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Private Equity in Finland

An assessment of value creation and drivers for buyout activity

Gaute Bakke and Johan Marcus Bull-Berg

Supervisor: Carsten Bienz[⊥]

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NORWEGIAN SCHOOL OF ECONOMICS

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ABSTRACT

Studying over 80 buyouts from 1999-2015 in Finland, we analyse companies subject to a buyout before and after acquisition, relative to a carefully constructed benchmark. Both groups are analysed across four dimensions: A) Operating performance, B) Insolvency risk, C) Employment and D) Total Factor Productivity (TFP). Firstly, private equity investors do not appear to select companies that grow faster than benchmark, but rather companies with an efficient asset base. We proceed to prove that portfolio companies achieve significantly higher growth in turnover after acquisition. Secondly, financially healthy companies appear more likely to become subject to buyout activity, but private equity investors do not appear to utilize the strong financial position by increasing debt levels subsequent to acquisition. Thirdly, portfolio companies increase employment substantially more than benchmark in the three years after acquisition, but seemingly at the expense of lower wage growth. Finally, Private Equity investors appear to target efficient companies. However, the portfolio companies are unable to sustain their competitive advantage after acquisition.

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INTRODUCTION

Previous literature within the field of Private Equity (PE) primarily focuses on larger economies. However, smaller economies have experienced a steady growth of PE activity the last decade. The Nordic buyout market, in particular, has emerged to become one of the most successful and active in Europe (BCVA, 2012), which has led to a recent surge in studies. Despite this, there are no comprehensive assessments of the Finnish buyout market.

Applying a custom database of more than 80 Finnish buyouts between 1999 and 2015, this thesis makes two contributions to the existing literature on PE. First, we assess the economic impact of PE investments on portfolio companies in Finland, thereby contributing to a complete assessment of the Nordic buyout market. Second, we study the development in firm characteristics of buyout targets from four years prior to the acquisition. Ultimately we aim to identify key trends in the selection process that may serve as predictors for future buyout activity. As few studies analyse buyout targets before an acquisition we apply a partially novel approach. The thesis evaluates PE activity relative to a carefully constructed benchmark, across four dimensions: A) Operating performance, B) Insolvency risk, C) Employment and D) Total Factor Productivity (TFP).

In line with previous studies on the Nordic market, our findings suggest that sales growth of PE backed companies increase significantly subsequent to acquisition. We find no evidence suggesting that PE investors target firms with deviating EBITDA margins, nor indications for higher post-buyout growth propagating into higher margins in the years after buyout. In addition, PE investors appear to target companies with strong asset return, but are unable to further increase asset returns subsequent to buyout. Solvency measures suggest that companies with a strong financial position are more likely to be acquired. In contrast to most research, we do not find evidence of increased indebtedness subsequent to acquisition. Employment metrics suggests only slightly stronger increase in employment and wage levels for buyout targets prior to acquisition. However, after buyout, portfolio companies experience substantially higher employment growth than benchmark, but seemingly at the expense of lower average wage growth. Lastly, efficient companies appear more likely to become subject to buyout activity. Surprisingly, and in contrast to existing research, portfolio companies are not able to increase, nor sustain their competitive efficiency advantage after acquisition.

PE is not a new phenomenon. In the aftermath of the Leveraged Buyout (LBO) boom in the early 1980s, the PE industry has grown and evolved rapidly. However, the emergence of PE has not escaped criticism, politically nor academically. Critics argue that PE investments merely generate value for investors, and fail to have positive socioeconomic impact (Elliott, 2007). The PE market also received strong media attention during the run up to the 2012 U.S. presidential election, questioning whether PE investors are job destroyers, more than anything[1]. In contrast, existing literature largely dissents the prevailing criticism. Researchers argue that PE investors contribute to more efficient capital allocation and increased productivity, positively affecting the economy (Strömberg, 2009). The disciplining role of increased debt along with superior corporate governance are also addressed as a key sources of value creation (Jensen, 1986). Due to this polarized view, impartial assessments of the effects of the PE industry are important.

Focusing on operating performance, earlier research of PE-backed companies found clear evidence of value creation. In the 1980s, Kaplan (1989) found significant gains in operating profitability in buyout companies compared to the industry average. Similar results are reported by Smith (1990), using a sample from 1977-1986. In contrast to earlier findings, more recently published papers are not able to draw the same definite conclusion of value generation in portfolio companies after a buyout. On one hand, Cressy, Munari and Malipiero (2007), Boucly, Sraer and Thesmar (2011), and Weir, Jones and Wright (2015) all find significant operating improvements. On the other hand, Leslie and Oyer (2008) and Guo, Hotchkiss and Song (2011) find only limited gains in operating performance relative to a an industry adjusted benchmark. Focus on cost cutting was a common identifier in the earlier studies. In contrast, Gompers, Kaplan and Mukharlyamov (2015) find in a recent survey that PE investors anticipate creating value by increasing growth rather than cutting costs. Turning the focus to the Nordics, Gulliksen, Wara and Hansen (2008) also find that future growth potential is the most important investment criteria when identifying buyout targets in the Nordic. Grubb and Jonsson (2007), Gulliksen et al. (2008), and Friedrich (2015) find evidence of significant value creation in portfolio companies in Sweden, Scandinavia, and Norway, respectively. In contrast, other studies, in Sweden (Lundgren & Norberg, 2006) and Denmark (Vinten, 2007), are unable to find significant improvements in operating performance. Two papers have studied the effect on operating performance of portfolio companies on the Finnish market.

[1] See "Monster Inc?" (The Economist, 20112) and “The bane of Bain” (Financial Times, 2012).

Unfortunately, due to restrictions in the data samples, they do not provide an adequate analysis of the impact of a PE buyout on Finnish companies[2]. Thus, no comprehensive analysis of the Finnish buyout market exists.

A closely related aspect to operating performance, is whether PE investments contribute to enhance the efficiency of firms. Lichtenberg and Siegel (1990), and Harris, Siegel and Wright (2005) find significant post-buyout improvements in TFP when analysing the U.S.- and U.K market from 1972-1988 and 1994-1998, respectively. Newer research on the U.K buyout market, including the period of the financial crisis, show that TFP improvement tend to be even stronger in economic slowdowns (Wilson, Wright, Siegel, & Scholes, 2012). In the Nordics, Friedrich (2015) confirms that TFP for portfolio companies in Norway increase after buyout. In contrast to research addressing the effect of buyouts on operating profitability, research on TFP appears to be unequivocal.

One common critique of PE investments refers to the potentially negative effects associated with strong indebtedness of portfolio companies after buyouts. In a recent contribution to this topic, Tykova and Borell (2012) investigate financial distress risk of European companies in the period 2000-2008. Their findings suggest that PE investors target companies with low financial distress risk, and proceed to increase debt after acquisition. As a consequence, the distress risk increases. Surprisingly, however, PE backed companies do not appear to suffer from higher bankruptcy rates. Another proposed hypothesis is that PE firms target financially constrained firms and help them grow faster by increasing debt levels (Boucly, Sraer, & Thesmar, 2011). These two hypotheses indicate a somewhat different investment approach when selecting buyout targets, but both conclude that debt levels increase after buyout. In contrast, evidence from Norway suggests no considerable change in post-buyout distress risk, and even suggests a slight decrease in debt levels after buyout (Friedrich, 2015). Further, Grubb and Jonsson (2007) find no indications of increased debt levels for PE backed companies in post-buyout years for the Swedish market.

Another debated topic regarding PE, is the alleged wealth distribution from employees to shareholders (Shleifer & Summers, 1988). A comprehensive study on the U.S. PE market,

[2] Jääskeläinen (2011) studied the performance differences of 144 portfolio companies in the Nordic, including 30 Finnish companies in the period 2007-2009. However, the time-horizon only spans over the period of the financial crisis, as well as he did not study the isolated effect in Finland. Männisto (2009) studied the effect of 146 transactions from 2002-2004, but also included venture and seed investments. Due to the different characteristics of early- and later stage investments and a limited time horizon, further research is needed to better understand effects of PE activity in Finland.

analysing buyouts between 1980 and 2015, finds a decrease in employment relative to control firms five years after buyout (Davis, Haltiwanger, Jarmin, & Miranda, 2011). On the other hand, the Centre for Entrepreneurial and Financial Studies (2005) analyses job creation in Europe after buyouts, and estimates nearly four times higher employment growth in private-equity backed companies than for the economy in general. These findings are supported by Boucly et al. (2011), suggesting an increase in employment compared to non-targeted firms, three years after the buyout. In the Nordics, Olsson and Tåg (2012) analyse the effect on employees in the wake of a PE buyout. Despite a decrease in employment growth, employment risk declines in PE-backed companies. Friedrich (2015) finds a substantial increase in employment for the Norwegian buyout market. Grubb and Jonsson (2007) do not find indications that value creation comes at the expense of increased employee risk for the Swedish buyout market. Although research on the effect on employment risk in general may not be conclusive, recent studies appear to suggest that PE activity might contribute positively to employment in the Nordic.

This thesis analyses the *post-buyout* performance of portfolio companies relative to benchmark using a custom created data sample of 83 matched buyouts between 1999-2012 in Finland. Assessing the post-buyout results in detail, we identify several key findings. First, portfolio companies achieve a 14 percentage points (pp) higher sales CAGR than benchmark. These results confirm the majority of research conducted on the Nordic market[3]. Second, operating margins remain relatively unchanged, indicating that top-line growth rather than cost cutting is the main source of value creation in portfolio companies[4]. Third, we find no indications of increased indebtedness or distress risk for PE-backed companies in post-buyout years. These findings contradict recent hypotheses, of how PE investors utilize leverage to create value in portfolio companies[5]. However, the results give support to recent assessments of post-buyout leverage levels in the Nordic market[6]. Fourth, we find that portfolio companies on average experience a 29% employment growth, compared to 6% for benchmark. However, the growth in average wage per employee is 18 pp lower for PE backed companies. Nevertheless, the results do not suggest that portfolio companies achieve value creation at the expense of employees. This is line with related research on PE activity's effect on employment in the

[3] See for example, Gulliksen et al. (2008), Grubb and Jonsson (2007), and Friedrich (2015).
[4] This conclusion corresponds to evidence from Norway (Friedrich, 2015), but not Sweden (Grubb & Jonsson, 2007).
[5] See for example, Tykova and Borell (2012) and Boucly et al. (2011).
[6] Grubb and Jonsson (2007) and Friedrich (2015) find no indications of higher leverage in portfolio companies after acquisition.

Nordic market[7]. Fifth, portfolio companies are not able to increase, nor sustain their initial TFP advantage after buyout. These results stands in contrast to prevailing literature on PE activity's effect on productivity[8].

The analysis of the *pre-buyout* period applies the same methodology as the first part, using a sample of 84 buyout targets between 2002-2015. However, the development of buyout targets is analysed relative to a benchmark constructed four years prior to acquisition. We highlight several indicators of future buyout activity. First, we find that buyout targets experience an increase in asset return metrics leading up to acquisition, as opposed to a decrease for benchmark. This indicates that PE investors target companies with an efficient asset base. Second, future buyout targets reduce the leverage ratio by 24pp compared to benchmark. In combination with other insolvency measures, buyout targets, therefore, appear to be underleveraged and less financially constrained. This suggests that a strong financial position could serve as a predictor of future buyout activity, giving support to the hypothesis that PE investors seek to acquire companies with a strong financial position[9]. However, as indicated by the assessment of post-buyout insolvency metrics, we do not find that PE investors see the strong pre-buyout financial position as an opportunity to increase the indebtedness of portfolio companies. Three, in the years before being acquired, buyout targets increase the TFP compared to benchmark by 11 pp, indicating that PE firms seek to acquire productive companies. The assessment of pre-buyout TFP also contradicts previous research on firm level productivity prior to acquisition[10]. In addition, future buyout targets achieve a 7 pp higher three year mean sales CAGR than benchmark. However, running a robustness analysis we are not able to conclude that companies experiencing strong top-line growth are more likely to be acquired.

The remainder of the thesis is structured in four sections. The first section describes the data gathering process and sample construction. The second section presents the methodology used in the analyses. The third section presents a detailed review of our findings. The final section includes our conclusion and closing remarks.

[7] Olsson and Tåg (2012) find declining unemployment risk despite decreased employment growth in Sweden. Grubb and Jonsson (2007) find no support of increased value creation on a company level at the expense of employees. Friedrich (2015) identifies a substantial increase in employment remuneration and employment growth in Norway.
[8] For example, Lichtenberg and Siegel (1990), Harris et al. (2005), and Friedrich (2015) all find significant efficiency improvements in the years following a buyout.
[9] Tykova and Borell (2012) also find that buyout targets on average have lower financial distress risk before being acquired. However, our findings contradict recent evidence from France (Boucly, Sraer, & Thesmar, 2011).
[10] See for example Harris et al. (2005), Lichtenberg and Siegel (1990), and Friedrich (2015).

1. SAMPLE DESRIPTION

This section provides a walkthrough of the custom created dataset used in the analysis. The foundation for our data sample is two datasets. The first is a buyout database collected by Argentum Center for Private Equity (ACPE), with 549 identified buyouts in Finland. The second database, "Voitto+"[11], consists of accounting data of more than 200,000 Finnish companies from 1999-2015. Due to missing data points in the "ACPE database," additional transaction data has been extracted from two other sources, "Nordic Deals" and "Thompson Venture Economics". To the best of our knowledge, the constructed database applied in this thesis is the most comprehensive sample on the Finnish buyout market. Nevertheless, due to reporting standards in Finland, how the Voitto+ database is constructed, and poor quality of the accounting data, the sample size that forms the basis for the analysis is greatly reduced. The custom created buyout database contains 169 buyouts with corresponding accounting data in Finland, spanning from 1999 to 2015. After matching, we obtain 83 analysed deals in Part I, and 84 deals in Part II. Figure 1A in Appendix illustrates the data gathering process. Table I provides an overview of the different stages in the data gathering process.

1.1 CUSTOM BUYOUT DATABASE

Of the 549 identified buyouts in the original ACPE database, only a limited number of buyouts from 1995-2012 contain the organizational ID of the company being acquired and the year the investment took place, both which are necessary for the analysis. As described later in the data- and methodology section, the buyout sample is further reduced due to several factors. Therefore, to increase the data sample, probabilistic linkage method (reclink) (Wasi & Flaaen, 2015) is applied in order to extrapolate additional transaction data from "Thompson Venture Economics" and "Nordic Deals". Because "Nordic deals", "Thompson Venture Economics", and "ACPE" are collected by different entities, there is no common unit identifier between the databases. Thus we are not able to merge these using standard merging methods. However, reclink allows for merging between datasets, without a common unit identifier, by relying on approximate string comparison algorithms (Wasi & Flaaen, 2015).

[11] Developed by Asiakasieto.

Table I – Illustration of Data Sampling Process

Overview of the data gathering process and the construction of a custom database for analysing Finnish buyout deals. The ACPE database has been supplemented with information from the Thompson Venture Economics- and Nordic Deals databases using Probabilistic Record Linkage matching. The Custom database has been merged with accounting data from the Voitto+ database. The merged sample forms the basis for the Propensity Score Matching procedure.

Step	Description	Effect	Sample Size
1	Buyouts ACPE database		549
2	Missing only organizational ID	-50	499
3	Missing only investment year	-245	254
4	Missing both Organizational ID and Investment year	-170	84
5	Propensity Score Matching (PSM)	-61	23
5	**Buyouts from ACPE database containing all necessary data for analysis**		**23**
	Increasing sample size using Probabilistic Record Linkage (PRL)		
6	PRL - Qualitative information Voitto+	18	102
7	PRL - "Nordic Deals"	143	245
8	PRL - "Thompson Venture Economics"	16	261
9	PRL - Finding organizational ID for residual deals from "Nordic deals" and "Thompson Venture Economics"	131	392
10	**Custom created database**		**392**
	Merging Voitto+ with custom created database		
11	No match on organizational ID	-81	311
12	Investment year earlier than 1999	-29	282
13	Duplicate deals	-5	277
14	Missing accounting years	-108	169
15	**Total buyouts from 1999-2015**		**169**
	Buyouts analysed in Part I, after running Propensity Score Matching (PSM)*		**83**
	Buyouts analysed in Part II, after running Propensity Score Matching (PSM)*		**84**

* Number of buyouts are reduced due to missing data points when performing the Propensity Score Matching (PSM)

As reclink depends on "likely" matches, there is a margin for error. Therefore, a manual assessment of each match suggested by reclink is conducted. Only matches we are confident are correct, are transferred to the custom database. To illustrate, a typical "close" match is if the company names include "OY"[12] in one database, and not in the other. Applying reclink on the two additional databases allows us to substantially increase the data sample, from 84 – to 392 buyouts in Finland from 1988-2015.

1.2 MERGING PROCEDURE

Before merging the custom buyout database with the accounting data, we remove any duplicate deals. There are duplicate deals in the database due to two reasons. First, since we have collected transaction data from three different sources, some deals are counted twice[13]. Second, the remaining identified buyouts are not all associated with unique companies, meaning one company could have been involved in several transactions across the time period analysed. If two (or more) transactions involving a particular company happened within an interval of four years, this can distort the results in the analysis. In these circumstances, the oldest deal has been removed. However, buyouts for the same organizational ID, where the investment years are more than four years apart, are included in the analysis. These restrictions are set due to the limited information about the buyouts in the databases, forcing us to treat each buyout as separate investments.

Merging the buyout data with the accounting data reduce the sample size for two reasons. First, due to how the databases are collected, it is not possible to match all organizational IDs across the two databases. Organizational IDs in the buyout database are collected at the investment date, but may have changed subsequent to the buyout. To investigate this, a qualitative analysis, using several publicly available company registrars, is conducted. The most common reason for the change in organizational ID is a merger. The accounting data includes only the updated organizational numbers of the merged company. Without a common unit identifier, linking organizational IDs with the accounting data is not possible, thereby reducing the sample size. Second, the Voitto+ database contains only accounting data from 1999-2015, excluding any investments prior to this.

[12] "Incorporated" translates to "OY" in Finland.
[13] A buyout is counted twice if there are two deals that include the same organizational ID and investment year.

1.3 DATA CLEANING

The accounting database, Voitto+, presents five main challenges. First, the accounting data is structured according to the different reporting formats used in Finland, referred to as formulas. Formula 14, 15, and 24 refer to accounting data on company level, while formula 16 and 17 are consolidated figures. Due to the different formulas, the accounting figures for one year might be reported on both group and company level. Accounting data on group level is influenced by the performance of minority subsidiaries, which PE companies have little to no influence over. Thus, asserting group level data to a buyout will create a bias in the dataset. To solve this, accounting information on group level is deleted for companies reporting accounting information on both group- and company level. However, for companies involved in acquisitions that only report consolidated figures, we assert the group level accounting data as a proxy for the company's accounting figures. An exclusion of these companies would lead to a considerable loss of observations. The biasing effects of including group level data are minimal due to the matching procedure explained in the methodology. Therefore, we argue that it is a reasonably comprise between accuracy and sample size.

Second, companies report different accounting period lengths. For example, some companies have reported quarterly data, other two year results. In order to obtain a consistent comparison of accounting figures, equal accounting period length is necessary. Therefore, all accounting data reported for a period different from 12 months, are excluded[14].

Third, due to the different reporting formats, the accounting figures had to be unified across formulas. To illustrate, a unified Gross Result measure is manually calculated based on each formula's accounting setup, in correspondence with the database provider. This procedure is replicated across all applied accounting measures in the analysis.

Fourth, some accounting multiples and several key variables are not reported in the Voitto+ dataset. Among others, this include "EBITDA", "Working Capital", "Fixed Assets", and "Long Term Interest Bearing Debt". These variables are manually calculated in correspondence with the database provider.

Lastly, a considerable challenge is to account for extreme observations. Yaffe (2002) suggests running the statistical analysis on a winsorized distribution. Winsorizing a distribution

[14] Note, all buyouts report yearly accounting figures.

involves assigning the values of any observations outside a defined quantile, to the value of that quantile. Defining the quantile is a debated topic, but the difference between winsorizing at 95% or 99% is usually modest for large samples (Brandon & Songtao, 2012). Considering the Voitto+ dataset, we identify several extreme outliers. The outliers are particularly large for accounting measures such as leverage ratio and EBITDA margin. Investigating these measures further we find that data points representing these outliers are mostly small companies with little to no sales or assets. Consequently, multiples tend to be unrealistically large, or strongly negative. We choose to winsorize the dataset at a 99% level, implying that observations outside the 99.5^{th} and 0.05^{th} percentile is set to the value of the observation at the specified percentile. The 99% level can be viewed as a conservatively defined range (Leone, Minutti-Meza, & Wasley, 2014). Inspecting the post-winsorized distribution, we find a successful elimination of the most extreme outliers along with a good preservation of the original data.

1.4 SAMPLE DISTRIBUTION

The final sample consists of 169 buyouts between 1999 and 2015. The distribution of industries and buyout classifications between 1999 and 2015 is depicted in Table II and III. Close to 70% of the buyouts happened after 2006, and manufacturing comprises around a third of all buyouts. Other dominant industries are transportation, and administration and support services. Due to a lack of granularity in the investment databases, approximately 70% of the transactions are classified as buyouts, without any information on the size of the deals. Prior to 2006 the variation of different buyouts was larger, but after 2006 all transactions are classified as buyouts. We find this somewhat surprising. Investigating this further, we are not able to find any documented reason to this, but assert that this might be caused by new reporting- or classification formats after 2006. Note that the actual buyouts analysed are reduced to 83 and 84 for the analyses in Part I and Part II, respectively. The reason for the substantial reduction in sample size is due to the matching procedure and is explained in more detail in the methodology section.

Table II – Buyout Distribution by Sector and Investment Year

Sector-to-buyout year overview of the identified buyouts. Sector codes are defined by level 1 NACE-code. The stage classification was obtained using the Finnish Tulli Custom data base for industry classification. The year variable defines the year the acquisition took place. Note that due to missing covariates for some of the buyouts, running Propensity Score Matching reduces the sample to 83 and 84 buyouts in Part I and Part II, respectively.

Buyout Distribution over Industry and year

Industry	Total	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Mining and Quarrying	3	-	-	-	1	2	-	-	-	-	-	-	-	-	-	-	-	-
Manufacturing	52	2	2	2	-	4	2	2	4	9	7	1	3	4	4	2	3	1
Construction	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Wholesale and Retail Trade	8	-	-	1	-	-	1	-	-	2	1	2	-	1	-	-	-	-
Transportation and Storage	19	-	-	1	-	1	1	3	-	1	1	1	2	2	4	-	1	1
Accomodation and Food Service	4	2	-	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-
Information and Communication	3	1	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-
Financial and Insurance	12	-	1	1	-	-	-	-	-	-	2	-	-	2	-	2	3	1
Real Estate Activities	11	1	1	-	-	-	-	-	-	1	1	1	-	3	1	2	-	-
Science and Technology	3	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	1
Adm. & Support Service	27	-	1	2	1	-	-	2	2	1	4	-	2	4	2	3	3	-
Public Adm. & Defence	12	1	-	-	1	-	1	-	1	-	4	-	1	1	-	-	2	-
Arts, Entertainment and Recreation	14	-	-	-	-	-	1	-	-	1	1	-	2	1	1	2	4	1
Total	169	7	5	7	3	8	6	8	7	15	21	6	11	20	13	11	16	5

Table III – Buyout Distribution by Stage and Investment Year

Overview of stage-classification over investment year. All acquisitions prior to 1999 have been excluded from the overview due to lack of accounting information. The stage classification has been obtained by "Thompson Venture Economics"-, "Argentum ACPE-", and "Nordic Venture-PE deals"- database. Note that due to missing covariates for some of the buyouts, running Propensity Score Matching reduces the sample to 83 and 84 buyouts in Part I and Part II, respectively.

Buyout stage by Investment Year

Industry	Total	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Add-on	21	2	2	2	3	3	7	2	-	-	-	-	-	-	-	-	-	-
Buyout	119	7	3	6	2	8	3	7	5	11	10	3	7	15	12	8	9	3
Generalist	2	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Large-Cap	2	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PIPE	4	1	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Piublic to Private	2	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Recapitalisation	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Small/mid-cap Buyout	18	1	1	1	2	3	5	1	4	-	-	-	-	-	-	-	-	-
Total	169	15	10	11	7	14	15	10	9	11	10	3	7	15	12	8	9	3

1.5 STRENGHTS AND WEAKNESSES OF THE DATA SAMPLE

The custom created buyout database is comprehensive, highlighted by three main reasons. First, the database is based on buyout data from three different sources, arguably making the database more robust. Second, the database differentiates between group- and company level. This enables us to isolate the direct performance effect of a buyout on the target company. Third, the database includes complete income statements and balance sheets, allowing us to analyse across most accounting figures.

Despite the strengths, there are several weaknesses associated with the sample. First, we have not been able to find the investment year and organizational ID for all the 549 buyouts identified by the ACPE database. If there is a systematic reason for the missing investment years and organizational IDs, a potential bias can be inherent in the dataset. Second, the database does not contain detailed information on whether an investment happened in stages. An example is a fund acquiring 40% of the company in 2004, and proceeding to increase its ownership to 100% five years later. As explained earlier, we need to treat each investment as a separate unique investment in order to perform the analysis, and hence effectively ignore step-wise investments. However, we have mitigated this problem by removing multiple investments that involves the same company and where the investment period is within a four-year timespan. Three, balance sheet items lack necessary details. This is particularly a problem when calculating debt figures. A disproportionally large portion of the companies' debt is lumped together in "Other Loans and Liabilities" for a considerable part of the database. This prevents us from accurately differentiating between long-term interest bearing debt and working capital figures. In collaboration with the provider of the Voitto+ database, we have unfortunately not been able to completely resolve this issue. However, a proxy for the companies' interest bearing debt and working capital has been created, and approved as a representative proxy by the database provider. Fourth, we are unable to merge a large portion of the organizational IDs when merging with the accounting database. However, investigating this issue, we find no persistent trend to this problem apart from a lack of investment IDs. Therefore, this problem does not introduce a considerable bias in the analysis other than reducing the number of observations. Lastly, several companies only have accounting figures for the years leading up to acquisition and not after, while other companies only have accounting figures for the years after acquisition. This entails that a direct comparison between pre- and post-buyout development for each firm is not feasible.

2. METHODOLOGY

In this section we seek to provide an overview of the different methodologies applied in the analyses. First, we discuss the matching procedure central to Part I and – II of the thesis, namely Propensity Score Matching (PSM). Second, we briefly discuss the selection of outcome variables. In addition, we address the different statistical methods used to verify the validity of our findings as well as other considerations needed for the analysis.

The thesis aims to test whether there is a relationship between an acquisition and the development of firm characteristics for buyout targets *subsequent*- (Part I) and *prior to* (Part II) an acquisition. In both parts of the analysis the buyout companies are analysed in relation to their benchmark group across four dimensions: A) Operating performance, B) Insolvency risk, C) Employment, and D) Total Factor Productivity (TFP).

2.1 PROPENSITY SCORE MATCHING

Due to the unique investment approach by PE firms, where buyout targets are chosen on the basis of certain characteristics, the selection process is not random (Caliendo & Kopeinig, 2008). First, PE investors tend to specialise in certain industries, indicating that some industries are more prone to experience buyout activity than others (Cressy, Munari, & Malipiero, 2007). Second, PE activity tend to correlate with economic boom- and bust cycles, implying that timing is a non-random factor (Kaplan & Strömberg, 2009). Further, once a target company is selected, the PE firm undertakes a due diligence of the target company based on several company specific- and market factors, resulting in a non-randomized selection process. Consequently, there is a systematic difference between the companies that are subject to a buyout and those that are not. In technical terms, this creates a selection bias, making it difficult to estimate the casual treatment effect (Rosenbaum & Rubin, 1983) (Dehejia & Wahba, 2002). Therefore, in order to accurately estimate the true effect of a buyout, a valid control group, adjusted for market timing, and industry- and firm characteristics, is required. PSM mitigates the selection bias by creating a group consisting of companies that, based on a set of covariates, have similar probabilities of being acquired (Stuart, 2010). For Part I, this entails that the two groups are similar at buyout date (t=0). For Part II, this entails that the two groups are similar four years before the buyout (t-4).

According to Stuart (2010) "matching" is any method that seeks to reduce the differences in distribution of the covariates between the treatment- and control group. Alternatives to matching methods like propensity matching include adjusting for covariates in a multiple regression, including instrumental variables, structural equation modelling or selection models. However, one of the key benefits of matching is the randomization process, which implies that the treated- and untreated group are only randomly different from one another. Thus, analyses based on matched samples tend to be more robust than alternative models (Stuart, 2010).

Generally, there are two key assumptions underlying the use of matching methods (Rosenbaum & Rubin, 1983). First, the strong ignorable assumption states that there exists a set of observable covariates that leads to potential outcomes being independent of treatment status once controlled for these observable covariates. Second, common support states that for each value of a covariate there is a positive probability of being in the untreated and treated group. A discussion about satisfaction of these assumptions is presented in the segments below.

Although PSM methods have been widely used to process data for causal inference, the methods have several drawbacks. King and Nielsen (2016) recently highlighted the weakness of PSM's attempt to approximate completely randomized experiments, making it blind to often considerable imbalance in the data sample. They show that this is more effectively eliminated by using other matching methods that apply full blocking. King and Nielsen continue to argue that even in balanced data, the randomization might actually increase the imbalance compared to the original data. On the other hand, they point out that these problems are more evident in smaller data samples. Further, in data sets containing data that are too imbalanced to draw any causal inference without heavy modelling assumptions, the PSM method effectively reduce the imbalance. Focusing on our data set, we see strong imbalance between the treatment- and control group[15], indicating that PSM is a desirable model of choice. However, as King & Nielsen points out, even in strongly imbalanced data sets, PSM has to be handled with caution. In relation to this, Stuart (2010) proposes three steps when creating a matched sample based on PSM. The first step is to determine the measure of distance. The second step involves choosing the appropriate matching method. The third step is to assess the quality of matches.

[15] The imbalance of the buyout companies and the control group before matching is illustrated in Table V.

2.1.1 DISTANCE MEASURE

The key concept of stage one, "Distance measure", is the assumption of strong ignorable treatment assignment (Rosenbaum & Rubin, 1983). To satisfy this assumption it is important to match on all variables that are believed to be related to both the treatment assignment and the outcome. Ignoring important variables will, according to Heckman (1997) and Dehejia and Wahba (1999), increase the bias of the estimated results. A second critical issue is the timing of the matching. According to Barber and Lyon (1996), the variables should be matched in the year prior to the buyout year, in order to reduce the biases. Kaplan (1989) and Holthausen and Larcker (1996) also use the same approach. Lastly, a similarity threshold between the two groups has to be set. According to Stuart (2010) there are four primary ways to define the distance; 1) Exact matching, 2) Mahalanobis matching, 3) Propensity score and 4) Linear propensity score. The next three paragraphs explain how we have applied these three issues on the Finnish sample.

First, we match based on the following covariates; "Year of investment", "EBITDA", "NACE code", "Turnover", "Total Assets", "Long-term-debt-to-Total-Assets (Ltd/TA)", "Number of Employees" and "Age". We have excluded some variables, such as Cash in Hand and previous sales growth[16], although they may potentially affect whether the firm is likely to be subject to a buyout. This can lead to a potential bias in our results (Barber & Lyon, 1996). However, the data sample contains a considerable amount of missing observations for these variables. Consequently, including these would significantly reduce the matched sample. In conclusion, we argue that the variables chosen represent an adequate compromise between sample size and the fulfilment of the strong ignorable assumption.

Second, the accounting data lacks several data points for the year prior to the buyout (t-1). In Part I, as we restrict the sample to only consider deals prior to 2013, the number of observations would be significantly reduced if we matched on data points the year prior to acquisition. This problem is apparent in Part II, as we match four years prior to the acquisition. However, as we include deals up to 2015, we still achieve a sufficiently large data sample. For these reasons, we match on company characteristics at the year of acquisition (t=0) in Part I and four years prior to acquisition (t-4) in Part II, following Bienz, Thorburn and Walz (2015).

[16] Note, a robustness analysis on previous sales growth is applied on the performance metrics, and hence implicitly controlling for previous sales growth differences between the two groups. See the analysis section under "Operating Performance".

Third, we apply a combination of exact matching and linear propensity score for the distance measure, as proposed by Stuart (2010). We conduct exact matching on buyout year and NACE-code. The exact matching on industry and investment year is applied to control for industry specialisation and market timing effects, as pointed out in earlier studies by Kaplan (1989). NACE classification is not appropriate as an approximate matching variable. The reason for this arise from the way NACE codes are constructed. NACE is the industrial classification for economic activities, prescribed in the EC regulations (NACE/TOL standard industrial classification, 2016). There are 19 industry sections. As section 18 is not more similar to 19 than section 1, anything less than an exact match on NACE-code could potentially create a bias in the data. As seen in the distribution of buyouts by industry in Table II, there is a clear difference in buyout activity between industries. This implies that an exact industry matching procedure is important in order to fulfil the strong ignorable assumption. As PSM does not allow for exact matching on certain covariates, we have applied a workaround in Stata by creating unique combinations of each investment year within each specific industry. The matching procedure is then applied using linear propensity score on the remaining variables. Rosenbaum and Rubin (1985), Rubin and Thomas (1996) and Rubin (2001) have shown that this method can be particular effective in terms of reducing bias.

2.1.2 MATCHING METHOD

According to Stuart (2010) there are several matching algorithms used when conducting PSM. These primarily differ in terms of number of observations that remain after matching, and the relative weights assigned to each observation. Rubin (1973) argues that the nearest neighbour matching is the easiest to implement and understand, leaving this to be a conventional procedure. Further, more complex procedures may create a risk of unknowingly introducing biases in the model. Therefore, we choose to apply the nearest neighbour match in this thesis.

Choosing the number of firms assigned to the control group involves an inherent trade-off between variance and bias in the model. Increasing the number of companies in the control group implies reduced variance, but increased bias in the matched sample (Stuart, 2010). If the control sample is large, Smith (1997) and Rubin and Thomas (2000) argues that it might be preferable to include more matches for each treatment observation. As there are more than 200,000 companies in our control group, the probability of finding multiple matches for each buyout is high. In accordance to similar studies (Friedrich, 2015), and due to the risk of

matching too many firms to each treatment firm, we have applied 5:1 nearest neighbour matching to account for the variance-bias trade-off[17]. Further, in relation to fulfilling the common support assumption, we have ensured that all matches are within the common support region. For the distribution of common support for Part I and Part II, see Figure 2A in Appendix.

2.1.3 DIAGNOSING THE MATCHED SAMPLE

To best mimic a randomized experiment, the treatment should be uncorrelated with the matched covariates. This implies that the covariates should not be statistically different in the treatment group and the control group. There are several procedures to test whether PSM effectively balances the distribution of the relevant variables. A suggested approach is to use a two-sample t-test to identify if there are significant differences in covariate means for both groups (Rajeev & Adek, 2002). Rubin (2001) recommends that the difference in the means of the propensity scores between the treated- and untreated group (B)[18] should be small – preferably less than 25%. Further, he recommends that the ratio of the variances of the propensity scores (R)[19] between the treated- and untreated group should be close to one. Assessing the matching results for Part I Table IV, we find a somewhat stronger bias reduction for 1:1. However, in line with the bias-variance trade-off presented above, we find higher variance for 1:1- than 5:1 neighbours. Furthermore, Smith (1997) argues that for increased data samples, the choice of PSM procedures should be of less importance. With more than 200 000 control companies, the Voitto+ database produces a strong control group. Based on this, and in order to maintain consistency in the analysis, the 5:1 matching is applied in both parts of this thesis. See Table 1A for an assessment of matching quality for Part II.

[17] See "Diagnosing the matched sample" for a comparison of 1:1 and 5:1 nearest neighbor matching.

[18] $B = \frac{\overline{T_t} - \overline{C_t}}{\sigma_T}$, where $\overline{T_t}$ and $\overline{C_t}$refers to the mean propensity score of the buyout- and control group, respectively. σ_T refers to the standard deviaton of the buyout group.

[19] $R = \frac{\sigma_T^2}{\sigma_C^2}$, where σ_T^2 and σ_c^2 refers the variance of the propensity score of the buyout- and control group, respectively.

Table IV – Assessment of Matching Quality at buyout year

Quality assessment of the matching quality of Propensity Score Matching for one-to-one and five-to-one nearest neighbour matching. The matching applies replacement and common support. Bias represents average bias between treated and untreated group. P-value represents the statistical difference between the treated and untreated group. Mean P-value is estimated using T-tests. Median P-value is estimated using Wilcoxon-Mann-Whitney rank-sum test. B denotes number of standard deviations between group means. R denotes variance ratio between the treated and untreated group.

	Unmatched Sample	Five-to-one	One-to-one
Bias			
Mean	879.8 %	8.3 %	4.1 %
Median	963.0 %	7.8 %	4.0 %
P-Value			
mean	0.7 %	59.8 %	74.3 %
Median	0.0 %	56.9 %	71.2 %
B	-	23.3	16.5
R	-	0.53	0.52
R-sq	-	1.0 %	0.5 %
LR chi-sq	-	2.98	1.47

Table V exhibits the differences in mean for all matched covariates between the treated- and untreated group, before and after matching for Part I. See Table 2A in Appendix for bias reduction in Part II. The corresponding statistical significance along with the bias reduction for 5:1 is reported in the same table. Note that the number of buyouts are reduced to 83 after running the propensity score matching. This is due to several buyouts missing data for one or more of the covariates included in the PSM. As discussed earlier, the chosen covariates represent an adequate trade-off between a representative benchmark group and sample size. If there are no systematic reasons for the missing accounting figures, it should not create a bias in the analysis.

Table V – Bias Reduction in Covariates – At Acquisition Date

Assessment of bias reduction in the covariates used for Propensity Score Matching. The table provides comparison of the matched sample in relation to its control group, as well as the mean values for the entire data sample. The matching procedure was conducted applying five-to-one nearest neighbour matching with replacement and common support. Note that in addition to the matched covariates, exact matching for industry code (NACE level 1) and accounting year has been applied to avoid introducing time and sector bias. Bias reduction is measured as the sample bias reduction compared to the unmatched data sample. "T-test p-value" is assigned to assess matching quality prior to and after the matching. Increased p-value indicates higher matching quality.

Matching Variables		Control Group	Buyout Group	*Percentage Bias*	*Abs. Perc. Reduc. Bias*	*T-Test p-Value*
Turnover (EURm)	Unmatched	1.58	16.74	*963 %*		*0.0%*
	Matched	17.41	16.74	*-4 %*	*100 %*	*81.9%*
EBITDA (EURm)	Unmatched	0.12	1.45	*1072 %*		*0.0%*
	Matched	1.50	1.45	*-3 %*	*100 %*	*85.5%*
Total Assets (EURm)	Unmatched	1.32	24.33	*1740 %*		*0.0%*
	Matched	23.41	24.33	*4 %*	*100 %*	*80.7%*
Debt/Total Assets	Unmatched	0.62	0.38	*-38 %*		0.0%
	Matched	0.47	0.38	*-18 %*	*52 %*	*49.5%*
Number of Employees	Unmatched	10	74	*679 %*		*0.0%*
	Matched	82	74	*-9 %*	*99 %*	*56.9%*
Log Age	Unmatched	2.36	2.23	*-6 %*		0.0%
	Matched	2.12	2.23	*5 %*	*5 %*	*41.9%*
Number of Observartions	Unmatched	899564	83	-	-	-
	Matched	402	83	-	-	-

2.2 OUTCOME VARIABLES

This segment introduce the outcome variables applied in this thesis. The variables are structured under the following categories: Operating performance, Insolvency risk, Employment and Total Factor Productivity (TFP). In addition, we introduce the statistical tests used to evaluate the results and discuss other relevant considerations for the analysis.

2.2.1 OPERATING PERFORMANCE

Primarily, we apply the same dependent variables as Guo et al. (2011) and Boucly et al. (2011) to measure the effect on operating performance for portfolio companies. In order to provide a holistic assessment of the effects on the Nordic market, we supplement the analysis with performance metrics used in previous research on buyouts in the Nordic (Grubb & Jonsson, 2007), (Gulliksen, Wara, & Hansen, 2008), (Friedrich, 2015). Thus, we proceed to include the following measures in the analysis: Compounded annual sales growth rate (Sales CAGR), Gross Profit Margin, Turnover-to-Total Assets (R/TA), EBITDA-to-Turnover (EBITDA margin), EBITDA-to-Total Assets (EBITDA/TA), EBIT-to-Total Assets (ROA), Net Operating Cash Flow-to-Capital Expenditures (CAPEX Ratio), Net Operating Cash Flow-to-Turnover (NCF/R), Net Operating Cash Flow-to-Total Assets (NCF/TA), and Current Assets-to-Current Liabilities (Current Ratio). Applying these measures, we effectively exclude tax and leverage effects, thereby focusing on operational performance exclusively. We have included both EBITDA and EBIT, but EBTIDA should provide the cleanest assessment of operating performance as it is not influenced by accounting decisions. All variables[20] are scaled in relation to either Turnover or Total Assets to assure that we can compare the metrics across industries and company sizes. In addition, we have included the CAPEX ratio to assess the relative spending on fixed assets.

2.2.2 INSOLVENCY RISK

In addition to assessing operating performance, we aim to analyse the insolvency risk of the buyout companies compared to benchmark. Following Boucly et al. (2011) and Tykova and Borell (2012), the applied variables to assess insolvency risk are: Long Term Debt-to-Total

[20] Except sales CAGR, which is yearly average growth rate in turnover.

Assets (Ltd/TA), ZM-score, and O-score. Ltd/TA, more commonly referred to as the leverage ratio, indicates the debt burden of a company relative to its total asset base. Note that this is an accounting figure which is not influenced by any debt raised in the buyout transaction[21]. However, following Boucly et al. (2011), this variable is interesting as it indicates the portfolio companies' ability to attain new debt after the transaction. Altman's Z-score (Altman, 1968) is an additional measure of insolvency risk, but has not been included due to insufficient data on earnings figures. In addition to the leverage ratio, we have included EBIT-to-Interest Expenses (Coverage Ratio) and Long Term Debt-to-EBITDA (Ltd/EBITDA), mainly to supplement previous studies in the Nordic ((Gulliksen, Wara, & Hansen, 2008); (Friedrich, 2015)).

Following Tykvová and Borell (2012), the financial distress risk of privately held companies can be measured using accounting data as specific indicators. Therefore, we have included the ZM-score (Zmijevski, 1984) and the O-score (Ohlson, 1980) to strengthen the analysis of insolvency risk.

The ZM-score is estimated as:

$$ZM_{it} = -4.336 - 4.513 * \frac{NI_{it}}{TA_{it}} + 5.679 * \frac{TL_{it}}{TA_{it}} + 0.004 * \frac{CA_{it}}{CL_{it}}$$

Where NI = Net income, TA = Total Assets, TL = Total Liabilities, CA = Current Assets and CL = Current Liabilities.

The O-Score is estimated as:

$$O_{it} = -1.32 - 0.407 * \left(\frac{TA_{it}}{GNPdeflator_t}\right) + 6.03 * \frac{TL_{it}}{TA_{it}} - 1.43 * \frac{WC_{it}}{TA_{it}} + 0.0757 * \frac{CL_{it}}{CA_{it}} - 1{,}72 * TL_{D_t} - 2.37 * \frac{NI_{it}}{TA_{it}} - 1.83 * \frac{EBITDA_{it}}{TL_{it}} + 0.285 * NL_{D_t} - 0.521 * \frac{NI_{it} - NI_{it-1}}{|NI_{it}| + |NI_{it-1}|}$$

TA = Total Assets, GNP deflator = "Inflation in current year"*100, TL = Total Liabilities, TA = Total Assets, WC = Working capital, CL = Current Liabilities, CA = Current Assets, TL_D

[21] Debt raised in a buyout is usually born through a holding company. Therefore, this debt does not appear in the accounting data we have access to.

equals 1 if total liabilities exceed total assets, otherwise 0. NI = Net Income, EBITDA = Earnings before interest, taxation, depreciation and amortization, and NL_D equals 1 if net income is below zero in both the current and the previous period, otherwise 0.

2.2.3 EMPLOYMENT

We have included three measures for employment in the analysis. Following Kaplan (1989), Amess and Wright (2007), Cressy et al. (2007), and Olsson and Tåg (2012). The three measures are: Number of employees (Employees), Wages EURt and Average Wages per employee (Wage level EURt).

2.2.4 TOTAL FACTOR PRODUCTIVITY

We seek to measure the Total Factor Productivity (TFP) of acquired firms in relation to their respective control firms, prior to, at-, and after the buyout. We follow the approach conducted in various studies that evaluates productivity improvements as a result of PE activity, applying a one-step augmented Cobb Douglas production function ((Harris, Siegel, & Wright, 2005); (Wilson, Wright, Siegel, & Scholes, 2012)).

Generally, a Cobb Douglas function can be specified as follows

$$Q_{it} = L_{it}^{\alpha} * K_{it}^{\beta}$$

As the objective is to estimate productivity differences between buyout firms and benchmark, B_{it} is introduced as a binary variable taking on value 1 if the company is a buyout company, otherwise 0. Further, an age variable and an industry dummy variable has been included in order to account for potential bias in the estimation of B_{it}, supported by previous research (Harris, Siegel, & Wright, 2005) (Wilson, Wright, Siegel, & Scholes, 2012).

Rearranging the production function as a Cobb Douglas function, introducing control variables and taking the logarithms, we obtain

$$\ln Q_{it} = \beta_0 + \beta_1 \ln L_{it} + \beta_2 \ln K_{it} + \beta_3 \ln Age_{it} + \sum_{k=1}^{19} \theta_k \, nace_{ik} + \beta_4 B_{it} + \mu_{it}$$

Q_{it} denotes output, represented by gross profit, for firm i ($i = 1,\ 2, \dots, N$) at time t (t= 1, $2, \dots, T$). L_{it} represents labour inputs through the number of employees, and K_{it} denotes the firm's capital base, represented through the firm's fixed asset base. Age_{it} is the number of years the company has been in operation. $Nace_{ik}$ is a dummy for the industry section (1-19), specified by the Nace code in Finland. Arguably, competition concentration within each industry will affect the firms' productivity, and should be adjusted for in the regression. However, as the model is only adjusted for Nace-code level 1, an industry specific effect is not suited as an adequate representation for all sub-industries within each code, and is therefore omitted.

In addition to capture the differences in TFP between buyout firms and benchmark, we seek to estimate if the change in average TFP compared to benchmark, between the pre- and post-buyout period, is significant. In Part I, the pre-buyout period is defined as period $[t-3, t-1]$, where t represents buyout year. The post-buyout period is defined as period $[t+1, t+3]$. We apply a two-period, two-group difference-in-difference estimation (Imbens & Wooldridge, 2008). The model is specified as follows.

$$\ln Q_{it} = \beta_0 + \beta_1 \ln L_{it} + \beta_2 \ln K_{it} + \beta_3 \ln Age_{it} +$$

$$\sum_{k=1}^{19} \theta_k \, nace_{ik} + \beta_4 B_{it} + \beta_5 D_{it}^{p} + \beta_6 D_{it}^{p} * B_{it} + \mu_{it}$$

In addition to the initial TFP regression, D_{it}^{p} represents a time-dummy taking on the value of 1 for the post-buyout period, 0 otherwise. $D_{it}^{p} * B_{it}$ is a combination of the time-dummy and buyout-dummy that equals 1 for a buyout firm in the post-buyout period, otherwise 0. The difference-in-difference estimation allows for a direct comparison of the difference in post-buyout- and pre-buyout TFP compared to benchmark, through the coefficient β_6 of the interaction term. A positive coefficient indicates an increase in TFP for buyout firms compared to benchmark over the two periods.

In Part II, we apply the same econometric approach to estimate whether the change in TFP between the two groups leading up to the buyout is significant. The first period is specified as $t-4$. The second period is specified as $t-1$.

Due to the panel data used in the analysis, the error term, μ_{it}, is assumed to contain three parts.

$$\mu_{it} = \vartheta_i + \varphi_t + e_{it}$$

ϑ_i is assumed to affect all observations across time for unit *i*. φ_t is assumed to affect all units for time period *t*. e_{it} is assumed to only affect unit *i* at time *t*. Clustered standard errors are applied to control for within-cluster correlation and heteroscedasticity, as recommended by Bertrand, Duflo and Mullainathan (2004). Correctly accounting for possible omitted variable bias in the estimators is crucial. Previous research has applied random effects[22]. Generally, if random effects are consistent, they are preferred due to stronger efficiency than fixed effects. In contrast, fixed effects are consistent. We have conducted a Durbin-Wu-Hausman test (Hausman test) to evaluate the consistency of the estimators, following (Greene, 2011). The Hausman test can be specified as follows.

$$m = \hat{q}_1'[VC(\hat{q}_1')]^{-1}\hat{q}_1'$$

$$\hat{q}_1 = \hat{\beta}^{FE} - \hat{\beta}^{RE}$$

Where m is assumed to follow a chi-square distribution, $m \sim x_{df}^2 = k$. $\hat{q}_1$ is defined as $\hat{q}_1 = \hat{\beta}^{FE} - \hat{\beta}^{RE}$, and $VC(\hat{q}_1) = VC(\hat{\beta}^{FE}) - VC(\hat{\beta}^{RE})$. The null-hypothesis states equality of estimators, $H_0 = \hat{\beta}^{FE} \cong \hat{\beta}^{RE}$. The results of the Hausman tests are found in the Table VII and Table IX. In part I, we find that random effects are preferred when assessing TFP-differences at matching year. In contrast, fixed effects are mainly preferred for the remaining time periods. The Haumsan test indicates that random effects can be applied for most years in Part II. However, in order to maintain consistency, we apply fixed effects across both parts of the analysis. Note that the same tables applying random effects are found in table 7A for Part I and Table 9A for Part II in Appendix. Random effects and fixed effects depicts the same trends.

2.2.5 TESTS

The constructed randomized matched sample allows us to test the difference between the portfolio companies and benchmark. A variety of techniques can be used to compare differences between two populations. T-tests on differences between the two groups'

[22] See Wilson, Wright, Siegel and Scholes (2012) and Friedrich (2015).

covariate-means allows for testing specific differences between the groups. This can in turn be supplemented with a joint-significant test across all covariates (Rajeev & Adek, 2002). As we aim to single out factor specific differences between the treated- and untreated group, we apply t-tests on differences in means on all covariates of the two groups. In the Analysis Section, the null hypothesis specifies equality of means for the two groups, and as alternative hypothesis we have applied a two-tailed tests.

Profitability measures, insolvency risk and employment are tested using T-tests. Total Factor Productivity (TFP) is estimated through a multiple regression, applying fixed effects and clustered standard errors. The procedure behind this methodology is explained in detail in the previous segment.

To add robustness to the results, we also use Wilcoxon-Mann-Whitney rank-sum tests to assess whether the changes in median values are significant. In addition, we apply a robustness analysis on operating performance measures, adjusting for differences in initial sales growth. We emphasize that in addition to testing for statistical significance, we seek to examine whether our results are economically significant. That is, the statistical results should have an economic impact for decision making.

2.2.6 OTHER CONSIDERATIONS

Changes in ratios over time can either be measured by a percentage change or level change. The advantage of a percentage change is that it takes into account the initial level of the variable it measures. However, if the initial value is negative, the percentage calculation will be difficult to interpret economically. Due to a large number of variables with negative values, we choose to apply a level change for the majority of variables. Discarding observations due to difficulties in interpreting the percentage change could have created a bias in our sample. Further, Barber and Lyon (1996) argue that using level change should not distort the results. The only variables exempted from the level change decision is growth in turnover and employment measures, which by definition cannot have negative initial values[23].

[23] This should also apply for debt levels as well. However, due to poor sample data, several companies report negative debt figures.

3. ANALYSIS

In this section we provide a detailed summary of the results of our analyses. Part I evaluates the effects of private equity activity *subsequent* to a buyout by measuring the differences in mean performance changes for portfolio companies compared to a constructed benchmark group. The analysis is conducted across four dimensions; A) Operating performance, B) Insolvency risk, C) Employment, and D) Total Factor Productivity (TFP). Part II analyses the development of buyout targets relative to a benchmark group in the years *prior* to an acquisition. The development in key firm characteristics is measured across the same four dimensions. The analyses focus on findings that are of economical or statistical significance, and further evaluate whether they support or contradicts previous literature. A full variable list, including a description of each variable, can be found in Table 3A in Appendix. Note that the number of observations decrease in the years after matching year in both parts of the analysis, due to missing observations.

3.1 PART 1

To assure that all buyouts have accounting data three years after acquisition, the final sample in Part I is limited to buyouts that took place before 2013. This results in a sample of 83 buyouts between 1999-2012 with a corresponding benchmark group of 402 companies[24]. As the matching minimizes the mean differences between the two groups[25], the analysis emphasizes changes in mean values. Median changes are used as robustness measures to strengthen and support the findings for mean values. The significance of mean and median changes are analysed using t-tests and Wilcoxon-Mann-Whitney rank-sum tests, respectively. Further, a robustness analysis controlling for previous sales growth is applied on performance measures. Table VI depicts the mean change in operating performance, insolvency risk and employment at the year of buyout (t=0), and the three subsequent years. Table 4A in Appendix depicts the median change for the same variables.

[24] Note, as explained in the methodology section, several observations are not included in the analysis due to missing data points when running the Propensity Score Matching (PSM).
[25] See the methodology section for details of the matching procedure (PSM).

Table VI – Performance Subsequent to Buyout – Matched at Buyout Year – Mean Values

Mean value changes in performance measures for portfolio companies and benchmark from buyout year (t=0). Part A of the table reports the groups' changes in operating performance. Part B reports changes in ratios relating to the groups' solvency, using accounting figures, supplemented with O- and ZM-scores. Part C reports changes in employment and wages. Significance in differences are based on t-tests of ATT, with null hypothesis of difference equal to zero. Significance levels of 1%, 5%, and 10% are denoted as ***, **, and *, respectively. All statistical significant variables are marked with bold text.

	Values at T-0		Difference in Relation to T-0														
	T-0		+1					+2					+3				
	Buyout Mean Levls	Control Mean Levels	Buyout Mean Change	Control Mean Change	ATT Mean	SE(ATT)	P-Score	Buyout Mean Change	Control Mean Change	ATT Mean	SE(ATT)	P-Score	Buyout Mean Change	Control Mean Change	ATT Mean	SE(ATT)	P-Score
A. Operating Performance																	
CAGR	-	-	0.63	0.46	0.17	(0.29)	0.58	0.27	0.11	**0.15***	(0.08)	0.06	0.17	0.04	**0.14*****	(0.05)	0.00
Gross Profit Margin	0.89	0.94	-0.02	0.00	-0.02	(0.02)	0.23	0.00	0.00	0.00	(0.02)	0.98	-0.03	-0.01	-0.01	(0.02)	0.60
Turnover/Total Assets	1.56	2.01	0.07	-0.06	0.14	(0.22)	0.54	0.03	-0.11	0.13	(0.20)	0.51	0.10	-0.02	0.12	(0.24)	0.60
EBITDA/Turnover	-0.10	-0.09	0.02	0.03	-0.01	(0.09)	0.94	0.03	0.03	0.00	(0.10)	0.98	0.06	-0.04	0.11	(0.12)	0.40
EBITDA/Total Assets	0.14	0.09	-0.02	0.00	-0.01	(0.05)	0.80	-0.04	0.01	-0.05	(0.05)	0.33	-0.03	0.02	-0.04	(0.06)	0.50
ROA	0.10	0.03	-0.01	-0.01	-0.01	(0.05)	0.88	-0.03	0.01	-0.04	(0.05)	0.45	-0.02	0.01	-0.03	(0.06)	0.59
CAPEX Ratio	14.10	22.50	-5.77	-78.10	72.30	(93.90)	0.44	56.90	-157.90	214.80	(234.30)	0.36	79.60	-279.90	359.50	(329.90)	0.28
Net CF/Turnover	-0.02	0.31	0.89	0.04	**0.85***	(0.45)	0.06	0.73	0.00	**0.73***	(0.42)	0.08	0.68	-0.22	**0.91***	(0.49)	0.07
Net CF/Total Assets	0.13	0.10	-0.01	0.03	-0.04	(0.08)	0.66	-0.05	0.01	-0.05	(0.07)	0.44	-0.05	0.01	-0.06	(0.08)	0.44
Current Ratio	4.06	3.82	0.05	1.29	-1.24	(1.84)	0.50	-0.35	1.55	-1.90	(1.88)	0.31	1.70	3.37	-1.67	(2.86)	0.56
B. Insolvency Risk																	
Coverage Ratio	285.30	166.20	25.10	-28.80	53.90	(122.60)	0.66	147.90	32.10	115.70	(154.10)	0.45	-66.50	107.80	-174.30	(159.00)	0.27
Ltd/EBITDA	-8.07	-4.90	3.83	2.83	1.00	(6.40)	0.88	8.01	4.62	3.39	(6.22)	0.59	15.20	3.58	**11.6***	(6.66)	0.08
Ltd/Total Assets	0.38	0.47	-0.05	0.06	-0.11	(0.11)	0.35	-0.05	0.07	-0.12	(0.13)	0.37	-0.05	0.05	-0.10	(0.15)	0.50
ZM-score	-2.35	-1.65	-0.12	0.26	-0.38	(0.67)	0.58	-0.09	0.18	-0.27	(0.66)	0.68	-0.13	0.12	-0.25	(0.70)	0.73
O-score	-7.18	-11.30	-2.20	2.07	**-4.27***	(2.57)	0.10	-0.72	2.11	-2.84	(2.88)	0.32	-0.84	2.00	-2.83	(3.35)	0.40
C. Employment																	
Growth Employees	74	82	0.14	0.04	**0.093****	(0.04)	0.02	0.20	0.04	**0.16*****	(0.05)	0.00	0.29	0.06	**0.24*****	(0.07)	0.00
Growth Wages (EURt)	3 158	3 396	0.16	0.32	-0.16	(0.20)	0.42	0.29	0.43	-0.14	(0.25)	0.56	0.45	0.72	-0.27	(0.40)	0.50
Growth Wage Level (EURt)	56	45	0.08	0.16	-0.08	(0.06)	0.15	0.10	0.18	-0.08	(0.06)	0.18	0.15	0.33	**-0.18***	(0.10)	0.06
Number of Observations	83	402	83	395	-	-	-	83	385	-	-	-	75	339	-	-	-

Focusing on the company characteristics at the date of acquisition, both groups report close to -10% EBITDA-to-Turnover (EBITDA margin). However, the median values indicate a positive margin close to 10% for both groups. This suggests that the mean values are negatively influenced by outliers, and hence the EBITDA margin may not be as strongly negative as suggest by mean values. In contrast, EBITDA-to-Total Assets (EBITDA/TA) and ROA, were 14% and 10% for the portfolio companies, compared to 9% and 3% for benchmark. Other operating performance measures are relatively similar, with the exception of Net CF-to-Turnover (NFC/R) and Capex ratio. The NFC/R was -2% for the portfolio companies compared to 31% for benchmark. However, the median values are identical at 5%. Combined, the portfolio companies appear to have slightly better operating performance at the time of acquisition, mainly due to the higher return on assets. Considering the solvency risk, a ratio of considerable importance is Long-Term-Debt-to-Total Assets (Ltd/Assets). The portfolio companies report 9 percentage points (pp) lower Ltd/Assets than benchmark. For financial distress risk, the ZM-score and O-score provides contradicting conclusions. Note that the Long-Term-Debt-to-EBITDA (Ltd/EBITDA) is negative due to several companies reporting negative EBITDA values. In addition, the coverage ratio is heavily influenced by outliers. Both of these findings are confirmed when assessing median values. Therefore, changes in these two measures are interpreted with caution. Considering employment measures, the initial workforce is larger for benchmark, employing an average of 8 people more than the portfolio companies. Wage level per employee is approximately EURt 11 higher for the portfolio companies.

A. OPERATING PERFORMANCE

There are primarily two key findings when analysing operating performance. First, we find a 14 pp higher average sales CAGR for buyout companies compared to benchmark, supported by the change in median values. Both mean and median values are statistically significant. These results gives support to previous research on buyouts in the Nordics[26]. Second, although we find indications of an improved mean EBITDA margin compared to benchmark, these results are not statistically significant and are contradicted by changes in median values. Thus, we are not able to infer that portfolio companies increase the EBITDA margin relative to benchmark. Combined, these results may indicate that PE-backed companies primarily focus

[26] For example, Grubb and Jonsson (2007), Gulliksen et al. (2008) and Friedrich (2015) show a significant growth in turnover for portfolio companies.

on ensuring higher top-line growth rather than strict cost cutting measures. By this, our results do not give support to the majority of earlier research, that finds clear evidence of improvements in operating margins for portfolio companies[27]. However, more recent research on the Nordic and US market indicates that PE investors have a greater focus on increasing growth than reducing costs[28]. The focus on increasing top-line growth while maintaining the EBITDA margins still ensures value creation by increasing the absolute EBITDA[29].

In addition to the key findings, we find a trend of increased Turnover to Total Assets (R/TA) for both mean and median values, although statistically not significant. In contrast, EBITDA-to-Total Assets (EBITDA/TA) and ROA are reduced by 3- and 2 pp for portfolio companies, compared to an average increase of 2- and 1 pp for benchmark. Again, we do not find statistical justification for the changes in mean and median values. Additionally, taking into account that the median change suggests the opposite development, the economical- significance is arguably low. By this, we are unable to infer increasing asset return subsequent to a buyout, suggesting different results than related research[30].

The mean Net cash flow relative to turnover (NCF/R) for the portfolio companies appears to be significantly improved relative to benchmark. However, assessing median values we are unable to detect any clear changes, statistically nor economically. The remaining operating performance measures do not indicate results of economic, nor statistical importance.

The magnitude of the increase in growth rates raises some concern. Despite the comprehensive matching technique applied when creating the benchmark group, there may still be some unobserved differences between benchmark and the portfolio companies. Sales growth prior to t=0 has not been included in the matching procedure due to missing observations. Therefore, we conduct a robustness analysis controlling for any difference in pre buyout growth in turnover between the buyout targets and the assigned control group. Technically, this issue is

[27] For example, Kaplan (1989), Grubb and Jonsson (2007), and Cressy et al. (2007) find a significant improvement in margins for portfolio companies.
[28] Evidence from two comprehensive surveys Gulliksen et al. (2008) and Gompers et al (2015) identify growth opportunities as the most important value creating factor for private equity investors. Furthermore, other studies are unable to find the same significant improvements in operating performance as earlier research ((Leslie & Oyer, 2008); (Guo, Hotchkiss, & Song, 2011)).
[29] Mathematically, growing the top-line while maintaining a constant margin will increase the EBITDA. This argument holds as the firms are matched on absolute Turnover and EBITDA.
[30] For example, Grubb and Jonsson (2007) and Boucly et al. (2011) find a significant increase in ROA subsequent to a buyout.

addressed by running a fixed effect[31] model with clustered standard errors, in addition to an interaction term. The robustness analysis is formulated as follows.

$$Y_{it} = \beta_0 + \beta_1 Buyout + \beta_2 SalesGrowth + \beta_3 SalesGrowth * Buyout + \varepsilon_{it}$$

Where B_0 is a constant term, Buyout is a dummy equal to one if the company has been subject to a buyout and zero otherwise, SalesGrowth is the growth in turnover from the year before the buyout (t-1) to the year of the acquisition (t=0) and SalesGrowth*Buyout is an interaction term isolating the effect of a buyout on the outcome variable Y_{it}, controlled for any initial differences in sales growth between the two groups.

Table 5A in Appendix depicts the results conducting these regressions on the profitability measures[32]. The robustness analysis indicates that the growth in turnover is still prominent when controlling for initial sales growth, and indicates a 14 pp difference, although slightly insignificant at an 11,5% p-value. Combined with the observed persistent trend for mean and median values, we argue that the growth in turnover for portfolio companies subsequent to a buyout is of economic significance. Briefly addressing other measures, we find a somewhat worse performance when controlling for initial sales growth. However, as these measures are not statistically significant before controlling for sales-growth, we choose not to elaborate further on these results.

B. INSOLVENCY RISK

Considering insolvency risk in the years subsequent to buyout, we are unable to prove any strong significant results. Despite this, we identify three key trends. First, the portfolio companies appear to decrease the ZM-score and O-score by 0.13 and 0.84 after buyout, compared to an increase of 0.12 and 2.00 for benchmark. The results are not within a 10% significance threshold. Nevertheless, the decreasing trend suggests that the portfolio companies at least do not experience increased financial distress risk. This is contrary to previous research examining the distress risk subsequent to a buyout[33]. Second, the average change in Ltd/TA suggest a decrease of 5 pp for portfolio companies after buyout, and an average increase of 5 pp for benchmark. However, the difference is not statistically significant.

[31] See methodology for justification of fixed effects over random effects.
[32] Note: Results differ from figures in performance table due to lack of data on previous sales-growth for some observations.
[33] For example, Tykova and Borell (2012) find evidence of portfolio companies having higher financial distress risk after acquisition.

The change in median values indicates a 5 pp reduction for the portfolio companies compared to benchmark, with an associated P-value of 11%. Although not statistically supported, we identify the same trend across mean and median values, and hence argue that the reduction in leverage may be of economic significance. This is consistent with evidence from the Nordic[34]. Third, relating the findings above to the initial lower leverage and financial distress risk for portfolio companies, we do not find evidence supporting recent research, that points to relaxing financial constraints as a key component to increase growth in portfolio companies[35].

Although the change in Ltd/EBITDA is the only statistically significant measure, we choose not to give an economic interpretation to the results. This is due to a considerable amount of companies in the sample reporting close to zero or negative EBITDA values[36], which distorts the economic interpretation. Additionally, changes in median values do not provide the same clear increase or statistical significance, implying that the mean changes are not of economic significance. Also, considering Coverage Ratio, we find conflicting and insignificant changes between mean and median values, and hence choose not to discuss these results further.

Lastly, assessing the initial increase in leverage would allow us to address whether the observed reduction in leverage after buyout is consistent with the theory of portfolio companies substituting dividends for debt (Muscarella & Vetsuypens, 1990) (Jensen, 1986) (Kaplan & Strömberg, 2009). However, we are not able to assert if additional debt related to the portfolio companies have been imposed on related holding companies. Thus, we are not able to analyse the free cash flow hypothesis (Jensen, 1986).

C. EMPLOYMENT

A common conception is that PE investors, among other activities, increase the efficiency of their portfolio companies by reducing wages and the size of the workforce, thereby redistributing wealth from workers to owners[37]. However, considering employment changes three years after buyout, the portfolio companies increase employment by 29%, compared to an increase of 6% for benchmark. This implies that the portfolio companies transform from

[34] The reduction in debt is consistent with results from Norway (Friedrich, 2015). In addition, Grubb and Jonsson (Grubb & Jonsson, 2007) find no significant increase in leverage after acquisition.
[35] For example, Boucly, Sraer and Thesmar (2011) identify relaxed financial constraints as important source to achieve significantly higher growth than benchmark. There results suggest a significant increase in leverage ratio after buyout.
[36] See descriptive statistics in Appendix.
[37] For example, Schleifer & Summers (1988) and Pindur (2007, ss. 97-98) argue that to cut cost and increase efficiency workers may be laid off or wages cut.

having an initial smaller average workforce, to becoming larger three years after buyout. Considering the remuneration of workers, wage cost per employee (Wage level) appear to increase significantly less than benchmark. This trend is persistent across all three post-buyout years, but only significant after three years. Assessing median values, we find support for the same trend. However, the difference is smaller and the results are not statistically significant. The results may suggest that that PE investors restrict wage growth, allowing for increased employment to support the strong top-line growth. Considering the effect for stakeholders, we observe a wealth increase for employees by increased hiring. However, the relatively lower wage increase indicates a wealth reduction compared to benchmark. Based on the available data, we are not able to state a definite conclusion to whether buyout activity contribute to wealth increase for employees, or not. Nonetheless, considering the substantially stronger employment growth of portfolio companies, the notion that PE investors are job destroyers appear to be unfounded in Finland. This result is line with evidence from the Nordic market[38].

D. TOTAL FACTOR PRODUCTIVITY (TFP)

This part of the analysis attempts to link the performance evaluation presented above to the total factor productivity (TFP) of buyout- and benchmark firms. The objective of measuring TFP is to examine whether buyout companies are able to utilize their fixed assets and labour force more effective than benchmark in the years after the buyout. Table VII depicts a fixed effect comparison of TFP between buyout- and control companies in the years leading up to the buyout, at buyout, and three years subsequent to acquisition[39]. Post- and pre calculations are based on three years preceding and subsequent to the buyout, respectively.

The analysis suggests that buyout companies have a significantly higher TFP of 27 pp compared to benchmark at the time of the acquisition. In the years preceding the buyout we also find a significantly higher TFP for portfolio companies than benchmark. This development will be discussed in more detail in Part II.

[38] For example, Friedrich (2015) find a significantly higher employment growth of portfolio companies in Norway, while Grubb and Jonsson (2007) find no evidence of value creation at the expense of employees.
[39] In order to add robustness to the results, Table 4A in Appendix depicts the same variables running a fixed effect analysis.

Table VII – Total Factor Productivity – Matched at Buyout Year – Fixed Effects

Total Factor Productivity (TFP) of buyout firms compared to control firms matched at the year of buyout. TFP is estimated using Fixed Effects and controlled for Labour, Fixed Assets (Capital), Company Age, and Industry Code. The TFP difference is highlighted in bold, and measured through the dummy variable "Buyout". "Pre buyout", "Buyout Year" and "Post buyout" measures within-year differences. "Pre vs Post" measures the total average difference between the period prior to- and subsequent to buyout. "Diff-in-Diff" estimates the significance of the difference between post- and pre TFP for buyout firms, relative to benchmark, through the variable "Post*buyout dummy". Each variable's standard error is depicted in parenthesis. Significance levels of 1%, 5%, and 10% are denoted as ***, **, and *, respectively. The Hausman test indicates the consistency of random effects estimates.

	Pre Buyout			Buyout Year	Post Buyout			Pre vs post		
	T-3	T-2	T-1	T	T+1	T+2	T+3	Pre	Post	Diff-in-Diff
ln(L)	0.80***	0.82***	0.81***	0.81***	0.83***	0.78***	0.94***	0.82***	0.85***	0.84***
	(0.034)	(0.036)	(0.046)	(0.069)	(0.029)	(0.042)	(0.068)	(0.019)	(0.020)	(0.016)
ln(K)	0.17***	0.14***	0.18***	0.23***	0.18***	0.22***	0.16***	0.15***	0.19***	0.18***
	(0.027)	(0.042)	(0.038)	(0.053)	(0.038)	(0.029)	(0.046)	(0.015)	(0.015)	(0.010)
ln(Age)	-0.0064	0.061	-0.057	0.076	0.031	0.0078	-0.046	-0.013	-0.017	0.0057
	(0.072)	(0.059)	(0.050)	(0.064)	(0.052)	(0.055)	(0.076)	(0.029)	(0.020)	(0.024)
Nace, level 1	0.0014	-0.0089	-0.030	-0.054***	-0.043	-0.010	-0.026	-0.0067	-0.019*	-0.015**
	(0.016)	(0.022)	(0.022)	(0.013)	(0.029)	(0.015)	(0.019)	(0.0096)	(0.011)	(0.0060)
Buyout	**0.23****	**0.31****	**0.24****	**0.27****	**0.070**	**0.091**	**0.24**	**0.29*****	**0.14**	
	(0.10)	(0.13)	(0.097)	(0.095)	(0.13)	(0.17)	(0.19)	(0.041)	(0.099)	
Buyout (< t+1)										**0.29*****
										(0.049)
Post-dummy										**-0.019**
										(0.064)
Post*buyout-dummy										**-0.15**
										(0.12)
Constant	10.4***	10.5***	10.6***	9.61***	10.3***	9.85***	10.3***	10.6***	10.1***	10.2***
	(0.44)	(0.53)	(0.47)	(0.62)	(0.54)	(0.24)	(0.46)	(0.19)	(0.18)	(0.12)
Statistics										
Observations	256	275	317	386	390	386	339	848	1115	2349
R-squared	0.70	0.70	0.79	0.78	0.78	0.77	0.76	0.73	0.77	0.76
Clustered SE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hausman Test										
Chi2	9.93	18.68	17.14	5.18	3.71	29.62	2.18	12.51	44.71	139.00
P-value	0.08	0.00	0.00	0.39	0.59	0.00	0.82	0.03	0.00	0.00

TFP companies drops substantially for portfolio in the year after acquisition, ending at an insignificant difference of 7 pp compared to benchmark. However, TFP increase from this dip to a 24% difference in the two following years. The average TFP difference for the first three years after buyout suggests that portfolio companies maintain a 14 pp higher TFP. However, the difference between portfolio companies and benchmark is insignificant at a 10% level for all years subsequent to buyout. The difference-in-difference takes into account the initial difference in TFP, and estimates the isolated expected causal effect of the buyout on portfolio companies' efficiency, relative to benchmark. The coefficient *Post*Buyout-dummy* suggests a TFP decrease of 15 pp as a result of the buyout, although not statistically significant. Thus, evidence suggests that portfolio companies are not able to increase, nor sustain their competitive advantage in TFP after the buyout. These findings are the opposite of earlier research of buyouts in the U.S., U.K and Norway[40].

When evaluating the operating performance in the years subsequent to acquisition, we pointed out that buyout companies experience significantly higher top line growth than benchmark. Connecting these findings to this part of the analysis, evidence may suggest that the increased top line growth is not a result of higher productivity of the inputs, but rather a growing labour force. It should be noted that the decreasing productivity could be negatively correlated with the observed changes in employment. Newly hired employees may lack necessary skills and experience, thereby reducing the average productivity of the acquired firms. Therefore, the observed upward trend in TFP in the second and third year after buyout could be explained by the inexperienced employees increasing their productivity. The results suggest that buyout firms may be in the process of regaining the initial TFP advantage three years after being acquired. This may in turn indicate that PE investors invest with a long-term objective of building a larger and efficient workforce. An interesting aspect would therefore be to include a longer time horizon to assess whether portfolio companies are able to regain their initial TFP advantage. However, due to lack of data we are not able to implement this analysis. Apart from this, we do not find any clear trends in operating performance that may explain the drastic decrease in TFP for portfolio companies.

[40] For example, Lichtenberg and Siegel (1990), Harris et al. (2005), Wilson et al., (2012) and Friedrich (2015) find a significantly increase in TFP for portfolio companies subsequent to a buyout.

SUMMARY PART I

To summarize the analysis in Part I, we identify five noticeable trends. First, the portfolio companies achieve a 14 pp significantly higher sales CAGR than benchmark. Second, we do not find an increase in EBITDA margin, EBITDA/TA, or ROA relative to benchmark, but the increase in turnover combined with stable margins suggests a higher absolute operating return. Third, we find no indication of PE investors increasing leverage or relaxing financial constraints to spur growth and create value for portfolio companies. Fourth, results suggest a 24 pp significant increase in employment relative to benchmark. In contrast, average increase in wages per employee is lower for PE backed companies. Nonetheless, the notion that PE investors are job destroyers appear to be unfounded in Finland. Fifth, portfolio companies are not able to increase, nor sustain their competitive advantage in TFP.

3.2 PART 2

In Part II we examine the development in key characteristics of buyout targets prior to acquisition. In order to maintain consistency, and link the two parts of the thesis, we analyse the buyout group relative to its benchmark across the same dimensions as in Part I. The objective is, however, different than in Part I. We attempt to determine investment criterions used by PE investors when evaluating possible takeover companies, ultimately aiming to predict buyout targets prior to acquisition. To assess this, a new comparable benchmark has been constructed for the buyout group, matched four years prior to acquisition, using PSM with the same covariates as in Part I. Previous research has, to some extent, evaluated characteristics of portfolio companies prior to a buyout[41]. However, these studies have been conducted relative to a benchmark matched at the buyout year. This implies comparing companies that share the same characteristics at the time of acquisition. Little to no research has applied a new matching procedure four years prior to buyout. Matching four years prior to the buyout date creates a benchmark group that in year t-4, in theory, is equally likely to be subject to a takeover four years later. By assessing diverging trends between the two groups leading up to the buyout, we aim to predict characteristics that differentiates companies that are subject to a takeover, from those that are not. As this section applies a partly novel approach, we will be discussing our results in a careful manner, and highlight results and trends

[41] For example, Boucly et al. (2011) conduct a regression using company- and time fixed effects to measure the differences in operating performance before and after buyout.

of economic- and statistical significance. The analysis includes examining changes in performance using both changes in mean figures applying t-tests, and changes in median values using Wilcoxon-Mann-Whitney rank-sum tests. Further, a robustness test controlling for previous sales growth is applied on performance measures. Lastly, TFP is analysed using a fixed effect model.

Table VIII depicts the mean changes in operating performance, insolvency risk and employment for both the buyout- and control group, from four years before the buyout (t-4) to the year prior to the buyout (t-1). The same table estimated by median values is found in Table 7A in Appendix. Note, the selected buyout sample is different from Part I due to two reasons. First, as the focus now is to analyse the development before acquisition, we do not need to exclude deals undertaken after 2012. Second, the sample in Part I lacks sufficient data for several companies in the years prior to the buyout year. At the same time, several companies in Part II may have missing observations for the years after they were acquired. Therefore, the samples in Part I and Part II are not completely identical. Thus, a direct comparison of measures in Part I and Part II is not feasible. However, the sample sizes are equally large, with 83 and 84 buyout firms for Part I and Part II, respectively.

Briefly examining key findings in operating performance in year t-4, both groups report strong gross profit margins and R/TA. These figures suggest a somewhat stronger performance for the control group in year t-4. Both groups report low mean EBITDA margin. However, median values suggest EBITDA margins of approximately 10%, indicating that some outliers may be affecting the mean results negatively. The ROA figures suggest the same positive operating performance for both groups. Lastly, as indicated by a current ratio well above 1, both groups report larger current assets than – liabilities. This suggests a relatively strong ability to meet short-term obligations. Focusing on insolvency risk, both groups report average Long Term Debt-to-Total Assets (Ltd/TA) well below 50% and coverage ratio above 2. The ZM-score and O-score is higher for the control group. Combined these results suggest a relatively stronger solvency for buyout targets. Average number of employees is approximately 80 for both groups, while average wage cost per employee is slightly higher for buyout firms.

Table VIII – Performance Prior to Buyout – Matched Four Years Prior to Buyout – Mean Values

Mean value changes in performance measures in the years leading up to the buyout. Part A of the table reports the groups' changes in operating performance. Part B reports changes in ratios relating to the groups' solvency, using accounting figures, supplemented with O- and ZM-scores. Part C reports changes in employment and wages. Differences are measured in relation to company characteristics four years prior to buyout (t-4). Significance in differences are based on t-tests of ATT with null hypothesis of difference equal to zero. Significance levels of 1%, 5%, and 10% are denoted as ***, **, and *, respectively. All statistical significant variables are marked with bold text.

	Values at T-4		Difference in Relation to T-4														
	T-4		+1					+2					+3				
	Buyout Mean Levls	Control Mean Levels	Buyout Mean Change	Control Mean Change	ATT Mean	SE(ATT)	P-Score	Buyout Mean Change	Control Mean Change	ATT Mean	SE(ATT)	P-Score	Buyout Mean Change	Control Mean Change	ATT Mean	SE(ATT)	P-Score
A. Operating Performance																	
CAGR	-	-	0.44	0.30	0.14	(0.23)	0.54	0.18	0.13	0.05	(0.07)	0.46	0.14	0.07	0.07	(0.05)	0.13
Gross Profit Margin	0.91	0.94	0.01	0.00	0.01	(0.01)	0.55	0.00	0.01	-0.01	(0.01)	0.65	0.01	0.01	0.01	(0.01)	0.59
Turnover/Total Assets	1.89	2.09	-0.06	-0.03	-0.03	(0.11)	0.79	0.10	-0.06	0.16	(0.11)	0.14	0.12	-0.09	**0.20***	(0.12)	0.08
EBITDA/Turnover	0.00	0.04	0.04	-0.01	0.05	(0.07)	0.44	0.01	0.00	0.01	(0.05)	0.88	-0.02	-0.02	-0.01	(0.07)	0.91
EBITDA/Total Assets	0.16	0.17	0.00	-0.01	0.01	(0.04)	0.85	0.00	-0.01	0.01	(0.03)	0.87	0.02	-0.05	**0.07****	(0.03)	0.03
ROA	0.12	0.12	0.00	-0.01	0.00	(0.04)	0.90	0.00	0.00	0.00	(0.03)	0.97	0.03	-0.04	**0.07****	(0.03)	0.03
CAPEX Ratio	-14.2	-204.6	52.36	161.10	-108.70	(287.10)	0.71	26.52	66.20	-39.68	(361.20)	0.91	-429.60	73.96	-503.60	(428.60)	0.24
Net CF/Turnover	0.15	0.32	-0.13	0.08	-0.21	(0.40)	0.59	0.32	0.07	0.25	(0.39)	0.52	0.46	0.13	0.34	(0.40)	0.40
Net CF/Total Assets	0.12	0.15	0.00	0.02	-0.02	(0.05)	0.76	0.01	0.01	0.00	(0.05)	0.95	0.05	0.00	0.05	(0.05)	0.27
Current Ratio	2.74	5.32	-0.05	-0.16	0.11	(1.43)	0.94	0.16	-0.25	0.41	(1.98)	0.84	0.35	0.17	0.18	(2.30)	0.94
B. Insolvency Risk																	
Coverage Ratio	261	255.8	-163.90	-60.71	-103.20	(88.70)	0.25	228.30	-110.90	**339.2****	(146.90)	0.02	40.09	-120.60	160.70	(143.20)	0.26
Ltd/EBITDA	-4.04	-3.66	0.60	5.74	-5.14	(5.71)	0.37	0.63	6.66	-6.03	(6.29)	0.34	0.41	8.97	-8.56	(5.75)	0.14
Ltd/Total Assets	0.39	0.35	-0.01	0.11	-0.12	(0.10)	0.23	-0.08	0.06	**-0.14***	(0.07)	0.06	-0.11	0.08	**-0.18***	(0.10)	0.06
ZM-score	-2.41	-2.04	-0.10	0.02	-0.12	(0.31)	0.71	-0.39	-0.11	-0.28	(0.34)	0.41	-0.68	0.17	**-0.85***	(0.51)	0.09
O-score	-13.9	-12.5	1.60	0.34	1.27	(2.54)	0.62	1.70	0.74	0.96	(3.22)	0.77	-0.62	2.00	-2.62	(3.17)	0.41
C. Employment																	
Employees	83	81	0.14	0.11	0.03	(0.07)	0.69	0.44	0.25	0.19	(0.15)	0.19	0.35	0.15	**0.20****	(0.10)	0.03
Wages (EURt)	3023	3046	0.26	0.19	0.07	(0.11)	0.55	0.43	0.33	0.10	(0.15)	0.52	0.71	0.58	0.13	(0.36)	0.71
Wage Level (EURt)	44	41	0.17	0.19	-0.02	(0.11)	0.89	0.17	0.15	0.02	(0.08)	0.83	0.30	0.22	0.08	(0.09)	0.38
Number of Observations	84	409	84	406	-	-	-	84	398	-	-	-	84	386	-	-	-

A. OPERATING PERFORMANCE

Concentrating on operating performance, we identify three key trends. First, the results suggest twice as high mean sales CAGR (14% compared to 7%) for the buyout group up until acquisition (t-1). Although the sales difference is not statistically significant at mean values (P-value of 13%), median values suggest a significant 5% higher sales growth for future buyout targets. The trend of higher sales growth is apparent in all years for both mean and median values. Growth as an important indicator for future buyout targets is also supported by Gulliksen et al. (2008)[42]. Second, results do not indicate that high growth rate propagates into higher margins. Assessing the mean and median changes in the EBITDA margin, we find it to be centred around the same value across the entire period. These findings could on one side indicate that PE firms seek to acquire companies that have experienced consistent high top-line growth, but has not been able to utilize economics of scale and translate the high growth into higher margins. Contrary to this, recent studies that evaluate the prioritizing of PE firms, both in the process of selecting target companies and after acquisiton, find that the focus is primarily on top-line growth in its portfolio companies[43]. Third, the mean change in R/TA, EBITDA/TA, and ROA for portfolio companies increase significantly more than benchmark. The results for the median comparison confirm the higher return on assets for portfolio companies. This may indicate that PE firms seek to acquire companies with an efficient asset base.

The strong negative change in CAPEX Ratio leading up to buyout might suggest that buyout targets have not increased the fixed asset base in relation to the higher top-line growth. However, the results are not statistically significant, the trend is not persistent for all years, and median results depicts opposite results. This suggests that outliers may strongly affect the mean values. The remaining measures do not indicate any clear differences of economical or statistical significance between the two groups.

We proceed to estimate the robustness of the results by adjusting for possible differences in sales growth in the years prior to matching, applying the same difference-in-difference estimation as in Part I[44]. The results are depicted in Table 8A in Appendix. Considering sales

[42] Surveying 35 private equity investors in Scandinavia, Gulliksen et al. (2008) identify growth potential as the most important factor when considering buyout targets.
[43] For example, surveying 79 private equity investors in the US, Gompers et al. (2015) find that private equity investors expect to add value by focusing on growth rather than cost cutting measures.
[44] Note: Results differ from figures in performance table due to lack of data on previous sales-growth for some observations.

CAGR, we find that buyout firms have a 6 pp higher sales growth in the years before matching. The *buyout* dummy still suggests a 5 pp higher sales CAGR for buyout targets. However, the difference is not statistically significant. This suggests that most of the observed higher growth rate for buyout targets is explained by higher growth prior to matching year (t-4). However, R/TA, EBITDA/TA, and ROA indicates the same significant higher asset return, when controlling for initial sales growth. Robustness testing of the EBITDA margins suggests the same insignificant results as previously found.

B. INSOLVENCY RISK

Evaluating the development of the financial situation of the buyout firms, we find a significant reduction in both mean and median Ltd/TA. Results suggest that the portfolio companies reduce Ltd/TA by 11 pp, compared to an average increase of 8 pp for benchmark. Considering insolvency metrics, we find a significant reduction in ZM-score of -0.85 compared to benchmark, both for mean and median values. The O-score suggests the same decreasing trend, although only statistically significant for median values. These metrics suggest lower financial distress risk for future buyout targets. Additionally, although not statistically significant for all years, we find an observed persistent increase in Coverage Ratio compared to benchmark across all years. Combined, the observed changes in insolvency metrics, the significant reduction in Ltd/TA, along with improvements in the other insolvency measures, indicate that buyout targets may be underleveraged and display stronger solvency relative to benchmark. These results thereby contradict the hypothesis proposed by Boucly et al. (2011), which states that PE investors target financially constrained companies. Thus, our analysis indicates that decreasing debt levels and improved insolvency risk may serve as predictors for future buyout activity[45]. This does not necessarily imply that PE investors will increase the leverage after acquisition. It could also suggest that they seek to acquire companies in a strong financial position.

C. EMPLOYMENT

Assessing employment metrics, future buyout targets appear to increase employment by 35%, compared to 15% for benchmark, in the years leading up to acquisition. Note that when assessing the median values, any growth in employment is absent for both groups. As the trend

[45] Tykova and Borell (2012) also find evidence suggesting that buyout targets have lower financial distress risk.

in median values do not support the changes in mean values, a few outliers with substantial employment growth may be affecting the mean values. For that reason, it is difficult to infer that future buyout targets have significantly higher employee growth than benchmark. Further, results suggest higher growth in wage levels for buyout targets in the years prior to acquisition. Although the results are not statistically significant for mean values, the results are supported by a significant growth in median values. Mean and median results propose the same trend, with a relative increase in wages per employee of 8 pp and 5 pp, respectively. From an acquirers' point of view, the increase in wage levels might represent a cost-cutting opportunity to boost operating margins. For example, increasing the labour force at lower wage levels, both to reduce the costs associated to each employee and support a higher top-line growth.

D. TOTAL FACTOR PRODUCTIVITY (TFP)

This segment studies the TFP of target companies relative to benchmark, four years prior to buyout. To clarify once again, the benchmark applied in this segment has been matched with accounting figures four years prior to the buyout, and is therefore not the same as in Part I. The TFP difference between the buyout- and control group is analysed through the coefficient of the "*Buyout*" variable in Table IX. A positive coefficient indicates higher TFP for buyout companies than benchmark. Consistent with Part I, we find higher TFP for buyout companies leading up to the acquisition date. However, due to the re matching at four years prior to the buyout, the difference is now substantially smaller. This indicates that the new control group is characterized by inherently higher efficiency than the control group in Part I.

Table IX – Total Factor Productivity – Matched Four Year Prior to Buyout – Fixed Effects

Total Factor Productivity (TFP) of buyout firms compared to control firms matched four years prior to buyout. TFP is estimated using Fixed Effect and controlled for Labour, Fixed Assets (Capital), Company Age, and Industry Code. The TFP difference is highlighted in bold, and measured through the variable "Buyout". "Pre buyout", measures within-year differences. "All Periods" measures the total average difference between buyout- and control firms. "Diff-in-Diff" estimates the significance of the difference between t-4 to t-1 for buyout firms, relative to benchmark, through the variable "t-1*buyout dummy". Each variable's standard error is depicted in parenthesis. Significance levels of 1%, 5%, and 10% are denoted as ***, **, and *, respectively. The Hausman test indicates the consistency of random effects estimates.

	Pre Buyout				All Periods	
	T-4	T-3	T-2	T-1	T-4 to T-1	Diff-in-Diff
ln(L)	0.78***	0.82***	0.74***	0.70***	0.77***	0.74***
	(0.047)	(0.040)	(0.042)	(0.042)	(0.024)	(0.033)
ln(K)	0.14***	0.13**	0.18***	0.21***	0.17***	0.18***
	(0.035)	(0.053)	(0.048)	(0.048)	(0.026)	(0.030)
ln(Age)	-0.013	-0.031	-0.081	-0.15**	-0.028	-0.048
	(0.063)	(0.065)	(0.090)	(0.070)	(0.027)	(0.049)
Nace, level 1	-0.064***	-0.056***	-0.061***	-0.051**	-0.037***	-0.049***
	(0.015)	(0.014)	(0.011)	(0.019)	(0.0065)	(0.010)
Buyout	**0.058**	**0.12****	**0.19***	**0.18*****	**0.12*****	
	(0.064)	(0.052)	(0.090)	(0.042)	(0.034)	
Buyout t-4						0.062
						(0.069)
T-1 dummy						-0.094
						(0.12)
T-1*Buyout						**0.11**
						(0.093)
Constant	3.21***	2.74***	3.42***	3.67***	2.76***	3.25***
	(0.82)	(0.44)	(0.48)	(0.67)	(0.27)	(0.43)
Statistics						
Observations	412	407	406	398	1623	810
R-squared	0.86	0.85	0.85	0.86	0.86	0.86
Clustered SE	Yes	Yes	Yes	Yes	Yes	Yes
Hausman test						
Chi2	5.13	3.15	3.65	6.28	13.96	4.66
P-value	0.40	0.67	0.60	0.28	0.02	0.70

There are two prominent findings when analysing TFP prior to acquisition. First, we find a significantly higher TFP of 18% for buyout companies the year prior to the buyout. Note that the higher TFP in the year prior to the buyout is influenced by a higher entry-level TFP in matching year. Second, evidence suggests increasing TFP for buyout companies relative to benchmark from an insignificant 5.8% difference at matching year (t-4), to an 18% significant difference the year prior to buyout (t-1). This indicates that the buyout targets consistently improve their efficiency compared to benchmark leading up to acquisition. Applying the difference-in-difference estimation on increased TFP growth of buyout firms relative to benchmark over the period, results suggest an 11 pp TFP improvement through the coefficient "*t-1*Buyout*". However, the coefficient is not statistically significant at a 10% significance level. Nevertheless, the results indicate a clear trend of increasing TFP for buyout firms over the entire period. Thus, we argue that the increase in TFP is of economic significance. Relating these results to the development in operating performance, we find support for the observed increased productivity in the higher ROA and EBITDA/TA for buyout firms. However, the positive increase in TFP appears to be somewhat stronger than suggested by these measures. This might imply that in addition to increased return on capital relative to benchmark, target firms have a more productive labour force.

Interestingly, the observed higher TFP for buyout companies contradicts related research that finds a lower TFP for buyout than benchmark prior to acquisition[46]. How effective a firm utilizes its inputs to add value is arguably important. Intuitively, increasing a company's TFP implies that each euro invested in the company is creating more value. As seeking possibilities for value creation is important to PE firms, the analysis suggests that PE firms may seek to leverage on the high TFP of buyout firms in order to increase the growth further in the years subsequent to the buyout. Therefore, we argue that TFP may be an important assessment criterion for PE investors when evaluating potential buyout targets, and further that a high TFP growth may serve as an indicator for buyout activity.

[46] For example, Lichtenberg & Siegel (1990) and Harris et al. (2005) find lower industry adjusted efficiency of buyout targets before acquisition.

SUMMARY PART II

To summarize Part II, we assess whether there are any clear trends and differences in firm characteristics that may serve as predictors for future buyout activity. The analysis highlights four possible predictors for buyout activity. First, results suggest that PE Investors target companies with strong asset return. Second, buyout targets appear to be underleveraged and shows lower insolvency risk than benchmark, indicating that a strong financial position may serve as a predictor of future buyout activity. Third, an assessment of the TFP indicates that acquired companies tend to be more efficient, and that the efficiency is increasing more rapidly for the buyout targets leading up to acquisition. In addition, assessing mean changes, companies experiencing strong top-line growth appear to be more likely to be acquired. However, the robustness analysis indicates that the observed difference in growth rates is primarily explained by an initial higher growth rate for buyout targets prior to the examined time-horizon. Thus, we are not able to conclude that companies experiencing strong top-line growth are more likely to be acquired. Furthermore, results on employment metrics are not conclusive across mean and median estimations, although we find indications of increased employment and wage levels for buyout targets leading up to acquisition.

4. CONCLUSION

This thesis makes two contributions to the existing literature on PE. First, by assessing the economic impact of PE on its portfolio companies in Finland, we complete the analysis for the Nordic buyout market. Second, using evidence from Finland and a partially novel approach, we highlight key firm characteristics and trends that separate buyout targets from companies that are not subject to an acquisition. Both analyses study the development in A) Operating performance, B) Insolvency risk, C) Employment and D) Total Factor Productivity (TFP). In this section we will attempt to connect the findings from both parts of the analyses.

The analysis indicates that PE investors target companies with high sales growth. However, the robustness analysis suggests that this is partly explained by a higher growth rate prior to the examined time-horizon. This implies that we are not able to conclude that companies experiencing strong top-line growth are more likely to be acquired. Subsequent to buyout, however, PE backed companies achieve a substantially higher growth in turnover than benchmark. This supports previous studies on the Nordic Market. The higher post-buyout growth also appears to be economically significant when controlling for previous sales growth. We find no evidence suggesting that PE investors target firms with deviating EBITDA margins, nor indications for higher post-buyout growth propagating into higher margins. Thus, PE investors appear to create value by helping portfolio companies grow further, rather than improving margins through cost cutting measures. We find evidence suggesting that PE investors target companies with strong return on assets. Nevertheless, the portfolio companies are unable to achieve higher asset return subsequent to acquisition. Considering solvency measures, results suggest that companies with a strong financial position are more likely to be acquired. In contrast to earlier research, we do not find evidence of increased indebtedness being a source for value creation for portfolio companies after buyout. Assessing employment metrics, we find only a modest increase in employment and wage levels for buyout targets compared to benchmark in the years leading up to acquisition. Comparing this to the post-buyout assessment, we find that PE backed companies experience substantially higher employment growth than benchmark after buyout, but seemingly at the expense of lower average wage growth. These results may suggest that PE investors cut wages, allowing for increased employment to support the strong top-line growth. Despite the lower wage levels per employee, the notion that PE companies are job destroyers appear to be misplaced in Finland. Further, future buyout targets increase their productivity relatively more than

benchmark in the years leading up to buyout. Surprisingly, contradicting previous research, the portfolio companies experience an efficiency reduction after buyout. These results suggest that PE investors successfully select efficient companies, but fail to sustain the efficiency in the years following the buyout.

We identify three main areas for future research. First, as little research contributes to a better understanding of which key firm characteristics PE investors emphasize when evaluating buyout targets, more research is needed to validate whether the findings from Finland serves as general predictors. Evidence from larger economies with more well developed PE markets, such as the U.S. or large European countries, will bring a more fundamental understanding of drivers and predictors for future buyout activity. Second, the observed post-buyout decrease in efficiency combined with the significant increase in employment after buyout raises an interesting question as to whether the two trends are correlated. We point out that the portfolio companies may be in the process of regaining their initial efficiency advantage at the end of the analysed period. Conducting an analysis on more comprehensive accounting data, with a sufficient time horizon, might reveal whether the portfolio companies are able to regain their efficiency advantage, and even increase it. Lastly, the significant increase in employment after buyout might suggest higher marginal productivity of labour at the time of acquisition. An interesting analysis would be to evaluate whether PE firms are investing more heavily in capital or labour based on their pre-buyout estimated marginal productivity of the respective inputs.

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6. Appendix

Figure 1A – Illustration of data sampling

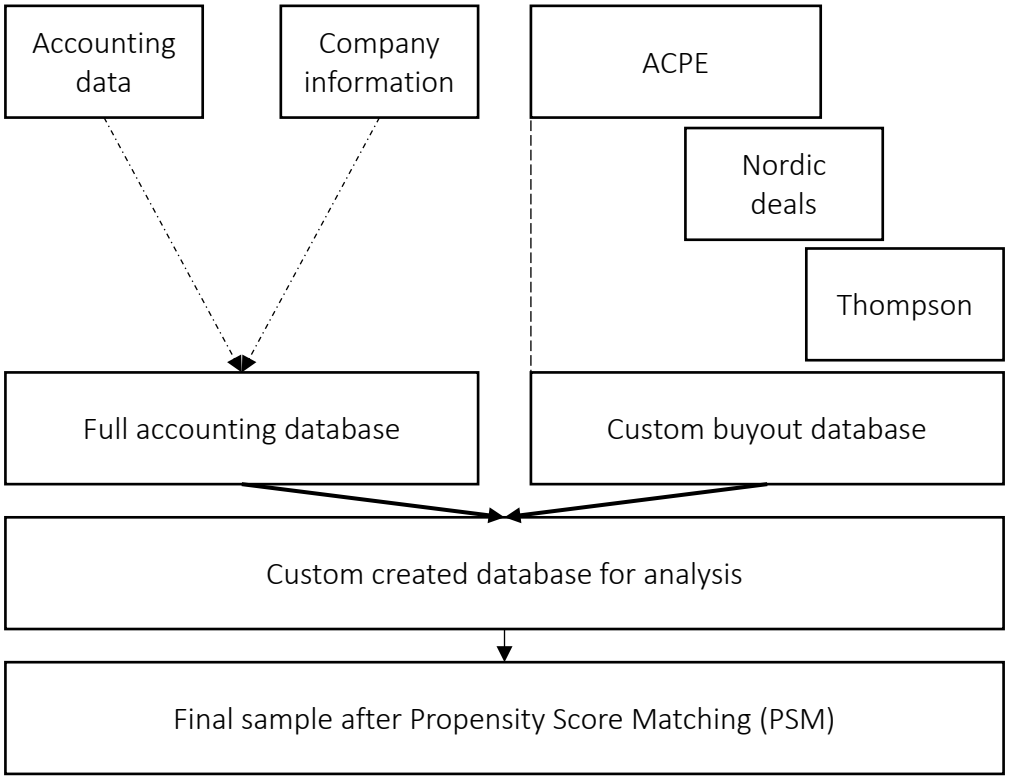

Figure 2A – Common Support Part I and Part II

Common support distribution for Part I and Part II. The matching is conducted applying five-to-one nearest neighbour, allowing for replacement and restricted to common support. The continuous line denotes the propensity score distribution for the buyout group. The dotted line denotes the propensity score distribution for the control group. The vertical axis is given by the kernel density. The horizontal axis represents the propensity score.

Common Support Part I | **Common Support Part II**

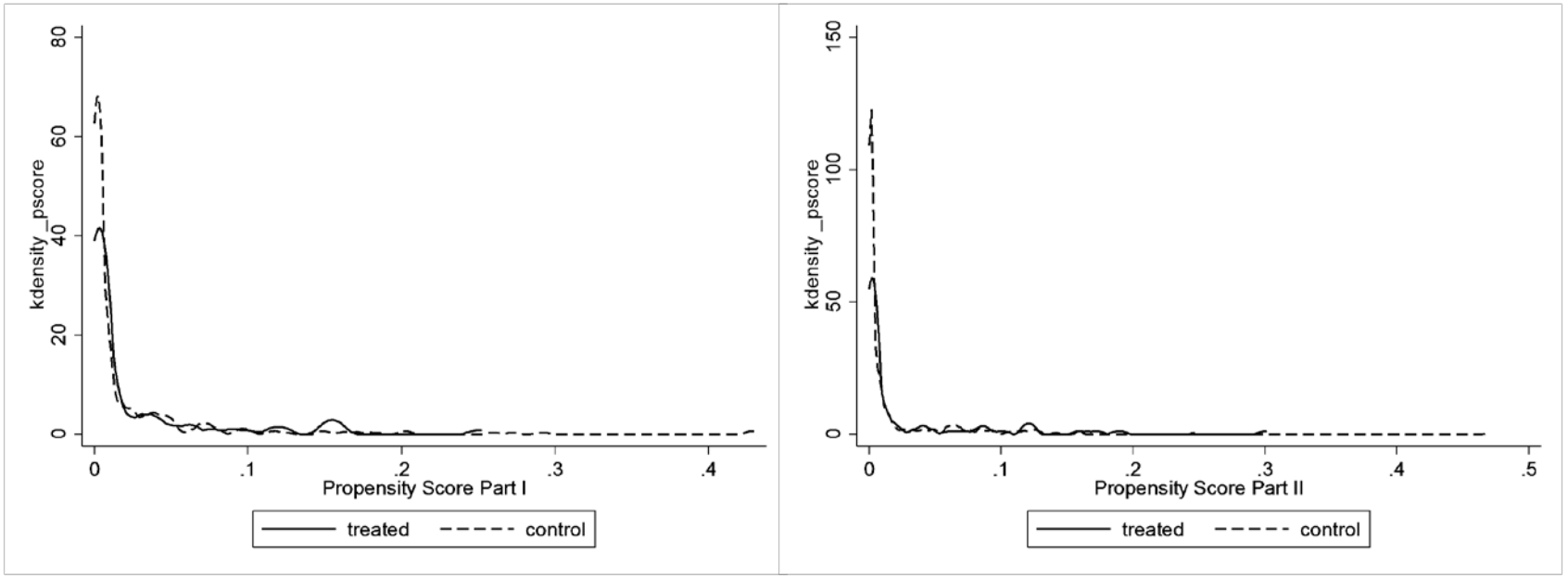

Table 1A – Assessment of Matching Quality Four Years Prior to Acquisition

Quality assessment of the matching quality of Propensity Score Matching for one-to-one and five-to-one nearest neighbour matching. The matching applies replacement and common support. Bias represents average bias between treated and untreated group. P-value represents the statistical difference between the treated and untreated group. Mean P-value is estimated using T-tests. Median P-value is estimated using Wilcoxon-Mann-Whitney rank-sum test. B denotes number of standard deviations between group means. R denotes variance ratio between the treated and untreated group.

	Unmatched Sample	Five-to-one	One-to-one
Bias			
Mean	879.8 %	8.4 %	4.1 %
Median	963.0 %	7.8 %	4.0 %
P-Value			
mean	0.7 %	59.6 %	76.9 %
Median	0.0 %	61.4 %	77.3 %
B	-	19.2	19.4
R	-	71.0 %	110.0 %
R-sq	-	0.7 %	0.7 %
LR chi2		1.57	1.59

Table 2A – Bias Reduction in Covariates – Four Years Prior to Acquisition

Assessment of bias reduction in the covariates used for Propensity Score Matching. The table provides comparison of the matched sample in relation to its control group, as well as the mean values for the entire data sample. The matching procedure was conducted applying five-to-one nearest neighbour matching with replacement and common support. Note that in addition to the matched covariates, exact matching for industry code (NACE level 1) and accounting year has been applied to avoid introducing time and sector bias. Bias reduction is measured as the sample bias reduction compared to the unmatched data sample. "T-test p-value" is assigned to assess matching quality prior to and after the matching. Increased p-value indicates higher matching quality.

Matching Variables		Control Group	Buyout Group	*Percentage Bias*	*Abs. Perc. Reduc. Bias*	*T-Test p-Value*
Turnover (EURm)	Unmatched	1.58	17.40	*1005 %*		*0.0%*
	Matched	18.02	17.40	*-3 %*	*100 %*	*83.3%*
EBITDA (EURm)	Unmatched	0.12	1.41	*1041 %*		*0.0%*
	Matched	1.48	1.41	*-5 %*	*100 %*	*79.2%*
Total Assets (EURm)	Unmatched	1.32	18.30	*1284 %*		*0.0%*
	Matched	17.87	18.30	*2 %*	*100 %*	*89.5%*
Debt/Total Assets	Unmatched	0.62	0.39	*-36 %*		0.0%
	Matched	0.35	0.39	*13 %*	*64 %*	*56.1%*
Number of Employees	Unmatched	9.52	82.60	*768 %*		*0.0%*
	Matched	81.00	82.60	*2 %*	*100 %*	*90.4%*
Log Age	Unmatched	2.36	2.41	*2 %*		0.0%
	Matched	2.47	2.41	*-2 %*	*4 %*	*67.1%*
Number of Observartions	Unmatched	899564	84	-	-	-
	Matched	409	84	-	-	-

Table 3A – Variable Description, 1/2

Performance variables	
A. Operating performance	
CAGR	Compounded annual growth rate of Turnover
Gross Profit Margin	Gross Profit/Turnover
Turnover/Total Assets	Turnover/Total Assets
EBITDA/Turnover	Operating result before depreciation, interest and taxes per Asset
EBITDA/Total Assets	EBITDA/Total Assets
ROA	EBIT/Total Assets
CAPEX Ratio	Operating cash flow/CAPEX
Net CF/Turnover	Net cash flow measured as EBITDA - CAPEX - Change in Working capital scaled by turnover
Net CF/Total Assets	Net cash flow measured as EBITDA - CAPEX - Change in Working capital scaled by Assets
Current ratio	Current Assets/Current Liabilities
B. Insolvency risk	
Coverage ratio	EBIT/Interest
Ltd/EBITDA	Long term debt/EBITDA
Ltd/Total assets	Long term debt/Total assets
ZM-score	See methodology section for calculations
O-score	See methodology section for calculations
C. Employment	
Employees	Number of employees
Wages (EURt)	Total wage costs
Wage Level (EURt)	Wage cost per employee

Table 3A – Variable Description, 2/2

Total Factor Productivity variables	
lnQ	Natural logarithm to Gross profit
lnK	Natural logarithm to Fixed Assets
lnL	Natural logarithm to Number of Employees
lnAge	Natural logarithm of Company age
B	Dummy taking the value of 1 if the company is a portfolio company
Buyout (<t+1)	Dummy taking the value of 1 for accounting periods precedent to buyout
Post-dummy	Dummy taking the value of 1 for accounting periods after the buyout
Post*buyout-dummy	Dummy taking the value of 1 for accounting periods after the buyout, and if the company is a buyout company
Buyout t-4	Dummy taking the value of 1 for accounting period four years preceding the buyout
T-1 dummy	Dummy taking the value of 1 for accounting period one year preceding the buyout
T-1*Buyout	Dummy taking the value of 1 for accounting period one year preceding the buyout, and if the company is a buyout company
Matching variables	
Investment year and industry	Unique combination of investment year and industry code. Created to make the propensity score matching loop more efficient
Turnover	Revenue measured in million euros
EBITDA	Operating result before depreciation, amortization, interest and taxes. Assumptions verified by database provider.
Total Assets	Outgoing balance of Total Assets the same year the investment took place
Ltd/Total assets	Long term debt/Total assets
Number of Employees	The number of employees the year the investment took place
Age	Company age
Other variables used	
EBIT	Operating result before interest and taxes
Net Income	Total earnings
Long Term Debt	Liabilities requiring payment of interest. Assumptions verified by database provider.
Total Sales Growth, from t-1	Percentage change in turnover

Table 4A – Performance Subsequent to Buyout – Matched Sample at Buyout Year – Median Values

Median value changes in relation to buyout year (t=0). Part A of the table reports the groups' changes in operating performance. Part B reports changes in ratios relating to the groups' solvency, using accounting figures, supplemented with O- and ZM-scores. Part C reports changes in employment and wages. Diff-in-diff median is based on the difference in between the groups' difference in medians from the associated fiscal year to the buyout year. Significance in median differences are based on Wilcoxon-Mann-Whitney rank-sum tests testing equality in medians. Significance levels of 1%, 5%, and 10% are denoted as ***, **, and *, respectively. All statistical significant variables are marked with bold text.

	Values at t - 0		Difference in Relation to T-0											
	T - 0		+1				+2				+3			
	Buyout Median Levels	Control Median Levels	Buyout Change Median	Control Change Median	Diff-in-Diff Median	Ranksum P-value	Buyout Change Median	Control Change Median	Diff-in-Diff Median	Ranksum P-value	Buyout Change Median	Control Change Median	Diff-in-Diff Median	Ranksum P-value
A. Operating Performance														
CAGR	-	-	0.14	0.04	**0.10****	0.01	0.10	0.02	**0.08*****	0.01	0.08	0.02	**0.06*****	0.00
Gross Profit Margin	1.00	1.00	0.00	0.00	0.0	0.22	0.00	0.00	0.00	0.37	0.00	0.00	0.00	0.57
Turnover/Total Assets	1.29	1.54	0.01	0.00	0.0	0.49	0.01	0.00	0.01	0.66	0.06	0.00	0.06	0.17
EBITDA/Turnover	0.08	0.09	-0.01	-0.01	0.0	0.91	-0.01	-0.01	0.00	0.58	-0.01	-0.02	0.00	0.49
EBITDA/Total Assets	0.09	0.12	0.00	0.00	0.0	0.86	-0.01	-0.01	0.00	0.79	0.00	-0.01	0.01	0.25
ROA	0.05	0.06	-0.01	-0.01	0.0	0.95	-0.01	-0.01	0.00	0.95	0.00	-0.02	0.01	0.12
CAPEX Ratio	1.48	1.14	-0.34	-0.09	0.0	0.83	0.59	0.13	0.00	0.67	0.27	0.55	0.00	0.95
Net CF/Turnover	0.05	0.05	-0.01	0.00	-0.01	0.43	-0.01	0.00	0.00	0.83	0.00	0.00	0.00	0.64
Net CF/Total Assets	0.09	0.09	-0.02	0.01	-0.02	0.66	-0.01	0.00	0.00	0.84	-0.01	-0.01	0.00	0.94
Current Ratio	1.74	1.58	-0.02	0.03	-0.05	0.37	-0.11	0.04	**-0.14****	0.03	-0.04	0.06	-0.09	0.22
B. Insolvency Risk														
Coverage Ratio	2.71	4.26	0.05	-0.02	0.06	0.80	0.01	0.00	0	0.59	0.42	-0.05	0.46	0.43
Ltd/EBITDA	0.92	0.45	-0.18	0.00	**-0.17****	0.01	-0.16	0.01	-0.17	0.18	0.04	0.02	0.02	0.70
Ltd/Total Assets	0.33	0.22	-0.01	0.00	**-0.00***	0.07	-0.03	0.00	**-0.02***	0.08	-0.05	0.00	-0.04	0.11
ZM-score	-2.49	-3.22	0.05	0.00	0.05	0.89	0.05	0.04	0	0.58	-0.13	0.13	-0.25	0.24
O-score	-4.54	-5.98	-0.05	0.04	-0.08	0.45	-0.37	0.41	**-0.78****	0.03	-0.19	0.69	**-0.88****	0.02
C. Employment														
Growth Employees	32.00	13.00	0.00	0.00	**0****	0.03	0.03	0.00	**0.03*****	0.00	0.06	0.00	**0.05*****	0.00
Growth Wages (EURt)	1 387.48	659.00	0.06	0.00	**0.05***	0.08	0.13	0.00	**0.13****	0.03	0.17	0.00	**0.16****	0.03
Growth Wage Level (EURt)	48.24	39.11	0.02	0.04	-0.02	0.21	0.04	0.07	-0.02	0.44	0.07	0.10	-0.02	0.42
Number of Observations	83	402	83	395	-	-	83	385	-	-	75	339	-	-

Table 5A – Robustness test adjusting for Sales Growth (t-1 to t) – Part I

Applying interaction terms to estimate the robustness of operating profitability measures by adjusting for pre-buyout top line growth. The results are estimated using a Fixed Effects model with clustered standard errors. *"Sales Growth (t-1 to t) * Buyout Dummy"* and *"Sales Growth (t-1 to t)"* adjust for different pre-buyout growth levels for buyout firms and control firms, respectively. The *"Buyout"* dummy estimates the excess change in the respective measures for buyout firms compared to benchmark. Each variable's standard error is depicted in parenthesis, and P-values in percentage. Significance levels of 1%, 5%, and 10% are denoted as ***, **, and *, respectively.

	CAGR t+3	Gross Profit Margin t+3	EBITDA Margin t+3	Return on Assets t+3	EBITDA-to-Total Assets t+3
Figures Controlled for Pre Buyout Sales Growth					
Buyout	**0.14**	**-0.031**	**0.058**	**-0.042**	**-0.059**
	(0.090)	(0.032)	(0.16)	(0.062)	(0.063)
	11.5 %	32.3 %	71.9 %	50.4 %	35.1 %
Sales Growth (t-1 to t)	0.023	0.0051	0.11**	0.024	0.027*
* Buyout Dummy	(0.022)	(0.0050)	(0.046)	(0.016)	(0.015)
	30.8 %	30.8 %	1.5 %	12.6 %	5.9 %
Sales Growth (t-1 to t)	-0.028**	0.0036	-0.11***	-0.012	-0.013
	(0.013)	(0.0066)	(0.034)	(0.0091)	(0.0081)
	3.3 %	58.3 %	0.1 %	18.9 %	11.7 %
Constant	0.014	-0.022*	-0.0026	0.0082	0.014
	(0.025)	(0.013)	(0.063)	(0.043)	(0.047)
	59.3 %	9.4 %	96.8 %	85.1 %	76.8 %
Number of Observations	323	310	320	322	321
R-sq	0.061	0.0078	0.058	0.0049	0.0071
Clustered SE	Yes	Yes	Yes	Yes	Yes
Figures Without Controlling for Pre Buyout Sales Growth					
Buyout	**0.13****	**-0.0090**	**0.12**	**-0.035**	**-0.043**
	(0.068)	(0.027)	(0.12)	(0.036)	(0.039)
	4.8 %	74.0 %	31.0 %	32.5 %	27.0 %
Constant	0.038	-0.017	-0.055	0.015	0.018
	(0.028)	(0.012)	(0.053)	(0.037)	(0.037)
	17.3 %	16.2 %	30.4 %	69.0 %	62.5 %
Number of Observations	413	398	409	411	413
R-sq	0.018	0.00036	0.0021	0.00071	0.0011
Clustered SE	Yes	Yes	Yes	Yes	Yes

Table 6A – Total Factor Productivity – Matched Sample at Buyout Year – Random Effects Estimation

Total Factor Productivity (TFP) of buyout firms compared to control firms matched at the year of buyout. TFP is estimated using Random Effects and controlled for Labour, Fixed Assets (Capital), Company Age, and Industry Code. The TFP difference is highlighted in bold, and measured through the dummy variable "Buyout". "Pre buyout", "Buyout Year" and "Post buyout" measures within-year differences. "Pre vs Post" measures the total average difference between the period prior to- and subsequent to buyout. "Diff-in-Diff" estimates the significance of the difference between post- and pre TFP for buyout firms, relative to benchmark, through the variable "Post*buyout dummy". Each variable's standard error is depicted in parenthesis. Significance levels of 1%, 5%, and 10% are denoted as ***, **, and *, respectively. The Hausman test indicates the consistency of random effects estimates.

	Pre Buyout			Buyout Year	Post Buyout			Pre vs post		
	T-3	T-2	T-1	T	T+1	T+2	T+3	Pre	Post	Diff-in-Diff
ln(L)	0.82***	0.84***	0.83***	0.82***	0.85***	0.79***	0.94***	0.84***	0.87***	0.85***
	(0.040)	(0.045)	(0.045)	(0.068)	(0.030)	(0.043)	(0.067)	(0.026)	(0.022)	(0.018)
ln(K)	0.15***	0.12**	0.17***	0.23***	0.18***	0.22***	0.16***	0.15***	0.18***	0.18***
	(0.030)	(0.048)	(0.040)	(0.053)	(0.038)	(0.029)	(0.046)	(0.016)	(0.016)	(0.010)
ln(Age)	-0.015	0.032	-0.048	0.079	0.041	0.023	-0.037	0.0017	0.034	0.040
	(0.076)	(0.050)	(0.040)	(0.051)	(0.042)	(0.046)	(0.070)	(0.036)	(0.026)	(0.027)
Nace, level 1	0.019	0.011	-0.024	-0.045***	-0.034	-0.0041	-0.020	0.0052	-0.012	-0.0092
	(0.018)	(0.016)	(0.020)	(0.010)	(0.024)	(0.012)	(0.017)	(0.0069)	(0.0096)	(0.0057)
Buyout	**0.25*** **	**0.33** **	**0.25*** **	**0.28*** **	**0.071**	**0.100**	**0.24**	**0.28*** **	**0.12**	
	(0.090)	(0.14)	(0.090)	(0.093)	(0.13)	(0.16)	(0.18)	(0.044)	(0.097)	
Buyout (< t+1)										**0.28*** **
										(0.049)
Post-dummy										**0.058**
										(0.065)
Post*buyout-dummy										**-0.15**
										(0.12)
Constant	10.4***	10.7***	10.5***	9.47***	10.2***	9.73***	10.2***	10.5***	9.99***	10.0***
	(0.54)	(0.55)	(0.52)	(0.62)	(0.51)	(0.30)	(0.44)	(0.28)	(0.20)	(0.18)
Statistics										
Observations	256	275	317	386	390	386	339	848	1115	2349
R-squared	0.70	0.70	0.79	0.78	0.78	0.77	0.76	0.73	0.77	0.76
Clustered SE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hausman Test										
Chi2	9.93	18.68	17.14	5.18	3.71	29.62	2.18	12.51	44.71	139.00
P-value	0.08	0.00	0.00	0.39	0.59	0.00	0.82	0.03	0.00	0.00

Table 7A – Performance prior to Buyout – Matched Sample Four Years Prior to Buyout – Median Values

Median value changes in performance measures leading up to buyout. Part A of the table reports the groups' changes in operating performance. Part B reports changes in ratios relating to the groups' solvency, using accounting figures, supplemented with O- and ZM-scores. Part C reports changes in employment and wages. Differences are estimated in relation to company characteristics four years prior to buyout (t-4). Diff-in-diff median is based on the difference in between the groups' difference in medians from the associated fiscal year to the buyout year. Significance in median differences are based on Wilcoxon-Mann-Whitney rank-sum tests testing equality in medians. Significance levels of 1%, 5%, and 10% are denoted as ***, **, and *, respectively. All statistical significant variables are marked with bold text.

	Values at T-4		Difference in Relation to T-4											
	T-4		+1				+2				+3			
	Buyout Median Levels	Control Median Levels	Buyout Change Median	Control Change Median	Diff-in-Diff Median	Ranksum P-value	Buyout Change Median	Control Change Median	Diff-in-Diff Median	Ranksum P-value	Buyout Change Median	Control Change Median	Diff-in-Diff Median	Ranksum P-value
A. Operating Performance														
CAGR	-	-	0.08	0.06	0.02	0.15	0.09	0.05	**0.03*** **	0.01	0.08	0.03	**0.05** **	0.01
Gross Profit Margin	0.99	1.00	0.00	0.00	0	0.50	0.00	0.00	0	0.25	0.00	0.00	0	0.39
Turnover/Total Assets	1.43	1.62	0.00	0.01	-0.01	0.83	0.04	0.00	**0.04***	0.10	0.00	-0.03	0.02	0.23
EBITDA/Turnover	0.11	0.10	0.00	0.00	0	0.80	-0.01	-0.01	0	0.86	0.00	-0.01	0.01	0.11
EBITDA/Total Assets	0.18	0.16	0.00	0.00	0	0.38	0.00	0.00	0	0.50	0.02	-0.02	**0.03*** **	0.00
ROA	0.15	0.11	0.00	0.00	0	0.46	0.00	0.00	0	0.41	0.01	-0.02	**0.03*** **	0.00
CAPEX Ratio	1.06	2.00	0.02	0.04	0.00	0.40	1.07	0.19	0.00	0.31	-0.01	0.14	0.00	0.74
Net CF/Turnover	0.06	0.07	0.01	0.00	0	0.64	0.00	0.00	0	0.41	0.00	0.00	0	0.38
Net CF/Total Assets	0.09	0.11	0.01	0.00	0	0.82	0.03	0.00	0.02	0.22	0.02	-0.01	**0.03** **	0.04
Current Ratio	1.64	1.76	0.01	0.00	0	0.76	-0.03	0.01	-0.03	0.78	0.04	0.02	0.01	0.79
B. Insolvency Risk														
Coverage Ratio	8.28	5.89	0.05	0.03	0.02	0.53	0.69	-0.64	1.33	0.15	0.04	0.02	0.43	0.26
Ltd/EBITDA	0.57	0.52	-0.08	0.01	-0.08	0.14	-0.01	-0.02	0.01	0.73	0.02	-0.42	-0.03	0.67
Ltd/Total Assets	0.29	0.16	-0.02	0.00	**-0.02*** **	0.00	-0.04	0.00	**-0.03*** **	0.00	-0.01	0.02	**-0.07*** **	0.00
ZM-score	-2.97	-3.55	-0.20	-0.03	**-0.16** **	0.04	-0.33	-0.04	-0.29	0.16	-0.07	0.00	**-0.41*** **	0.00
O-score	-5.32	-6.03	-0.38	0.14	-0.51	0.12	-0.54	-0.13	-0.41	0.71	-0.41	0.01	**-1.15*** **	0.01
C. Employment														
Employees	31.00	15.00	0.00	0.00	0	0.53	0.02	0.00	0.01	0.40	0.00	0.00	0	0.34
Wages (EURt)	943.0	568.1	0.10	0.02	**0.07** **	0.05	0.14	0.05	**0.08** **	0.02	0.29	0.07	**0.21*** **	0.00
Wage Level (EURt)	38.0	37.2	0.05	0.03	0.02	0.60	0.08	0.05	0.03	0.72	0.14	0.08	**0.05** **	0.04
Number of Observations	84	409	84	406	-	-	84	398	-	-	84	386	-	-

Table 8A – Robustness test adjusting for Sales Growth from (t-5 to t-4) – Part II

Applying interaction terms to estimate the robustness of operating profitability measures when adjusting for sales growth from the year before the matching in t-4. The results are estimated using a Fixed Effect model with clustered standard errors. *"Sales Growth (t-5 to t-4) * Buyout Dummy"* and *"Sales Growth (t-5 to t-4)"* adjust for different pre-matching growth levels for buyout firms and control firms, respectively. The *"Buyout"* dummy estimates the excess change in the respective measures for buyout firms compared to benchmark in the years leading up to buyout. Each variable's standard error is depicted in parenthesis, and P-values in percentage. Significance levels of 1%, 5%, and 10% are denoted as ***, **, and *, respectively.

	CAGR t-1	Gross Profit Margin t-1	EBITDA Margin t-1	Return on Assets t-1	EBITDA-to-Total Assets t-1
Figures Controlled for Pre Buyout Sales Growth					
Buyout	**0.054**	**0.0055**	**-0.029**	**0.072***	**0.072***
	(0.047)	(0.010)	(0.065)	(0.040)	(0.037)
	0.250	0.587	0.657	0.0687	0.0509
Sales Growth (t-5 to t-4)	0.057*	0.0066	0.031	-0.017	-0.0093
* Buyout Dummy	(0.031)	(0.011)	(0.049)	(0.026)	(0.029)
	0.0652	0.554	0.521	0.531	0.747
Sales Growth, (t-5 to t-4)	-0.0039	-0.0092	-0.020*	-0.019**	-0.019**
	(0.014)	(0.0066)	(0.012)	(0.0073)	(0.0078)
	0.773	0.165	0.0842	0.0111	0.0167
Constant	0.058***	0.012*	-0.00079	-0.037**	-0.040***
	(0.021)	(0.0072)	(0.041)	(0.015)	(0.014)
	0.00648	0.0998	0.985	0.0127	0.00343
Number of Observations	411	406	408	413	412
R-sq	0.011	0.024	0.0043	0.035	0.035
Clustered SE	Yes	Yes	Yes	Yes	Yes
Figures Without Controlling for Pre Buyout Sales Growth					
Buyout	**0.069**	**0.0073**	**-0.0076**	**0.070***	**0.072****
	(0.049)	(0.0093)	(0.049)	(0.037)	(0.035)
	0.157	0.428	0.876	0.0620	0.0388
Constant	0.075**	0.0068	-0.017	-0.044***	-0.047***
	(0.033)	(0.0092)	(0.036)	(0.015)	(0.015)
	0.0241	0.458	0.649	0.00419	0.00164
Number of Observations	458	453	454	462	461
R-sq	0.0051	0.00066	0.000027	0.0097	0.010
Clustered SE	Yes	Yes	Yes	Yes	Yes

Table 9A – Total Factor Productivity – Matched Sample Four Year Prior to Buyout – Random Effects

Total Factor Productivity (TFP) of buyout firms compared to control firms matched four years prior to buyout. TFP is estimated using Random Effect and controlled for Labour, Fixed Assets (Capital), Company Age, and Industry Code. The TFP difference is highlighted in bold, and measured through the variable "Buyout". "Pre buyout", measures within-year differences. "All Periods" measures the total average difference between buyout- and control firms. "Diff-in-Diff" estimates the significance of the difference between t-4 to t-1 for buyout firms, relative to benchmark, through the variable "t-1*buyout dummy". Each variable's standard error is depicted in parenthesis. Significance levels of 1%, 5%, and 10% are denoted as ***, **, and *, respectively. The Hausman test indicates the consistency of random effects estimates.

	Pre Buyout				All Periods	
	T-4	T-3	T-2	T-1	T-4 to T-1	Diff-in-Diff
ln(L)	0.78***	0.82***	0.75***	0.70***	0.77***	0.74***
	(0.044)	(0.041)	(0.042)	(0.041)	(0.024)	(0.032)
ln(K)	0.14***	0.14***	0.18***	0.22***	0.17***	0.19***
	(0.035)	(0.051)	(0.047)	(0.047)	(0.026)	(0.030)
ln(Age)	-0.0074	-0.020	-0.068	-0.12*	-0.028	-0.043
	(0.058)	(0.058)	(0.081)	(0.065)	(0.027)	(0.047)
Nace, level 1	-0.059***	-0.050***	-0.054***	-0.041**	-0.037***	-0.046***
	(0.013)	(0.013)	(0.010)	(0.016)	(0.0065)	(0.0097)
Buyout	**0.055**	**0.12****	**0.18***	**0.18*****	**0.12*****	
	(0.066)	(0.054)	(0.093)	(0.046)	(0.034)	
Buyout t-4						0.062
						(0.069)
T-1 dummy						-0.064
						(0.12)
T-1*Buyout						**0.11**
						(0.092)
Constant	3.02***	2.54***	3.17***	3.36***	2.76***	3.10***
	(0.80)	(0.42)	(0.49)	(0.63)	(0.27)	(0.44)
Statistics						
Observations	412	407	406	398	1623	810
R-squared	0.86	0.85	0.85	0.86	0.86	0.86
Clustered SE	Yes	Yes	Yes	Yes	Yes	Yes
Hausman Test						
Chi2	5.13	3.15	3.65	6.28	13.96	4.66
P-value	0.40	0.67	0.60	0.28	0.02	0.70

Table 10A – Descriptive statistics – Matched Sample at Buyout Year – Part I

Company characteristics of matched sample. The sample is matched based on mean values of company characteristics at buyout year, with an exact matching for industry (NACE-level 1) and accounting year. The table reports mean and median values for both groups, as well as the smallest and largest observation, reported through min and max, respectively.

	Buyout				Control Group			
	Min	Mean	Median	Max	Min	Mean	Median	Max
Size (EURm)								
Turnover	0.00	16.70	8.62	66.10	0.00	17.40	2.68	66.10
EBITDA	-0.49	1.45	0.58	6.04	-0.49	1.50	0.09	6.04
EBIT	-0.83	0.93	0.35	4.15	-0.83	0.88	0.04	4.15
Net Income	-0.77	0.68	0.27	3.21	-0.77	0.65	0.03	3.21
Total Assets	0.06	24.30	8.78	77.50	0.00	23.40	3.82	77.50
Interest Bearing Debt	0.01	8.23	1.99	32.00	0.00	6.82	0.46	32.00
Company Age	0	13	10	47	0	15	8	114
Operating Performance								
Total Sales Growth, from t-1	0.14	0.89	1.00	1.07	0.14	0.94	1.00	1.16
Turnover/Total Assets	0.01	1.56	1.29	7.42	0.01	2.01	1.54	18.97
EBITDA/Turnover	-6.00	-0.10	0.08	0.55	-6.00	-0.09	0.09	1.00
EBITDA/Total Assets	-0.70	0.14	0.09	1.02	-3.22	0.08	0.12	1.33
ROA	-0.91	0.10	0.05	0.95	-3.45	0.03	0.07	1.25
CAPEX ratio	-52.3	14.1	1.5	363.9	-4 131.3	22.5	1.1	4 948.0
Net CF/Turnover	-13.95	-0.02	0.05	14.44	-13.95	0.31	0.05	14.44
Net CF/Total Assets	-0.86	0.13	0.09	2.73	-2.00	0.10	0.08	4.00
Current Ratio	0.04	4.06	1.74	109.51	0.03	3.82	1.57	97.90
Insolvency Risk								
Coverage Ratio	-131.6	285.3	2.7	8 536.4	-684.9	166.2	4.5	8 536.4
Ltd/EBITDA	-300.0	-8.1	0.9	165.7	-300.0	-4.9	0.5	165.7
Ltd/Total Assets	0.00	0.38	0.33	2.95	0.00	0.47	0.22	13.29
ZM-score	-7.1	-2.4	-2.5	15.0	-9.0	-1.7	-3.3	87.9
O-score	-44.7	-7.2	-4.5	13.7	-154.4	-11.3	-6.0	94.4
Probability of Default	0.00 %	0.08 %	1.05 %	100.00 %	0.00 %	0.00 %	0.25 %	100.00 %
Employment								
Employees	1	74	32	306	0	82	12	306
Wages (EURm)	29	3 158	1 387	12 600	0	3 396	649	12 600
Wage per Employee (EURt)	13.6	55.7	48.2	128.0	0.2	44.9	39.2	128.0
Number of Observations	83	83	83	83	402	402	402	402

Table 11A – Descriptive statistics – Matched Sample Four Years Prior to Buyout – Part II

Company characteristics of matched sample. The sample is matched based on mean values of company characteristics four year prior to buyout, with exact matching for industry (NACE-level 1) and accounting year. The table reports mean and median values for both groups, as well as the smallest and largest observation, reported through min and max, respectively.

	Buyout				Control Group			
	Min	Mean	Median	Max	Min	Mean	Median	Max
Size (EURm)								
Turnover	0.01	17.40	6.49	66.10	0.00	18.00	2.52	66.10
EBITDA	-0.49	1.41	0.75	6.04	-0.49	1.48	0.17	6.04
EBIT	-0.83	1.01	0.48	4.15	-0.83	0.88	0.08	4.15
Net Income	-0.77	0.71	0.31	3.21	-0.77	0.55	0.04	3.21
Total Assets	0.04	18.30	4.42	77.50	0.00	17.90	2.03	77.50
Interest Bearing Debt	0.01	6.78	0.71	32.00	0.00	4.84	0.29	32.00
Company Age	0	15	11	101	0	19	13	114
Operating Performance								
Gross Margin	0.14	0.91	0.99	1.16	0.14	0.94	1.00	1.16
Turnover/Total Assets	0.01	1.89	1.43	9.99	0.01	2.09	1.62	9.76
EBITDA/Turnover	-6.00	0.00	0.11	0.47	-6.00	0.04	0.10	0.86
EBITDA/Total Assets	-0.92	0.16	0.18	0.90	-2.60	0.17	0.16	1.33
ROA	-1.05	0.12	0.15	0.90	-3.45	0.12	0.11	1.25
CAPEX ratio	-1 491.3	-14.2	1.1	239.7	-28 958.0	-204.6	2.0	4 948.0
Net CF/Turnover	-13.95	0.15	0.06	14.44	-13.95	0.32	0.07	14.44
Net CF/Total Assets	-1.44	0.12	0.09	3.40	-1.51	0.15	0.11	4.00
Current Ratio	0.06	2.74	1.64	27.64	0.01	5.32	1.76	233.00
Insolvency Risk								
Coverage Ratio	-100.3	261.0	8.3	8 536.4	-634.8	255.8	5.9	8 536.4
Ltd/EBITDA	-300.0	-4.0	0.6	27.2	-300.0	-3.7	0.5	165.7
Ltd/Total Assets	0.00	0.39	0.29	4.29	0.00	0.35	0.16	7.44
ZM-score	-7.3	-2.4	-3.0	25.2	-7.4	-2.0	-3.6	82.9
O-score	-155.7	-13.9	-5.3	23.6	-156.0	-12.5	-6.0	88.1
Probability of Default	0.00 %	0.00 %	0.49 %	100.00 %	0.00 %	0.00 %	0.24 %	100.00 %
Employment								
Employees	1	83	31	306	0	81	15	306
Wages (EURt)	25	3 023	943	12 600	0	3 046	568	12 600
Wage per Employee (EURt)	9.6	43.7	38.0	128.0	0.2	41.0	37.2	128.0
Number of Observations	84	84	84	84	409	409	409	409