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Master Thesis

The Effects Private Equity Owned Firms Have on the Norwegian Society

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Content

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1. Abstract

There is a long-standing controversy regarding private equity (PE) and its impact on society. Using unique data from ACPE[1], Reuters and Danske Bank, the economic effects of PE on portfolio companies is analyzed in a sample of 239 buyouts and 438 ventures in the period from 1998 to 2011, examining the effect these companies have on different stakeholders. The contribution to stakeholders is measured by five dimensions: Value creation, Financial distress, Employees, Tax and Productivity. At first, enhancements in revenue are observed for portfolio companies, followed by improved productivity, and finally, wage increases coupled with no-less-than benchmark changes in number of employees, indicating that the frequent negative criticism of the impact of PE-activity on employment is groundless and misdirected.

2. Introduction

In the past decade, the international PE market has experienced tremendous growth, with over $551 billion capital raised in 2015, an increase of 7.1% from the previous year (Preqin, 2016). This growth has not become inattentive, where some stakeholders criticize that the short holding period only focus on short-term gains, including labor unions who claim that PE, through wage cuts, generate return to investors at the cost of employees (Cumming, 2012). Despite these critics, PE funds have often been instrumental in rescuing financially troubled companies and by providing new capital to enter new markets and realize opportunities for growth. The Nordic buyout and venture capital markets have become highly successful and is an active player throughout Europe (BVCA, 2013). Despite many studies on PE, there has been no comprehensive research on the effects PE ownership has on the Norwegian community overall. In our thesis, we focus on the Norwegian PE market and investigate whether PE ownership changes a firm's impact on society.

The objective of our thesis is to contribute to an increased awareness of the effect of PE ownership on society. To fully measure contribution to society, it is necessary to consider all relevant stakeholders. In our thesis, we define these stakeholders as shareholders, lenders, customers, employees and the firm itself. The analysis of the created custom database, compromising 677 Norwegian ventures and buyouts ranging from 1998 until 2011, makes this thesis a

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[1]Argentum Centre for Private Equity

contribution to the existing literature on PE by investigating PE activity to a cautiously created benchmark across five dimensions: 1. Value creation, 2. Insolvency risk, 3. Employment, 4. Tax consideration and 5. Total factor productivity (TFP).

Our analysis reveals four major points in relation to these dimensions. First, improvement in revenue for both ventures and buyouts are observed after an acquisition when compared to a benchmark. In fact, three years after investment, venture and buyout firms have, on average, 1.36% and 1.21% higher revenue CAGR than comparables, respectively. While we do not find significant differences in profitability between buyouts and the control group, we do find a slightly lower return on assets (ROA) and earnings (EBITDA) to total assets for venture capital investment, but no difference in EBITDA-margin. This suggests that both buyouts and ventures are increasing absolute profitability in kroner. Secondly, there is no evidence to support that PE-investors impose higher insolvency risk, despite PE-investors' focus on capital structure for buyouts. Thirdly, we find evidence of productivity improvements in both ventures and buyouts. Evidence suggests that PE-investors target venture firms with lower productivity. Finally, there is evidence that PE-investors favor employment. The PE investment results in a significant improvement in wages without significantly different changes in number of employees when compared to non-PE enterprises. We find that portfolio companies increase the actual wages with on average 4.6 mNOK and 3.5 mNOK more than comparable firms for venture and buyout, respectively. Based on these findings, we conclude that PE-investors enhance the overall corporate contribution to Norwegian society based on higher revenue, productivity and wages. This is not to say that other stakeholders, not addressed in this thesis, could not be negatively affected by certain factors of PE-investment.

The remainder of our thesis is structured as follows. Section 3 reviews existing academic literature on the aforementioned dimensions. Section 4 explains the data, the data-gathering procedure and the creation of the custom database used in the analysis. Section 5 outlines the analytical methodology, and our analysis and conclusions are presented in sections 6 and 7 respectively.

3. Literature review

3.1. Prior studies on value creation and operating performance

Earlier research on operating performance of PE-backed firms found strong evidence of value creation. During the 1980s, S. Kaplan (1989) found significant improvements in operating profitability in buyout corporations compared to the industry mean. Analogous findings are reported by A. J. Smith (1990), using a sample period ranging from 1977 to 1986. These findings are supported by more recent literature, for example Douglas and Uwe (2009) and Cochrane (2005) who find average PE returns of 69% and 59%, respectively. Weir, Jones, and Wright (2015) who study public-to-private deals and Guo, Hotchkiss, and Song (2011) who study buyout deals also find evidence of operating improvements. In addition, Phalippou and Gottschalg (2009) find that PE funds outperformed the S&P500 by 3% between 1980 and 1996. While the focus on improving profitability was a common denominator in past studies, more recently Gompers, Kaplan, and Mukharlyamov (2016) discover that PE investors create value by focusing on growth drivers rather than cost savings. Focusing on the Nordics, Gulliksen, Wara, and Hansen (2008) discover that future growth is the most vital investment factor in identifying buyout targets in that region. Several studies also find evidence of significant value creation through EBITDA-margins, ROA levels and growth for portfolio companies[2] in Scandinavian countries (Bergström, Grubb, & Jonsson, 2007; BVCA, 2013; Gulliksen et al., 2008), while other studies on Denmark (Vinten, 2007) and Sweden (Molander Alexander, 2011) do not find such enhancements.

3.2. Prior studies on insolvency risk

Common criticism of PE ownership centers on the potentially negative consequence associated with high gearing of portfolio companies after investment, often performed as a Leverage Buyout (LBO). A recent contribution on this issue is research by Tykvová and Borell (2012) on European corporations Financial Distress Risk (FDR) in the beginning of millennium. Their findings indicate that PE investors select firms with low FDR and proceed to increase debt after acquisition, which results in increased distress risk. Despite increased distress risk, PE-owned firms might not suffer from higher bankruptcy costs. This is supported by earlier studies by Kaplan and Strömberg (2009), who found that

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[2] "Portfolio companies" is in this thesis referring to companies invested in by private equity.

6% of buyouts between 1970 and 2007 ended in either bankruptcy or reorganization. This equals an annual bankruptcy rate of 1.2%, which is lower than the average default rate of 1.6% for U.S. corporate bond issuers, but higher than publicly traded firms with a bankruptcy rate of 0.6% (Wilson, Wright, & Altanlar, 2009).

Boucly, Sraer, and Thesmar (2011) suggest that; 1. PE investors select companies under financial distress, 2. Facilitate growth through increased gearing. These two hypotheses suggest their own investment method, however, they found that both methods resulted in increased debt levels after buyout. Despite this, others find no evidence of higher gearing for PE-owned firms in post-buyout years for the Swedish buyout market (Bergström et al., 2007). Furthermore, evidence from Norway indicates that PE ownership actually reduces probability of financial distress compared to peer companies (BVCA, 2013).

3.3. Prior studies on employment

A much-debated issue of PE-activity is its potential effect on employment and wages. One comprehensive study on the US PE-market finds a decrease in employment five years after buyout relative to a specified benchmark (Davis, Haltiwanger, Jarmin, Lerner, & Miranda, 2011). In contrast, a study conducted by Menon Economics found that the Norwegian portfolio companies had an average employment growth of 14% between 2002 and 2014 compared to Oslo Børs small cap at 4.3% (Klemsdal, 2016). These findings are supported by BVCA (2013), which finds a substantial increase in employment in the Norwegian buyout market. In contrast, Amess and Wright (2007) find no evidence that PE-owned companies affect wages and employment. These contradicting findings seem to have a root in demography and time aspects. It is, however, not only the number of employees and their relative wages that are valid measures of employee benefits. Amess, Brown, and Thompson (2007) find that firms subject to buyout result in craft and skilled service employees having more individual discretion, together with less direct supervision, suggesting that employees gain by increasing the value of their human capital and enjoying improved working conditions.

3.4. Prior studies on tax

We next investigate the much-debated issue of taxation. Researchers do not find any significant difference in Nordic-region taxation of PE-owned firms (Cumming, 2012). There is no comprehensive analysis of whether PE ownership increases taxation in the Norwegian context.

3.4. Prior studies on total factor productivity

Finally, considering operating performance, we are interested in whether PE ownership enhances productivity to a greater extent than other investors. Lichtenberg and Siegel (1990) found that PE ownership enhances TFP gains up to three years after buyout, relative to industry benchmarks. These findings are supported by Harris, Siegel, and Wright (2005), who find that buyouts result in significant productivity gains. Elisa Ughetto (Cumming, 2012) has a more modest finding, where only 46% of PE-backed companies outperform contemporary companies in the growth rate of TFP. Despite this, newer studies of the Great Britain buyout market, including studies of performance during the economic downturns, indicate that TFP developments tend to be even greater in periods of financial slowdown (Wilson, Wright, Siegel, & Scholes, 2012). Focusing on the Nordics, BVCA (2013) confirms that TFP increases for PE-backed firms in Norway after buyout. Chemmanur, Krishnan, and Nandy (2011) find evidence that venture capitalists select companies with relatively higher TFP, and are able to further increase the productivity during PE ownership. This finding differs from BVCA (2016), which finds that general partners acquire firms with relatively lower TFP, and subsequently improve productivity, thereby generating value for the investors.

4. Data

This section details the custom database created in the retrieval of accounting information. The foundation for the custom database is information regarding PE deals from Argentum Center for Private Equity with supplementary data from both Thompson One and Danske Bank. This information was then merged with accounting data from Centre for Corporate Governance Research (CCGR) relating to more than 3.5 million Norwegian companies. To the best of our knowledge, this custom database is the most complete data set of the Norwegian buyout and venture market. Table 1 provides an overview of the different stages in the data collection process.

4.1. Data Collection

The data collection process is divided into two parts[3], namely the identification of Norwegian buyout and venture firms, and information gathering of the underlying accounting data. To identify venture and buyout investments, this thesis uses a unique database created by the Argentum Centre for Private Equity[4]. Initiated by Energy Ventures, PwC, HitecVision, Northzone Ventures, BA-HR, Norvestor Equity and Argentum, ACPE is an independent research center, instigated to develop research in the area of PE. Since its inception in 2012, the ACPE database has collected information from numerous sources in order to form a comprehensive database of PE investments in the Scandinavian market.

Our custom database is based on a large sample of PE deals in Norwegian portfolio companies identified by ACPE. The information used from the ACPE database comprises of the company name, investment date, organization identification numbers and investment fund. Data relating to the latter three was often incomplete or missing entirely. In some cases, additional information such as exit date, IRR and deal-pricing was available. In the first round of locating missing organization identification numbers, some companies were excluded as being irrelevant or having insufficient accounting information for further analysis. This left 1,727 usable investments from the ACPE database. The database was supplemented and quality controlled using databases from Thompson One and Danske Bank. Thompson One provided information pertaining to a further 203 deals and control information for 589 deals included in the ACPE database, whereas Danske Bank database provided information on additional 17 unique deals. The latter database provided information about more recent deals that were not yet included in the ACPE and Thompson databases. We used a probabilistic record linkage method[5] to merge this data, which allowed matching companies based on an approximate string comparison algorithm. Cases without a perfect match (match<1) were individually checked. The custom database was then enhanced by locating missing organization identification numbers, using probabilistic record linkage method linking the custom database with Brønnøysund's registry of Norwegian companies. In cases of non-perfect match, these were also individually verified as well. As we could not access the CCGR

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[3] As highlighted in Figure I
[4] Also referred to as ACPE
[5] More popularly called Fuzzy Matching

database before having ready a final request, we downloaded accounting and company information for all companies in the database. This made it possible to count the number of trading years, before and after investment, to see if there might have been structural changes, from for example M&A transactions. In cases where company stage was not set by Argentum specifications, EVCA standards[6] (EVCA, 2015) were applied. Afterwards, investments with missing data, as well as misclassified deals, for example cases of seed stage companies or where the investor was not actually PE, were discarded. In addition, when manually checking the validity of the PE deals, we discovered 65 additional deals that had not been included.

Finally, where a company was subject to multiple investments, only the first investment within four years was included, so that the study does not analyze the same accounting data twice. This process removed 384 observations, being either duplicates or subsequent acquisitions increasing the stake in portfolio companies beyond an initial investment. To be able to study effect of PE three years after investment, deals completed after 2011 have been excluded from the dataset. The final custom database thereby comprises of 677 investments in 566 portfolio companies.

Comprehensive accounting information for a large number of Norwegian companies was also needed to realize the empirical objective of this thesis. The CCGR at BI Norwegian Business School maintain a database of individual company and group-consolidated financial and ancillary information for Norwegian companies spanning the period from 1994 to 2014[7.] This includes accounting information, as well as the number of employees and salaries.

4.2.1. Merging and Cleaning data

Merging the custom database with accounting data was done by counter and separator to account for multiple investments in a firm. This presented two challenges. Firstly, some accounting multiples and key variables, such as EBITDA, as well as working capital and CAPEX, which are calculated manually,

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[6] Seed is defined as financing provided to research, assess and develop an initial concept before a business has reached the start-up phase, venture as companies may be in the process of being set up or may have been in business for a short time, and buyouts as later and more mature firms
[7] Before we were able to retrieve this dataset, we had to create our own dataset using Proff Forvalt and algorithms

are not reported in the dataset. Secondly, how to deal with extreme observations presented a challenge. Tukey (1962) suggests trimming the dataset by generating a winsorized distribution. This involves assigning the value of any data points outside a defined quantile to the value of that quantile. Choosing the quantile is in itself a subject for discussion, but the difference between winsorizing at 99% and 95% is usually small for a large sample (Brandon & Wang, 2012). Having extreme outliers will particularly affect ratios such as ROA and EBITDA-margin among others. Examining the data, we find that data points representing outliers are typically small firms with little or no revenue and few assets. Consequently, these multiples tend to be negative or unusually large. Based on this, we elect to winsorize the dataset at a 99%-level, which can be regarded as conservative (Leone, Minutti-Meza, & Wasley, 2015). Inspecting the distribution after winsorization, we discover a successful removal of the most extreme outliers without compromising the original data.

Table 1 - Data collection process

A step-by-step overview of the data collection process. The ACPE database is supplemented with Thompson One, Danske Bank and manually added deals. The custom database has been merged with CCGR accounting database. The final sample ex-ante Propensity Score Matching (PSM)

Description	Deals		Companies	
	Effect	Sample size	Effect	Sample size
Deals in ACPE		1786		1022
Irrelevant deals or insufficient information	-59		-53	
Sum ACPE		**1727**		**969**
Other Databases				
Thompson One		792		792
Unique Thompson One	203		203	
Danske Bank		186		178
Unique Danske Bank	17		17	
Sum Databases without adjustments		**1947**		**1189**
Adjustments				
Investment date not found or irrelevant deal	-398		-281	
Manually Added deals for relevant companies	65		0	
Removed Seed stage Companies	-438		-220	
Custom Database		**1176**		**688**
Merging Accounting Database with Custom Database				
Removed deals before 1998	-29		-23	
Removed deals after 2011	-74		-67	
Removed deals without accounting data for t=0 to t=3	-12		-32	
Removed deals for same org id within 4 years, keeping oldest	-384			
Final Sample Before Propensity Score Matching (PSM)		**677**		**566**
Venture		438		362
Buyout		239		204

4.2.2. PE Investment Activity – Data Sample Distribution

The final sample consists of 677 investments made between 1998 and 2011. The distribution of industries and investment classification are highlighted in Tables 2 and 3. Historically, the two most popular industries of PE investments in Norway have been technology & engineering and manufacture & repair, which comprise 40% and 21% of all investments in the studied timespan, respectively. In later years, especially after the global financial crisis of 2007 - 2008, there has been a shift towards the information & communication, and retail & wholesale sectors, while the proportion of investment in the technology & engineering and transportation & storage sectors has reduced. In the years following the financial crisis, the overall level of investment activity saw a noticeable decline. The finding of reduced activity are in line with NVCA's reporting (2016) of the number of initial buyout and venture investments in Norway. Approximately two thirds of the final data sample is classified as venture transactions, with the remaining third classified as buyouts. Until 2006, there had been a stable and consistent growth in buyouts. The number of deals after the financial crisis, is however still substantially low when comparted to ex-ante crisis.

Table 2 - PE Activity by Investment Year and Sector

Investment year to buyout overview of identified ventures and buyouts. Sector codes are specified by Level 1 NACE-code by using SSB industry classification. The year variable identifies the year of investment. Note that due to missing covariates, running Propensity Score Matching (PSM) may reduce the sample.

Buyout & Venture

Industry	Total	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Food Production	5	-	1	-	-	-	-	-	-	-	-	2	1	1	-
Mining & Support Activities	18	-	-	-	-	-	4	2	3	3	2	2	1	1	-
Manufacture & Repair	141	2	2	4	6	8	22	7	1	19	14	12	21	7	7
Utilities	19	1	1	-	-	-	1	2	10	1	7	2	1	-	2
Constructing	4	-	-	-	-	-	-	-	-	-	-	1	-	2	1
Retail & Wholesale	21	-	-	-	-	-	1	-	-	-	-	5	3	6	6
Transportation & Storage	56	5	2	3	5	3	5	3	9	8	11	1	1	-	-
Information & Communication	59	-	2	-	-	-	2	-	1	1	1	19	8	16	9
Financial Services, Real Estate & Insurance	45	-	1	5	-	1	3	4	4	11	5	4	3	3	1
Technology and Engineering	271	1	6	12	11	21	29	27	25	36	40	17	17	14	15
Rental & Leasing Activities	2	-	-	-	-	-	-	-	-	-	-	1	1	-	-
Public and Administration Activities	30	1	1	2	-	1	-	-	1	2	4	7	3	5	3
Entertainment & Arts	5	-	-	-	1	1	2	-	-	1	-	-	-	-	1
Total	**677**	**10**	**16**	**26**	**23**	**35**	**69**	**45**	**54**	**82**	**84**	**73**	**60**	**55**	**45**

Table 3 - Investment Activity by Investment Year

Overview of type of PE-Activity by Investment year. The stage classification is from the custom database, and all data prior to 1998 is excluded due to lack of accounting data, as are all acquisitions that took place after 2011. Note that due to missing covariates from some of the investments, Propensity Score Matching (PSM) may reduce the sample.

Type of PE Activity by Investment year

Type	Total	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Buyout	239	4	7	5	8	9	14	13	19	28	32	33	21	25	21
Venture	438	6	9	21	15	26	55	32	35	54	52	40	39	30	24
Total	677	10	16	26	23	35	69	45	54	82	84	73	60	55	45

4.2. Strengths and Weakness of the Final Database

Three key factors ensure that the final custom database is comprehensive. First, including accounting data for all Norwegian companies allows choosing from the entire population when identifying an appropriate sample of comparable companies. Secondly, the deal overview is specified based on company stage, making it possible to study and compare different PE stage investments. Lastly, the deal overview is based on data from three reliable sources, giving a wide cover of all PE-deals in Norway, making the database more robust and valid.

There are also potential weaknesses inherent in the final sample. Firstly, PE investors are likely to be more forthcoming about good investments and more reluctant in relation to less successful investments. These missing observations may lead to a potential overestimation of the true effect PE ownership has on portfolio companies. However, deal specifics apart from acquirer, target and timing are not used in this study. Most transactions in venture and buyout size companies are, due to their size, observed[8] even without PE-reporting. Since our database consists of three reliable sources, the inclusion of such deals seems reasonable. As general partners do not randomly select companies to invest in, there will be sample selection bias due to a flaw in the selection process (Stock & Watson, 2014). This bias is controlled using propensity score matching (Bryson, Dorsett, & Purdon, 2002). Secondly, extreme outliers, especially within ratios, have been adjusted using winsorization at a 99% level following Tukey (1962). Thirdly, the database does not contain detailed information of PE ownership percentages, so that we are not able to distinguish stepwise investments and the degree of influence the PE investor has on the portfolio company. As described above, we have treated each investment as an isolated, unique investment in order to conduct the analysis, thereby implying bias against stepwise investments. This is mitigated by including only the oldest investment in a portfolio company within a four-year period. Finally, several of the portfolio companies do not have accounting data prior to the investment, due to structure changes performed by the PE investor and a direct comparison of pre- and post- investment changes in the individual company is therefore not feasible in all cases.

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[8] Through news from stakeholders such as employees, partners, competitors, local community etc.

5. Methodology

In order to investigate whether PE ownership contributes positively to society, we measure portfolio companies against their respective control group across five dimensions; 1. Value creation, 2. Insolvency risk, 3. Employment, 4. Tax consideration and 5. Total factor productivity.

5.1. Propensity Score Matching (PSM)

General partners specialize in certain industries, making some industries more exposed to PE than others (Cumming, 2012), suggesting that the PE company selection process is not random. Additionally, PE investments are timed with the booms and busts of markets, imposing time to be a non-random factor. This results in target companies being systematically different from companies not acquired, causing sample selection bias if comparing portfolio companies with a random group of companies. This selection problem can be controlled by matching, thereby creating a proper control group adjusted for market timing as well as individual industry and firm characteristics (Rosenbaum & Rubin, 1983). Propensity scoring is a method of matching based on the probability of participating in a programme, given observed characteristics, and therefore determining the probability of being acquired by PE.

Alternatives to matching methods include adjusting for background variables in a regression model, instrumental variables, structural equation modelling or selection models (Stuart, 2010). There are two main advantages of using PSM over other models. First matching incorporates a randomization process, which implies that the control group and portfolio companies are only randomly different from one another. Secondly, using PSM requires common support, where in cases of poor overlap other methods might extrapolate outside common support, thereby providing less robust models (Dehejia & Wahba, 2002).

Generally, PSM builds on two key assumptions. First, Propensity score matching relies strongly on the assumption of ignorability, which implies that treatment assignment is independent of the potential outcomes given the covariates. Secondly, matching assumes that there is a positive probability of receiving treatment for all the covariates (Rosenbaum & Rubin, 1983). Even if there is an assumption of overlap, this is controlled by restricting the matched samples to a common support region.

As the PSM has potential drawbacks, it is important to optimize the matching implementation. This is achieved through the following four steps: 1. Defining closeness, 2. Implementing the matching method, 3. Assessing quality of samples, and 4. Analysis of the outcome and estimation of treatment effects.

First, we discuss which variables to include, what time the variables are to be observed, and the choice of distance measure. Secondly, the matching method is chosen. This is done in conjunction with a third step where the quality of the control group specified by the model is evaluated. The latter comprising analysis is discussed in detail in a separate chapter.

5.1.1. Defining closeness

To ensure that the assumption of strong ignorability is fulfilled all variables that are related to both treatment and the outcome, must be included as covariates. Variables chosen for matching are: NACE code, Year of investment, Turnover, EBITDA, Log of total assets, Log-age, Number of employees, as well as Long-term debt to Total assets. We have excluded some variables such as revenue CAGR and cash. This is due to missing observations where many portfolio companies had new identifiers[9] for the year of investment, we therefore exclude these variables based on the potential of too large a decrease in the matched sample and therefore reduced validity in our results. However, we have included revenue CAGR as a robustness verification factor in the analysis section. Conclusively, we claim that to the best of our knowledge the used variables are an adequate representation to justify the assumption of strong ignorability.

Having chosen covariates, it is essential to decide the relevant observation year. Matching is commonly based on the period prior to treatment, so that variables are unaffected by the treatment (Caliendo & Kopeinig, 2008). However, due to lack of company data prior to the relevant investment year for several of the portfolio companies, we have chosen to perform matching based on the current investment year values in line with Bienz, Thorburn, and Walz (2016).

When performing matching we have chosen to use exact and linear propensity score as distance measures (Stuart, 2010). Exact matching requires a control

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[9] Organization identification number (ORG_ID)

company to match the exact covariate value of the treatment. As the economy could be in a boom in one year and in crisis the following year, we apply exact time matching. We also restrict exact matching to the NACE (industry) code, since one industry group may be very different from another. After reducing the sample of possible comparable firms through exact matching, linear propensity score matching is used for the remaining covariates as distance measure. This method summarizes the score for all these covariates into a measure of probability being acquired by PE, selecting control companies with the highest probability.

5.1.2. Implementing matching method
There are several matching techniques used when applying PSM, and these mainly differ in terms of the matched sample size and the relative weight applied to each individual observation (J. A. Smith & Todd, 2005). Some authors argue that nearest neighbor matching is the easiest to use and interpret (Rosenbaum & Rubin, 1983), and this is therefore our chosen method. More complex techniques may introduce additional bias-risk to the specified model.

Following Smith and Todd's argumentation, choosing the number of firms assigned to the control group imposes a trade-off between bias and variance in the model. Including more companies will reduce variance but this is done at the cost of increased bias through the inclusion of less similar companies. As the CCGR database consists of accounting data from about 100,000 active limited liability companies, there is high likelihood that we might match more than one control company to a given portfolio company. To reduce the risk of matching too many control-firms to each treatment firm, we have applied matching with five nearest neighbors, ensuring reduced variance, but without imposing considerable bias. As already mentioned, there is a common support assumption that there is positive probability that the sample companies appear both to be in the treated and untreated group. However, this might also not be the case, and the propensity matching is restricted so that only companies within a common support region, having a propensity score sufficiently similar to treated score, will be included. In addition, matching is done with replacement to increase the quality of samples (Caliendo & Kopeinig, 2008).

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5.1.3. Quality of matches

There are several procedures to test the quality of the matched sample. Following the same procedure as Rubin (2001), we use two-sample t-test to identify if there are significant differences between average covariates for the two groups. The difference in means of the propensity score between the two groups should be small and the variance ratio[10] should be close to one. Table II in the Appendix describes the results of quality matching for both one neighbor and five neighbor matching. According to the results, in the buyout segment we find some evidence towards choosing one neighbor, while in venture we find a higher bias but lower variance for when applying five neighbors. As Stuart (2010) argues, the larger the data sample, the less importance the choice of PSM method. Given that the database contains more than 100.000 active limited liability companies and given the requirement to provide consistency across venture and buyout, we proceed to continue using five neighbors. Table III confirms this, demonstrating a balance between not having a too large bias and not too low variance ratio, ending up with about 2400 control firms.

5.2. Dimensions

This part of the thesis presents the variables applied for analysis. The variables are organized as follows: Value creation, Insolvency risk, Employment, Tax consideration and Total factor productivity.

5.2.1. Value creation: Operating performance and return to investors

To measure value creation for investors we investigate operating performance and return to investors. Previous studies find evidence that 90% of the added value in financial industry transaction is due to operational advances and Cumming (2012) argues that operating performance may be the primary value driver. Accordingly, we focus on operating performance, which is also applicable given the lack of data regarding the actual payoff to investors. To achieve this, we use the same dependent variables as Boucly et al. (2011) and Guo et al. (2011). To make a comprehensive analysis, we also use performance metrics from previous buyouts in the Nordic (Bergström et al., 2007; Gulliksen et al., 2008; Tobias Friedrich, 2015) as supplementary measures. This results in the following measures:

EBITDA-margin, Revenue CAGR, Gross profit margin, Revenues-to-total assets,

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[10] Variance ratio is calculated by dividing variance of treatment divided by variance of control group

ROA, EBITDA/TA, CAPEX changes, Current ratio, Net operating cash flow to total assets (NOCF/TA) and Net operating cash flow to revenue (NOCF/R)[11]. By applying these measurements, the analysis investigates solely on operational performance since these measurements omit gearing and tax effects. Most variables are scaled to either total assets or turnover to ensure comparability across company sizes and sectors. CAPEX changes are included to control for the firm relative spending on Property Plant & Equipment (PP&E). EBITDA is referred to as the cleanest calculation of operating performance since it excludes depreciation and thereby less affected by accounting subjectivity (Inc, Company, Koller, Goedhart, & Wessels, 2010).

5.2.2. Insolvency risk

We also seek to measure the potential increased insolvency risk of PE-owned firms. Common measurements for insolvency risk are Coverage ratio and Ltd/EBITDA (BB&T, 2011). Applying the same procedure as Tykvová and Borell (2012) and Boucly et al. (2011), the additional variables to measure insolvency risk are ZM-score, O-Score and Ltd/TA. The latter measurement is known as the leverage ratio, giving an indication of a firm's capital structure and is interesting to examine as it specifies the firm's capability to attain new debt after it is acquired. ZM-score is a modified model of Altman's Z-score (Altman, 1968). The Z-score depends highly on market value of equity and, since this is unobservable in our sample, ZM-s is a more reliable measure (Zmijewski, 1984). The ZM-score used in our analysis is specified as follows:

$$ZM_{it} = -4.33 - 4.51 \frac{Net\ Income_{it}}{Total\ Assets_{it}} + 5.69 \frac{Total\ Liabilities_{it}}{Total\ Assets_{it}} + 0.004 \frac{Current\ Assets_{it}}{Current\ Liabilities_{it}}$$

To augment our study of the effects on insolvency risk we use the method proposed by Vestbekken and Engebretsen (2016), the O-score. The Ohlson O-score (1980) is specified as follows:

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[11] See further description in Appendix 1

$$O_{it} = -1.32 - 0.407 \frac{Total\ Assets_{it}}{GNP_{Deflator_t}} + 6.03 \frac{Total\ Liabilities}{Total\ Assets_{it}}$$
$$- 1.43 \frac{WorkingCapital_{it}}{Total\ Assets_{it}} + 0.0757 \frac{Current\ Liabilities_{it}}{Current\ Assets_{it}}$$
$$- 1.72\ Total\ Liabilities_{D_t} - 2.37 \frac{Net\ Income_{it}}{Total\ Assets_{it}}$$
$$- 1.83 \frac{EBITDA_{it}}{Total\ Liabilities_{it}} + 0.285 NL_{D_t} - 0.521 \frac{NI_{it} - NI_{it-1}}{|NI_{it}| + |NI_{it-1}|}$$

$Total\ Liabilities_{D_t}$ is a dummy variable that equals one if total liabilities exceed total assets and is zero otherwise. NI is net income and NL_D equals one if net income is below zero in the present and earlier period and is zero otherwise. The ZM-score and O-score have similarities, however, comparing the current assets to current liabilities and its inverse, they have opposite signs. This is because ZM-score relies on fewer variables, indicating that the effects measured in O-score are included as net effects.

5.2.3. Employees
We have applied three measures of employee effects, as recommended by Cressy, Munari, and Malipiero (2007), Olsson and Tåg (2012) as well as S. Kaplan (1989). These are Nominal wages (NW), Number of employees (E) and Wage level (NW/E). In addition to these, we also want to include the changes in management salaries.

5.2.4. Tax consideration
We measure whether PE owned firms generate more or less tax revenue than other firms in the same sector, and whether PE-investors focus on short-term taxation gains by comparing tax before and after buyout within a specified control group.

5.2.5. Total factor productivity (TFP)
In order to measure TFP we follow the same approach used in previous studies, focusing on the productivity progress of PE-owned activity by applying the one-step augmented Cobb-Douglas product function (Harris et al., 2005; Wilson et al., 2012). This method is applied to PE-owned companies in relation to their respective control companies, and assessed at both the time of investment and subsequently.
In general terms the Cobb Douglas product function can be expressed as follows:
$$Q_{it} = L_{it}^\alpha * K_{it}^\beta \qquad (1.1)$$
$$i = 1,2,\dots,N\ and\ t = 1,2,\dots,T$$

Q_{it} denotes output for firm i at time t. Our aim is to measure productivity differences between acquired firms and control firms. In order to distinguish between these groups a binary variable PE_{it} is included, using one if the company is acquired and zero otherwise. Industry and age variables are included to account for potential bias in the estimation of PE_{it}, as recommended in earlier studies (Harris et al., 2005; Wilson et al., 2012).

By rearranging the product function (1.1), including the control variables and finding its natural logarithm, we get:

$$\ln Q_{it} = \beta_0 + \beta_1 \ln L_{it} + \beta_2 \ln K_{it} + \beta_3 \ln Age_{it} + \sum_{l=1}^{96} \theta_l nace_{ik} + \beta_4 PE_{it} + u_{it}$$

K_{it} denotes the firm's capital base represented by a firm's fixed asset base and L_{it} represents labor inputs through the number of employees. Age_{it} is the number of years the company has been operating and $nace_{it}$ is an industry dummy for section (1-96), specified by SSB[12]. Arguably, the degree of competition in each industry will impact the firms' productivity and therefore this should be controlled. Despite this, the model is specified to only account for the first two digits of the nace code and thereby the industry specification is not satisfactory as a suitable representation for all sub-industries within each code and are hence excluded.

In order to capture the differences in TFP between acquired firms and the control group, it is necessary to capture the mean change in TFP compared to the control group, both before and after the PE investment. These periods are defined as three years before and three years after the investment, respectively. The same approach proposed by Imbens and Wooldridge (2009) is used in the two-period with two-group difference-in-difference estimation. The model is therefore expressed as follows:

$$\ln Q_{it} = \beta_0 + \beta_1 \ln L_{it} + \beta_2 \ln K_{it} + \beta_3 \ln Age_{it} + \sum_{l=1}^{96} \theta_l nace_{ik} + \beta_4 PE_{it} + \beta_5 D_{it}^p + \beta_6 D_{it}^p * PE_{it} + u_{it} \qquad (1.2)$$

D_{it}^p is a time-dummy equaling one for the post-investment period and zero otherwise. $D_{it}^p * PE_{it}$ is an interaction dummy between time and investment and

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[12] Statistics Norway

equals one when investigating an acquired firm in its post-investment period and zero otherwise. This approach allows for straightforward comparison of the difference between post- and pre-investment periods compared to the control group through the interaction term β_6. A negative coefficient represents a decrease in TFP for acquired firms compared with the control group over the two periods. In addition to difference-in-difference, we investigate productivity for all prior, at, and subsequent years to the investment.

The data set in the analysis is panel data and the error term u_{it} is assumed to consist of three parts:

$$u_{it} = \omega_t + \tau_i + \mu_{it}$$

ω_t and τ_i are assumed to impact all units and observations for time period t and unit i, respectively. The error term μ_{it} is assumed to only impact unit i at time t. As suggest by Bertrand, Duflo, and Mullainathan (2004) clustered standard errors on accounting year are corrected to control for possible heteroscedasticity and internal-cluster correlation. Previous studies highlight the importance to correctly account for this bias and previous PE-related studies have applied random effects (Wilson et al., 2012). With this in mind, if random effects are consistent, they are preferred due to stronger efficiency than fixed effects and vice versa. In order to investigate the consistency of the estimators, the Durbin-Wu-Hausman test[13] is applied, following the approach by Greene (2012). The Hausman test is described as follows:

$$H' = \hat{\gamma}'[EAV(\hat{\gamma})]^{-1}\hat{\gamma}$$
$$\text{Where } \hat{\gamma} = \hat{\beta}^{FE} - \hat{\beta}^{RE} ,$$
$$EAV(\hat{\gamma}) = EAV(\hat{\beta}^{FE}) - EAV(\hat{\beta}^{RE})$$

H' is assumed to follow a chi-square distribution[14], EAV is the estimated asymmetric variance, where $\hat{\beta}^{FE}$ represent fixed effects and $\hat{\beta}^{RE}$ random effects. The null hypothesis states the difference between the estimators to be zero[15]. The outcome of the test can be found in Table 4. For most results of the Hausman test, applying fixed effects is suggested, and with this in mind, we control for fixed effects throughout the thesis.

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[13] Often referred to as Hausman test

[14] $m \sim x_{df}^2 = k$

[15] $H_0: \hat{\beta}^{FE} - \hat{\beta}^{RE} \cong 0$

5.3. T-Test, Multiple Regression and Other Reflections

The PSM makes it possible to test for company differences between an acquired firm and a control group. In order to test the differences, several techniques can be applied. In our thesis we focus on t-test when comparing the two groups because covariate-means allow us to test for specific differences between them. This is the same approach used by Dehejia and Wahba (2002). The main focus will be to test the null hypothesis of zero average difference between the two groups[16] and as substitute, hypothesis of two-tailed tests is computed. In order to add robustness to the results, operating performance measures are adjusted for differences in initial revenue CAGR. A rank-sum[17] test is also applied to the variables to determine whether the changes in median values are significant. In the thesis it is assumed that the rank-sum test is a supplement to the t-test. It is worth highlighting that we seek to investigate whether our findings have both a meaningful significant and economic effect. As highlighted in previous section, TFP is measured through multiple regression clustered standard errors on accounting year by applying fixed effects, whereas t-test is applied to insolvency, employment, operational performance and tax measurements.

In our analysis we focus in most cases on changes in levels[18]. In contrast, percentage change considers the initial level of the variable measured. In our case, however, some variables are negative and therefore the interpretation of the findings is lacking economical relevance. Researchers suggest that using changes in levels should not mislead findings (Barber & Lyon, 1996), and we therefore apply level change in our analysis. One suggestion could be to disregard these observations, however due to the fact that large number of observations is negative, this could misrepresent our findings. Table VI provides descriptive statistics of both the control group and treatment.

6. Results and Analysis

We measure the consequence of PE ownership by analyzing the development in differences between average performance for PE-backed firms and peer-comparable companies. The analysis is measured across the same five aforementioned dimensions mentioned: 1. Value creation, 2. Insolvency risk, 3.

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[16] $H_0: \beta_{it}^{treatment} - \beta_{it}^{control} = 0$
[17] Referred to as Wilcoxon-Mann-Withney test
[18] Except growth in turnover and employment because these cannot have negative values

Employment, 4. Tax and 5. Total factor productivity. Our analysis focuses on statistical and economic evidence and compares our findings to previous literature. As investments are made in companies at different company stages, the study is conducted by separating venture from buyout firms.

In this last part, we conduct the analysis using the difference in median and mean using rank-sum[19] tests and t-tests, respectively, as well as performing multiple regression analysis of the effect on TFP. Robustness is applied to control for prior revenue growth on variables of interest. Table 3A & 3B shows the average change in operating performance, insolvency risk, taxation and employment at the buyout year (t=0), and the three subsequent years. Table IV in the Appendix shows the median change for the same variable.

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[19] This is often referred to as Wilcoxon-Mann-Whitney test

Table 3A - Venture Capital Performance Subsequent to PE Investment (Treatment) - Matched at Year of PE Investment - Average

Changes in mean performance values from year of investment (T=0). Part 1. reports groups' changes in measures of operating performance. Part 2. reports changes measures of the groups' solvency, using accounting figures as well as O- and ZM-scores. Part 3. reports changes employment factors. Part 4. reports changes in tax paid by the companies. ATT Average is the Average Treatment effect on the Treated, which is the difference between treated and control group changes. Significance is reported based on the null hypothesis of no difference between treated and control group. Significance levels of 1%, 5% and 10% are denoted as ***, **, and * respectively, as well as being highlighted in bold text.

| | Value at T=0 | | Difference to T=0 | | | | | | | | | | | | | |
| | T=0 | | +1 | | | | | +2 | | | | | +3 | | | | |
	Treatment Average	Control Average	Treatment Average Change	Control Average Change	ATT Average	SE(ATT)	P-Value	Treatment Average Change	Control Average Change	ATT Average	SE(ATT)	P-Value	Treatment Average Change	Control Average Change	ATT Average	SE(ATT)	P-Value
1. Value Creation																	
Revenue CAGR	-	-	2.23	1.28	**0.96***	-0.31	0.00	1.92	0.62	**1.3***	-0.30	0.00	1.72	0.36	**1.36***	-0.30	0.00
Gross Profit Margin	0.73	0.74	-0.01	0.01	-0.02	-0.02	0.18	0.03	0.01	0.02	-0.02	0.27	0.03	0.01	0.02	-0.02	0.43
Revenue/Total Assets	0.7	1.46	0.11	0.09	0.02	-0.09	0.86	0.17	0.08	0.1	-0.10	0.35	0.23	0.06	0.17	-0.11	0.10
EBITDA/Revenue	-1.78	-1.04	0.39	0.47	-0.08	-0.19	0.68	0.73	0.80	-0.07	-0.24	0.76	0.92	0.95	-0.04	-0.28	0.89
EBITDA/Total Assets	-0.31	-0.32	0.00	0.13	**-0.13**	-0.06	0.03	0.06	0.21	**-0.15**	-0.06	0.01	0.07	0.23	**-0.16**	-0.07	0.03
ROA	-0.34	-0.38	-0.02	0.13	**-0.15**	-0.06	0.02	0.03	0.21	**-0.18***	-0.07	0.01	0.03	0.22	**-0.19**	-0.08	0.02
CAPEX (000' NOK)	6351	3896	-1519	-1244	-275	-1392	0.84	-3297	-303	**-2994***	-1590	0.00	-231	-1239	1008	-1713	0.56
NCF/Revenue	-5.04	-1.85	2.48	1.12	**1.36**	-0.65	0.04	3.77	1.74	**2.03***	-0.64	0.00	3.19	2.05	1.14	-0.76	0.13
NCF/Total Assets	-0.53	-0.13	0.25	0.18	0.07	-0.07	0.31	0.40	0.21	**0.2***	-0.07	0.01	0.39	0.28	0.12	-0.07	0.11
Current Ratio	7.16	9.12	-3.42	0.93	-4.36	-2.80	0.12	-1.29	1.52	-2.81	-3.43	0.41	1.89	2.80	-0.91	-4.32	0.83
2. Insolvency Risk																	
Coverage Ratio	-25.60	-2.51	8.44	-7.58	16	-15.50	0.30	21.00	5.73	15.2	-16.70	0.36	14.90	1.64	13.2	-16.50	0.42
LTD/EBITDA	0.42	0.05	-0.35	-0.03	-0.32	-0.25	0.20	-0.26	0.12	-0.38	-0.27	0.16	-0.21	0.07	-0.28	-0.29	0.34
LTD/Total Assets	0.05	0.08	0.02	-0.01	**0.02**	-0.01	0.05	0.02	0.00	0.02	-0.01	0.17	0.02	0.01	0.01	-0.02	0.46
ZM-Score	-7.22	-10.60	-0.43	-0.45	0.02	-0.42	0.97	-0.66	-0.33	-0.33	-0.45	0.47	-1.00	-0.21	**-0.79**	-0.47	0.10
O-Score	-8.45	-8.43	0.17	0.19	-0.02	-0.55	0.97	0.12	0.04	0.08	-0.69	0.91	-0.12	0.01	-0.12	-0.72	0.87
3. Employees																	
Employees	8.4	8.34	0.59	-1.76	**2.36***	-0.72	0.00	-3.23	-5	1.78	-1.1	0.11	-4.6	-6.2	1.6	-1.3	0.22
Wages (000' NOK)	6796	6931	2408	481	**1927***	-371	0.00	4480	631	**3849***	-514	0.00	5583	987	**4596***	-653	0.00
Wage level (000' NOK)	3877	4116	2519	1005	**1514***	-457	0.00	5862	2405	**3457***	-709	0.00	7324	3284	**4040***	-852	0.00
CEO salary (000' NOK)	558	466	135	37	**98***	-24	0.00	237	53	**184***	-31	0.00	280	73	**206***	-34	0.00
CEO salary level (000' NOK)	390	320	148	61	**87***	-24	0.00	312	133	**178***	-35	0.00	401	189	**212***	-37	0.00
4. Tax																	
Tax (000' NOK)	119	-34	-63	-169	106	-112	0.34	-487	-182	**-306**	-134	0.02	-471	-376	-95	-147	0.52
N	354	1661	352	1595	-	-	-	344	1536	-	-	-	315	1367	-	-	-

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Table 3B - Buyout Performance Subsequent to PE Investment (Treatment) - Matched at Year of PE Investment - Average

Changes in mean performance values from year of investment (T=0). Part 1. reports groups' changes in measures of operating performance. Part 2. reports changes measures of the groups' solvency, using accounting figures as well as O- and ZM-scores. Part 3. reports changes employment factors. Part 4. reports changes in tax paid by the companies. ATT Average is the Average Treatment effect on the Treated, which is the difference between treated and control group changes. Significance is reported based on the null hypothesis of no difference between treated and control group. Significance levels of 1%, 5% and 10% are denoted as ***, **, and * respectively, as well as being highlighted in bold text.

| | Value at T=0 | | Difference to T=0 | | | | | | | | | | | | | | |
| | T=0 | | +1 | | | | | +2 | | | | | +3 | | | | |
	Treatment Average	Control Average	Treatment Average Change	Control Average Change	ATT Average	SE(ATT)	P-Value	Treatment Average Change	Control Average Change	ATT Average	SE(ATT)	P-Value	Treatment Average Change	Control Average Change	ATT Average	SE(ATT)	P-Value
1. Value Creation																	
Revenue CAGR	-	-	1.16	0.49	**0.67****	-0.29	0.02	0.98	-0.08	**1.06*****	-0.28	0.00	0.89	-0.33	**1.21*****	-0.27	0.00
Gross Profit Margin	0.75	0.66	0.02	0.01	0.02	-0.01	0.21	0.01	0.00	0.01	-0.02	0.73	0.00	0.00	0	-0.02	0.97
Revenue/Total Assets	1.2	1.87	-0.04	0.01	-0.06	-0.11	0.60	0.06	-0.01	0.07	-0.11	0.54	0.14	0.00	0.14	-0.15	0.37
EBITDA/Revenue	0.08	-0.01	-0.12	0.17	-0.29	-0.22	0.19	0.09	0.12	-0.03	-0.20	0.90	0.09	0.31	-0.23	-0.29	0.43
EBITDA/Total Assets	0.08	0.03	0.02	0.05	-0.03	-0.06	0.59	0.02	0.03	-0.01	-0.06	0.87	0.05	0.04	0.01	-0.07	0.90
ROA	0.04	-0.01	0.04	0.05	-0.01	-0.07	0.84	0.02	0.02	0	-0.06	0.99	0.03	0.04	0	-0.07	0.94
CAPEX (000' NOK)	26006	13594	-5117	-1096	**-4022****	-3840	0.30	169	-892	**1061*****	-3869	0.78	-7745	-1329	**-6416****	-4118	0.12
NCF/Revenue	-0.94	-0.23	0.40	0.63	-0.23	-0.62	0.71	0.35	0.39	-0.05	-0.65	0.94	1.38	0.69	0.69	-0.81	0.39
NCF/Total Assets	-0.05	0.06	0.11	0.11	-0.01	-0.09	0.95	0.18	0.09	0.09	-0.09	0.33	0.22	0.12	0.1	-0.08	0.22
Current Ratio	2.02	5.39	3.06	1.60	1.46	-2.94	0.62	2.86	4.00	-1.14	-4.39	0.80	3.23	3.92	-0.69	-4.72	0.88
2. Insolvency Risk																	
Coverage Ratio	-7.14	9.88	4.85	-1.11	5.96	-21.40	0.78	1.26	-12.60	13.8	-19.50	0.48	18.60	-7.83	26.5	-21.70	0.22
LTD/EBITDA	1.34	0.46	-0.58	-0.20	-0.38	-0.55	0.49	-0.62	0.10	-0.72	-0.55	0.19	-0.24	-0.08	-0.16	-0.61	0.79
LTD/Total Assets	0.09	0.11	0.02	0.00	0.02	-0.02	0.31	0.03	-0.01	**0.04****	-0.02	0.04	0.04	-0.01	**0.05****	-0.02	0.01
ZM-Score	-9.27	-12.20	0.29	-0.08	0.37	-0.49	0.45	-0.09	0.03	-0.11	-0.52	0.82	-0.38	-0.09	-0.29	-0.70	0.68
O-Score	-11.60	-11.30	0.86	0.46	0.4	-1.19	0.74	1.01	-0.13	1.14	-1.21	0.35	-0.18	-0.04	-0.14	-1.33	0.92
3. Employees																	
Employees	15.4	15.6	-2.27	-4.1	1.83	-1.64	0.26	-6.81	-6.47	-0.34	-2.09	0.87	-10.5	-9.87	-0.6	-2.76	0.83
Wages (000' NOK)	25527	27854	2715	663	**2052****	-869	0.02	4732	1138	**3594*****	-1084	0.00	5544	2025	**3519****	-1370	0.01
Wage level (000' NOK)	20125	20711	3775	2072	1703	-1088	0.12	6002	3451	**2552***	-1382	0.07	8500	5891	2609	-1929	0.18
CEO salary (000' NOK)	883	792	106	35	72	-44	0.10	51	51	1	-56	0.99	178	91	87	-68	0.20
CEO salary level (000' NOK)	715	641	122	67	56	-47	0.23	108	100	8	-59	0.89	294	188	105	-72	0.14
4. Tax																	
Tax (000' NOK)	-1802	-2105	-482	104	**-586***	-322	0.07	-530	-220	-310	-373	0.41	-657	-255	-402	-428	0.35
N	164	805	161	786	-	-	-	156	747	-	-	-	136	655	-	-	-

6.1. Value creation: Operating Performance and return to investors

The first dimension to be discussed is operating performance, which is also used as a means for estimating return to investors. We find three pieces of evidence that indicate that PE-investors enjoy a larger value increase than comparable firms. First, we observe a significant increase in revenue CAGR of 1.36 pp[20] and 1.21 pp for ventures and buyouts, respectively. We confirm some of these results considering the median values. Tables IV A & IV B in the Appendix find a median reduction in revenue growth for both venture and buyout, however this is a statistically smaller reduction in revenue growth when compared to the control group at the 1%-level. The above average increases in revenue growth and less-than average reductions are in line with previous research in the Nordics[21].

Secondly, while buyout firms have no significant differences in profitability and venture firms have reduced profitability to assets, both stages seem to sustain revenue margins. For ventures, differences in EBITDA to total assets and ROA are significantly negative for all subsequent years. However, when considering EBITDA over revenue, there are no significant differences. These results indicate that venture firms are able to maintain revenue margins. For the buyout firms, there are no significant differences in profitability changes, suggesting sustained margins even with significantly higher revenue growth.

Thirdly, the findings suggest increased total assets, even without increased CAPEX differences. As the asset profitability measures are decreased for venture firms, but not revenue margins, this indicates major increases (or lower decreases) in total assets. However, there are no significant CAPEX differences, suggesting capital injections are not invested in fixed assets. For the buyout firms, despite the high revenue growth, there are no significant differences in neither revenue nor relative total assets profitability, suggesting that the size of total assets in actual kroner has increased together with revenue and profitability. Despite this, CAPEX is significantly halved three years after investment.

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[20] Percentage point

[21] E.g. Gulliksen et al. (2008) and Bakke and Bull-Berg (2016)

Conclusively, PE ownership has a positive contribution to the Norwegian society, through increased operating performance[22]. The operating performance is mainly improved through increased top-line growth without compromising margins. This causes a value creation for investors and other stakeholders as the actual profit in kroner has increased. Despite this, some of the value creation could come by way of capital injection, making it hard to evaluate the investor's actual return on invested capital.

6.2. Insolvency Risk

As PE firms often leverage their investment, one could expect that insolvency risk would increase, but we find no evidence that portfolio companies impose higher risks of insolvency. However, three key trends are discovered. First, for both venture and buyout, there is, on average, an increase in debt, but this is only significant for buyouts. This confirms recent literature that PE-investors are focusing on capital structure[23]. Second, we find a trend that PE-backed ventures and buyouts improve coverage ratio from a sufficiently low ratio at acquisition date. Three years after acquisition, PE-investors manage to turn, on average, a negative coverage ratio to positive for buyouts, although these values are not significant. These potential improvements are also seen in the median table. One explanation could be that PE-investors manage to renegotiate debt contracts, reducing interest expense. However, it is worth having in mind that PE-investors seek to maximize exit value, trying to time performance. Finally, we find that increased debt is not supported by an increased in insolvency risk. In fact, for PE-backed venture firms we find a statistically significant decrease in ZM-score. This indicates that venture firms have reduced their insolvency risk. The same evidence is found investigating the median values. Focusing on buyout firms, we observe reductions in both the ZM-score and O-score of 0.38 and 0.18 compared to reductions of 0.09 and 0.04 for the control group, however, these differences are not significant at a 10% level. Nonetheless, the reducing trend in risk measures indicate that PE-backed firms do not experience increased financial risk and therefore the potential bankruptcy costs to society seems unaffected.

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[22] According to Cumming (2012) higher operating performance lead to higher value of the company.
[23] See Tykvová and Borell (2012)

6.3. Employment

A much-debated topic is whether PE-investors increase efficiency of their firms by reducing staff and lowering wages, reallocating wealth from workers to owners[24]. Nevertheless, considering employment changes three years after investment for venture firms, PE-backed firms reduce their employment on average by 4.38 fewer workers compared to 6.41 fewer workers in the control group, although this difference is not statistically significant. This implies that the PE-backed firms are not reducing staffing numbers after investment at a level higher than control group. These findings are not in line with the majority of the literature, reporting modest decrease in employment, contradicting the notion that PE-investors lay off more employees after acquisition than others.

Considering the compensation of employees in PE-backed venture firms, changes in wages and wage level are positive and statistically significant at 1%-level. The same indications can be found by looking at median estimates. This suggests that PE-investors are willing to raise wages without any reduction in workforce when compared to others. In addition, CEO salary increases for venture-backed firms is positive and significant at 1%-level for all subsequent periods. This indicates that after PE-investment, PE-investors are on average rewarding CEOs by about 212 000 NOK more than others. PE-backed buyouts decrease their workforce with 10.6 employees, compared with 6 for the control group. However, this is not significant at 10%-level. Focusing on compensation, PE-backed buyout firms have statistically significant higher wages compared with the control group. In fact, three years after buyout, PE-backed firms are, on average, paying their employees, 3.5 mNOK more than others, an increase of 5.5 million over the three years. Overall, PE-owned firms increase wealth for employees through increased wages, but without significant changes in number of employees. Based on these findings, we can conclusively state that PE-backed activity creates more wealth to workers.

6.4. Tax

It would appear to naturally follow that company tax should change proportionally with net corporate income, as well as employee taxes with individual wages. In addition to their direct contribution to the company and its employees, positive

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[24] For example http://www.businessinsider.com/how-employees-get-totally-screwed-in-private-equity-deals-2011-6?r=US&IR=T&IR=T

changes in profitability would therefore also contribute to society more generally though overall increases in taxation revenue.

Section 4 represents the estimated values for taxes paid by PE-backed firms and the control group for venture and buyout, respectively. Focusing on venture capital, there is no significant different in tax levels in the first year. Three years after investment, there is no statistically significant difference compared to control group in tax paid for either ventures or buyouts. Evidence suggests that PE-backed firms are paying no less company tax than others. As wages increased significantly more for PE backed companies, there is reason to believe that employee taxes also increased, imposing a positive contribution to society. However, we are unable to detect this relationship with the current data.

6.5. Total Factor Productivity (TFP)

The objective of this section is to combine performance evaluation in previous sections with the total factor productivity section. This is done by examining whether PE-owned firms have better utilization of their labor and assets after the investment when compared with the control group. Tables 4A and 4B represent fixed effect comparison of TFP in the years leading up to the investment, at investment, and three years after the investment, between venture and the control group and buyout and the control group, respectively. For ventures, the analysis suggests that PE-investors invest in companies with sufficiently lower productivity. In fact, one year prior to, and at investment, these firms have on average -24 pp and -26 pp lower productivity respectively when compared with others. There seems to be an immediate productivity improvement for the venture firms, since they do not have any significant differences in productivity three years after investment. However, looking at year t+1 to t+3, venture firms underperform by -13 pp, substantially better than for year 0. For illustration the productivity development for buyout and ventures see the graph 1, below.

For all years, the Ex-post * PE-Investment dummy is a measure trying to isolate the productivity effect PE-investors have on portfolio companies. This measure is positive, as expected when "Post" is less negative than "Pre", however the dummy is not significant. From table 4B we find that there are no significant differences in productivity for buyout firms prior to, nor at the year of investment. Three years after investment, the productivity is 19 pp higher at a 10% significance level, indicating that PE-Investors' monitoring abilities are both superior and

endure in the long-term, in line with previous research[25]. This supports the case that PE-activity increases the portfolio company's competitive position after investment. Evaluating PE portfolio companies, the interaction term Ex-post*PE-investment is positive but not significant, meaning that PE-investors are not able to increase ex-post efficiency above average, at least the in short-term. However, we observe ascending productivity trend, suggesting that productivity is improving.

Comparing operating performance against total factor productivity in the year's ex-post investment, we find that companies are experiencing significantly higher revenue growth than the control group. Therefore, evidence suggests that increased revenue growth is a result of higher productivity of inputs, supplemented with increased financing activities. Higher wages may motivate the employees to increase productivity. This is in line with earlier research[26]. Changes in employee benefits and corporate strategy appear to have positive effects on productivity. Therefore, the observed rising trend in TFP in the years after investment for both venture and buyout could be explained by both employees and capital becoming more productive. These findings may suggest that buyout and venture firms improve their competitive position after being acquired. In turn, this could indicate that PE-investors need more time to improve productivity when investing in buyouts compared with venture investments. It would have been interesting to study PE-ownership effect on TFP over a longer timeframe and, given that we see productivity improvements. Previous research find that changes in TFP occurs with a lag on profitability, indicating that the potential profitability improvements from PE ownership are not yet fully exploited within the timeframe evaluated. However, due to lack of data we are not able to implement this in our analysis. Increased productivity has a positive impact on society through increased economic growth and could potentially create more competitive markets.

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[25] For example Chemmanur et al. (2011)
[26] For example Wolfers and Zilinsky (2015)

Table 4A - Venture Capital Total Factor Productivity - Matched at Year of PE Investment - Fixed Effects Estimation

Total Factor Productivity for PE invested firms compared to control group, matched at the year of PE investment. Regression on TFP is estimated using fixed effects, controlled for Labour, Fixed Assets, Company Age and Industry Code. PE Investment is the dummy variable that measures the TFP difference. Output for T=-3 until T=3 are measured as within-year differences, while Pre-Investment (T=-3 to T=-1), Post-Investment (T=1 to T=3) and All Years (T=-3 to T=3) are measured as the total average difference within their respective periods. The standard error of each variable is listed as in parenthesis below their respective value. Significance levels of 1%, 5% and 10% are denoted as ***, **, and * respectively. The Hausman test indicates the consistency of random effects estimates.

	Before Investment			At investment	After investment			Pre vs Post		All Years
	T=-3	-2	-1	0	+1	+2	+3	Pre	Post	
PE	-0.030	-0.26	-0.24*	-0.26**	-0.13	-0.11	-0.11	-0.23***	-0.13*	-0.22***
	(0.087)	(0.16)	(0.12)	(0.12)	(0.13)	(0.14)	(0.18)	(0.038)	(0.068)	(0.042)
Ex-post-dummy										0.20**
										(0.072)
Ex-post*PE Investment										0.078
										(0.10)
Ln L	0.029*	0.019***	0.030***	0.038***	0.025**	-0.0029	0.048**	0.029***	0.015**	0.025***
	(0.013)	(0.0040)	(0.0058)	(0.0097)	(0.011)	(0.0050)	(0.016)	(0.0051)	(0.0063)	(0.0038)
Ln K	0.49***	0.45***	0.45***	0.42***	0.40***	0.43***	0.46***	0.45***	0.43***	0.44***
	(0.041)	(0.030)	(0.033)	(0.039)	(0.030)	(0.027)	(0.024)	(0.026)	(0.019)	(0.018)
ln Age	0.53***	0.50***	0.47***	0.52***	0.48***	0.44***	0.42***	0.50***	0.45***	0.49***
	(0.089)	(0.085)	(0.061)	(0.056)	(0.034)	(0.049)	(0.071)	(0.028)	(0.021)	(0.015)
NACE	0.0059**	0.0044	0.0042	0.0027	0.0016	0.0014	-0.0010	0.0035*	0.0011	0.0022**
	(0.0025)	(0.0040)	(0.0027)	(0.0036)	(0.0029)	(0.0039)	(0.0041)	(0.0017)	(0.0013)	(0.00079)
Constant	7.67***	8.38***	8.63***	9.39***	9.57***	8.44***	10.1***	8.66***	9.07***	8.80***
	(0.62)	(0.48)	(0.47)	(0.70)	(0.48)	(0.49)	(0.81)	(0.45)	(0.31)	(0.28)
Statistics										
Observations	653	818	987	1262	1245	1196	1039	3720	3480	7200
R-squared	0.48	0.46	0.40	0.33	0.35	0.37	0.33	0.41	0.38	0.39
Clustered Fixed Effects SE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hausmann Test										
Chi-squared	1.15	1.43	15.99	8.63	10.28	3.29	.73	20.99	-26.34	51.55
P-value	.94	.92	.0069	.12	.068	.66	.98	.00081	1	7.14e-09

Table 4B - Buyout Total Factor Productivity - Matched at Year of PE Investment - Fixed Effects Estimation

Total Factor Productivity for PE invested firms compared to control group, matched at the year of PE investment. Regression on TFP is estimated using fixed effects, controlled for Labour, Fixed Assets, Company Age and Industry Code. PE Investment is the dummy variable that measures the TFP difference. Output for T=-3 until T=3 are measured as within-year differences, while Pre-Investment (T=-3 to T=-1), Post-Investment (T=1 to T=3) and All Years (T=-3 to T=3) are measured as the total average difference within their respective periods. The standard error of each variable is listed as in parenthesis below their respective value. Significance levels of 1%, 5% and 10% are denoted as ***, **, and * respectively. The Hausman test indicates the consistency of random effects estimates.

	Before Investment			At investment	After investment			Pre vs Post		
	T=-3	-2	-1	0	+1	+2	+3	Pre	Post	All Years
PE	-0.054	0.13	0.014	-0.13	-0.023	0.014	0.19*	-0.028	0.037	-0.013
	(0.13)	(0.13)	(0.13)	(0.12)	(0.10)	(0.13)	(0.11)	(0.054)	(0.066)	(0.054)
Ex-post-dummy										0.012
										(0.047)
Ex-post*PE Investment										0.019
										(0.090)
Ln L	0.014*	0.020	0.019**	0.062	0.012	0.044*	0.049*	0.019**	0.029**	0.021**
	(0.0074)	(0.016)	(0.0081)	(0.071)	(0.010)	(0.022)	(0.025)	(0.0075)	(0.012)	(0.0079)
Ln K	0.57***	0.59***	0.58***	0.56***	0.55***	0.55***	0.54***	0.58***	0.55***	0.57***
	(0.029)	(0.026)	(0.025)	(0.028)	(0.023)	(0.029)	(0.017)	(0.012)	(0.013)	(0.0085)
In Age	0.15**	0.16***	0.18***	0.29***	0.21***	0.22**	0.27**	0.20***	0.23***	0.21***
	(0.049)	(0.038)	(0.048)	(0.058)	(0.057)	(0.084)	(0.11)	(0.019)	(0.029)	(0.016)
NACE	0.011***	0.010**	0.016**	0.016***	0.010**	0.0077	0.0093*	0.013***	0.0079***	0.010***
	(0.0035)	(0.0033)	(0.0065)	(0.0047)	(0.0044)	(0.0052)	(0.0048)	(0.0019)	(0.0025)	(0.0017)
Constant	7.57***	7.60***	7.45***	8.75***	8.00***	9.29***	9.47***	7.41***	8.64***	7.87***
	(0.50)	(0.66)	(0.71)	(2.35)	(0.59)	(1.17)	(1.01)	(0.34)	(0.59)	(0.35)
Statistics										
Observations	513	556	625	720	690	663	559	2414	1912	4326
R-squared	0.64	0.62	0.58	0.42	0.61	0.51	0.57	0.60	0.57	0.59
Clustered Fixed Effects SE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hausmann Test										
Chi-squared	9.52	5.86	6.38	22.12	5.53	5.15	8.94	10.07	6.33	18.40
P-value	.090	.321	.27	.00049	.35	.40	.11	.073	.27	.010

Graph 1 - Productivity development for PE portfolio companies
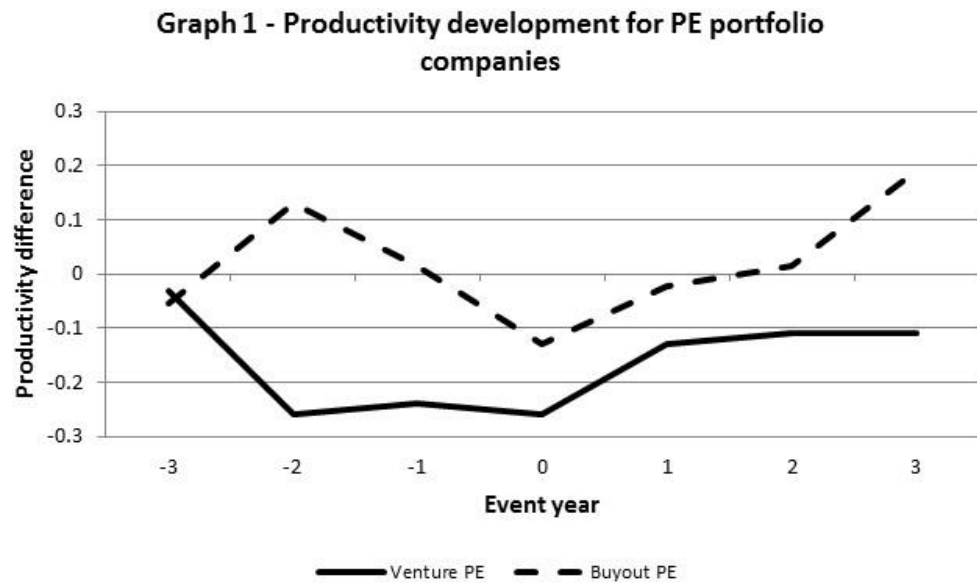
6.6. Robustness

Although the comprehensive matching method was applied, there may be some unobserved differences between the treatment and control groups. In order to consider the validity of the value creation sub-section, particularly in relation to the extent of increased revenue growth, we have conducted a robustness check. Revenue growth before acquisition is not considered during the matching procedure, due to missing observations. Consequently, we conduct a robustness analysis, highlighted in the Appendix in Table V, to control for difference in ex-post and ex-ante revenue growth[27]. The table indicates that for buyouts, the growth difference in revenue is 5 pp higher when controlling for ex-ante revenue growth. This reveal that our results in 6.1 are to some degree underestimating the true effect PE-ownership has on revenue. However, we find somewhat opposite results for venture. Conclusively, we can argue that the revenue growth is of economic significance with a potential underestimation of buyouts and an overestimation of venture. Other measurements in the buyout segment are not significant. Focusing on other measures for venture, we see that controlling for pre-investment revenue growth the ROA and EBITDA is negative and significant, but lower without controlling for pre-investment revenue growth. This highlights the potential overestimation of the negative effects of the ROA and EBITDA/TA when not considering pre-investment revenue growth, this supports our earlier argument that it seems that PE-backed ventures are maintaining profitability margins.

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[27] This is controlled for running fixed effects clustering

7. Conclusion

This thesis seeks to address the controversial issue of the impact PE-ownership has on the Norwegian society by examining both ventures and buyouts. This thesis contributes to the existing literature by considering the development and trends in portfolio companies across five dimensions: 1. Value creation, 2. Employees, 3. Insolvency risk, 4. Tax considerations, 5. Total factor productivity. The sample of 438 ventures and 229 buyouts ranging from 1998 to 2011 provides a fundamental view on the PE-activity in Norway.

The analysis indicates that subsequent to investment, PE-backed firms accomplish a considerably higher revenue growth than comparable non-PE entities. The portfolio companies have significantly higher CAGR than control firms of 1.36% and 1.21% for venture and buyout, respectively. This is in line with previous studies in Scandinavia. The large increase in revenue growth after investment seems to be economically significant even when controlling for prior revenue growth. There is no evidence that this high revenue growth has any impact on the profitability for buyouts. For ventures, on the other hand, we discover some reduction in profitability ratios such as ROA and EBITDA to total assets. This indicates that portfolio companies are unable to accomplish greater return on assets after acquisition. However, neither venture nor buyout have significant differences in EBITDA to revenue, suggesting that margins are not changing with revenue growth and therefore PE-ownership increases company value through increased profitability in actual kroner. Despite this, we are unable to determine whether the return on invested capital has increased. Supported by previous research, we find a modest increase in indebtedness for buyout firms, but identify the insolvency risk to remain unchanged. Focusing on employment, evidence suggests that PE-investors pay higher wages without any significant difference in level of employment. The idea that PE-investors are job destroyers seems to be groundless and misdirected. In fact, portfolio companies increase the actual wages with on average 4.6 mNOK and 3.5 mNOK more than comparable firms for venture and buyout, respectively. Finally, the analysis shows that PE-investors target low-productivity ventures and subsequently appear to improve productivity. On the one hand, PE-investors are unable to increase productivity beyond benchmark for both ventures and buyouts but on the other hand, we observe

ascending productivity trend for both ventures and buyouts, suggesting that productivity is improving.

Conclusively, we observe that all measures indicate either an increase or no change in the contribution PE ownership has for the different stakeholders. These results contradict several critics addressed towards PE investments. Combining these conclusion marks, we observe for the defined stakeholders that the corporate's contribution to the Norwegian society is positively affected by private equity ownership.

For further research, we detect three main areas of interest. First, we observe an increased productivity trend for both ventures and buyouts and it would be interesting to examine this in the context of a longer horizon. Extending the time frame may disclose that PE-backed firms are sufficiently more effective than others. Secondly, it would be interesting to perform a study using fund level clustering, in order to determine the various general partners' contribution to stakeholders over time, and potentially identify the factors that separate the better and worse performing contributions. The third area of interest would be to support our study of productivity enhancement, by including innovation measures such as number of patents and citations. It would be interesting to supplement the productivity analysis by investigating whether PE-investors increase the frequency and the quality of innovations.

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9. Appendix

Table I.A– Variable Description

Variable	Description
1. Value Creation	
EBITDA/Revenue	EBITDA to Revenues
CAGR	Annual Growth in Revenue
Gross profit margin	Revenues subtract costs of goods sold to revenues
R/TA	Revenues to total assets
ROA	Return on assets
EBITDA/TA	EBITDA to total assets
CAPEX	Capital expenditures
Current ratio	Current assets to current liabilities
NOCF/TA	Net Operating cash flow over total assets
NOCF/R	Net operating cash flow over revenues
2. Insolvency Risk	
Coverage ratio	EBIT to interest ratio
ZM-Score & O-Score	See section 5 for description
Ltd/EBITDA	Long term debt to EBITDA
Ltd/TA	Long term debt to total assets
3. Employment	
Wages	Wages in NOK
Employees	Number of Employees
Wage Level	Wage in NOK divided by Employees
CEO Salary	CEO salary in NOK
CEO Salary Level	CEO salary in NOK divided by Employees
4. Tax	
Tax on operations	Tax paid
5. TFP (Total Factor Productivity)	
Ln K	Log of Fixed Assets
Ln L	Log of Employees
Ln Q	Log of Gross Profit
PE	Dummy equalling one if portfolio company
Ln Age	Log of firms' age
Pre-Dummy	Dummy equalling one if accounting period is ex-ante investment
Post-Dummy	Dummy equalling one if accounting period is ex-post investment
Post*Buyout	Dummy of the above mentioned dummies
Buyout t-4	Dummy equalling one if accounting period is four years ex-ante investment
T-1	Dummy equalling one if accounting period is one year ex-ante investment

T-1*Buyout	Dummy equaling one if for accounting period one year ex-ante investment and if the firm is acquired

5. Other variables

Net Income	Total Earnings
Age	Firm Age
EBIT	Operating result before tax and interest
EBITDA	Operating result before interest, taxes, depreciation and amortization
Long Term Debt (Ltd)	Interest bearing debt
Total Revenue Growth	% change in Revenues

Table I.B – Formula Description

Variable	Formula
Working Capital (WC)	$WC_t = Current\ Assets_t - Current\ Liabilities_t$
CAPEX	$CAPEX_t = Fixed\ Assets_t - Fixed\ Assets_{t-1} + Depreciation_t + Amortization_t$
NOCF	$NOCF_t = EBITDA_t - CAPEX_t - (WC_t - WC_{t-1})$

Figure I – Data sampling illustration
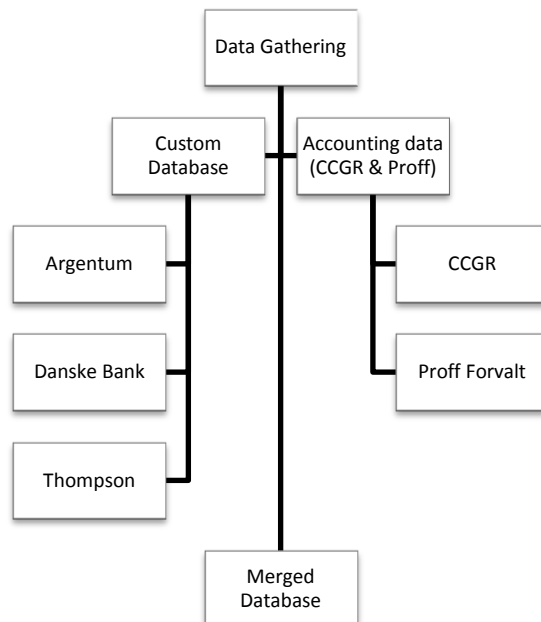
Table II - Assessment of Matching Quality at Investment year

Matched quality of Propensity Score Matching (PSM) for one- and five-to-one nearest neighbor matching procedure with common support and replacement. Bias is the Average/Median difference between the treatment and control group. %Var is the average variance of treatment group divided by the average variance to control group.

	Buyout		Venture	
	N=5	N=1	N=5	N=1
Bias				
Average	9.6	6.8	15.4	5,7
Median	10	5	12.7	6
%Var	17	83	100	67
R-squared	0.9 %	0.6 %	2.4 %	0.7 %
LR Chi-sq	4.3	3.25	23.12	7.22

Table III - Bias assessment at Investment date

Assessment of %bias between treated and control group using Propensity Score Matching (PSM). Table provides comparison of the treatment group to control group, where the treatment is firms owned by PE. The matching procedure was constructed using five neighbors with common support and replacement. In addition to this, it is also applied exact matching on accounting year and NACE codes, in order to reduce sector and time bias. Bias is the Average/Median difference between the treatment and control group. %Var is the average variance of treatment group divided by the average variance to control group. The lower the bias and variance closer to one, the better comparison we have.

	Buyout					Venture				
	Treated	**Control**	**%Bias**	**P-Value**	**Vt/Vc**	**Treated**	**Control**	**%Bias**	**P-Value**	**Vt/Vc**
EBITDA (mNOK)	29	320	-6.6	0.55	1.05	2.2	3.6	-6.7	-6.7	0.43
Revenue (mNOK)	240	270	-11.4	0.30	0.84	35	55	-14.8	-14.8	0.25
Total Assets (mNOK)	300	340	-9.6	0.39	0.82	73	97	-9.8	-9.8	0.34
Debt/Total Assets	0.9	0.1	-17.7	0.11	0.56	0.0	0.1	-22.1	-22.1	0.63
# of Employees	14.7	15.3	-1.7	0.88	0.94	7.7	10.2	-10.6	-10.6	0.63
Log Age	2.0	2.1	-10.5	0.34	0.98	1.4	1.7	-28.7	-28.7	0.79

Figure II - Common Support for Venture & Buyout

Overview of Common Support for both Venture and Buyout created using five neighbors and also controlling for common support. The dotted and the continuous line stand for PS (propensity score) distribution for control group and treatment, respectively. The horizontal axis and vertical axis represent propensity score and kernel density, respectively.
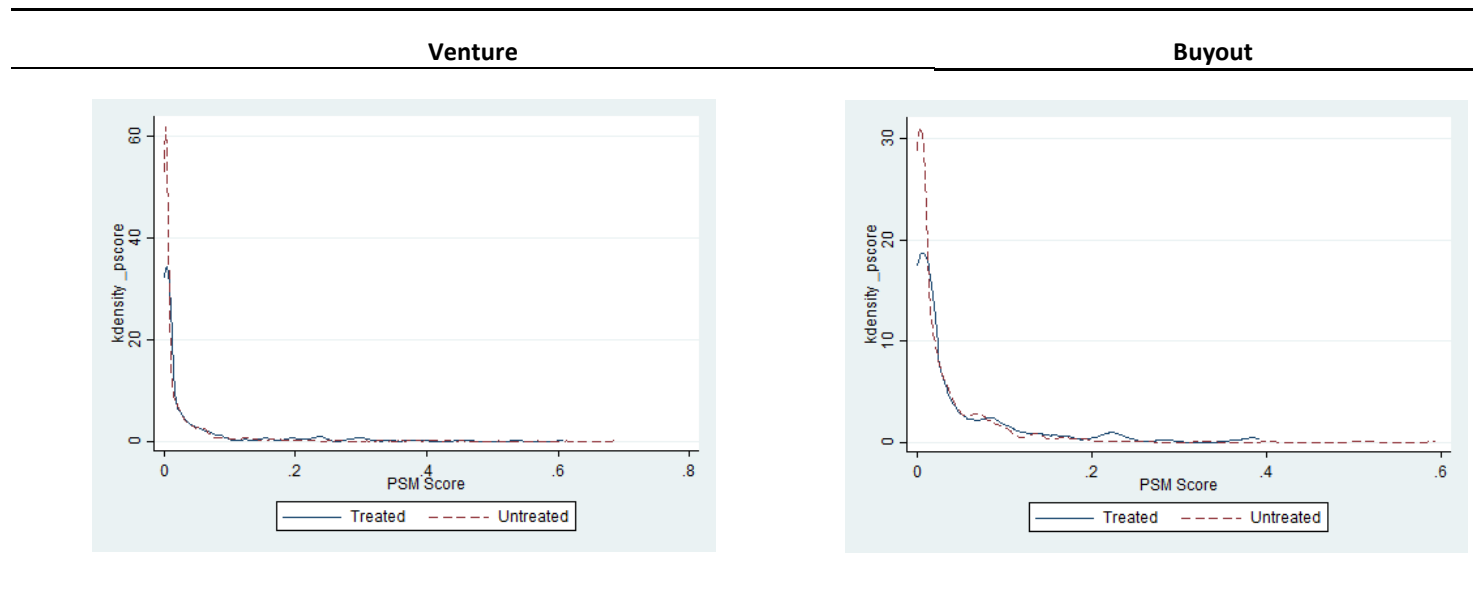
Venture	Buyout

Table IV A - Venture Capital Performance Subsequent to PE Investment (Treatment) - Matched at Year of PE Investment - Median

Changes in median performance values from year of investment (T=0). Part 1. reports groups' changes in measures of operating performance. Part 2. reports changes measures of the groups' solvency, using accounting figures as well as O- and ZM-scores. Part 3. reports changes employment factors. Part 4. reports changes in tax paid by the companies. ATT Average is the Average Treatment effect on the Treated, which is the difference between treated and control group changes. Significance is reported based on the null hypothesis of no difference between treated and control group. Significance levels of 1%, 5% and 10% are denoted as ***, **, and * respectively, as well as being enhanced with bold text.

	Value at T=0		Difference to T=0											
	T=0		+1				+2				+3			
	Treatment Average	Control Average	Treatment Average Change	Control Average Change	ATT Average	P-Value	Treatment Average Change	Control Average Change	ATT Average	P-Value	Treatment Average Change	Control Average Change	ATT Average	P-Value
1. Value Creation														
Revenue CAGR	-	-	0.41	0.11	**0.3***	0.00	-0.06	-0.42	**0.36***	0.00	-0.35	-0.60	**0.25***	0.00
Gross Profit Margin	0.92	0.90	0.00	0.00	**0***	0.09	0.00	0.00	0	0.89	0.00	0.00	0	0.87
Revenue/Total Assets	0.48	0.96	0.06	0.00	**0.06***	0.02	0.13	0.00	**0.13***	0.00	0.14	0.00	**0.14***	0.00
EBITDA/Revenue	-0.18	-0.01	0.02	0.04	**-0.02***	0.05	0.04	0.06	-0.02	0.21	0.07	0.08	-0.01	0.41
EBITDA/Total Assets	-0.08	-0.01	0.00	0.02	**-0.02***	0.00	0.02	0.04	**-0.03***	0.04	0.02	0.06	**-0.04***	0.07
ROA	-0.12	-0.04	0.00	0.02	**-0.02***	0.00	0.01	0.04	**-0.03***	0.01	0.02	0.06	**-0.04***	0.02
CAPEX (000' NOK)	975	45	66	0	**66***	0.01	0	0	**0***	0.00	0	0	0	0.58
NCF/Revenue	-0.89	0.00	0.39	0.03	**0.36***	0.00	0.50	0.04	**0.45***	0.00	0.57	0.06	**0.51***	0.00
NCF/Total Assets	-0.49	0.00	0.21	0.05	**0.17***	0.00	0.27	0.06	**0.21***	0.00	0.34	0.10	**0.24***	0.00
Current Ratio	2.10	1.27	-0.21	0.00	**-0.21***	0.00	-0.25	0.01	**-0.27***	0.00	-0.47	0.03	**-0.5***	0.00
2. Insolvency Risk														
Coverage Ratio	-5.23	1.67	-0.02	-2.65	**2.63***	0.06	1.68	-1.27	2.95	0.16	2.80	-1.65	4.45	0.10
LTD/EBITDA	0.00	0.00	0.00	0.00	**0***	0.09	0.00	0.00	**0***	0.07	0.00	0.00	**0***	0.08
LTD/Total Assets	0.00	0.00	0.00	0.00	0	0.22	0.00	0.00	**0***	0.10	0.00	0.00	**0***	0.07
ZM-Score	-6.19	-8.41	-0.31	-0.06	-0.25	0.12	-0.56	-0.04	**-0.52***	0.00	-0.64	-0.01	**-0.63***	0.00
O-Score	-7.82	-8.22	-0.15	-0.12	-0.02	0.65	-0.26	-0.17	-0.1	0.73	-0.22	-0.22	0	0.47
3. Employees														
Employees	1	1	0	0	**0***	0.00	0	0	**0***	0.01	0	0	0	0.96
Wages (000' NOK)	2605	1008	868	0	**868***	0.00	1471	0	**1471***	0.00	1959	0	**1959***	0.00
Wage level (000' NOK)	642	435	229	2	**227***	0.00	1141	17	**1124***	0.00	1789	25	**1764***	0.00
CEO salary (000' NOK)	547	354	83	0	**83***	0.00	150	11	**139***	0.00	210	15	**195***	0.00
CEO salary level (000' NOK)	179	89	30	0	**30***	0.+00	139	15	**124***	0.00	247	26	**221***	0.00
4. Tax														
Tax (000' NOK)	0	0	0	0	0	0.18	0	0	0	0.47	0	0	**0***	0.09
N	354	1661	352	1595	-	-	344	1536	-	-	315	1367	-	-

Table IV B - Buyout Performance Subsequent to PE Investment (Treatment) - Matched at Year of PE Investment - Median

Changes in median performance values from year of investment (T=0). Part 1. reports groups' changes in measures of operating performance. Part 2. reports changes measures of the groups' solvency, using accounting figures as well as O- and ZM-scores. Part 3. reports changes employment factors. Part 4. reports changes in tax paid by the companies. ATT Average is the Average Treatment effect on the Treated, which is the difference between treated and control group changes. Significance is reported based on the null hypothesis of no difference between treated and control group. Significance levels of 1%, 5% and 10% are denoted as ***, **, and * respectively, as well as being enhanced with bold text.

| | Value at T=0 | | Difference to T=0 | | | | | | | | | | | |
| | T=0 | | +1 | | | | +2 | | | | +3 | | | |
	Treatment Average	Control Average	Treatment Average Change	Control Average Change	ATT Average	P-Value	Treatment Average Change	Control Average Change	ATT Average	P-Value	Treatment Average Change	Control Average Change	ATT Average	P-Value
1. Value Creation														
Revenue CAGR	-	-	0.16	0.04	**0.12***	0.00	-0.34	-0.45	**0.11***	0.00	-0.49	-0.62	**0.13***	0.00
Gross Profit Margin	0.91	0.74	0.00	0.00	0	0.38	0.00	0.00	0	0.63	0.00	0.00	0	0.88
Revenue/Total Assets	1.09	1.62	0.00	0.00	0	0.85	0.03	0.00	0.03	0.19	0.05	0.00	**0.05**	0.02
EBITDA/Revenue	0.08	0.07	0.01	0.00	0.01	0.52	0.00	0.00	0.01	0.49	0.01	0.00	0.01	0.75
EBITDA/Total Assets	0.09	0.11	0.00	0.00	0	0.82	0.00	0.00	0	0.95	0.01	0.00	0.01	0.19
ROA	0.07	0.08	0.00	0.00	0	0.51	0.00	0.00	0	0.97	0.01	0.00	0.01	0.24
CAPEX (000' NOK)	9220	604	0	0	**0***	0.91	-53	0.00	**-53***	0.39	-318	0	**-318***	0.18
NCF/Revenue	-0.05	0.03	0.04	0.01	**0.04**	0.03	0.04	0.00	**0.04***	0.06	0.12	0.01	**0.11***	0.00
NCF/Total Assets	-0.03	0.05	0.07	0.01	**0.07**	0.02	0.07	0.01	**0.06**	0.03	0.15	0.02	**0.13***	0.00
Current Ratio	1.40	1.21	-0.10	0.00	**-0.11***	0.00	-0.13	0.02	**-0.15***	0.00	-0.17	0.02	**-0.19***	0.00
2. Insolvency Risk														
Coverage Ratio	-4.62	-0.81	0.64	-0.08	0.72	0.35	0.52	-0.94	1.46	0.25	0.17	-1.14	1.31	0.14
LTD/EBITDA	0.03	0.00	0.00	0.00	0	0.23	0.00	0.00	0	0.11	0.00	0.00	0	0.46
LTD/Total Assets	0.02	0.00	0.00	0.00	**0**	0.01	0.01	0.00	**0.01***	0.00	0.00	0.00	**0***	0.00
ZM-Score	-8.90	-11.21	0.01	0.00	0.01	0.64	-0.13	0.00	-0.12	0.47	-0.11	0.05	-0.16	0.25
O-Score	-10.71	-11.41	-0.02	0.09	-0.11	0.98	-0.10	-0.12	0.02	0.91	0.05	-0.09	0.14	0.50
3. Employees														
Employees	1	1	0	0	0	0.33	0	0	0	0.42	0	0	0	0.28
Wages (000' NOK)	11300	7185	341	0	**341***	0.00	660	0	**660***	0.00	1525	0	**1525***	0.00
Wage level (000' NOK)	3916	1086	14	0	**14**	0.04	694	0	**694***	0.00	1667	0	**1667***	0.00
CEO salary (000' NOK)	875	589	1	0	1	0.28	1	0	1	0.95	132	1	**131**	0.02
CEO salary level (000' NOK)	404	323	1	0	1	0.56	2	0	2	0.88	137	7	**130**	0.04
4. Tax														
Tax (000' NOK)	-41	-31	0	0	0	0.21	0	0	0	0.94	0	0	0	0,72
N	164	805	161	786	-	-	156	747	-	-	136	655	-	-

Table V - Robustness test

Robustness test of operating profitability adjusting for ex-ante investment revenue growth. These results are estimated using clustered standard errors using Fixed Effect model. Revenue Growth and Revenue Growth*ID is added to adjust for different revenue growth levels for investment companies. ID is an investment dummy taking one at investment year. Significant levels of 10%, 5% and 1% are denoted as *,** and *** respectively. The formula is specified as follows: $Y_{it} = \alpha_0 + \alpha_1 PE + \alpha_2 Revenue\ Growth + \alpha_3 Revenue\ Growth * PE$

Where α_0 is an interaction term and PE is a dummy taking one if the company is acquired and zero otherwise. Revenue Growth is the one year revenue growth prior to acquisition, whereas Revenue Growth*A is an interaction term isolating the effect of acquisition controlled for prior revenue growth.

	Buyout					Venture				
	CAGR	Gross Profit Margin	EBITDA Margin	ROA	EBITDA/TA	CAGR	Gross Profit Margin	EBITDA Margin	ROA	EBITDA/TA
Without controlling for Pre-Investment Revenue Growth										
PE	1.21**	0.00049	-0.21	-0.0077	0.0064	1.34***	0.015	-0.065	-0.20***	-0.17***
P-Value	0.0127	0.956	0.588	0.908	0.897	0.00623	0.556	0.876	0.00165	0.00289
Constant	-0.33***	-0.00019	0.31***	0.040***	0.037***	0.37***	0.0089	0.96***	0.22***	0.23***
P-Value	0.000816	0.906	0.000519	0.00366	0.000667	0.000658	0.110	3.20e-08	5.21e-12	9.84e-13
R-squared	0.027	0.0000023	0.00090	0.000006	0.000021	0.014	0.00047	0.00001	0.0034	0.0028
Clustered SE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	715	685	685	790	790	1436	1342	1342	1673	1673
Controlling for Pre-Investment Revenue Growth										
PE	1.26***	-0.0013	-0.14	-0.0088	-0.0054	1.22**	0.014	-0.11	-0.18**	-0.14**
P-Value	0.00961	0.892	0.735	0.860	0.894	0.0140	0.596	0.788	0.0156	0.0322
Revenue Growth	-0.027**	-0.0014	0.073	-0.0051	-0.0068	-0.050***	0.0050*	-0.018	-0.00050	-0.0024
P-Value	0.0312	0.581	0.386	0.600	0.512	(0.013)	(0.0025)	(0.046)	(0.014)	(0.013)
Revenue Growth*ID	-0.057	0.0036	-0.24	-0.0040	-0.0028	0.029	-0.015*	-0.052	0.014	0.014
P-Value	0.744	0.390	0.221	0.789	0.853	0.766	0.0910	0.458	0.516	0.482
Constant	-0.30***	0.0012	0.28***	0.027**	0.026***	0.36***	0.0069	0.90***	0.22***	0.23***
P-Value	0.00174	0.597	0.00287	0.0194	0.00890	(0.087)	(0.0053)	(0.089)	(0.014)	(0.013)
R-squared	0.030	0.00056	0.0059	0.0011	0.0019	0.015	0.0073	0.0013	0.0034	0.0026
Clustered SE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	702	683	683	716	716	1389	1317	1317	1463	1463

Table VII A - Venture Descriptive statistics

Descriptive statistics for the PE owned companies and their respective Control variables. Company values are reported at the year of investment.

	Treatment				Control			
	Min	Average	Median	Max	Min	Average	Median	Max
1. Value Creation								
Gross Profit Margin	-0.20	0.73	0.92	1.00	-0.20	0.74	0.90	1.00
Revenue/Total Assets	0.00	0.70	0.48	5.62	0.00	1.46	0.96	16.24
EBITDA/Revenue	-11.93	-1.78	-0.18	3.45	-11.93	-1.04	-0.01	30.48
EBITDA/Total Assets	-5.13	-0.31	-0.08	0.90	-5.13	-0.32	-0.01	3.33
ROA	-5.58	-0.34	-0.12	0.90	-5.58	-0.38	-0.04	3.25
CAPEX (000' NOK)	-32200	6351	975	115000	-32200	3896	45	115000
NCF/Revenue	-40.66	-5.04	-0.89	13.13	-40.66	-1.85	0.00	48.25
NCF/Total Assets	-2.00	-0.53	-0.49	1.76	-2.00	-0.13	0.00	8.00
Current Ratio	0.04	7.16	2.10	473.41	0.00	9.12	1.27	548.00
2. Insolvency Risk								
Coverage Ratio	-671.00	-25.61	-5.23	865.00	-671.00	-2.51	1.67	865.00
LTD/EBITDA	-17.79	0.42	0.00	22.65	-27.11	0.04	0.00	22.65
LTD/Total Assets	0.00	0.05	0.00	1.16	0.00	0.07	0.00	1.16
ZM-Score	-29.68	-7.22	-6.19	2.05	-77.62	-10.60	-8.41	2.27
O-Score	-50.93	-8.45	-7.82	24.02	-54.45	-8.43	-8.22	91.97
3. Employees								
Employees	1.0	8.4	1.0	102.0	1.0	8.3	1.0	102.0
Wages (000' NOK)	-7	6796	2605	86000	-7	6931	1008	86000
Wage level (000' NOK)	-7	3877	642	86000	-7	4116	435	86000
CEO salary (000' NOK)	0	558	547	2075	0	466	354	2075
CEO salary level (000' NOK)	0	390	179	2075	0	320	89	2075
4. Tax								
Tax (000' NOK)	-12100	119	0	3099	-12100	-34	0	3099
N	354				1661			

Table VII B - Buyout Descriptive statistics

Descriptive statistics for the PE owned companies and their respective Control variables. Company values are reported at the year of investment.

	Treatment				Control			
	Min	Average	Median	Max	Min	Average	Median	Max
1. Value Creation								
Gross Profit Margin	-0.20	0.75	0.91	1.00	-0.20	0.66	0.74	1.00
Revenue/Total Assets	0.00	1.20	1.09	4.98	0.00	1.87	1.62	16.24
EBITDA/Revenue	-11.93	0.08	0.08	20.02	-11.93	-0.01	0.07	30.48
EBITDA/Total Assets	-3.66	0.08	0.09	0.85	-5.13	0.03	0.11	2.02
ROA	-3.83	0.04	0.07	0.85	-5.58	-0.01	0.08	1.78
CAPEX (000' NOK)	-32200	26000	9220	115000	-32200	13600	604	115000
NCF/Revenue	-40.66	-0.94	-0.05	48.25	-40.66	-0.23	0.03	48.25
NCF/Total Assets	-2.00	-0.05	-0.03	4.59	-2.00	0.06	0.05	8.00
Current Ratio	0.05	2.02	1.40	22.97	0.00	5.39	1.21	548.00
2. Insolvency Risk								
Coverage Ratio	-671.00	-7.14	-4.62	865.00	-671.00	9.88	-0.81	865.00
LTD/EBITDA	-8.12	1.34	0.03	22.65	-27.11	0.46	0.00	22.65
LTD/Total Assets	0.00	0.09	0.02	0.90	0.00	0.11	0.00	1.16
ZM-Score	-26.78	-9.27	-8.90	0.72	-77.62	-12.19	-11.21	2.27
O-Score	-38.99	-11.60	-10.71	-1.00	-55.62	-11.25	-11.41	52.13
3. Employees								
Employees	1.0	15.4	1.0	102.0	1.0	15.6	1.0	102.0
Wages (000' NOK)	0	25500	11300	86000	-7	27900	7185	86000
Wage level (000' NOK)	0	20100	3916	86000	-7	20700	1086	86000
CEO salary (000' NOK)	0	883	875	2075	0	792	589	2075
CEO salary level (000' NOK)	0	715	404	2075	0	641	323	2075
4. Tax								
Tax (000' NOK)	-12100	-1802	-41	3099	-12100	-2105	-31	3099
N	164				805			

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Preliminary Master Thesis

The Effects Private Equity owned firms have on Norwegian Society

Hand-in date:
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Supervisor:
Janis Berzins

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BI Oslo

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Master of Science in Business, major in Finance

1. Content

2. Introduction

The private equity market have in the last decade had tremendously growth with over $551bn capital raised in 2015, an increase of 7,1% from previous year (Preqin, 2016). The increased PE-activity have met criticism, people in the industry critic the effect of the short holding period and labour unions claim that buyouts, through wage cuts, generate return to investors at the cost of employees (Cumming, 2012). On the other side, private equity funds have often become an important saviour for companies facing financial distress and an opportunity for firms seeking new capital to enter new markets or continue growing. Despite this, previous studies are somewhat limited in the Nordic region. In our thesis, we focus on the Norwegian society, to investigate whether private equity owned firms have a positive impact on society.

We specify our working research question as follows: "How is corporate's contribution to the Norwegian society affected by private equity ownership?"

The objective of the thesis

The objective of the thesis is to contribute to an increase awareness of the effect private equity has on the society. Due to the increasingly rapid growth there have been much debate on private equity owned firms' contribution to society. To measure the contribution to society it is important to consider all relevant stakeholders. In our thesis, we define the relevant stakeholders as shareholders, customers, employees, the industry and the firm itself. Assessing the research question five dimensions are considered when examining PE activity relative to constructed benchmark: 1. Value creation, 2. Employees, 3. Total factor productivity (TFP), 4. Insolvency risk, 5. Tax considerations.

3. Literature review

Previous private equity literature lack on assessing the impact private equity owned firms have on society. In our thesis we believe that focusing on the five dimension below give a reasonable measurement of the effect on the overall society.

Previous studies on operating performance and return to investors
One of the most covered recent literature is whether private equity owned firms outperform a relative benchmark specified. Previous studies find evidence that 90 % of the added value in financial industry transaction are due to operational advances (Cumming, 2012). Douglas and Uwe (2009) find that the private equity mean actual return to investors to be 69% whereas Cochrane (2005) finds 59%. Guo, Hotchkiss, and Song (2011) focusing its study mainly on pure buyouts, the calculated average transaction return of 63% on a sample size of 90. Phalippou and Gottschalg (2009) finds that the performance of private equity funds outperform the S&P500 with 3% per year between 1980 and 1996. Smiths on the other hand, finds evidence for increased operating returns prior and during buyouts, measured by per dollar of operating assets and operating cash flow per employee. Much due to an increase in leverage and transformation in ownership structure. Other studies focusing on LBO transactions discoveries that operating performance to private equity owned firms are the same or higher than benchmark (Guo et al., 2011).

Previous studies on Employees
The most debated issue regarding private equity activity is their effect on employees. S. Kaplan (1989) finds median employment increased by 0.9% for large management buyouts that took place in the beginning of 1980s to mid-1980s. Researchers focusing on the Norwegian private equity market have found similar results (Klemsdal, 2016). In contrast, Muscarella and Vetsuypens (1990) have studied 72 US private equity owned firms from 1976 to 1887 and found a decline in employment of 0.6% between the time the buyout took place and when the firm went public. There is also evidence that private equity held companies have no effect on wages and employment (Bergström, Grubb, & Jonsson, 2007). By not looking wage effects and employment, one study by Amess and Wright (2007) finds that firms subject to a buyout give less supervised employees and craft and gain more skilled employees. Suggesting that private equity owned firms provide less hierarchical structures and more autonomy.

Previous studies on Total factor productivity (TFP)
Lichtenberg and Siegel (1990) found that private equity gave TFP gains at the plant level up to three years postbuyout relative to industry benchmarks. Harris, Siegel, and Wright (2005), who had a larger sample (4,877 plants), found that

plants experiencing a MBO are less productive than comparable plants before the ownership change, however after buyout the study showed a significant increase in productivity. On the other side, Elisa Ughetto (Cumming, 2012) found in her study that only in 46% of the cases do private equity-backed companies outperform their matched companies in terms of the growth rate of TFP.

In spite of this, most research conclude with increased productivity. Jensen (1989) argue that private equity firms reduce agency problems concentrating ownership, which in later terms remove the low incentives of dispersed owners to monitor managers (Shleifer & Vishny, 1986). This again will result in higher productivity. Increased leverage structures management forcing them to deliver "free cash flows" (Jensen, 1986; Murphy, 1985). However, this can have negative effect in the long term, with evidence that increased leverage reduces long-run investments and R&D spending (Himmelberg & Petersen, 1994). Private equity also provides capital and knowledge to the firms, which in turn increase productivity both from operational improvements as well as enabling investment in profitable projects (Boucly, Sraer, & Thesmar, 2011).

Previous studies on insolvency risk
It is not a secret that private equity often try to maximize profits by increasing leverage, with buyout transactions often being Leverage Buyouts (LBO). Increased leverage might hence increase the risk of insolvency, and maybe even bankruptcy which in turn impact the society. Steven N Kaplan and Strömberg (2009) found that 6% out of 17,171 buyout deals between 1970 and 2007 ended in either bankruptcy or reorganization. This equals an annual bankruptcy rate of 1.2%, which is lower than the average default rate of 1.6% for U.S. corporate bond issuers. Yet, this is higher than for publicly traded firms with a bankruptcy rate of 0.6% (Wilson, Wright, & Altanlar, 2009). However, bankruptcy rate varies with business cycle and across countries. A study conducted by S. N. Kaplan and Stein (1993) found that in a sample of forty-one, only 2% of buyout deals defaulted between 1980 and 1984, but that out of eighty-tree buyouts between 1985 and 1989 27% defaulted with 11% ending in bankruptcy.

Previous studies on tax
There has not been done a lot of studies on the tax effect of private equity ownership. Will private equity ownership increase the sum tax paid? If a company improves its operations and increase wages or employ more people this should lead to increased company tax as well as personal tax. However, private equity firms are known of placing their funds in tax havens such as Guernsey, Jersey, Luxembourg and Cayman Islands and the taxation of private equity firms have been much debated. In 2015 Herkules Capital I AS won in the Norwegian Supreme Court on their appeal of the judgement in Lagmannsretten (Høyesterett, 2015). The Supreme Court acknowledged that carried interest, the share of profits that general partners earn, is to be considered as a success fee and not as income. This is the way private equity firms have considered carried interest before, and that Herkules won has major impact on the industry and the tax paid by private equity firms in Norway (Lorentzen, 2015).

4. Methodology

The thesis aims to test the relationship between acquisition and the development of firm characteristics for buyout targets prior and after an acquisition. This is done through both indirect (insolvency) and direct measurements. Where the latter one is value creation, employees, total factor productivity and tax considerations. We will apply various measurements conduction on OLS and Hackman model (1979).

Value creation: Operating performance and return to investors
To measure value creation for investors we investigate two dimensions: Operating performance and actual profit. To tackle the first measurement we use the same dependent variables as Boucly et al. (2011) and Guo et al. (2011). In addition, we supplement with performance metrics from previous buyouts in the Nordic (Bergström et al., 2007; Gulliksen, Wara, & Hansen, 2008; Tobias Friedrich, 2015). Hence, this results in the subsequent measurements: Actual profit (entry and exit values), EBITDA-margin, Sales CAGR, Gross profit margin, revenues-to-total assets, ROA, EBITDA/TA, CAPEX ratio, current ratio, NOCF/TA and NOCF/R (Appendix 1). By applying these measurements, the analysis focuses solely on operational performance since these measurements omit leverage and tax effects. Most of the variables are scaled to either total assets or turnover to

ensure comparability across company sizes and sectors. EBITDA is referred to the cleanest assessment of operating performance since it excludes depreciation and are thereby not affected by accounting subjectivity.

Employees

According to Cressy, Munari, and Malipiero (2007), Olsson and Tåg (2012) & S. Kaplan (1989) three measurements for employment is recommended: Nominal wages (NW), Number of employees (E) and Avg. NW/E (Appendix 1). We will apply the same measurement in our thesis.

Total factor productivity (TFP)

In order to measure TFP we follow the same approach used in previous studies that focuses on productivity progresses of PE owned activity by applying one-step augmented Cobb-Douglas product function (Harris et al., 2005; Wilson, Wright, Siegel, & Scholes, 2012). However, possibly facing a smaller sample size with peculiar structure, it might be that using the methodology proposed by Duguet (2006) would be more convenient.

Tax consideration

The last direct measure is whether private equity owned firms produce more or less tax than other firms in the same sector. One of the leading accounting firms in the world, PWC (2008) is using TTR (appendix 1), tax-to-revenues, employment taxes borne and collected per employee and we consider to apply the same measurement in addition to changes in tax payable.

Insolvency risk

In addition to direct measurements mentioned above, we want to include the potential increased insolvency risk of private equity owned firms.

The first measurement we want to focus on is Coverage ratio and Ltd/EBITDA mainly because this measurements are the most common measurement of insolvency risk (BB&T, 2011). Going forward with the same procedure as Tykvová and Borell (2012) and Boucly et al. (2011), the additional variables to measure insolvency risk are as follows: ZM-score, O-Score, Ltd/TA (appendix 1). The latter measurement is known as the leverage ratio, giving an indication of the debt burden of a firm to its assets. O-score Ohlson (1980) & Z-score provided by Altman (1968) are additional measures of insolvency risk.

5. Background/Data

A major part of this thesis will be data gathering. The private equity industry is known of its reluctance of sharing data, and we hence expect challenges gathering data. Nevertheless, we decided writing this thesis after getting access to information on Norwegian private equity owned firms from the government owned fund-in-fund private equity investment firm, Argentum. In addition, we cooperate with the Centre for Corporate Governance Research (CCGR) at BI Norwegian Business School to get access to a database on accounting and other firm specific data on Norwegian firms. The database from CCGR will allow us to do a more detailed analysis comparing PE-owned firms with similar companies, plausibly also filling missing links in the Argentum dataset. Furthermore, we will use several well-known databases such as Datastream, Bloomberg, Thomson One, Zephyr as well as Mergermarket. Additionally, we hope to get data from the employee-owned consultancy, Menon, that have done several studies relevant to the thesis' topic.

Data-biases

The database from argentum is potentially data-biased because of the risk that private equity firms only disclose certain types of information. For example, the PE-firms are likely to be more open about good investments and more reluctant sharing information on less successful investments. Looking to previous research on the field we expect to have data both with sample size bias and systematic bias.

Sample selection bias

Sample selection bias is caused by using samples from non-random data, due to a flaw in the selection process (Stock & Watson, 2014). This is bias very likely to be found in our selection, due to the assumed selectiveness PE-firms have in regards of reporting.

Taking sample selection bias to account in the OLS estimation, we will adopt the two-step Heckman correction method (Valkama, Maula, Nikoskelainen, & Wright, 2013).

Phase	Week																				
	January				February				March					April				May			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Systemize data and gather additional data	▬	▬	▬	▬																	
Analysis of data				▬	▬	▬	▬	▬													
Structuring and documenting our results									▬	▬	▬	▬	▬								
First draft														◆							
Final draft																		◆			
Milestones																					

6. Time schedule

7. Appendix 1 – Measurements

Measurement	Description
Actual profit	Return to investors, included dividends
EBITDA-Margin	EBITDA to Revenues
Sales CAGR	Growth in sales
Gross profit margin	Revenues subtract costs of goods sold to revenues
R/TA	Revenues to total assets
ROA	Return on assets
EBITDA/TA	EBITDA to total assets
CAPEX ratio	Net operating cash flow to capital expenditures
Current ratio	Current assets to current liabilities
NOCF/TA	Net Operating cash flow over total assets
NOCF/R	Net operating cash flow over revenues
Avg. NW/E	Average nominal wages per employee
Coverage ratio	EBIT to interest ratio
Ltd/EBITDA	Long term debt to EBITDA
Ltd/TA	Long term debt to total assets
TTR	Total tax rate

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