal of Finance 9.

Rubin, D. B., Rosenbaum, P. R., 1985. Constructing a control group using multivariate matched sampling methods that incorporate the propensity score. The American Statistician 39 (1), 33–38.

Schoeffler, S., Buzzell, R. D., Heany, D. F., 1974. Impact of Strategic Planning on Profit Performance. Harvard Business Review, 18.

Schwert, G. W., 2002. Anomalies and Market Efficiency. University of Rochester and National Bureau of Economic Reasearch.

Spliid, R., 2013. Is Nordic Private Equity Different? The Journal of Private Equity 16 (2), 38–57.

Valkama, P., Maula, M., Nikoskelainen, E., Wright, M., 2013. Drivers of Holding Period Firm-Level Returns in Private Equity Backed Buyouts. Journal of Banking Finance 37, 2378–2391.

Wilson, N., Wright, M., Siegel, D., Scholes, L., 2012. Private Equity Portfolio Company Performance During The Global Recession. Journal of Corporate Finance 18, 193–205.

Wright, M., Nikoskelainen, E., 2007. The Impact of Corporate Governance Mechanisms on Value Increase in Leveraged Buyouts. Journal of Corporate Finance 13, 511–537.

Appendix A

Appendix

A.1 Independent Variables

In the following table, the independent variables included in any of the regressions made are presented.

Firm-specific variables	
Holding period	The number of years between entry and exit by the PE firm. For all firms where the PE firm has not exited, holding period is recorded as zero. Abbreviated to HP.
Costs	An aggregated measure of costs of goods sold, financial costs and other operating expenses.
EBITDA	Measure of the EBITDA for each portfolio company.
Cost level	Measure of the aggregated costs of a portfolio company divided by its operating revenue.
Change in financing costs	Measure of the difference in interest-to-debt ratio between PE exit and entry. A negative change in financing costs is interpreted as achieved financial synergies in the portfolio company *i*.
Add-on acquisitions	Measure of the number of executed add-on acquisitions made by each individual portfolio company during the holding period. The add-ons are exclusively transactions where the portfolio companies have acquired 100% or a majority-stake in the acquired company.
Entry year	Binary variable equal to one if the portfolio company is acquired by a PE firm within the defined period of time, and zero otherwise. The periods of time are: 1993 to 1997, 1998 to 2002, 2003 to 2007, 2008 to 2012, and 2013 to 2017.
Buy-and-build	A binary variable equal to one if the portfolio company is registered as a buy-and-build and zero otherwise.

Portfolio size	Measured as operating revenue, at the year prior to PE entry, and the year of PE exit.
Change in portfolio size	Measure of the difference in portfolio company *i* size between PE exit and PE entry. A positive change in portfolio size is interpreted as an increased operating revenue during the holding period.
Relative growth	Measure of the growth in portfolio company *i* during the holding period relative to the growth in the industry *k* it operates within. The measure is calculated as a fraction, where the numerator is the the change in size of the portfolio company, and the denominator is the change in size of the industry in which that specific portfolio company operates within. Following is the mathematical formulation of the variable: $Market\ share = \frac{\Delta Size_i}{\Delta Size_k} = \frac{OpRevExit_i - OpRevEntry_i}{OpRevExit_k - OpRevExit_k}$
Location of the portfolio company	Binary variables equal to one if the portfolio company is located in that country and zero otherwise.
Location of the PE firm	Binary variables equal to one if the portfolio company is located in that country and zero otherwise.
Industry-specific variables	
Industry	Variable where the industry in which the portfolio company operates within is registered. The industry is classified by NACE Rev. 2 Primary codes, and we utilize the top hierarchical level in the NACE hierarchy to assign the companies to one of the 21 main NACE categories. When used in regressions, binary variables have been created for each of the main NACE codes.
HHI	Measure of the level of competition within an industry. HHI can be any value between 1 and 10,000, where 1 denotes the highest level of competition possible, and 10,000 is a monopoly market. The measure is calculated by adding the square of the market share of each company within an industry. HHI is measured both at the year prior to PE entry and the year of PE exit. When registering HHI, the Nordics have been considered as one market.
Change in HHI	Measures the difference between HHI at exit and HHI at entry. Thus, a positive change in HHI is interpreted as a market that has become *less competitive* during the holding period.

A.2 Correlation

The below figures depicts the correlation between holding period and add-ons, and holding period and size. We observe that the two former variables seem uncorrelated, and there seem to be some correlation between the two latter variables. However, this may be caused by the size of the x-axis, and the calculated correlation between the variables is only 0.12, thus we infer that there is no significant problem with multicollinearity.

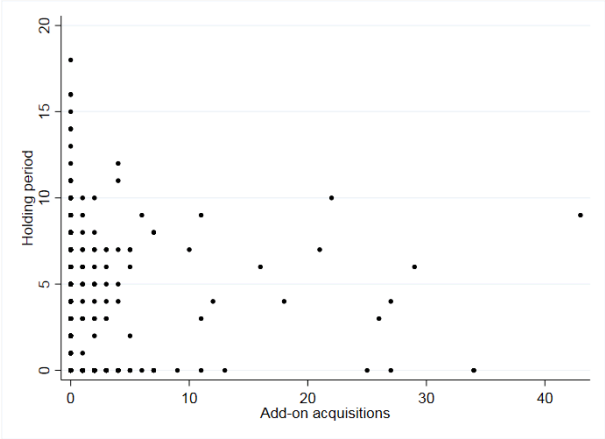

Figure A.1: Correlation between holding period and add-ons

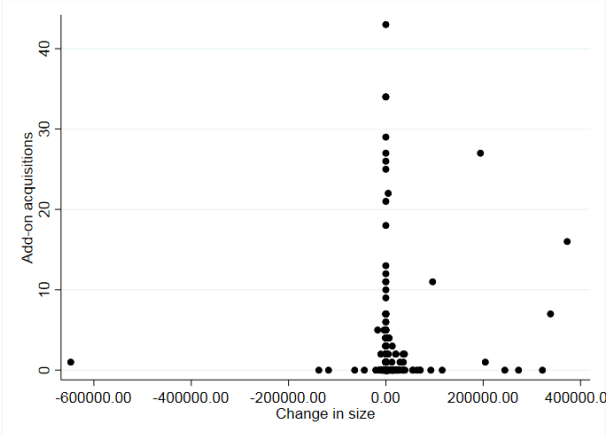

Figure A.2: Correlation between holding period and size

Table A.2: **PSM for change in size**

The table shows the result of PSM on bias reduction in covariates, and tests of the matching quality. The mean and median estimates of the bias has been substantially reduced by the matching, although not lower than the common threshold of 5. The standard deviation between means in the two groups, B, has been reduced, but the variance ratio of the propensity score, R, does not lay in between its desired interval of 0.5 and 2. However, the large reduction in bias leads to the conclusion that the identified sample is more expedient than the sample in total. Hence, this forms the sample used for regressing model 5.2.

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Covariates		*Platform companies*	*Portfolio companies*	*Percentage bias*	*Percentage reduction in bias*	*T-statistic*	*p-value*
Location of portfolio company	Unmatched	2.94	2.98	-4.00		-0.55	0.58
	Matched	2.94	3.0175	-8.00	-98.60	-0.68	0.49
Industry	Unmatched	8.97	5.36	73.00		8.66	0.00
	Matched	8.95	9.46	-10.40	85.80	-1.03	0.30
Cost level	Unmatched	2,169.10	300.67	21.00		3.97	0.00
(in EURth.)	Matched	2,156.70	493.47	18.70	11.00	1.80	0.07
Long term debt	Unmatched	5,786.90	243.01	26.70		7.47	0.00
(in EURth.)	Matched	2,175.40	1,645.60	2.50	90.40	0.79	0.43

Matching quality	*Unmatched sample*	*Matched sample*
Bias		
Mean	31.20	9.90
Median	23.80	9.20
LR chi-sq	120.81	6.16
B	51.20	23.50
R	11.82	6.09
Pseudo R^2	0.10	0.01

A.3 Propensity Score Matching

Table A.4: **PSM for change in HHI**

The table shows the result of PSM on bias reduction in covariates, and tests of the matching quality. The mean and median estimates of the bias has been substantially reduced by the matching, although not lower than the common threshold of 5. The standard deviation between means in the two groups, B, has been reduced, and the variance ratio of the propensity score, R, lays in between its desired interval of 0.5 and 2. This forms the sample used for regressing model 5.3.

Covariates		*Platform companies*	*Portfolio companies*	*Percentage bias*	*Percentage reduction in bias*	*T-statistic*	*p-value*
Country	Unmatched	2.94	2.98	-4.10		-0.55	0.58
	Matched	2.94	3.01	-7.00	-72.20	-0.61	0.55
Industry	Unmatched	8.98	5.36	73.10		8.66	0.00
	Matched	9.00	9.34	-6.90	90.60	-0.69	0.49
Aggregated costs at entry	Unmatched	2,181.50	301.03	21.10		3.98	0.00
	Matched	2,144.20	4,398.70	-25.30	-19.90	-1.05	0.30
Long-term debt at entry (in EURth)	Unmatched	5,819.90	195.25	27.10		7.71	0.00
	Matched	2,655.70	2,255.40	1.90	92.90	0.51	0.61

Matching quality	*Unmatched sample*	*Matched sample*
Bias		
Mean	31.30	10.30
Median	24.10	6.90
LR chi-sq	133.54	3.50
B	42.50	20.00
R	31.04	0.95
Pseudo R^2	0.12	0.01

Table A.6: **PSM for change in relative cost level**

The table shows the result of PSM on bias reduction in covariates, and tests of the matching quality. The mean and median estimates of the bias has been substantially reduced by the matching, and close to the common threshold of 5. The standard deviation between means in the two groups, B, has been reduced substantially, and the variance ratio of the propensity score, R, lays in between its desired interval of 0.5 and 2. This forms the sample used for regressing model 5.4

Covariates		*Platform companies*	*Portfolio companies*	*Percentage bias*	*Percentage reduction in bias*	*T-statistic*	*p-value*
Location of portfolio company	Unmatched	3.06	3.20	-15.20		-1.86	0.06
	Matched	3.06	2.98	7.80	48.30	0.57	0.57
Industry	Unmatched	9.08	8.41	15.30		1.71	0.09
	Matched	9.07	8.74	7.50	51.20	0.61	0.54
Cost level	Unmatched	2,404.50	648.33	17.00		2.31	0.02
(in EURth.)	Matched	2,409.20	1,915.30	4.80	71.90	0.29	0.77
Long term debt	Unmatched	7,015.80	378.11	29.10		5.67	0.00
(in EURth.)	Matched	2,343.80	2,214.50	0.60	98.10	0.19	0.85

Matching quality	*Unmatched*	*Matched*
Bias		
Mean	19.20	5.20
Median	16.20	6.10
LR chi-sq	57.51	0.80
B	30.60	10.70
R	137.48	0.94
Pseudo R^2	0.07	0.00

Table A.8: **PSM for change in interest-to-debt ratio**

The table shows the result of PSM on bias reduction in covariates, and tests of the matching quality. The mean and median estimates of the bias has been substantially reduced by the matching, although not lower than the common threshold of 5. The standard deviation between means in the two groups, B, has been reduced, but is high and indicates that there still exist a substantial amount of variation between the samples. The variance ratio of the propensity score, R, lays in between its desired interval of 0.5 and 2. In total, we deem the matched sample to be more expedient than the sample in total. Hence, this forms the sample used for regressing model 5.5.

Covariates		*Platform companies*	*Portfolio companies*	*Percentage bias*	*Percentage reduction in bias*	*T-statistic*	*p-value*
Location of portfolio company	Unmatched	2.76	3.10	-35.20		-3.03	0.00
	Matched	2.74	2.55	20.00	43.40	1.20	0.23
Industry	Unmatched	9.66	8.12	33.50		2.81	0.01
	Matched	9.72	9.53	4.10	87.90	0.26	0.80
Cost level	Unmatched	2,669.10	1,137.20	11.90		1.13	0.26
(in EURth.)	Matched	2,608.60	9,218.30	-51.30	-331.50	-1.43	0.16
Long term debt	Unmatched	11,982	1,074.50	37.00		4.95	0.00
(in EURth.)	Matched	5,570.50	4,269.40	4.40	88.10	0.83	0.41

Matching quality	*Unmatched*	*Matched*
Bias		
Mean	29.40	19.90
Median	34.40	12.20
LR chi-sq	47.75	5.22
B	48.30	35.40
R	20.09	0.92
Pseudo R^2	0.11	0.02