Aalto University
School of Economics

Private equity firms and the benefits of specialisation: Nordic evidence pre and during the financial crisis

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Master's thesis

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Abstract
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PRIVATE EQUITY FIRMS AND THE BENEFITS OF SPECIALISATION - NORDIC EVIDENCE PRE AND DURING THE FINANCIAL CRISIS

PURPOSE OF THE STUDY

The private equity market has had two distinct waves, first in the 1980s and second in the late 2000s. The first wave and the beginning of the second have been extensively studied, however, due to data availability issues the complete second wave has not yet been studied. Also, while the determinants of private equity performance as well as specialisation have received attention in the literature, the Nordic markets have been left untouched. This paper will be able to contribute to the literature in four distinct areas: first by covering whole time period of the latest wave of buyouts, second by shedding light on private equity performance over the financial crisis, third probing further in the specialisation advantages of private equity firms and fourth providing more evidence on the Nordic markets which are one of the most active buyout markets in Europe and still not yet have enjoyed much attention in the literature.

DATA

This paper studies 127 private equity backed buyouts and their corresponding peers with complete operational data available in Nordic (Finland, Sweden, Norway and Denmark) countries. The data contains all buyouts completed within the time frame of 2003-2007 as well as operational data for three years post-buyout, or until the exit. The effect of sample selection bias is estimated with an additional of 66 buyouts and the peers without complete operational data. The hand-collected peer group is matched by industry, size and geography.

RESULTS

This study has four key findings in Nordic private equity buyouts during the latest wave of buyouts and over the recession. First, private equity firms are able to outperform their peer companies in sales growth and profitability. Second, PE firm specialisation on industries or stages both drive higher performance for sales growth and profitability, where stage specialisation may have an advantage in the latter. Third, under pre-crisis economic conditions private equity backed buyout operating performance is comparable to peers on average. However, under crisis conditions private equity firms are able to maintain the performance of the portfolio companies thus creating clear difference to that of the peers. Specialisation seems to have an advantage during more difficult economic conditions compared to peer companies. And lastly, private equity firm performance across all stages and industries does not seem to largely differ across time periods.

KEYWORDS

Private equity, leveraged buyouts, specialisation

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Joonas Viitala

PÄÄOMASIJOITTAMINEN JA ERIKOISTUMISHYÖDYT POHJOISMAISSA ENNEN RAIHOITUSKRIISIÄ JA KRIISIN AIKANA

TUTKIELMAN TAVOITTEET

Pääomasijoitusmarkkinoilla on ollut kaksi selkeää sykliä, 1980-luvulla sekä 2000-luvun puolivälissä. Kirjallisuus on tutkinut kattavasti ensimmäisen syklin, mutta viimeisintä ei ole pystytty tutkimaan aineiston saatavuuden vuoksi. Aiempi kirjallisuus on keskittynyt myös pääomasijoittajien menestyksen tekijöihin ja erikoistumishyötyjen tutkimiseen, mutta pohjoismaisia pääomasijoitusmarkkinoita ei ole kattavasti tutkittu. Tämä tutkielma laajentaa aikaisempaa kirjallisuutta neljällä osa-alueella: kattaa koko viimeisimmän pääomasijoitussyklin, tutkii pääomasijoittajavetoisten yritysten ja niiden verrokkien operationaalisen tehokkuuden eroja ennen kriisiä ja kriisin aikana, tutkii pääomasijoittajien erikoistumishyötyjä niiden portfolioyrityksissä sekä kattaa pohjoismaiset pääomasijoitusmarkkinat.

LÄHDEAINEISTO

Tutkimusaineisto käsittää 127 pääomasijoitusvetoista yritysostoa ja niiden verrokkiyritykset Pohjoismaissa (Suomi, Ruotsi, Norja ja Tanska) vuosina 2003-2007. Aineistoon on sisällytetty myös 66 vastaavaa yritysostoa ja verrokkiyritykset, joille täydellistä operationaalista aineistoa ei ollut saatavilla estimoimaan lähdeaineiston valinnan puoluellisuutta. Tutkimusaineiston yrityksille on kerätty kolmen vuoden operationaalinen aineisto yritysostojen jälkeen, tai siihen asti, kun yritys on myyty. Verrokkiyritykset ovat koottu toimialan, koon ja geografian mukaisesti.

TULOKSET

Tutkimuksella on neljä keskeistä löydöstä viimeisimmän pääomasijoitusmarkkinasyklin yritysostoille Pohjoismaissa: 1) Pääomasijoittajavetoisten yritysten operationaalinen tehokkuus on huomattavasti parempi kuin verrokkien myynnin kasvussa sekä kannattavuudessa. 2) Toimialoihin tai investointivaiheisiin erioistuneet pääomasijoittajat ovat pystyneet vaikuttamaan merkittävästi portfolioyrityksiensä myynnin kasvuun sekä kannattavuuteen. Investointivaihe-erikoistuminen voi johtaa suurempiin parannuksiin kannattavuudessa. 3) Pääomasijoittajavetoisten yritysten operatiivinen tehokkuus on keskimäärin vastaavaa verrokkiyrityksien kanssa. Taantumassa pääomasijoittajat pystyvät kuitenkin ylläpitämään portfolioyritystensä tehokkuuden, tehden merkittävän pesäeron verrokkiyritysten tehokkuuteen vaikeammassa talouden tilanteessa. Pääomasijoittajan erikoistumisella näyttää olevan etu operationaalisessa tehokkuudessa taantumassa verrokkeihin verrattuna. 4) Pääomasijoittajien välinen tehokkuus ei muutu eri talousoloissa.

AVAINSANAT

Pääomasijoittaminen, yritysostot, erikoistuminen

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Table 1 - Explanation of key terms in the paper

Term	Explanation
Bn	Billion
CCC	Cash Conversion Cycle
EBITDA	Earnings before interest, tax, depreciations and amortisations
EVCA	European Venture Capital Association
HHI	The Herfindahl- Hirschman- Index, used to measure the degree of industry and stage specialisation
ICA	The Index of Competitive Advantage, used to measure industry and stage specialisation
LBO	Leveraged buyout
LP	Limited partner, institutions or high net worth individuals who invest in private equity funds
MBO	Management buyout where the current management acquires the company, with private equity firm backing
Nordic region	Denmark, Finland, Norway and Sweden. Also used in the form of the Nordics or the Nordic countries
PE	Private equity. Refers to private equity firms, might also be used along with the word fund (PE fund) meaning a private equity fund or company i.e. a private equity backed company
PE vs. VC	Private equity firms tend to invest in more mature companies whereas venture capital firms' focus tend to be start-ups and early stage investments
Peer company	Comparable company for a buyout company in terms of industry, size and geography
Private equity company	Company acquired by a private equity fund, managed by a private equity firm. Also referred to as private equity backed company, target or buyout company
Private equity firm	Entity which manages private equity funds, which in turn invest in companies. Also referred to as a general partner (GP)
Private equity fund	Managed by a private equity firm, capital pool which invests in companies
PTP	Public-to- Private transaction. Where a public company is acquired, delisted and taken back to private
ROIC	Return on Invested Capital
RLBO	Reverse leveraged buyout. A company which has previously been delisted when taken over by a private equity firm over is listed upon exiting the investment
WC	Working capital

1. Introduction

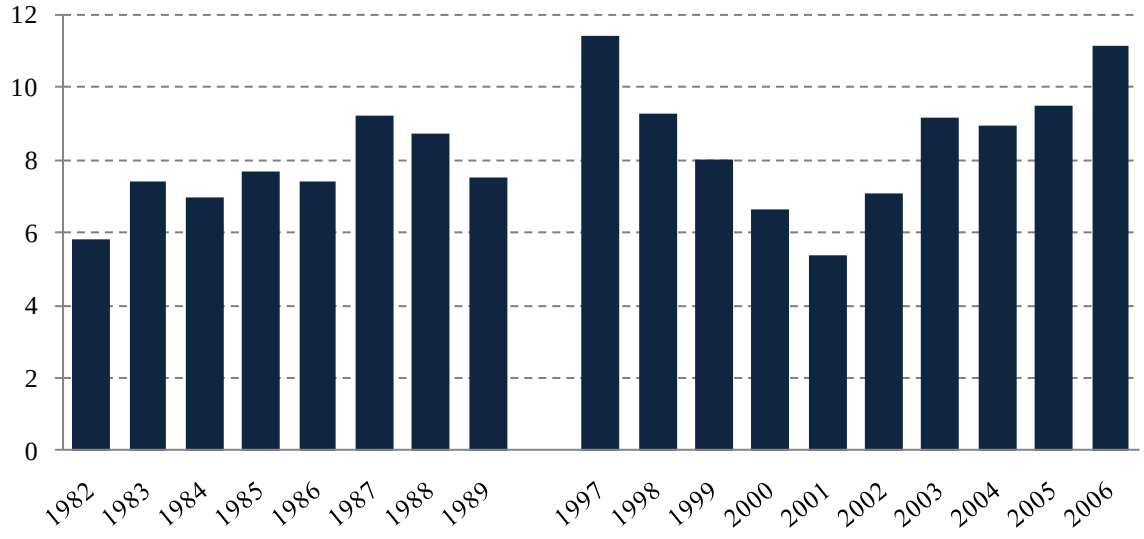
1.1. Background and motivation

Leveraged buyouts (LBOs) and private equity (PE) industry have been widely studied since the first LBO wave in the 1980s. Jensen (1989) predicted that leveraged buyout organisations, which later became private equity firms, would emerge as the dominant corporate organisational form. Since then the private equity industry value has grown in three-digit multiples, alone in the U.S. commitments of the buyout funds were over 100 times greater in 2006 than they were in 1985 measured in inflation-adjusted dollars (Cao and Lerner, 2009). Such growth in private equity investments has spurred a wide range of research on the abnormal performance of PE-lead buyout companies, each providing either a new piece of explaining their operations or offering mixed evidence contradicting the previous research.

The research recognises two distinct waves of LBOs; first being from 1982 or 1983 to 1989, second beginning in 2003 or 2004 and ending in 2007 or 2008 (Kaplan & Strömberg 2009). Burrows and Wright (2009) cover a slightly longer time period and report a drop in the PE activity in 2008 to the levels of 2002 and a further accelerating trend in the first two quarters of 2009 indicating the end of the second LBO boom. The same pattern can be seen in Figure 1 which summarises the median valuation levels of U.S. public-to-private (PTP) transactions from 1982 to 2006.

Figure 1 - Enterprise value to EBITDA in U.S. public-to-private buyouts from 1982 to 2006 (excluding 1990-1996)

EBITDA is a commonly used cash flow measure and stands for earnings before interest, taxes, depreciations and amortisations



Source: Kaplan & Stein (1993) for 1982 to 1989 and Guo et al. (2011) for 1997 to 2006. Adapted from Kaplan and Strömberg (2009)

Evidence suggests that availability of debt financing is a major factor in determining private equity activity. Ljungqvist et al. (2007) report accelerating investment pace of private equity funds as interest rates decline whereas Axelson et al. (2009b) find current (at the time of the buyout) market conditions the most significant factor in explaining leveraged buyouts' capital structures. Further proof is provided by Shivdasani and Wang (2011) who conclude that the credit market conditions before the recent financial crisis fuelled the LBO boom through banks' looser lending policies and private equity firms' better access to capital. Thus, the favourable market conditions resulted in a record amount of invested capital in private equity totalling USD 375bn through 654 companies alone in the U.S. in 2006. Furthermore, nine of the ten largest buyouts occurred in 2006. (Washington Post, March 15, 2007).

After the first wave of buyouts, researchers have comprehensively studied LBOs with a steady number of new research being published each year. However, the new research has always trailed with a few year lag due to data availability issues. The newly available post-buyout operational data of three years after the most recent cycle busted now provides a unique opportunity to research the most recent deals and the PE-backed buyout companies' performance pre and during the financial crisis as well as the bust of the private equity market. Little evidence has yet been provided on the characteristics and performance of PE-backed buyouts during and after the recent boom from 2003 through 2007. This thesis aims at filling the gap in the research as well as to dig deeper into the determinants of the performance.

1.2. The research problem

This paper studies the operating performance of private equity backed buyout companies in the Nordic region including Finland, Sweden, Denmark and Norway and the buyouts' relative performance on that of the comparable companies. The focus is in the specialisation effects of private equity firms i.e. can industry or stage specialised firms create higher or abnormal operating performance.

The paper also tests whether the specialisation effects and operating efficiency of buyouts will change under different economic conditions i.e. pre and during the financial crisis. This study includes factors that have previously found to affect the abnormal performance of PE-backed companies to control for other operational efficiency drivers.

The literature suggests that private equity firm specialisation or the degree of non-diversification is providing competitive advantage of the buyout companies over their peers.

Although there are mixed evidence, both stage and industry specialisation are found to be positively related on the abnormal returns of PE firms as well as on abnormal operating performance. Specialisation is approached with two methods, the Index of Competitive Advantage (ICA) as presented by Cressy et al. (2007) on the basis of the study by Archibugi and Pianta (1994) and with Herfindahl-Hirschman Index (HHI) (Hirschman, 1945; Herfindahl, 1950) measuring the degree of diversification. Both methods allow the study of industry and stage specialisation of private equity firms, more detailed description of the methods is provided in Section 6.

Research has also presented a wide variety of variables explaining either the returns on PE investments or the operational performance. Focusing on the latter, this study attempts to find evidence if these variables continue to be significant in the financial crisis explaining the buyout company performance or whether the factors have changed under different market conditions. Further insight is provided through expanding the current literature to cover the Nordic countries in greater detail as previous research suggest that there might be a difference in the nature and determinants of private equity performance across countries and market areas.

1.3. Contribution to the existing literature

This study will be able to contribute to the literature in four distinct areas, first by covering whole time period of the latest wave of buyouts, second by shedding light on PE performance over the financial crisis, third probing further in the specialisation advantages of PEs and fourth providing more evidence on the Nordic markets which are one of the most active buyout markets in Europe and still not yet have enjoyed much attention in the literature.

Research on private equity and buyouts has largely concentrated in the U.S. and in the UK which are the most active buyout markets in the world. These studies have covered a wide array of fields such as returns on PE investments e.g. Kaplan and Schoar (2005), Groh and Gottschalg (2006), Nikoskelainen and Wright (2007) and Guo et al. (2011), the role of corporate governance and ownership e.g. Weir and Wright (2006) and Acharya and Kehoe (2008) and the operational effects of PE investments of the buyout companies e.g. Lichtemberg and Siegel (1990), Harris et al. (2005), Bergström et al. (2007), Cressy et al. (2007), Boucly et al. (2008) and Davis et al. (2008). However, the majority of the research has covered only the first wave and the buyouts occurred before the last few years of the latest boom.

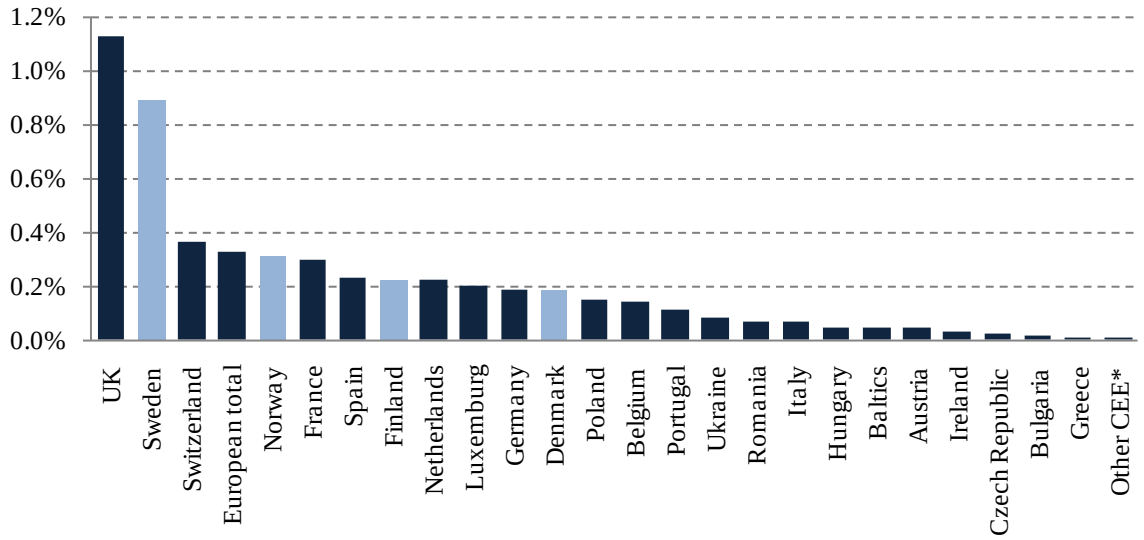
Due to the recent nature of the recession of which effects the world is still enduring, it has not been previously possible to study the buyout companies under the influence of the crisis as sufficient amount of data and a number of years has not yet been available. However, in 2011/2012, a three year window after the PE boom busted in 2007-2008, and the crisis began, provides enough data points for a viable research. Furthermore, only a little evidence thus far has been published on these effects. To the best of my knowledge Jääskeläinen (2011) currently represents the only study in this area with a data set covering the years after 2007, where Jääskeläinen studied which areas of operational efficiency PE firms are able to improve on compared to peer companies. This study expands on the topic by concentrating on the factors of PE firms that drive the operational efficiency improvements and whether these factors change during different economic conditions.

Cressy et al. (2007) argue that private equity companies which are specialised relative to their competitors either through industry or stage expertise have acquired and possess deeper knowhow on the different aspects of the company and its operating environment. Therefore the specialised PE companies can provide more effective monitoring and advice resulting in superior performance over their peers. Also, the authors suggest that using their knowledge, PEs may be able to pick winners, companies that initially have better grounds to succeed. There are also a number of other studies covering private equity and venture capital specialisation. Norton and Tenenbaum (1993) suggested that early stage venture specialists were less diversified and Maningart et al. (2002) found highly stage diversified venture capitalists to require higher return for their investments. Cressy et al. (2007) and Gottschalg and Wright (2008) provided evidence that industry specialised private equity firms are able to create real and lasting value, having a positive impact on profitability. Cressy et al. (2007) also reported that stage specialisation may boost growth, however, not having an impact on profitability. Gompers et al. (2005) provided more evidence on industry specialisation by finding evidence that industry specialised VCs tended to be more successful. Contrary evidence has been provided by Ljungqvist and Richardson (2003) and Brigl et al. (2008) who concluded that industry diversification does not have significant effect on returns or the firm performance. Futhermore, more mixed evidence was found by Lossen (2006) who suggested that rate of return of PE funds declines with diversification across stages but increases with diversification across industries. The author's findings propose that stage specialisation could result in better returns whereas same improvements could not be gained with industry specialisation. This mixed evidence is far from conclusive and needs further probing in to the

issue in order to make more definite answers. Furthermore, it is topical to study whether the suggested specialisation gains persist over the crisis or is the PE firms' superiority diminished in the case of a major shock.

Nordic buyout markets have not enjoyed much attention in literature. To the best of my knowledge only Bergström et al. (2007) have published a research covering the Nordics, concentrating on operational performance of the Swedish private equity backed companies from 1998 to 2006. There are a number of master's theses covering a part of the Nordic market, however, many of them including only Finnish data such as Wistbacka (2002), Kekkonen (2004), Havu (2007) and Männistö (2009). Jääskeläinen (2011) is the only who covers all of the Nordic countries in his study. As Figure 2 suggests, Nordic countries (Finland, Sweden, Norway and Denmark) are among the biggest private equity markets in the Europe measured by private equity investments as percentage of GDP. UK and Sweden have both significantly larger PE markets than other European countries or than the European total.

Figure 2 - Private equity investments as % of GDP in 2010 in Europe



*Other CEE consist of Slovakia and Ex-Jugoslavia
Source: EVCA (2011), retrieved 27 September 2011

Regardless of Norway, Finland and Denmark being below the European total, as a whole, the Nordic countries could be considered one of the most important PE market in Europe if measured as % of GPD. Thus, it is necessary to cover Nordics in greater detail in order to understand fully the whole private equity scene. Cumming et al. (2007) find that there is a consensus in literature on different methodologies, measures and time periods suggesting that LBOs and particularly MBOs improve the target companies' performance and have a significant effect on work practices. However, the authors continue by introducing the need

for international research on buyouts as the nature and determinants of the performance of private equity backed buyouts and different types of LBOs differ by country.

1.4. Limitations of the study

This study has three main limitations. First, it is limited to Nordic (Finland, Sweden, Norway and Denmark) first-round private equity backed buyouts from 2003 to 2007 in the Thomson VentureXpert database. Second, the study concentrates only on private equity firms and thus excludes venture capital firms and the companies that have had venture capital backing according to Thomson VentureXpert database. The differences of private equity and venture capital are explained further in Section 2. And third, the focus is on operational efficiency and especially on the drivers behind the operational efficiency changes that previous literature has found significant. The possible biases in data selection are discussed in Section 5.

1.5. Main findings

This study has four key findings in Nordic private equity buyouts during the latest wave of buyouts and over the recession. First, private equity firms are able to outperform their peer companies in sales growth and profitability. Second, PE firm specialisation on industries or stages both drive higher performance for sales growth and profitability, where stage specialisation may have an advantage in the latter. Third, under pre-crisis economic conditions private equity backed buyout performance is comparable to peers on average. However, under crisis conditions PE firms are able to maintain the performance of the portfolio companies thus creating clear difference to that of the peers. Specialisation seems to have an advantage during more difficult economic conditions compared to peer companies. And lastly, private equity firm performance across all stages and industries does not seem to largely differ across time periods and economic conditions

1.6. Structure of the study

Section 2 introduces private equity firms' operations and transactions in detail. Section 3 discusses the literature and the theoretical framework of the thesis. Section 4 describes the hypotheses. Section 5 gives a description of the data gathered and Section 6 continues with the methods and variables. Section 7 discusses the results and analysis and finally, Section 8 concludes.

2. Private equity in essence

This section discusses and defines private equity; the model through which PE firms operate as well as the compensation system of the model. This section, however, is limited to

components that are deemed sufficient for the reader to understand the context of this thesis and for a more comprehensive description of private equity model and its components, please refer to Gilligan and Wright (2008).

2.1 What is private equity?

Private equity (PE) can be characterised as risk capital being invested in companies experiencing different stages of their life cycle. These stages include companies in their start-up phase, mature companies, distressed companies and every other stage in between. Private equity acts as a financial intermediary who raises capital from institutional investors and high net-worth individuals to invest these funds to private and illiquid companies. The aim of PE is thus to maximise the returns of their investors by increasing the value of target companies through financial, governance and operational engineering.[1] Private equity drives the change in the target companies as active investors by taking on significant control rights and board seats as well as by imposing contractual restrictions on management and by utilising full and timely information on the current state of their target. Private equity thus differs from other asset classes that have similar investment strategies with PE such as hedge funds, value funds or active funds through their ability to influence the companies' decision making.

The term private equity is a broad definition of an investor that is not quoted in the public market. However, academic literature and private equity firms recognise four distinct sub-classes of PE: venture capital (VC), mezzanine/growth capital, distressed and buyouts. Venture capital commonly refers to investments in start-ups or other companies with strong business ideas and high growth potential and investment needs but low current cash flows. Mezzanine capital acts as transitional funds between VC and buyout investments. Overlapping both investment types, mezzanine can be described as growth capital when invested in later-stage venture capital companies and as subordinate debt layers with an equity component when invested as a part of a buyout. Distressed company investments are part of buyouts, however, a specialised segment investing only in mature and distressed companies. Academic literature commonly separates private equity into venture capital and buyouts, where distressed investing is assigned to buyouts and mezzanine can be assigned to either depending on the type of the company; venture stage or buyout stage. This paper focuses on the latter, buyouts.

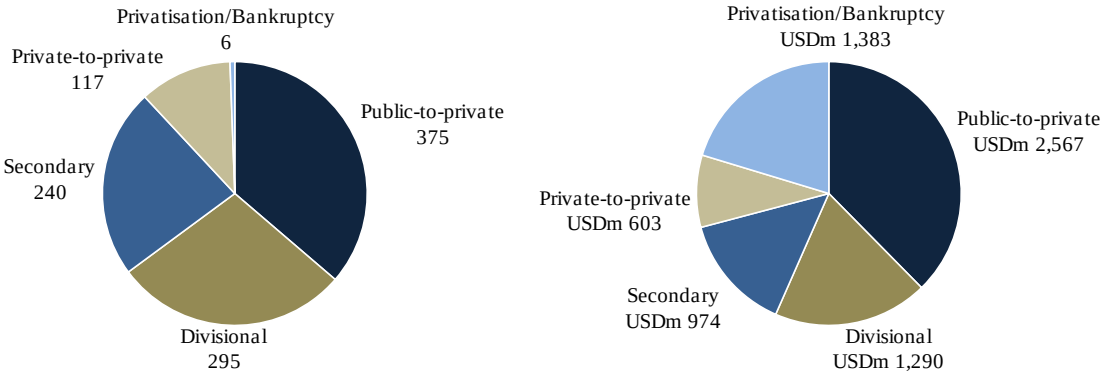
[1] Please refer to Section 3 for more detailed description of the three types of value generation of private equity as defined by academic literature.

Buyouts refer to one-time investments where controlling stake of a company is acquired using typically a significant amount of debt and a smaller portion of equity. Hence, a typical buyout can also be referred to as a leveraged buyout (LBO). LBO structure is used for acquisitions of mature companies with value creation potential and stable cash flows in order to repay the debt. Buyouts can also be conducted without private equity firms, however, literature has suggested that majority of buyouts are associated with private equity backing. Also, some confusion in the literature might arise from the 1980s leveraged buyout associations. However, these organisations are the predecessors of the current private equity firms and thus could be referred to as PE firms as well.

Within the buyout segment, there are several different classifications of buyouts. These sub-classes can be characterised as either through the driving forces behind the buyout or their vendor sources. The driving force is associated with the role of the management in the buyouts and can arise either from the inside or the outside. The insider buyouts, also known as management buyouts (MBOs), occur when the incumbent management acquires their company along with a private equity firm. The outsider buyouts, also known as management buyins (MBIs), on the other hand have private equity firms which impose a new management for their recently acquired company. Buyouts can also be classified through their vendor source; public-to-private (PTP) where a publicly listed company is taken private, divisional buyouts where a division of a larger company is acquired by a PE firm, private-to-private buyouts, family business buyouts, public sector buyouts as well as secondary buyouts where a private equity firm acquires a buyout company from another PE firm i.e. a second round buyout. Figure 3 shows the distribution of LBOs made from 1980 to 2008 in the sample of Axelson et al. (2010). Although the sample size is limited, the figure shows an approximation of deal type distribution, where public-to-private deals lead both in quantity in the number of deals made as well as the median enterprise value. However, the result might be biased as public-to-private deals have higher availability of data than private companies.

Figure 3 - The distribution of LBOs by vendor source from 1980 to 2008 in the World

The figure represents the distribution of LBOs by vendor source by number of acquisitions made and their median enterprise value in USD millions from 1980 to 2008 in the World. The sample contains only acquisitions which have disclosed their enterprise value within the sample of Axelson et al. (2010).



Source: Adapted from Axelson et al. (2010)

In this thesis I will use buyout, leveraged buyout and private equity backed buyout interchangeably as these terms are commonly used as substitutes in the literature and by industry practitioners.

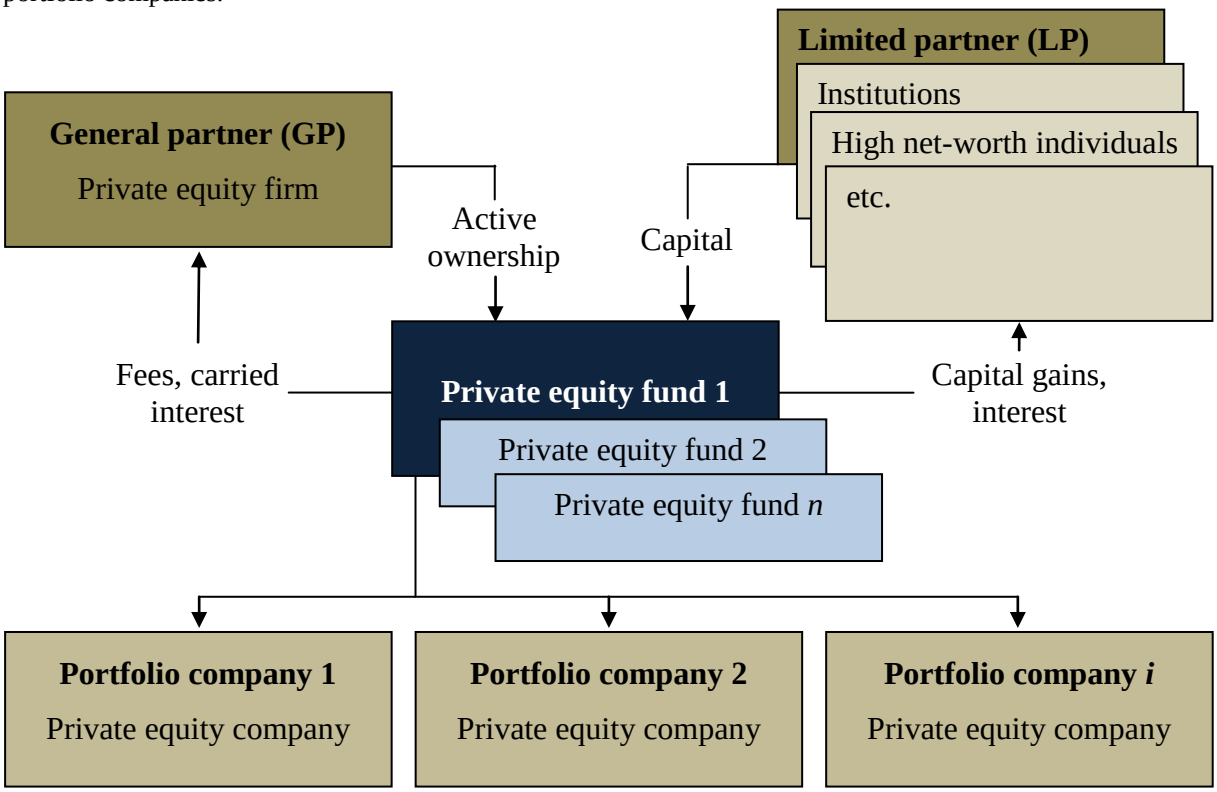
2.2 Structure of the private equity model

The typical private equity model is organised as closed-end fund limited partnerships where general partners (GPs) i.e. private equity firms, provide a minority share of equity and manage the funds and the funds' portfolio companies. Limited partners (LPs) on the other hand provide the majority of equity capital for these funds and are entitled also for the majority of the returns. Figure 4 provides an illustration of the PE structure.

In this thesis I refer to general partner as private equity firm and use them interchangeably as it is the case with portfolio company, private equity company and a buyout company. These terms are agreed among industry practitioners and in academic literature. Next, I will define main components of the model and discuss each in greater detail.

Figure 4 - The private equity model structure

A typical private equity model is structured as illustrated below. General partner (GP) i.e. a private equity firm manages *n* number of funds where in each fund a number of limited partners (LPs) provide majority of equity capital. This equity capital is pooled in a fund which in turn acquires with leverage *i* number of companies i.e. portfolio companies.



Source: Adapted from Gilligan and Wright (2008)

2.2.1 Private equity firm

Private equity firms provide investment management services where they set up a fund and gather investments from a variety of sources, however, mainly from large investors. This equity capital is then leveraged to boost the fund's investment potential. PE firms actively identify targets, invest in companies typically called portfolio companies and manage these companies to drive value generation until the exit. PE firms thus aim at maximising the investors' returns through active management. In return of these services PE firms receive a number of fees which are discussed in more detail in a later section.

2.2.2 Private equity fund

Private equity funds are closed-end funds with finite lives. This means that the investors who commits to a fund cannot draw their funds out until the fund has reached its end. Funds have clear targets as in investment strategy and focus as well as the size of the fund itself. Along with raising a sufficient amount of equity capital from LPs and before the first portfolio company investment, the parties agree on the contract's covenants. These covenants define clear boundaries for the GPs in terms of investment target characteristics, GP compensation,

the amount of capital per investment, the degree of leverage, types of securities used in the acquisitions, collaboration with other PE firms as well as re-investments if the first portfolio companies are exited early. This process of gathering the required amount of capital may take up to a year.

Metric and Yasuda (2010) suggest that a typical PE fund's life time is 10 years, in other words that the LPs must commit to illiquidity of their capital for up to 10 years. The lifetime of a fund can be divided roughly into two stages: investment stage and harvesting and growth stage. During the investment stage the PE firms actively identify a large quantity of prospective targets before committing to roughly 15 to 25 portfolio companies. PE firms do not require the LPs to transfer their committed capital when the fund is raised but rather the GPs draw down capital as investments are made. This characteristic separates PE funds from similar asset classes such as hedge or mutual funds. Drawdowns mitigate the long-term illiquidity of the investments and provide the LPs to seek for return from alternative sources in the mean time.

The remaining five years is known as harvesting and growth stage where a PE firm actively monitors and manages the portfolio companies, provides follow-on investments and prepares the companies for a successful exit. GP and LP contracts may also have a clause which allows the extension of harvesting stage in cases which may provide a more lucrative return if exited in a later time. Metric and Yasuda (2011) screen a number of previous studies and find median holding periods from four to nine years, depending on the study.

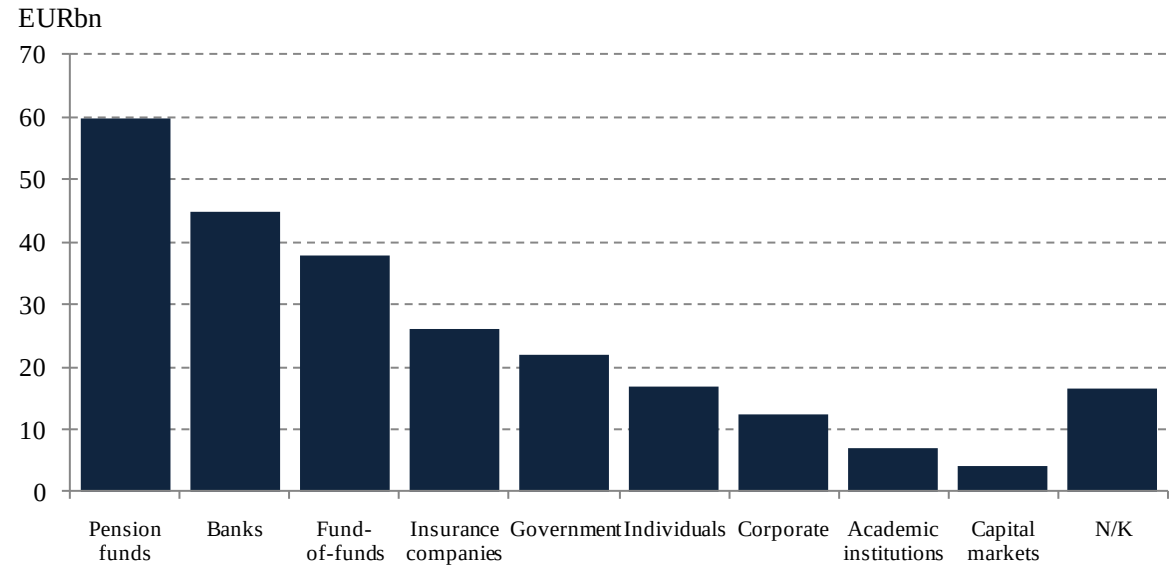
Academic literature has found persistence in the positive performance of PE firms' funds. Successful PE firms thus raise new funds within three to five years after the inception of the previous fund. (Metric and Yasuda, 2010). The year of the fund's inception is called the vintage year and the number of PE firms' funds is referred to as the fund's sequence number. These numbers can be used to determine the maturity of the fund as well as PE experience, as the number of funds raised by a PE implies successful investment history and thus is a commonly used proxy for the experience.

2.2.3 Limited partner

Roughly all private equity funds are organised as limited partnerships in which the LPs commit substantial amounts of equity capital to these funds, to be drawn down upon investing. Unlike the majority of other investment fund types where even households can

invest e.g. a typical open-end mutual fund, PE funds accept only certain types of investors. Figure 5 provides an illustration of private equity investors from 2002 to 2006.

Figure 5 - Private equity investments by investor type in 2002 to 2006



Source: Gilligan and Wright (2008)

The far largest investor type is pension funds, followed by banks and fund-of-funds. Gilligan and Wright (2008), however, point out that the investors of fund-of-funds are usually pension funds, insurance companies and high net-worth individuals thus inflating the importance of pension funds as an investor type even greater. Also, inadvertently households are PE investors although they can not invest in the funds directly.

2.3 Transaction structure and its components

Private equity transactions differ from other acquisitions by their structure, also private equity companies have capital structures that are unique only to these companies. This Section first presents the typical transaction structure and later moves on to the discussion of capital structures in PE deals.

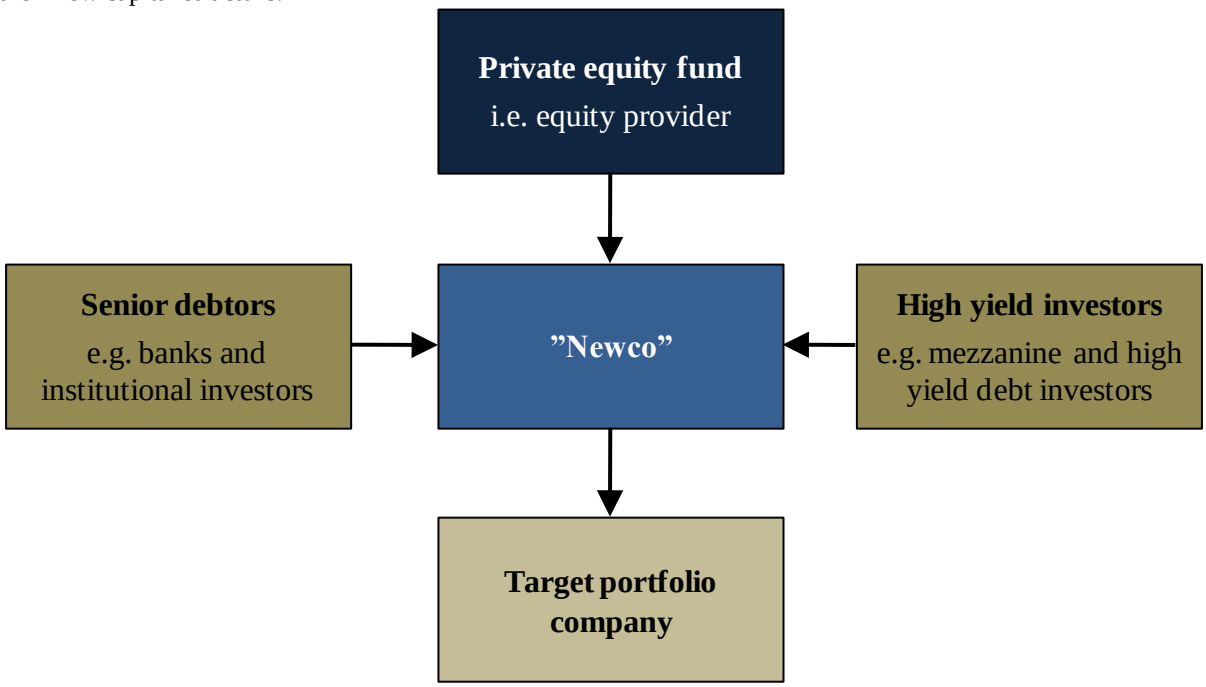
2.3.1 Private equity transaction structure

Private equity transactions involve a creation of an acquisition vehicle called “Newco”. This vehicle is a shell company with nominal capital and assigned temporary directors, designed only to facilitate the transaction. Both senior debt and sub-ordinate debt are raised directly to the Newco from variety of investors, backed by the assets of the target company. Banks and institutions are usually senior debtors whereas sub-ordinate classes are held by higher-yield investors such as hedge funds and mezzanine investors. The debt is contingent on a successful completion of the deal and not issued in the case of a failed transaction. Private equity deals

are typically highly levered and thus the success of the deal depends highly on the amount and conditions of debt raised. The remainder, minority portion, of capital is provided by the acquiring private equity fund in the form of equity. In the case of an unsuccessful deal, as said, the debt is never issued and as a result the Newco is disbanded. On the other hand, after a successful transaction the Newco is merged with the target company to form a new portfolio company with a new capital structure. Figure 6 illustrates this structure in a graphical form.

Figure 6 - Private equity transaction structure

Private equity transactions are conducted by forming a shell company called "Newco". This company holds temporary directors and raises the debt capital from variety of sources. The debt is contingent on a successful transaction thus not issued in case of a failed deal. Equity capital is provided by the private equity fund. To form the portfolio company after a successful acquisition, "Newco" is merged with the target company along with their new capital structure.



2.3.2 Capital structure in private equity transactions

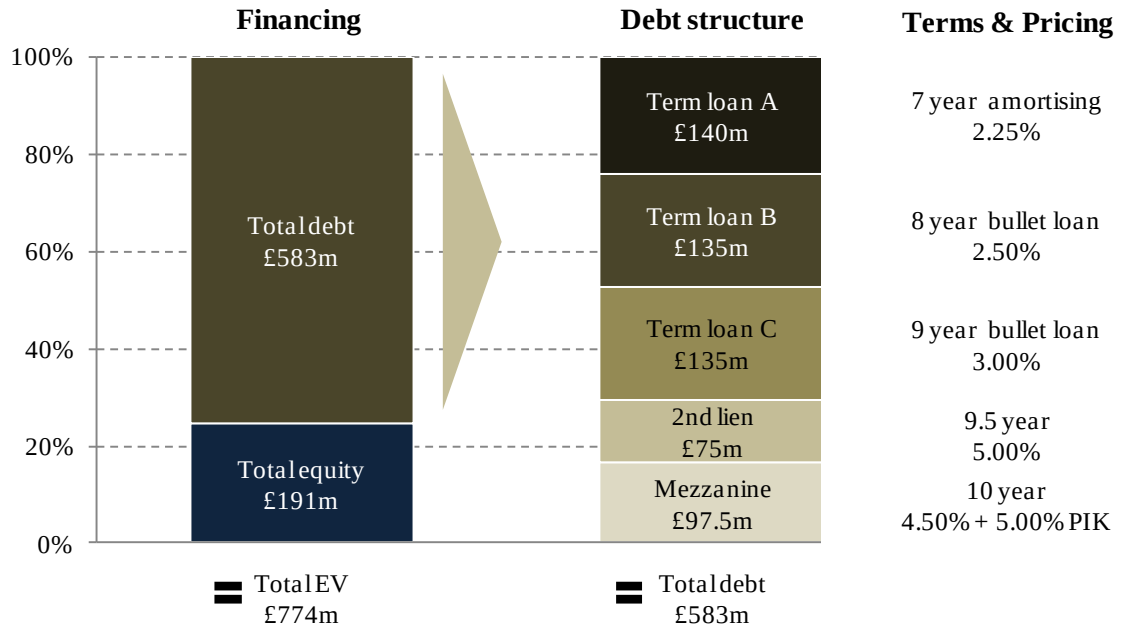
The previous sections have discussed in great detail about the equity investors and fund managers, limited partners and general partners, respectively. However, equally as important investor group are the creditors who provide secured senior debt as well as unsecured higher-yield financing.

The senior debt is typically provided by a group of creditors such as banks and institutional investors, divided to number of different tranches to cater for individual investor preferences and private equity needs. Such loan structure with a group of lenders is usually referred to as a syndicated loan. The tranches in a typical PE transaction are divided into Term loan A which is amortising debt held by a bank where as Term loan B, C and so forth are bullet loans that

are either securitised or sold to institutional investors. Further debt classes include several layers of sub-ordinated debt including 2nd lien debt, mezzanine and corporate bonds. Each layer has different credit terms reflecting their security and seniority. In addition to above, PE firms have a wide variety of contingent debt which may include e.g. revolving credit, capital expenditure facilities as well as acquisition lines of credit. The contingent debt is not necessarily drawn with other classes of debt, but instead drawn as needed depending on the type of the contingent debt. Figure 7 shows an illustration of a typical capital structure of private equity backed buyout in mid 2000s.

Figure 7 - A typical capital structure in a private equity buyout in mid 2000s

The figure represents the capital structure of a buyout of Kwik-Fit in 2005 which had a typical capital structure for buyouts during mid the 2000s. The deal had a total enterprise value (EV) of £774 million which was financed by roughly 75 percent of debt and 25 percent of equity. The debt component can be divided into several tranches, in this case three layers of senior debt (Term loans A through C) and two layers of junior debt in the form of 2nd lien and mezzanine. Pricing of the debt is shown relative to the London Inter-bank Offered Rate (LIBOR) and mezzanine debt's return is divided into two components: cash interest and payments-in-kind (PIK).



Source: Adapted from Axelson et al. (2010) and Jääskeläinen (2011)

Axelson et al. (2010) suggest that the capital structures of private equity transactions are more complicated than academic literature imply. Also, the authors report that debt structure is typically standardised and as an example for a typical debt structure in mid 2000s they provide statistics of a buyout of a U.K. tire and exhaust-fitting company Kwik-Fit in 2005. The deal, carried by a PE house PAI, was financed with roughly 75 percent of debt and 25 percent equity totalling to an enterprise value of £ 773.5 million. The senior debt comprised of three layers, where Term loan A was a seven year amortising loan with 2.25 percent spread

over LIBOR whereas layers B and C were bullet loans[2] maturing in eight and nine years with 2.5 percent and 3.0 percent LIBOR spread, respectively. In the junior debt category the company had a 9.5 year 2nd lien debt with 5.0 percent spread which was senior to a 10 year mezzanine loan. Return of the mezzanine loan was split in two components, 4.5 percent cash interest and a 5.0 percent payments-in-kind (PIK), where the holders are issued additional notes of 5.0 percent on the value of the outstanding debt. In addition to these, Kwik-Fit had a senior £40m revolving credit line and a £50m capital expenditure facility, both maturing in seven years with a 2.25 percent spread.

The level of leverage in PE deals has varied over time. Axelson et al. (2010) find significant cyclicality in the use of leverage depending on the prevailing market conditions in their sample containing private equity buyouts from 1980 to 2008. The authors report three peaks of high leverage use, in late 1980s, late 1990s and in 2006-2007 with corresponding drops in the leverage levels a few years post peaks. The authors also find similar cyclicality in the debt structure where the periods of high leverage are associated with longer maturities and smaller Term loan A layer i.e. the most senior and thus the most secure. Therefore, the high leverage levels are possible to obtain by increasing the amount of higher risk-higher yield debt. The authors conclude that based on their findings the determinants that drive public firms' debt usage are different to those of PE backed companies. PE backed companies' use of leverage is found to correlate the most with macro-economic conditions that allow PE firms to benefit from mispricing of debt and equity. Similar findings are provided by Kaplan and Stein (1993), Guo et al. (2007), Ljunqvist et al. (2007), Axelson et al. (2009b) and Kaplan and Strömberg (2009). Cyclicality and mispricing are discussed in more detail in Section 3.3.3.

2.4 General partner compensation

The compensation structure of general partners is based on management and performance of a pool of funds rather than a single deal. According to Axelson et al. (2009a) compensation is balanced to mitigate the risks of excessive risk taking as well as the obligation to pay the private equity firms for their performance. Therefore, GP compensation is divided into fixed and variable components which terms are agreed on the limited partnership contracts. In addition to these, GPs can receive other fees that may be significant in the total returns and are not allocated to either of these components.

[2] Bullet loan's principal is paid full at maturity and has no repayments in the course of its life time unlike an amortising loan.

Before introducing these components in detail, I must define a few terms that are needed to explain the structure. *Committed capital* is the amount that a LP has promised to invest in a PE fund. As discussed previously, *drawdowns* occur when a PE firm makes an investment in a portfolio company and thus requires the LPs to invest a part of their committed capital. A part of the committed capital is used to pay for the fees of general partners and therefore Metric and Yasuda (2010) make a distinction between *investment capital* and *lifetime fees* where investment capital refers to the portion of committed capital that may be invested in portfolio companies whereas lifetime fees refer to the portion that are used to pay the GP fees. Also, *invested capital* is the share of investment capital that has been invested whereas *net invested capital* is the difference between invested capital and value of exited investments and the associated costs.

2.4.1 Fixed component (management fee)

The fixed component consists of management fees which account around 1-1.5 percent of committed capital for larger funds and 2 percent for smaller funds (Gilligan and Wright, 2008). Management fees were originally created to pay for general partner's operating costs associated with salaries of the fund managers and other employees as well as other costs that were needed to manage the fund. Excess fees are allocated in new recruitments and other improvements in the business to enable PE firm's growth. To balance the incentive structure of general partners and limit excess management fees, four different approaches for setting up the management fee structure have been introduced in the private equity industry.

First, historically the most popular method has been to calculate the fee as constant percentage of committed capital. This method, however, creates incentives for the GP to inflate the size of the fund as it would result in greater amount of fees in absolute terms. Second, a recently popular method has been a decreasing fee schedule where the percentage of committed capital decreases after the investment phase. Third, a two phase rate that is constant and based on committed capital the first five years and constant and based on net invested capital for the last five years. The final method utilises both the second and the third method, where the rate is both decreasing and changes from committed capital to net invested capital during the fund's lifetime. Metric and Yasuda (2010) provide statistics on the issue and conclude based on their sample that a median level of lifetime fees is roughly 12 percent of committed capital.

2.4.2 Variable components (carried interest)

Management fees are fixed and thus LPs are obligated to pay the fees even for non-performing GPs. The variable component on the other hand is totally dependent on the success and performance of the fund. This component is known as carried interest. Gilligan and Wright (2008) estimate that on average carried interest generates roughly 30 percent of the GPs' total compensation although there is great variance around the average. The typical carried interest compensation is structured in a way that after the private equity fund has reached a certain return level for their limited partners, called the hurdle rate, the general partners will receive a 20 percent share of the excess returns.

Calculation of carried interest requires four components: carry level, carry basis, carry hurdle (hurdle rate) and carry timing. *Carry level* is the share of excess profits that are attributable to the GP, typically 20 percent as discussed above. *Carry basis* defines the basis on which the profits are calculated. The basis can be either equal to committed capital or to investment capital. Metric and Yasuda (2010) find that 93.6 percent of buyout fund use committed capital as their carry basis. *Carry hurdle (hurdle rate)* refers to the size of return that a LP must receive before a GP may receive their share of the excess returns over that particular return. The hurdle rate is typically based on committed capital as it mitigates the risk of PE firms to inflate the size of the fund beyond their manageable limits as the hurdle rate on funds that not have been invested reduces GP's carried interest. Metric and Yasuda (2010) report that the virtually all funds have a hurdle rate in the range of 6-10 percent. *Carry timing* defines the timing of the carried interest payments. Carry timing can allow GPs to collect some variable fee earlier than suggested with carry hurdle. This allows GPs to receive compensation for successful and early exits of their portfolio companies.

2.4.3 Other fees

Other fees beside management fees and carried interest, include transaction and monitoring fees. Transaction fee is similar to the fee that investment banks charge for their services in transactions. PE firms thus include a fee in the purchase price whenever they buy or sell a company. A majority of limited partners require GPs to share these fees where according to Metric and Yasuda (2010) 33 percent of LPs demand all transaction fees, 41 percent demand only 50 percent and the remaining LPs have arrangements somewhere between 50 and 100 percent.

Monitoring fee is charged by GPs from their portfolio companies in return for their services in improving the companies. Similarly, monitoring fee is also typically shared with limited

partners, limited partners having 80 percent of the fees and private equity firms having the remaining 20 percent. Metric and Yasuda (2010) report that yearly monitoring fees are in the range of 1-5 percent of EBITDA and smaller companies are charged higher percentages. The authors continue in their study in 2011 that these other fees are not widely studied but conclude that during the latest wave they accounted for a significant part in general partner compensation and especially for larger funds.

2.4.4 Limited partner return

The evidence at best is mixed whether limited partners investing in private equity funds receive abnormal returns compared to investing in other asset classes or whether the LPs receive returns at all net-of-fees. Kaplan and Schoar (2005) and Ljungqvist and Richardson (2003) suggest that net-of-fees PE funds return roughly equal return than S&P 500 during the same time frame and net-of-fee IRR is 5.7 percent higher for PE funds than a simulated investment in S&P 500, respectively. An example that contradicts the findings of the authors above is the acquisition of RJR Nabisco by KKR in 1988, where KKR paid a premium of roughly USD 10 billion to the former shareholders and managed to receive only a low return for the deal, thus resulting in even lower returns for their limited partners after the fees.

Metric and Yasuda (2010, 2011) find that the fees amount to USD 19 in present value for USD 100 of capital invested in a median PE fund. The authors conclude that net-of-fees, return for LPs will be lower than the return on the PE fund's investments. Also, the authors study GP compensation through sensitivity analysis and find that the fee structure is less sensitive to performance and is disproportionately large when the use of leverage reaches high levels. Although the current compensation structures are designed to mitigate the incentive problems of GPs and align the compensation with performance, it remains inconclusive that are the PE firms creating value for limited partners or do they capture most of the benefits to themselves.

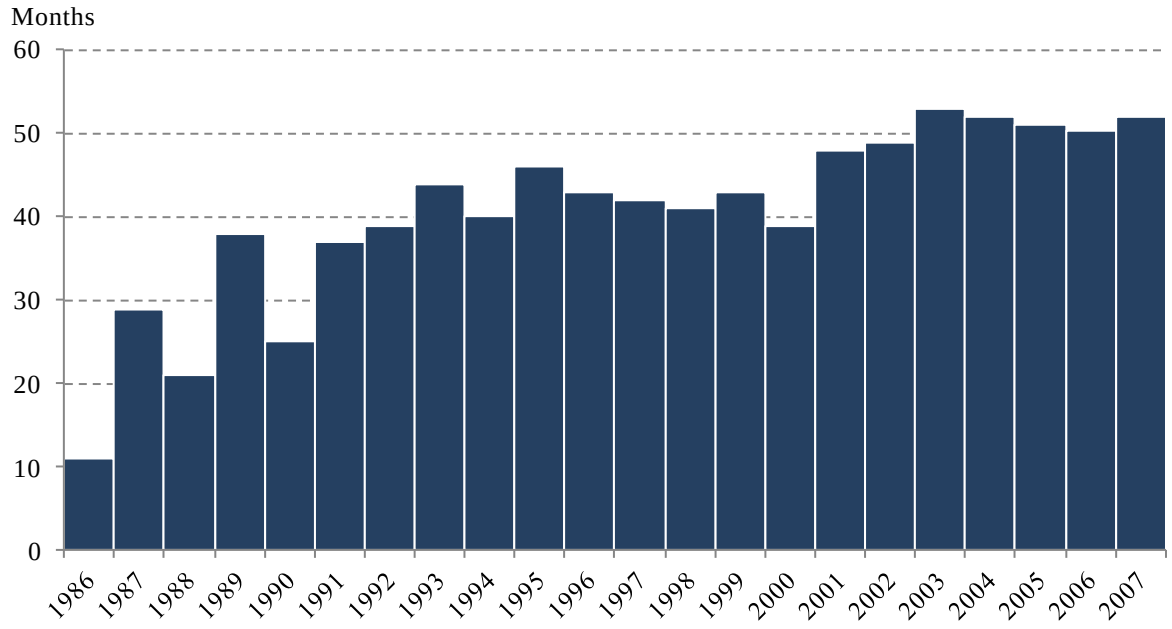
2.5 Exit of the investments

Private equity returns depend heavily on the value of companies at the time of exit. Returns are generated also through capital gains during the holding period, however, these cash flows represent the minority in returns. This distinction separates private equity from large corporations' strategic acquisitions which aim at synergy benefits and not exiting. Historically, PEs had three main exit channels: (1) sale of the company to a corporation i.e. a trade sale, (2) initial public offering (IPO) or (3) receivership and liquidation in case of a bankruptcy. Gilligan and Wright (2008) identify three alternative exit methods that have

emerged during the past decade: (4) a sale of the company to another PE fund i.e. a secondary buyout, (5) leveraged recapitalisation and (6) sale of investment portfolios to other financial institutions. Among these six methods of exit trade sale is identified to be the most typical.

The industry practitioners typically aim at a range from three to five years for an exit. In the academic literature there is evidence of wide variation in the holding periods which also vary through time. The evidence, however, does not support the claim that private equity firms would engage in "flip transactions" where the PE firms buy and sell companies in a short period of time for quick gains. On average, the evidence shows that larger deals tend to be exited within a shorter period than smaller deals. Wright et al. (2009) find that the most common range for time to exit was between four to five years for the deals exited before mid 2007. Figure 8 shows the average time to exit in private equity deals for buyouts of over £10 million. Gilligan and Wright (2008) find based on the data that time to exit has encountered an increasing trend over the years, the most current observation being around four years.

Figure 8 - Average time to exit in PE buyouts of over £10 million by year of exit



Source: Adapted from Gilligan and Wright (2008)

There has also been criticism towards private equity that the value is captured in the short term by the firms thus the portfolio companies' performance will deteriorate in the long term after the exit. The academic literature has reported changes in the companies to be present after the exit and the evidence somewhat support the criticism. Burton et al. (2002) find that agency problems do re-emerge after the exit, however, the change took several years become significant. Discussion on accounting performance is provided by Wright et al. (2009) who

suggest that pre-IPO portfolio companies' performance is significantly higher than that of their same sector buyout companies. The authors continue that the abnormal performance remains to be high after the exit but declines after four years. Cao and Lerner (2009) share similar findings as the authors provide evidence of higher or equal performance of buyouts that have gone through an IPO than other IPOs during the same period. However, the authors also report deterioration in returns over time.

3. Literature review (theoretical background)

In the wake of the first buyout wave Jensen (1989) suggested that leveraged buyout organisations, or later known as private equity backed buyouts, would displace the typical public corporations as the dominant organisational form of companies. The reasoning behind his suggestion leaned on nature of the typical public corporations with dispersed ownership, weak corporate governance and low leverage. These could be improved through PE firms' concentrated ownership, performance-based management incentives and higher leverage which would then show up as active corporate governance and more efficient organisations with reduced cost burden.

The growth of PE backed buyouts, especially during the second wave, has been accompanied by increased criticism. The arguments against PE buyouts have been made about negative effects on employment and remuneration, asset stripping, asset flipping[3] as well as tax aversion by using leverage and offshore holding accounts. Cumming et al. (2007), however, conclude that the literature suggest PE buyouts to "enhance performance and have a salient effect on work practices" across different time periods, measures and methodologies.

The following sections study in greater detail the theories and empirical evidence of the determinants of private equity performance as identified by Kaplan and Strömberg (2009) as well as alternative theories behind the abnormal performance of PE buyouts.

3.1 Three determinants of private equity performance

Kaplan and Strömberg (2009) identify three determinants of private equity performance through which the PE firms influence their buyout companies and create value: governance, financial and operational engineering.

The first wave of buyouts in the 1980s was associated mainly with governance and financial engineering. Value creation was sought through active ownership and increased tax benefits created by higher levels of leverage. Since the 1980s the buyout environment has changed

[3] Making profit through reselling of the target company's assets shortly after the buyout

significantly. Increased competition for deals across PE firms and the development of deal auctions have limited opportunities in mispricing, corporate governance has become more active in general and the leverage levels of buyouts more conservative. These changes have driven the PE firms to seek out alternative sources of value creation which has given way to the growth of operational engineering, referring to PE firms' operating and industry expertise through which they improve create value for their buyout companies.

3.1.1 Governance engineering

In Jensen's (1986, 1989) free cash flow theory, leveraged buyouts (private equity firms) create value of their target companies by enhancing governance, thus mitigating agency problems of the management and resulting in more efficient operations. Cumming et al. (2007) review much of this literature and conclude private equity transactions to use governance mechanisms that improve the target companies' performance. Leslie and Oyer (2009) emphasised three governance mechanisms that PE firms actively use in their value creation process: higher leverage ratios that drive discipline in managers, restructuring the board and management and managerial incentives. Table 2 introduces a summary of findings of recent studies relating to governance aspects of private equity transactions.

Table 2 – Recent empirical evidence of governance in private equity deals

Authors	Study sample	Findings
Cotter and Peck 2001	64 LBOs in U.S. from1984 to 1989	PE's majority stake in equity associated with less leverage. PEs are better represented in smaller boards suggesting active ownership and monitoring. Authors suggest that active monitoring by a PE substitutes tighter debt terms in monitoring and motivating management.
Heel and Kehoe 2005	60 exited deals from 11 leading private equity firms	In the top third best performing deals management team changed or strengthened in 83 percent of deals whereas the corresponding figure for worst performing third is 33 percent. Successful PE firms have management incentive plans in the range of 15-20 percent of total equity as well as require CEO to invest personally in the company. In the top third of deals PE firms spent more than half of their time on the company during the first 100 days, meeting the management almost daily whereas in the worst performing deals the corresponding figure was 20 percent.
Nikoskelainen and Wright 2007	321 exited buyouts in U.K. from 1995 to 2004	Management equity is a significant factor, among other corporate governance mechanisms, in determining returns for LBOs and context-dependent especially in relation to the size of the buyout
Acharya and Kehoe 2008	59 large buyouts in U.K. from 1991 to 2004	Median CEO ownership is 3 percent while the management team as a whole has 15 percent of the equity. PE buyout companies have 12 formal meetings per year in addition to several informal contacts. One-third of CEOs of PE buyout companies are replaced within the first 100

		days and the two-thirds are replaced during a four year period.
Kaplan and Strömberg 2009	43 LBOs in U.S. from 1996 to 2004	Median CEO equity ownership is 5.4 percent (stock and options) and the management team as a whole has 16 percent of the equity.
Leslie and Oyer 2009	144 reverse LBOs in U.S. from 1996 to 2006	Private equity backed companies have much higher equity incentives for top executives but lower salaries than similar public companies
Cornelli and Karakas 2011	142 PTP deals in U.K. from 1998 to 2003	After taking a company private the board size decreases and its composition undergoes significant changes. Private equity firms are involved in boards only if their expertise is most needed e.g. not in cases where the value gains are primarily driven by financial engineering. Higher PE involvement decreases CEO turnover.
Gong and Wu 2011	126 LBOs in U.S. from 1990 to 2006	CEO turnover of 51 percent within two years after the buyout. CEOs replaced in companies with high agency costs characterised as low leverage and high level of undistributed free cash flow. Entrenched CEOs and underperforming CEOs measured as low return on assets are also more likely to be replaced.

Debt discipline

One of the central elements of reducing the agency costs Jensen (1986, 1989) argued to be increased level of leverage. He suggested that debt could reduce the costs by substituting dividends and creating an obligation to periodically serve the interest and repayments as failure to do so would cause the company to be bankrupt. With high levels of leverage, considerable proportion of the free cash flow would have to be allocated to service the debt, which in turn would reduce the misallocation of free cash flow to unproductive investments or non-payments to shareholders. The threat of insolvency through higher debt levels would act as an incentive for the company to operate more efficiently.

Jensen (1986, 1989) also suggested that equity and active ownership are also key elements in reducing the agency costs. Higher debt levels enable the investors to acquire a controlling stake of the equity which otherwise would not be possible. The majority stake allows the investors to actively monitor and control the target company through a board presence further reducing the agency costs.

Building on this, Cotter and Peck (2001) continued with their study of the relationship between incentives created by debt levels and active ownership. The authors find LBO deals to be less levered with short-term and/or senior debt when the private equity firms have majority control of the target company's equity. The majority stake enables the PE firms to have greater representation on smaller boards which is also associated with active monitoring

of managers. For such transactions, higher levels of leverage do not seem to significantly increase the target company's performance. However, in all other cases e.g. where PE firms are not actively monitoring the using high leverage does significantly increase the target company's performance. The findings and the authors thus suggest that active involvement and ownership of PE firms work as a substitute for the monitoring and motivating gains achieved through high debt levels. Therefore, PE transactions are able to create value through improved governance and not only mainly through benefits of leverage as it was the case in the first wave of buyouts in 1980s.

Governance engineering

In addition to creating incentives for management through leverage and active ownership, the agency costs may be reduced through governance engineering by restructuring the board of directors and the management. The literature suggest that private equity firms frequently change the composition and size of the management and the board as well as engage in active monitoring through board seats.

Cornelli and Karakas (2011) concentrate on the role and changes of boards when a public company is taken private. The authors' findings suggest significant changes in the composition and structure of the board. They also probe further into the effects of these changes. First, the board size decreases and the representation of outside directors are limited as PE firm's representatives take over the board seats. The number of representatives and PE firm involvement is more pronounced in difficult deals.[4] Second, the authors find evidence of PEs being able to give a longer horizon to management. The target companies experience higher CEO turnover in difficult deals, however, a higher number of PE board seats does not seem to increase the turnover. Third, consistent with Cotter and Peck (2001), the authors find a negative correlation between leverage and PE firm presence in a board. Therefore, deals motivated by financial engineering and not by company restructuring require less attention from PE firms.

Gong and Wu (2011) provide evidence of PE firms using effective governance mechanisms to improve the target company. The authors concentrate on studying the turnover of entrenched CEOs or CEOs causing agency problems. They find a CEO turnover rate of 51 percent within two years of a transaction. CEOs are replaced in companies experiencing high agency costs characterised as low leverage and high levels of undistributed free cash flow. PE firms

[4] Difficult deals are defined by authors as transactions where private equity firms' involvement and expertise are especially needed.

controlled boards tend to replace non-performing CEOs, measured by pre-deal return on assets. In contrast to public companies, PE backed companies are more likely to replace entrenched CEOs. Acharya and Kehoe (2008) continue on these lines to conclude that PEs are not hesitant to replace non-performing management and actually one-third of CEOs are replaced within the first 100 days whereas the remaining two-thirds are replaced within four years of the buyout date.

More evidence on the relationship between management changes and performance is provided by Berg and Gottschalg (2005) who argue for the benefits to be gained in operational efficiency by replacing non-performing management. Heel and Kehoe (2005) build on their argument with statistics on 60 transactions by 11 leading private equity firms. They find that in the best performing third of the deals management is changed or strengthened in 83 percent of transactions whereas only in 33 percent of transactions experience management changes in the worst performing third. The authors find two other major factors influencing the company's performance: active management and management incentives. They approach active management by studying the number of days that PE firms' representatives spend with the target company's management during the crucial first 100 days after the transaction. In the top third the representatives spend more than half of their time with the company's management and meet almost daily whereas the corresponding figure for the worst third was 20 percent. Management incentives also play a key role in company performance. Successful deals have usually incentive systems totalling roughly 15 to 20 percent of the total equity where the leading PE firms usually require the CEO to invest personally in the company.

Management incentives

Management incentives are provided not only through salaries but more effectively through equity stakes given by a PE firm to the target company's management. Evidence on the topic suggests that incentives in general and especially the size have a considerable impact on company performance. Some PE firms have also found management's investments in the company to drive greater performance thus requiring management to acquire a stake of the equity. This investment allows the management to have a position to capture the benefits of success but on contrary to also have a significant downside in case of non-performance. The nature of management equity in private companies is illiquid, therefore the possible benefits through an equity stake are not realised before a successful exit. The nature itself thus reduces agency problems especially in the case of manipulating short-term performance.

Wright et al. (2008) suggest in their comprehensive literature review that management's equity incentives may have a substantial influence on company performance, however, the transaction price of the buyout could have a significant impact on the size of their stake. PE firms' target return is highly sensitive to the price paid, the amount of debt raised and thus the share of equity they can obtain. Therefore, a higher transaction price or less external funding may both leave less room for management to receive an equity stake as PE firms would require a larger equity stake to obtain their target return.

The actual size of management incentives in buyouts are studied by Acharya and Kehoe (2008) and Kaplan and Strömberg (2009) with similar data samples for U.K. from 1997 to 2004 and for U.S. from 1996 to 2004, respectively. Acharya and Kehoe (2008) find a median CEO equity stake of three percent whereas the median management team as a whole receives 15 percent of the company equity. Kaplan and Strömberg (2009) report similar findings with a median CEO stake of 5.4 percent and a median management team stake of 16 percent. The findings are consistent with the first wave of buyouts in the 1980s studied by Kaplan (1989b), he found an increase in management equity stake by a factor of four when taking a company private. Kaplan and Strömberg (2009) continue that even though a wider variety of management incentives are used today than in the 1980s, managers in leveraged buyouts still enjoy greater upside trough equity stakes than managers in public companies.

The impact of corporate governance on PE returns is studied by Nikoskelainen and Wright (2007). The specific factors which create value in buyouts differ with the characteristics of target companies i.e. MBI, MBO, size, ownership, leverage etc. Therefore, the authors report that corporate governance engineering does not drive performance in all deals. However, management's equity ownership is significant in determining returns in larger buyouts. The authors thus conclude that the value creation and returns are generated with interrelated governance mechanisms which all are context dependent in relation to characteristics of the company and the buyout.

Conflicting evidence on the relationship of management incentives and performance is provided by Leslie and Oyer (2009) who report that PE backed buyouts do not have any considerable advantage over non-PE backed companies in terms of operational efficiency e.g. ROA, operating income or headcount. However, the authors find that PE buyout companies have much higher management incentives comparable public companies. They provide further insights in this area through three main observations. First, buyout company management enjoys on average an equity stake of almost twice as large as comparable

companies' management which amounts to 2.3 percent equity ownership. Second, buyout company management has on average 11.7 percent lower salary than comparable management, which a considerable part can be explained with smaller size of buyout companies. Third, buyout company management has on average 12.5 percent higher variable pay share. The result thus suggest that management compensation does not drive abnormal operational performance in buyouts over peer companies even though the management has much stronger incentives.

3.1.2 Financial engineering

Jensen (1986, 1989) suggested that PE firms employ corporate governance mechanisms in their buyout companies to reduce agency costs which in turn increase the value of the company by operating more efficiently. The mechanisms are two-fold e.g. a carrot and a stick. First, PE firms improve incentives for management to work harder by involving them as equity owners of the buyout company, as discussed in greater detail in section 3.1.1. Governance engineering. These incentives act as a carrot to boost the potential upside at the time of time of an exit. Second, PE firms will lever the buyout companies creating a heavy debt burden. High leverage levels will force the management to operate the company more efficiently as a failure to do so would result in a bankruptcy and thus losing their jobs and realising the downside in their equity stakes, hence the stick.

The free cash flow problem will be alleviated or eliminated as higher leverage accompanied by higher interest costs and repayments will decrease the cash at disposal of managers, thus the management could not as easily engage in non-value maximising investments. Also, the risk of bankruptcy increases with the level of leverage, forcing the managers to act in the best interest of the company and to make optimal investments to reduce risks involved with leverage. Higher debt levels are beneficial as long as the costs of expected financial distress do not outweigh the benefits of reduced agency costs and increased interest tax shields. The optimal capital structure is discussed by Modigliani and Miller (1958) who argue that it is achieved when the marginal benefits of leverage equal the marginal costs.

The structure of the debt affecting motivation of managers is also taken in account in Jensen's (1986) argument. He suggests that not only the higher debt level is driving management towards more efficient operations but rather the amount of the periodical payments. More pressure during the critical early stages of the buyout created by shorter maturity debt creates

stronger incentives for the management to work. Therefore, the use debt is more likely to motivate managers if a buyout is financed partly with shorter term debt.

The literature has concentrated mainly on two aspects of leverage, first, the effect of leverage on returns and second, on the factors influencing the use of leverage. The next two chapters will discuss the empirical evidence on these two topics.

The effect of leverage on company value and returns

One main source of value creation in buyouts has been identified to be interest tax shields i.e. tax deductibility of interest payments. Prior research has studied the value of these tax shields, however, the estimates have always been highly sensitive to the assumptions made with the debt structure. Evidence on the value of tax shields as well as their sensitivity to the debt structure is provided by Kaplan (1989a) who finds interest tax shield to account from four to 40 percent of company's value. Lower estimates assume a debt repayment schedule of eight years and the benefit of corporate tax deductions are offset by personal taxes whereas higher estimates assume a permanent debt without any offset of personal taxes. Kaplan and Strömberg (2009) approximate a reasonable range for tax shields in 1980s, based on the results of Kaplan (1989a), to be from 10 to 20 percent.

Guo et al. (2011) study 192 public-to-private buyouts in the U.S. completed between 1990 and 2006 finding a 33.8 percent share of returns attributable to interest tax shields, other sources of returns being mainly operational improvements and general development in industry valuation. The authors, however, point out that the estimation is made under the assumption that the companies are able to maintain the same leverage ratios after the exit and thus being overstated for e.g. distressed companies. Similar findings are presented with European data by Acharya et al. (2011) who study 395 Western European PE transactions during the years 1991 to 2007. The authors conclude that 49.7 percent of average IRR in the deals in question is generated by financial leverage, other main sources being general industry valuation development and abnormal operating performance.

The benefits of using leverage for value gains has likely decreased recently due to more strict credit terms and less external financing given by lenders. The studies presented above have data samples ending before the most recent crisis and thus still reflect the booming economy and looser credit terms. However, the most recent deals studied (prior to 2008) show already the trend towards using less leverage. According to Guo et al. (2011) the 1980s leverage ratios were as high as 90 percent whereas their study revealed more conservative, but still

high, use of leverage of 70 percent measured by total debt to capital. Lower leverage ratios in recent deals might also be due to the more conservative transactions in the terms of pricing. The authors point out that despite the trend of less risky transactions, the deals completed in 2005 and later show higher valuations followed by higher leverage and lower interest coverage ratios. It seems that although financial engineering gains may be harder to obtain than in the 1980s, it still remains as the one key factor in creating value for PE investments.

Factors behind the use of leverage

The chapter above established a relationship between value generation and leverage, but are there other factors behind the use of leverage and to explain the development during recent years. The paper of Axelson et al. (2009b) answers the question by studying 153 large buyouts from 1985 to 2006 covering both the U.S. and Europe with roughly equal sub-samples. The authors find that the factors driving leverage in buyouts are cross-sectionally unrelated to comparable peer companies and mainly driven by the cost of borrowing. The authors conclude that leverage and pricing of deals are affected by the availability of financing which has caused the private equity waves. Ljungqvist et al. (2007) report similar conclusions that low interest rates result in private equity funds to accelerate their investments.

Kaplan and Strömberg (2009) raise a question on the difference between the factors driving leverage in buyouts and public companies. Guo et al. (2011) show that in their data sample buyouts result in a median increase in leverage of 45.7 percent, suggesting roughly 50 percent difference in leverage between public and buyout companies. In their comprehensive literature review, Kaplan and Strömberg (2009) propose three explanations to this difference. First, public equity investors' pressure from worry of higher debt levels and the associated risk of bankruptcy could prevent managers from exploiting favourable debt market conditions or managers themselves do not like to carry high debt loads. Second, as repeat borrowers PE funds have been able to build a good reputation with lenders leading to better credit terms and access to credit market. Third, compensation structure (discussed in more detail in Section 2) through management fees as a percentage of total capital managed give incentives to increase leverage ratios beyond optimal levels of an individual firm. Also, good recovery rates in the case of bankruptcies might also provide incentives to increase leverage. Andrade and Kaplan (1998) conclude for defaulted LBOs in the 1980s that the companies were valued roughly the same after a rescue or sale as going concern as they were before the buyout.

3.1.3 Operational engineering

Since the 1980s, the private equity field has seen major developments. One significant development, discussed by Kaplan and Strömberg (2009), was to use one additional source for value creation, operational engineering, in addition to governance improvements and gains from leverage. The authors define operational engineering as superior knowledge on industries and operations which PE firms use to create value in their portfolio companies. This has driven PE firms to seek out talent with various backgrounds in operations, finance, industries along with professionals in organic and inorganic growth strategies (Kaplan and Strömberg 2009, Acharya et al. 2011). The success of private equity firms has transformed the competitive landscape. Today, competition between a larger number of international and local PE firms for the best deals has led to a more diligent identification of potential targets. PE firms use their expertise, investment bankers as well as consultants to identify valuable investments and to construct beforehand comprehensive development plans to assess the target company's viability as an investment.

Literature on operational efficiency gains is largely positive; Table 3 provides a short review of research made in this area. The evidence is consistent across methods, time periods and geographical locations. However, analysing the evidence one should keep in mind the two main factors that may plague the results. First, literature has shown managers to manipulate companies' earnings prior to transactions (Wu, 1997) and second, selection bias arising from non-available accounting data for private companies, especially in the U.S. where private company reporting is voluntary.

Table 3 - Recent empirical evidence on operational efficiency in private equity deals

Authors	Study sample	Findings
Kaplan 1989b	76 large PTP MBOs in the U.S. from 1980 to 1986	Operational improvements create value in LBOs. Operating income, operating margin, operating income to assets, inventory to sales and net cash flow all have significant improvements during the first three years after the buyout. However, sales development lags behind the industry peers.
Lichtenberg and Siegel 1990	12,000 manufacturing plant LBOs in the U.S. from 1983 to 1986	Manufacturing plants experiencing a LBO had higher total factor productivity (TFP) than industry peers. The abnormal performance over peers continued after the LBO exit.
Wright et al. 1997	409 buyouts in the U.K. from 1982 to 1985	Buyout companies outperform their non-buyout peers in two to five years after the buyout in terms of productivity and financial ratios.
Desbrierers and Schatt	161 MBOs in France	MBO companies' performance exceeds that of their peers before and after the buyout, however, performance of the

2002	from 1988 to 1994	buyout companies decline after the exit.
Harris et al. 2005	35,752 manufacturing plant MBOs in the U.K. from 1982 to 1998	Manufacturing plants experiencing MBOs have significant improvements in productivity after the buyout. These improvements are not limited to certain industries.
Bergström et al. 2007	73 Swedish buyouts from 1998 to 2006	Using EBITDA margin and ROIC figures as indicators of operating profitability, the authors find significant improvements in the buyout companies relative to peer companies. However, the findings do not support abnormal growth in buyout companies over their peers.
Weir et al. 2008	138 PTPs in the U.K. from 1998 to 2004	The authors find for buyout companies significant improvements in financial health relative to the year prior the buyout and relative to their peer companies. Further evidence is provided of significant improvements in working capital and liquidity. However, same improvements cannot be found for profitability.
Leslie and Oyer 2009	144 reverse LBOs in the U.S. from 1996 to 2006	Buyout companies do not outperform public peer companies in terms of profitability or operational efficiency. In the data sample sales per employee is the only measure to show positive and significant relation to PE ownership and buyout performance.
Acharya et al. 2011	395 Western European PE buyouts from 1991 to 2007	Abnormal performance of buyouts over their peers is generated through EBITDA margin and sales growth. Evidence is also provided on the influence of PE firms' partners background on performance in organic and inorganic development of the buyouts.
Guo et al. 2011	192 PTP buyouts in the U.S. from 1990 to 2006	The modest operating gains found in the study either compare to or slightly exceed those of their peer companies depending on adjustments for the measures.
Jääskeläinen 2011	144 Nordic buyouts from 2005 to 2007	Industry adjusted change in operating performance of buyout companies is significant in terms of sales growth, profitability, employment efficiency and working capital efficiency.
Lerner et al. 2011	495 PE buyouts that have at least one patent in the U.S. from 1980 to 2005	The authors study whether long term performance is sacrificed for short term gains and measure this by using patenting activity as a proxy. They find that the quantity of patenting does not change, buyout companies' patents are more cited and their portfolios become more focused as a result of PE ownership.

United States

Kaplan (1989b) found major operational improvements in his sample of companies, results being significant both absolutely and relative to industry within a time frame of three years after completing the buyout. The author, however, found buyout companies to grow slower than comparable companies although other measures were highly positive and significant e.g. mean operating margin over peers ranged from 12.4 percent to 34.8 percent and inventory levels dropped 10 percent relative to sales. The results were unchanged even after controlling for divestments suggesting MBOs to create value trough operational improvements.

Guo et al. (2011) provide an exception to the highly positive operating improvements with a recent U.S. data sample. The authors find modest operating improvements which either compare to or slightly exceed those of their comparable companies, depending on adjustments made for the measures. Only after adjusting for industry, performance and market-to-book, there is a significant increase in EBITDA to sales and net cash flow to sales from one year prior to the buyout to one or two years after. The results do not match the high gains found in the 1980s. However, the authors do find high investor returns at the company level of which they can attribute 22.9 percent to operating efficiency improvements, 17.7 percent to changes in general industry valuation and 33.8 percent to tax shields.

Leslie and Oyer (2009) study managerial incentives in reverse LBOs in the U.S., along with their findings on the main topic the authors also study operational performance in these companies. The authors' operating metrics include Return on Assets, EBITDA/Total assets, sales per employee and employees/Total assets, however, the only measure to show significant and positive development under PE ownership is sales per employee. Furthermore, the authors find that even this measure shows no difference between the buyout companies and their public equivalents.

Europe and UK

Similar positive findings for operational performance improvements are provided by Wright et al. (1996), Weir et al. (2008) and Acharya et al. (2011). Wright et al. (1996) extend the study horizon to six years post buyout shedding evidence on longer term effects of buyouts in the U.K for the first time. The authors report no short term gains from PE ownership over comparable companies. However, over years from three to five after the transaction, buyout companies seem to outperform their peer companies in terms of return on assets and profit per employee. The authors also find evidence of deteriorating performance of buyout companies in the year six. Overall, during the six years under review buyouts outperform non-buyouts on average by 9 percent measured by the authors' productivity measure.

With a more recent public-to-private deal data in the U.K. Weir et al. (2008) show significant improvements in financial health post transaction for the buyout companies both absolutely and relatively to companies remaining public. The more detailed analysis reveals significant improvements in working capital efficiency and liquidity, however, profitability significantly declining after the buyout. The authors also make a distinction between PE backed and non-PE backed buyouts and find no difference in the two types of deals in terms of financial

health. Their analysis concludes privatisation to reduce agency costs in all deals but PE companies to achieve larger gains through financial and governance engineering, though the gains are limited to the latest wave of buyouts.

Acharya et al. (2011) expand their dataset to cover Western Europe. Their findings suggest PE buyout to outperform their peers especially in terms return which is associated with greater sales growth and EBITDA margin improvement relative to the comparable companies. The abnormal performance in operating efficiency creates on average 34 percent of the average IRR for the sample of companies. Other sources of return are identified as financial engineering (50 percent) and exposure to the industry (16 percent). The authors also show evidence of general partner background to influence buyout companies' performance. They find significantly higher outperformance in organic deals or internal value creation programs if driven by general partners with operational background e.g. consulting or industry managers. The same logic applies in M&A driven deals where GPs with banking or accounting background create significantly higher outperformance.

Mitigated bias

Selection bias in operational performance studies has been a major problem in making definite conclusions on the efficiency of PE backed buyout companies. While studies made with a U.S. data are mainly concentrated around reverse LBOs, PTPs or deals with other obligations to disclose their financial statements such as public debt, some European studies have been able to mitigate this problem by taking advantage of the legislation requiring private companies to disclose their accounts. As it is with this study, Desbrierers and Schatt (2002), Bergström et al. (2007) and Jääskeläinen (2011) have been said or could be described as to have encountered only slight selection bias, mainly associated with availability of some public accounts although required by legislation to disclose.

Desbrierers and Schatt (2002) study management buyouts in France in late 1980s and early 1990s, finding evidence of buyout companies to outperform their peer companies both before and after the buyout. In contrast to studies made with U.S. or U.K. data, the authors report a declining trend in performance after an exit of the buyout. Former family businesses are identified to encounter a more severe decline in performance after an exit than divestitures of subsidiaries of Groups, former constituting a significant share of the French company universe. The conclude that buyout companies are able to deliver higher return on investors measured by EBIT to economic assets, are significantly less levered, have higher liquidity

indifferent of the measure used and are more profitable than their peer companies. The authors argue that to a major part of this outperformance can be attributable to reduced agency costs through transferring the management to experts in a particular business field.

Important contribution to Nordic as well as European PE literature is provided by Bergström et al. (2007) who study Swedish PE buyouts in late 1990s to mid 2000s. As measured by PE investments as a percentage of GDP, Sweden represents the second largest private equity market in the Europe (EVCA, 2011). The authors' evidence suggest PE companies to have a significant and positive impact on their buyout companies' operational performance in terms of EBITDA margin and return on invested capital. They report a 3.07 percent change in EBITDA margin of buyout companies over their peers. The value created by PE firms can not be attributed to transfer of wealth from employees to investors or a breach of implicit contracts facilitated by a buyout. Furthermore, the authors find no evidence that higher leverage or management ownership would be drivers in the value creation process. Their results are consistent with the literature suggesting PE firms to drive abnormal performance of their buyouts over peer companies.

Jääskeläinen (2011) extends his study to cover the Nordic countries, including Sweden, Finland, Norway and Denmark with a data sample covering deals made between 2005 to mid 2007. The author studies operational performance buyouts, however, unlike Bergström et al. (2007) and this study, the author limits his report not to take in account the determinants of this performance. The findings are consistent with general literature that PE buyouts outperform their peers in terms of employment efficiency and working capital efficiency. However, opposed to a number of studies, he finds outperformance also in sales growth and profitability. Some evidence is also provided on the differences between Nordic countries, suggesting Swedish and Norwegian buyouts to drive the whole Nordic sample operational performance.

Real effects

The study of operational performance of buyout companies has been extended to cover to real effects i.e. productivity, R&D activity and the resulting patents. On this front, this paper indentifies two studies which have had a major contribution on the study of real effects, Lichtenberg and Siegel (1990) and Harris et al. (2005) who extend the former study with a larger and more detailed data sample.

Lichtenberg and Siegel (1990) were the first to study the relationship between LBOs and MBOs and productivity. Their data sample covered over 19,000 manufacturing plants in the U.S. from 1970s to 1980s. Their findings suggest that LBO plants outperformed their industry equivalents both pre and post buyout in terms of total factor productivity (TFP) and that plants which were under a MBO showed even greater performance over their peers. The mean TFP for the whole sample over their peers increased from 2.0 percent to 8.3 percent in a three year period post buyout. The corresponding figure for MBOs increased from 4.3 percent to 10.2 percent over the same time period. The productivity improvement could not be attributed to cuts in employee remuneration, investments or the number of blue-collar employees. The authors also shed some light on the impact of buyouts on R&D which has been especially difficult to study due to data availability. The authors report that LBO companies are much less R&D intensive than other companies due to the non-R&D intensive nature of typical buyout industries and overall buyout companies' R&D expenditure is below the industry average. The results suggest, despite the lower R&D intensity of buyouts that R&D investments do not change after a buyout transaction and thus the productivity gains measured by TFP are not driven by cuts in R&D.

Along on these lines, Lerner et al (2011) study whether long term performance of PE buyouts is sacrificed for short term gains. The authors study changes in patenting activity and find no change in quantity of patents being issued for the buyout companies, however, they do find and increase in patent citations (proxy for economic importance) and that the companies' patent portfolios converge into the core areas of a particular company. Therefore, consistent with Lichtenberg and Siegel (1990), PE firms do not engage in sacrificing long term performance for short term gains by tampering with the companies' R&D activity.

Harris et al. (2005) extended the study of Lichtenberg and Siegel (2005) with a larger data sample of roughly all manufacturing plant MBOs in the U.K. from 1982 to 1998, amounting to circa 36,000 individual plants. The authors found inconsistently with Lichtenberg and Siegel (1990) that the MBO plants were less productive than their industry equivalents, 1.6 percent and 2.0 percent less efficient before the buyout in the short term and in the long term, respectively. However, the authors did find significant increases in TFP in the short term and in the long term after the buyout, 70.5 percent and 90.3 percent, respectively. Furthermore, these productivity improvements were not limited to particular industries. The results suggest that the efficiency improvement were a result of new management or owners who reduced the

labour intensity of production increasing outsourcing in the manufacturing process and that the MBOs are an effective way to achieve these gains.

3.2 Abnormal benefits created by specialisation gains

The current literature, public press as well as industry reports all support the fact that private equity firms drive towards concentrating their investing activities around certain industries or development and investment stages (here forth stages) to accumulate and utilise their expertise to achieve competitive advantage over other investors. (The Economist, 2004; EVCA, 2005) Table 4 provides a short summary of literature on the relationship between specialisation and PE performance.

Table 4 - Recent empirical evidence on specialisation gains in private equity deals

Authors	Study sample	Findings
Norton and Tenenbaum 1993	A survey of 98 venture capitalists being members of National Venture Capital Association in 1990	The authors conclude that specialisation in a particular investment stage or in connected stages as well as specialisation in a limited number of industries or companies will enable the VCs to better control risk of their investments due to gains in information sharing.
Maningart et al. 2002	A survey of 200 VC companies in the U.S., U.K., France, Belgium and Netherlands in late 1990s	Stage specialist venture capitalists demand higher returns in deals which require higher intensity involvement i.e. in the deals which are not in their core investment stage.
Ljungqvist and Richardson 2003	73 funds that a major U.S. institutional investor invested in from 1981 to 1993	The authors found that private equity funds tend to specialise in a small number of industries and the mean of PE investments concentrated on one industry was roughly 40 percent of the total number of companies held. However, the authors did not find any significant impact of specialisation on returns of the funds.
Lossen 2006	227 PE funds of an European fund-of-funds investor gathered from 2004 and 2005	The authors study the impact of diversification on the PE funds' returns. They find that higher diversification across stages drives lower returns, but higher diversification across industries drives higher returns. This implies that specialisation benefits would drive returns in concentrating on a limited number of stages. The authors did not find any relationship between diversification across countries and the funds' returns.
Cressy et al. 2007	122 PE buyouts in the U.K. from 1995 to 2002	Private equity companies generate higher operating profitability for their portfolio companies compared to their non-PE backed peers. Industry specialisation drives higher abnormal performance whereas stage specialisation may give advantages in growth prospects.
Brigl et al. 2008	1,000 PE buyouts in Europe from 2000-2006	Diversification across countries or industries does not predict buyout performance in terms of PE fund IRR. The results suggest that there are no specialisation gains to be achieved by concentrating on a limited number of countries or industries.
Gompers et al.	1,084 VC firms and	Venture capitalists with higher level of industry

2008	13,785 VC companies in the Venture Xpert database from 1975 to 1998	specialisation have a higher likelihood of success in their portfolio companies.

Cressy et al. (2007) provide two theories which may explain the specialisation gains that drive the current development of private equity firms. First, by accumulating information of certain industries or stages PE firms reduce the information asymmetries associated with probability of success in a particular situation. Second, PE firms gaining more experience in these industries or stages allows the use of more in-depth understanding of the market environment and the target company's strengths and weaknesses in a particular situation i.e. PE firms reduce uncertainty of their investment prospects. Therefore, not only PE firms are able to drive higher performance in these companies through their expertise, they also may be able to select the companies with best possible prospects for investment. The authors also point out that while interpreting the possible specialisation benefits, one should measure them against possible costs of lower diversification.

Norton and Tenenbaum (1993) also studied the theories behind specialisation benefits along on the same lines as Cressy et al. (2007). The authors conclude that certain some venture capitalists are more focused as they seek to control the risk of their investments through the gains in information sharing.

The underlying hypothesis in this study thus is that industry as well as stage specialisation will enable private equity firms to drive higher performance in their portfolio companies than that of the non-specialised PE firms.

Cressy et al. (2007) find strong support for the specialisation hypothesis. The authors conclude PE backed buyouts to drive abnormal operating profitability over comparable companies by 4.5 percent and industry specialisation to add 8.5 percent on top of the normal PE operating profitability over peers. However, the authors do not find similar strong effects with stage specialisation but suggest that it may have a positive effect on growth. The authors also show evidence of financial engineering and skill in investment selection to drive PE company performance rather than managerial incentives as suggested by previous literature.

Similar positive findings are provided by Gottschalg and Wright (2008) who suggest that more experienced and more focused PE firms in certain industries are able to use their expertise to drive better development in their portfolio companies. Their results suggest that

by some PE firms which focus on a limited number of industries would be able to create real and lasting value for their companies.[5]

Evidence of specialisation benefits in venture capital markets is provided by Maningart et al. (2002) who conclude that venture capitalists who invest outside their core expertise demand higher returns for the deals as the deals require higher intensity involvement from the VCs. The results provide more support to the theory of specialisation decreasing the uncertainty and risks of the investments, thus resulting in lower required returns. Gompers et al. (2008) continue with specialisation and venture capitalists and report that more industry specialised VCs are associated with greater probability of success of the portfolio company.

Lossen (2006), however, provide mixed evidence on specialisation benefits as he finds that PE funds' returns increase with diversification across industries but decreases with diversification across stages. The results imply that specialisation gains would drive returns by focusing on a limited number of stages whereas industry specialisation and focus would have a negative effect on returns. The authors also shed light on country diversification, however, do not find any consistent influence on returns. The findings of Birgl et al. (2008) are along the lines of Lossen (2006) on geographical diversification. However, the authors do not find that industry diversification would be a significant driver in PE firm returns.

The conclusions of Ljundqvist and Richardson (2003) are consistent with Birgl et al. (2008) and report that they do not find any significant evidence of industry diversification to influence returns. The authors do provide further support for PE firm trend to concentrate and specialise on a limited number of industries e.g. on average a PE firm has 40 percent of their investments in a particular industry.

3.3 Other theories of private equity performance

Critics of private equity have argued that the value creation in PE investments does not arise from operational, financial or governance engineering but rather from wealth transfer from employees to owners, taking advantage of private information or market timing. This section discusses each topic in greater detail and provides further evidence on PE value creation.

3.3.1 Employment effects

Leveraged buyouts and private equity firms have received criticism for transferring wealth from the target companies' employees to the investors by severe cuts in the number of

[5] More detailed discussion of the authors' findings could not be provided due to their paper not being available through Aalto University's databases or public databases.

employees and their wages. It is true that PE firms restructure their target companies in seek for productivity and operating efficiency gains, however, there is no consistent proof in the literature that suggest layoffs to drive PE company performance. Table 5 provides a short review of evidence of employment effects in PE deals, consistent with the previous statement.

Table 5 - Empirical evidence on employment effects in private equity deals

Authors	Study sample	Findings
Kaplan 1989b	76 large PTP MBOs in the U.S. from 1980 to 1986	Median change in employment 0.9 percent during a buyout and the corresponding figure after controlling for divestments is 4.9 percent. The results are not consistent with allegations of buyouts leading to job cuts, however, buyout employment increases less rapidly than their peers'.
Lichtenberg and Siegel 1990	12,000 manufacturing plant LBOs in the U.S. from 1983 to 1986	The compensation and number of white collar employees drop after a buyout and those of blue collar employees remain roughly the same. The ratio of white collar to blue collar employees decrease after a buyout by 6.5 percent compared to industry average.
Amess and Wright 2007	533 LBOs in the U.K. from 1993 to 2004	The authors conclude that LBOs' or PE firms' effect on employment is quite neutral, they do not create or destroy jobs. The results suggest that buyouts have similar employment growth than their peers but wage development is slower.
Boucly et al. 2008	830 buyouts in France from 1994 to 2004	The authors study employment effects in buyouts and find that buyout companies enjoy higher job and remuneration growth than their peer companies. The excess job growth over their peers is 13% within three years post buyout.
Davis et al. 2008	3,200 PE firms in the U.S. from 1980 to 2005	The authors conclude that buyout companies' employment growth is smaller pre and post transaction than that of their peers. However, they find that buyouts engage in creative destruction in labour market where there is faster reallocation of jobs as well as more jobs at new establishments, resulting in overall only to a modest impact on net employment compared to their peers.

Interpreting and analysing the results, one should remember that some studies might suffer bias arising from methodology used in the studies. Some research have not been adjusted for M&A activity or do not answer the question of differences and shifts between full time and part time employees. As Kaplan (1989b) suggest that there is a four percent difference in employment growth after adjusting for divestments.

The evidence in literature, presented above, suggest that private equity firms do not engage in destroying jobs to transfer wealth to the investors. However, buyout companies' employment and wage level growth on average does not match the growth of comparable companies. One exception should be noted, a study made with French data, Boucly et al. (2008) conclude that

both employment and wage growth for PE companies is greater than that of their peers. These results might be a result of the different determinants in value creation by country as suggested by Cumming et al. (2007) and the conclusions of Desbrierers and Schatt (2002) of the French market being structurally different as the French market is dominated by family companies. Overall, this implies that PE firms do not drive employment growth in their portfolio companies in general, but rather concentrate on value creation through improved performance.

3.3.2 Asymmetric information

Private equity firms have been claimed to take advantage of asymmetric information between private equity firms and their potential target companies and to use this private information to drive operational improvements and thus value creation in their investments. It is discussed in previous chapters that PE firms do use superior information to achieve abnormal performance. Also, Kaplan and Strömberg (2009) have suggested that some critics argue that a target company's management would favour PE ownership in seek of a good deal for themselves thus causing undervaluation. Therefore, this PE firms are suggested to achieve value for their investments by operational improvements achieved with insider and private information and by information asymmetries causing undervaluation.

Operational improvements through private information as the only source of value is negated by evidence in literature. Kaplan (1989b) as well as Wistbacka (2002) both conclude that the buyout companies' projections are too optimistic and therefore their actual performance does not match their forecasts. The asymmetric information criticism would suggest that the actual performance would be greater than the projections.

Also, the claim of management to favour PE deals is not supported by evidence. A number of studies have shown that management is likely replaced after the transaction within a certain time period; Section 3.1.1 Governance engineering discusses these findings in greater detail. Therefore, the management can not be certain of PE firm's willingness to maintain the managers in their current positions.

There is, however, evidence on information asymmetries in pricing. Guo et al. (2007) as well as Acharya et al. (2011) suggest that PE firms can create large returns for their investments even with modest operational performance improvements. The results would suggest that PE firms can acquire companies with a considerably lower price than they receive when exiting the investment i.e. buyout companies are undervalued. Kaplan and Strömberg (2009) provide

alternative explanations on the undervaluation issue. The authors suggest that the undervaluation could be a result of good negotiation skills of PEs against the target company board or mispricing caused by market fluctuations.

3.3.3 Mispricing/cyclicality

The waves of private equity activity, especially the two main waves in the 1980s and in mid 2000s as identified by Kaplan and Strömberg (2009), suggests that credit market conditions would be a significant driver in PE investments. Evidence to support the pattern is provided by Kaplan and Stein (1993) for the 1980s wave by suggesting buyout specialist to have received abnormally favourable credit terms from high yield bond investors. For the wave in mid 2000, Guo et al. (2007) have similar findings. The authors show that deals completed in 2005 and later showed higher levels of leverage and lower interest coverage ratios, suggesting looser credit policy by lenders.

Kaplan and Strömberg (2009) thus provide a hypothesis, based on literature, that PE firms use mispricing of debt and equity as a source for returns i.e. arbitrage opportunities when interest rates are low compared to the cost of equity.

Axelson et al. (2009b) provide evidence of the use of leverage in large LBOs in the U.S. and Europe with a data set covering 153 deals from 1985 to 2007. The authors find that the use of leverage in LBOs has the strongest relationship on the debt market conditions at the time of the transaction. The decrease in interest rates is associated with larger amount of debt used in the deals and also the availability of debt financing is found to be positively correlated with the acquisition price. Ljunqvist et al. (2007) use a similar time frame with 2,274 companies in the U.S. for 207 private equity funds initiated during 1981 to 2000. The authors' results are consistent with the hypothesis that PE funds are more active in investing as interest rates decline.

The results imply that the availability of debt financing is a major driver in private equity investment cycles. Kaplan and Strömberg (2009) conclude that a necessary condition for high investment activity is for operating earnings yields to be higher than the interest rates of high yield bonds and vice versa for low investment activity.

3.4 Nordic evidence

Nordic countries have not received much attention in the buyout literature. To the best of my knowledge only Bergström et al. (2007) has conducted a detailed study of operational performance of buyouts, however, concentrating only on Sweden. Thus far, in Europe, only

British, Swedish and French buyouts have been studied in general although Nordic countries represent the largest PE market area in Europe if measured by private equity investments as a percentage of GDP (EVCA, 2011). There has been a number or Master's theses on buyouts in Finland and Nordics, but the studies have largely concentrated on only Finnish markets and PE firms' abnormal performance over their peers. Table 6 provides a short review of the private equity related studies conducted in the Nordic area.

Table 6 - Empirical evidence on private equity deals in Nordic countries

Authors	Study sample	Findings
Wistbacka 2002	39 LBOs in Sampo Bank in Finland from 1994 to 2000	The author studied the characteristics of leveraged buyouts that Sampo Bank gave financing in the late 1990s. He found that the deals were highly levered, no major changes in valuation or financial structure was present within the time frame and that the buyouts' projections were too optimistic. Also, for distressed companies he found that management equity has an alleviating effect.
Kekkonen 2004	40 MBOs in Finland from 1986 to 1999	The author studies the post buyout performance of management buyouts in Finland. He found profitability and general performance improvement in the companies, however, no improvement in operational efficiency.
Bergström et al. 2007	73 Swedish buyouts from 1998 to 2006	Using EBITDA margin and ROIC figures as indicators of operating profitability, the authors find significant improvements in the buyout companies relative to peer companies. However, the findings do not support abnormal growth in buyout companies over their peers.
Havu 2007	54 LBOs in Finland from 1996 to 2005	The author studies operational efficiency in Finnish LBOs and reports higher operational efficiency and growth over their peer companies with an exception on profitability.
Männistö 2009	191 PE buyouts in Finland from 2002 to 2004	The study was conducted on the private equity companies' societal and economic impact on Finland. The author found that sales, the number of employees, total assets as well as intangible assets grew faster than that of their peers. The results were more pronounced for high technology companies and seed stage investments.
Jääskeläinen 2011	144 Nordic buyouts from 2005 to 2007	Industry adjusted change in operating performance of buyout companies is significant in terms of sales growth, profitability, employment efficiency and working capital efficiency. In addition to above, Swedish and Norwegian buyouts tend to have higher performance than Finnish or Danish buyouts.

Specialisation effects as well as the determinants of the alleged abnormal performance have been neglected. This study aims to study that are there any outperformance of PEs, does specialisation drive even higher performance and as suggested by Cumming et al. (2007) do the determinants of performance differ by country and market area.

4. Hypotheses

The objective of this thesis is to study differences in operational efficiency between PE backed buyout companies and their peers as well as the determinants of the performance mainly PE firm specialisation advantages. In addition to this, this thesis covers the years from 2003 to 2007 providing an unique opportunity to study the above mentioned pre and during the financial crisis. The hypotheses are divided into three subgroups; first, private equity firms' performance on peer companies, second, the benefits of specialisation and third, changes of the performance and its determinants over the different economic conditions. The hypothesis are based on the theoretical framework provided by the previous literature which is discussed in more detail in Section 3.

4.1 Operational efficiency

First, the thesis attempts to answer to whether the Jensen (1989) hypothesis of alleged superior governance of private equity firms is creating superior operating performance for their portfolio companies over comparables. Operational efficiency is measured through sales growth, profitability, return as well as through working capital management which have been identified in previous literature as key areas of performance, among others Kaplan (1989b), Singh (1990), Berg and Gottschalg (2005), Bergström et al. (2007), Weir et al. (2008), Acharya et al. (2011), Guo et al. (2011) and Jääskeläinen (2011). Hence,

H1: PE backed buyouts' operational efficiency is significantly greater than that of the peer companies measured by Sales growth

H2: PE backed buyouts' operational efficiency is significantly greater than that of the peer companies measured by profitability as EBITDA margin and EBITDA/Total Assets

H3: PE backed buyouts' operational efficiency is significantly greater than that of the peer companies measured by return through ROIC

H4: PE backed buyouts' operational efficiency is significantly greater than that of the peer companies measured by working capital management as Cash conversion cycle and Net working capital/Sales

4.2 Specialisation benefits

The previous literature has provided evidence that private equity firms that specialise on either on industries or investment stages are able to drive higher operational performance and return in their portfolio companies. Among others, Norton and Tenenbaum (1993), Cressy et

al. (2007) as well as Gottschalg and Wright (2008) suggest deeper knowledge and expertise on certain areas to be the key driver in this abnormal performance. Hence,

H5: Industry specialised PE firms are able to drive stronger operational efficiency through the measures provided above

H6: Stage specialised PE firms are able to drive stronger operational efficiency through the measures provided above

4.3 Persistence over economic conditions

Previous literature has suggested persistence in performance for private equity firms due to accumulated experience and knowledge, among others Kaplan and Schoar (2005) and Wright et al. (2009). Therefore, it can be expected that private equity firm performance should persist over time periods. Furthermore, private equity firms should be able to leverage on the superior expertise even during difficult economic conditions such as the financial crisis. This ability should thus be seen as greater difference in operational efficiency over peer companies during these difficult times as well as specialised firms should be able to outperform the non-specialised firms due to the greater experience. Hence,

H7: PE-backed buyouts' abnormal operating efficiency has persisted over the financial crisis through the measures provided above

H8: Industry specialisation benefits have persisted over the financial crisis, measured by the variables provided above

H9: Stage specialisation benefits have persisted over the financial crisis, measured by the variables provided above

5. Data

This paper examines the Nordic (Finland, Sweden, Denmark and Norway) private equity backed buyout companies and the benefits of private equity firm specialisation on the buyouts. The buyout companies are benchmarked to their peers to study whether the PE firms can create superior performance on their portfolio companies. The research window of 2003-2007 also gives an opportunity to compare the pre and post financial crisis buyouts and their performance. A number of other explanatory factors are used in each stage to account for other determinants of performance, other than specialisation and PE backing.

The research window from 2003-2007 was chosen due to several reasons. First, as discussed in the Section 1, the private equity activity has experienced two major waves; first being from

1982 or 1983 to 1989, second beginning in 2003 or 2004 and ending in 2007 or 2008 (Kaplan & Strömberg, 2009). The first wave has enjoyed much attention in the literature where as data availability issues have thus far limited the scope of studies to concentrate on the first wave or on the earlier years of the second wave. Furthermore, a longer time period with a sufficient number of observations allows splitting the data to pre and post financial crisis buyouts.

Cressy et al. (2007) argue in their study that operating improvements of buyout firms should be visible within three years of the transaction. Further arguments are provided by Bull (1989), Kaplan (1989b), Malone (1989), Singh (1990), Opler (1992) and Muscarella and Vetsuypens (1990) who find that the buyouts made in the 1980s in the U.S. have considerable improvements in profitability and cash flow measures from one year prior the buyout to two to three years after the transaction. Wu (1997) on the other hand shows evidence of earnings manipulation in management buyouts prior to the transaction, thus casting doubt on the accuracy of the accounting measures used widely in the literature. To avoid the effects of manipulation on the measures, this study concentrates on the operating performance improvements on the year of the buyout to three years after the transaction. The accounting data for the base year, year of the transaction, is gathered in the spirit of Bergström et al. (2007). The authors suggest that to calculate only the impact of PE ownership, only the years which have enjoyed private equity backing for the majority of the months should be accounted for. Therefore the base year for the buyouts occurring on the first half of the year, the prior year will be used and for the buyouts occurring on the second half, the same year is used as the base year. The research window of this study thus must close in the end of 2007 in order to obtain full three years of operational data for each buyout company as at the time of this thesis the fiscal year 2011 figures are only partially available whereas the fiscal year 2010 figures can be obtained. However, operational data has been gathered only to the point where the private equity firm in question has exited the company if the divestment has been made within the three years of the buyout. This necessary adjustment is made as the paper concentrates on the improvements of the PE firm on the company under its influence.

The construction of the dataset was carried out in five phases; first identifying the transactions over the targeted time period, second, a matching peer group to the buyout companies was selected, third, information on private equity firms was collected for estimating the degree of specialisation and for control variables, fourth, operational data on both the buyout companies and the peer group was gathered and finally data on the other control variables were identified. These phases will be described in greater detail in the following chapters.

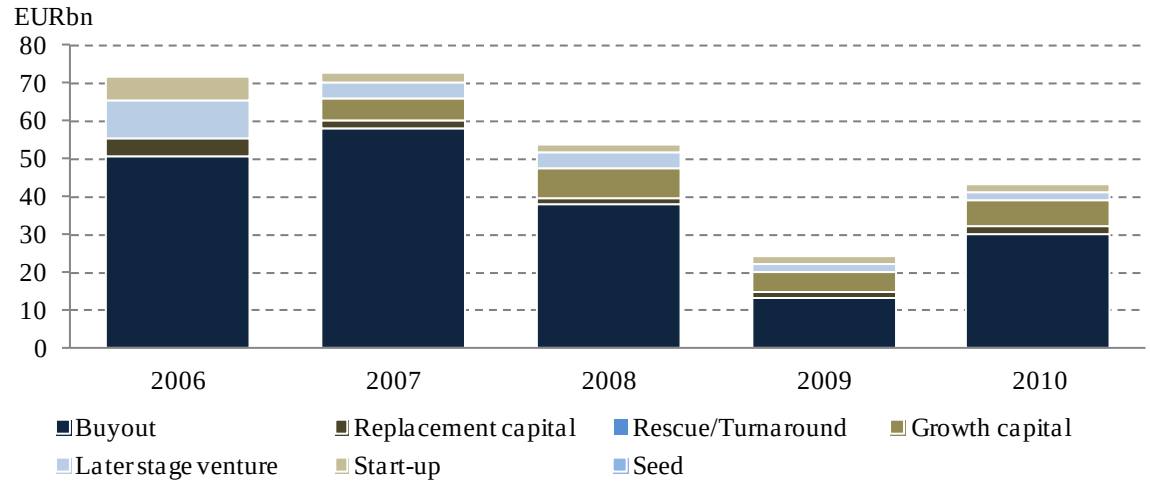
5.1 Bias

There are a number of biases that are present when studying LBOs and especially private equity backed buyouts. These biases are mainly concerned with selection and survivor bias.

First, it is possible that a selection bias arises due to the fact that buyouts might not occur randomly in the whole population of companies. Also, the study is made with data gathered from Thomson VentureXpert (also known as Thomson Financial Venture Economics) which does not represent the whole private equity scene, Kaplan and Schoar (2005) and Kaplan & Strömberg (2009) both acknowledge this caveat of VentureXpert in their papers. The database thus might omit the smallest funds with smallest buyouts, resulting in a slight selection bias. However, unlike a major part of previous studies especially made with U.S. data, this study does not rely on companies which are publicly listed in some form such as public-to-private (PTP) deals, reverse leveraged buyouts (RLBOs) or companies with public debt. By covering private companies, VentureXpert and this study suffers significantly less of the selection bias than the previous literature.

Further selection bias might arise from the study's focus on companies on their first round of financing of buyouts/acquisitions without prior private equity involvement rather than the whole universe of buyouts. VentureXpert lists the types of buyouts in the following manner: Startup/seed, early stage, expansion, buyout/acquisition, later stage and other. However, Figure 9 shows that the buyouts/acquisitions represent the majority of the market and provide less varying sample of private equity transactions. Other stages vary significantly by year e.g. replacement capital and later stage venture being only largely represented in 2006 and seed stage investments are absent totally in 2010.

Figure 9 - European private equity investment by stage 2006-2010 in EURbn



Source: EVCA, 2011, retrieved 27 September 2011.

Second, in some cases distressed companies might delay reporting their financials, the companies might not be even obligated to report or the population would be limited to companies remaining within the sample over the observation period, leading to survivor bias. This study concentrates on the post-buyout performance and does not cover explicitly exited companies, therefore, the sample used will include all companies, whether or not they have experienced distress and whether or not the companies have been exited. Disclosure of accounting data of private companies in the U.S. relies on voluntary reporting and thus is seldom done to limit the amount of information on the company of which the competitors could benefit (Bergström et al., 2007). In the European Union a directive sets the obligatory minimum standard of private company disclosure of accounting information to the public, the company should thus report the balance sheet, income statement as well as the notes to the financial statements (Cumming and Waltz, 2004). However, Weir et al. (2008) state that for their sample of companies in the UK that the quality of the disclosed accounts might limit the advantage of mandatory disclosure in Europe. This might be true especially for some commercial databases providing certain items of the financial statement information. However, Orbis (a database providing accounting information), which is used in this thesis sources their information from local registries.

5.2 Private equity company transactions

The private equity backed buyout companies were identified using Thomson VentureXpert. The data obtained includes all completed first round private equity backed buyout deals in the Nordic region within the time frame from 2003 to 2007. The focus of the study is limited to first round of financing i.e. the first private equity involvement of the company, to better capture the effects of private equity on their target companies. Bergström et al. (2007) support the argument by suggesting that there are less room for operating efficiency improvements in companies that are acquired from other private equity firms than in first round of financing buyouts. The authors' reasoning lies behind the expectation that a private equity firm will implement the possible operating efficiency improvement measures already during the first round, thus the subsequent measures made by a second private equity firm will have less effect on the company than the initial measures.

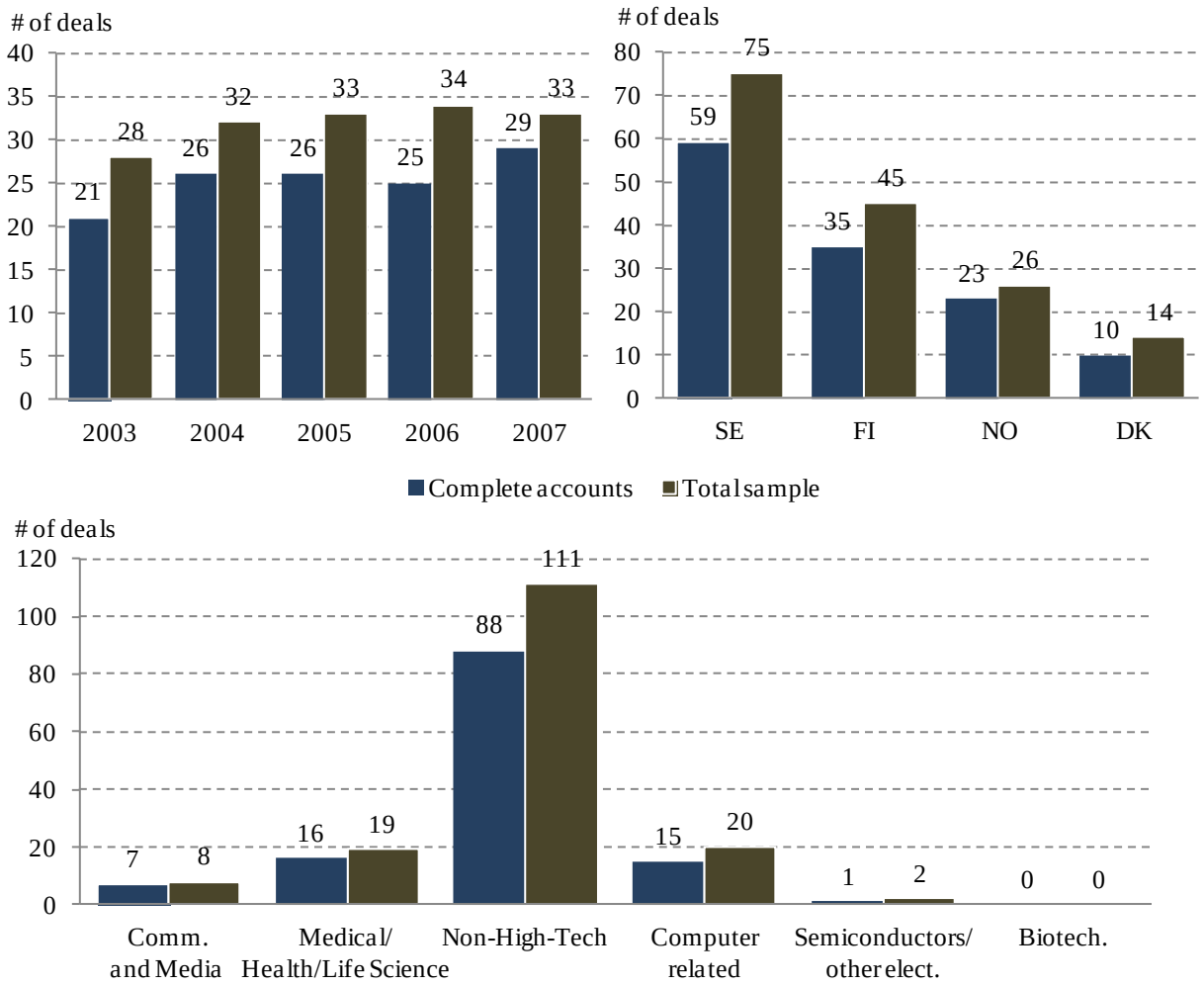
The dataset includes 504 PE buyout companies which have had their first round of financing within the research window. The number of the companies covered in this study is limited to a more manageable size through a random selection where one third of the total number of buyouts made each year was included. Bankrupt companies were excluded from the random

selection due to issues with bias associated with comparing bankrupt buyouts with healthy peer companies. Roughly 10 percent of the randomly selected buyouts were bankrupt and thus replaced with a new random selection. PE companies have higher risk of being bankrupt as the companies are highly levered and PE firms have tendency to take on higher risk in the search for higher returns. Financial companies were also excluded in the selection process. The final sample of companies thus covers 160 buyouts. Due to data availability issues 127 of the buyouts had complete accounts available for the observation period. The effects of random selection as well as the estimation of the effect of missing account data on the results will be discussed in more detail in Section 6 and tested in Section 7.

During this stage of data gathering Thomson VentureXpert was also used to gather additional data on the buyout companies and their private equity firms including the industry group, age of the company, fund and its size, sequence number of the fund, firm capital under management, PE firm affiliation as well as the number of companies invested in. These variables are used in the analysis as various proxies for sources for operational efficiency improvements.

Figure 10 shows the distribution of the buyouts by domicile and year. The data has been split in to a subsample having complete account data of 127 buyouts as well as into the total sample of 160 buyouts. The figures show quite equally distributed sample over the years, although having a roughly increasing trend towards the end of the sample as it was the case with the whole PE market activity as shown in the Introduction Section. And as discussed in the same Section, Sweden is the most active PE market among the Nordic countries whereas Denmark has only roughly one fifth of the deals of Sweden. The buyouts were grouped by VentureXpert's industry major group which shows a dominating quantity of companies in the Non-high-technology industry. The major group was selected as specialisation of the PE firms is increasingly hard to determine as more precise industry groups are used.

Figure 10 - Distribution of PE buyouts by domicile, year and industry group



Source: Thomson VentureXpert

5.3 Peer group selection

This study measures the operating performance improvements, if any, the private equity involvement and specialisation advantages for the target companies. A proper way of testing the PE's alleged advantages is to benchmark the buyout companies' performance to a similar group of private companies which are not enjoying the knowledge and support of a private equity firm.

Following the example of Alemany and Marti (2005) and Lerner (1999), a comparable sample of private non-PE buyout companies is matched with industry and size of the buyout companies. However, taking account differences in operating environment between each country, the peer group is further matched by geography (Cressy et al., 2007). Although the peer companies are matched through the factors above, a bias might still be present due to the fact that the companies might have completely different operations despite being in the same

industry. The method to compare performance with peer companies is not fool-proof, however, the literature suggests that it is accurate enough to make conclusions as well as a straightforward approach analyse the private equity benefits.

First, the peer group is matched to the buyout companies using the NACE (an European industry standard classification system) classifications in Orbis. Second, the potential companies are further narrowed down by selecting the companies operating in the Nordics. And third, sales on the year of the buyout is selected to represent a proxy for size and matched accordingly to the peer companies. The selection is made in the spirit of the previous literature. Data on the peer companies were gathered in a later stage and the summary statistics are presented in Section 5.6.

5.4 Private equity firm and funds

This study probes further in the determinants of operating efficiency of PE backed buyout companies, especially focusing on the alleged superior governance advantages that PE firms may provide. The benefits of PE ownership are approached through studying both industry specialisation as well as stage specialisation. The degree of specialisation of a PE firm is measured against all other PE firms operating throughout the same time period. Thus, the degree of specialisation is relative to the other PE firms.

The private equity firms operating within the research window were identified using Thomson VentureXpert totalling to 19,529 PE firms in the database. Each PE firm's funds as well as portfolio companies were listed along with the portfolio companies' operating industry and stage at the time of the buyout. The industry group of the portfolio company is classified according to the VentureXpert industry classifications and the stage in similar manner.

More precise data were gathered of the private equity firms involved in the buyouts in the selected sample of this thesis. Summary statistics of these firms is presented in Table 7. The Table shows that on average the PE firms in question are quite experienced with a mean number of funds of 7, 184 companies invested in as well as US$ 3,940m capital under management. The average figures are rather high due to a few larger PE firms in the sample. The median figures shed some more light on a typical PE firm, however, still quite experienced according to the statistics. The sample is not limited to only experienced firms as it includes firms on their first fund under management or their first buyout. A rather large share of the buyouts had not yet been exited at the time the data was gathered which may be an effect of the financial crisis as PE firms are reluctant to sell the companies with lower

returns in an economic downturn as well as the absence of buyers as a result of the difficulty of obtaining external financing as well as risk associated with uncertain future development.

Table 7 - Summary statistics of PE firms involved in the selected Nordic buyouts from 2003 to 2007

	Mean	Median	Min	Max	St.dev	No exit
Number of funds under management	7.13	4.00	1.00	50.00	9.57	
Holding period (years)	4.15	4.00	1.00	8.00	1.92	56.69%
Number of companies invested in	183.98	50.00	1.00	1,441.00	380.17	
Capital under management (US$ millions)	4,613.15	587.10	2.90	84,300.00	10,313.39	

The table presents the summary statistics for the subsample of PE firms that were involved in the selected Nordic buyouts during the time period of 2003-2007.

5.5 Operational data

Operational data was gathered using the Orbis database from the year of the buyout to three years after the transaction or to the year of the exit if the company was divested within the three years. The data was gathered for both the buyout companies as well as for the peer group companies. As described in the beginning of this section, the base year for the transaction (year 0) was identified as the current year if the deal occurred on the second half of that particular year and as the previous year if the deal had occurred on the first half of that year.

Operational data was gathered on sales, operating profit, depreciation, cost of goods sold, operating costs, total, fixed and current assets, current liabilities, inventory, receivables and payables, leverage, cash position and the number of employees. Roughly 21 percent of the selected companies did not have accurate coverage in the Orbis database, which was to be expected as PE firms are reluctant to publish or delay deliberately publishing the accounts data for their portfolio companies.

One more step in the data gathering was added due to the structure of the private equity transactions. Private equity firms typically form a new holding company for which they raise capital and use to acquire the target company. Later the holding company is merged with the target to form the new portfolio company. This imposes a problem in the reported financials as new layers of subsidiaries are formed for the new parent. The problems arise with new names of the parent holding companies as well as the consolidation of the financial

statements. However, the Orbis database was used to identify the correct ultimate parent of the portfolio company. Descriptive statistics of all the variables are shown in Section 5.6.

5.6 Other control variables

Data for additional control variables or other determinants of operating efficiency, which could not be obtained using VentureXpert or Orbis were gathered from a variety of sources. Mergers and acquisitions activity of the portfolio company was identified using Zephyr database, CEO change was obtained from news sources and company websites and MSCI World Index and 12 month Euribor were obtained from Datastream. Also missing accounts for company age were gathered using company websites and news sources.

5.7 Descriptive statistics

Table 8 shows the summary statistics of the 127 companies and their peers with complete data available and includes all the variables used or gathered for this paper. Leverage could not be gathered for all the companies despite Orbis having all the other relevant data available. The t-test shows that PE firms are able influence the sales growth and maintain a higher EBITDA margin than the peer companies, the differences being significant at 1 and 5 percent level, respectively. The results are in line with the previous literature. However, EBITDA/Total Assets or ROIC do not show any significant difference between the two groups. Working capital (here forth WC) measures show mixed evidence where cash conversion cycle (CCC) indicates that PE companies are using working capital more efficiently than peers although not significantly whereas Net Working Capital (NWC)/Sales and Inventory and Receivables are showing inefficient and Payables efficient use of WC compared to peers, the latter two significantly at 1 percent level. Overall the evidence at this stage suggests that PE firms are not more efficient in terms of use of working capital, not in line with the previous literature. The results thus seem to support the first and second hypothesis by outperforming the peer companies in terms of sales growth and profitability. Based on this simple comparison, hypothesis three and four should be rejected as there is no clear advantage for buyout companies in working capital management and return.

Of the other operational efficiency measures the ratio of improvement in sales and the number of employees is significant at one percent level. The significance may arise also from the fact that sales have increased significantly more for buyout companies than peers, employment staying at the same level, however, indicating that efficiency in the companies has improved, being consistent with previous literature.

Table 8 - Summary statistics of PE backed buyout companies and the corresponding peer companies from 2003 to 2007

		Panel A - PE backed buyouts				Panel B - Peer companies				
Variable	n	Mean	Min	Max	St.dev	Mean	Min	Max	St.dev	T-test
Sales growth	127	31.5%	-23.7%	263.7%	51.4%	8.7%	-25.6%	87.4%	20.5%	4.64***
EBITDA margin	127	9.0%	-50.0%	93.2%	15.8%	5.9%	-53.8%	45.5%	11.9%	1.79**
EBITDA/Total Assets	127	11.3%	-69.5%	44.4%	16.2%	10.9%	-82.6%	56.0%	16.0%	0.17
ROIC	127	7.6%	-154.2%	347.1%	37.9%	7.3%	-131.2%	135.2%	25.6%	0.08
CCC	127	60.15	-216.11	385.10	100.51	68.27	-126.30	493.30	98.42	-0.65
Current ratio	127	2.14	0.26	11.07	2.47	1.96	0.41	11.97	1.64	0.71
NWC/Sales	127	0.16	-1.46	4.47	0.47	0.13	-1.98	1.47	0.33	0.42
Inventory/Sales	127	0.12	0.00	0.73	0.12	0.11	0.00	0.53	0.11	0.33
Receivables/Sales	127	0.14	0.00	0.56	0.09	0.11	0.00	0.50	0.08	2.73***
Payables/Sales	127	0.10	0.00	1.56	0.15	0.07	0.01	0.34	0.05	2.38***
ICA IND	127	0.65	0.00	1.00	0.48	-	-	-	-	-
ICA STG	127	0.89	0.00	1.00	0.31	-	-	-	-	-
HHI IND	127	0.50	0.00	0.78	0.23	-	-	-	-	-
HHI STG	127	0.47	0.00	0.77	0.25	-	-	-	-	-
PE affiliation	127	0.85	0.00	1.00	0.36	-	-	-	-	-
Leverage	114	0.18	-331.50	169.73	44.42	-	-	-	-	-
Company age	127	30.06	0.00	414.00	45.70	24.15	0.00	98.00	22.68	1.31*
PE size	127	4,613.15	2.90	84,300.00	10,313.39	-	-	-	-	-
PE experience	127	7.13	1.00	50.00	9.57	-	-	-	-	-
Initial sales	127	150,988.86	120.00	6,244,565.00	670,485.85	178,923.39	8.00	6,312,360.00	802,105.96	-0.30
Initial profitability	127	13.33%	-227.71%	1032.71%	96.06%	6.66%	-229.38%	75.00%	24.25%	0.76
Employment	127	39%	-99%	406%	93%	6%	-78%	288%	38%	3.80***
CAPEX/Sales	127	-4.80%	-374.27%	106.61%	40.56%	0.11%	-187.10%	206.38%	28.54%	-1.11
CAPEX/Total Assets	127	-2.57%	-72.69%	316.43%	34.22%	-2.01%	-224.93%	137.82%	27.56%	-0.14
CEO	127	0.57	0.00	1.00	0.50	-	-	-	-	-
Acquisitions	127	0.30	0.00	1.00	0.46	-	-	-	-	-
Divestments	127	0.03	0.00	1.00	0.18	-	-	-	-	-
Acquisitions/Total Assets	127	4.46%	0.00%	141.46%	15.27%	-	-	-	-	-
Divestments/Total Assets	127	0.38%	0.00%	39.32%	3.57%	-	-	-	-	-

		Panel A - PE backed buyouts				Panel B - Peer companies				
Variable	n	Mean	Min	Max	St.dev	Mean	Min	Max	St.dev	T-test
MSCI	127	4,159,567.04	2,413,622.00	5,850,547.00	927,186.45	-	-	-	-	-
PE market	127	41.43	21.00	65.00	16.83	-	-	-	-	-
Interest rate	127	3.06%	1.99%	4.78%	0.91%	-	-	-	-	-

The table presents the summary statistics of 127 Nordic PE backed buyout companies over three years from the buyout or the holding period if the company has been sold within the three years and their corresponding 127 peer companies. The sample includes only companies with complete data available for the observation period. Comparisons of the mean values of the variables between the buyouts and peers have been calculated using Welch's corrected t-test. Sales growth is the mean growth of sales over the holding period. EBITDA margin and EBITDA/Total Assets are the mean values during the holding period, where EBITDA is Earnings Before Interest, Tax, Depreciations and Amortisations. ROIC is the mean value of Return on Invested Capital and CCC is the mean cash conversion cycle, a working capital measure. Current ratio shows the mean current ratio over the holding period. Net Working Capital/Sales, Inventory/Sales, Receivables/Sales and Payables/Sales all are working capital measures and indicated as mean values over the period. ICA IND is the industry specialisation dummy calculated using the Index of Competitive Advantage whereas ICA STG is the corresponding stage specialisation dummy, taking a value of one in the case of a specialised firm. HHI IND is the industy specialisation calculated using the Herfindahl–Hirschman Index whereas HHI STG is the corresponding stage specialisation. PE Affiliation dummy indicates whether the PE firm is independent or affiliated with e.g. a government or a bank, taking a value of one in the case of an independent firm. Leverage is the mean net debt/EBITDA over the period. PE Experience measures the experience of the PE firm using the fund's sequence number as a proxy. PE Size indicates the total capital commitments made to the firm. Initial sales and Initial profitability indicate the amount of sales and the level of profitability using EBITDA margin % as a proxy on the year of the buyout, respectively, indicators of PE firms alleged winner picking abilities. Company age measures the age of the company on the year of the buyout. CAPEX/Sales, CAPEX/Total Assets and Employment (Sales/Number of employees) measure the changes in the ratios over the holding period proxies for CAPEX stripping and efficiency improvements, respectively. CEO dummy indicates whether the CEO of the company has been replaced over the three years of the buyout, taking a value of 1 in the case of the event. Acquisitions and Divestments dummies indicate whether the company has made acquisitions or divestments during the three years after the buyout taking a value of 1 in the case of the event, respectively. Acquisitions/Total Assets and Divestments/Total Assets are the mean values for the values of the events relative to total assets of the company in question. MSCI is the Morgan Stanley Capital International World Index whereas Interest rate indicates the level of the 12 month EURIBOR at the time of the buyout and thus measuring the state of the market. PE market is the total investments of European PE firms made on the buyout year according to EVCA in EURbn. *p<0.1, **p<0.05, ***p<0.01

Capital Expenditure relative to Sales and Total Assets has decreased in the buyout companies, however, the difference to peers not being significant. This could be interpreted as a sign of diverting cash flows to PE firm returns or other functions, not being the case with this sample as the peer companies have had the same tendency during the observation period. The M&A activity of the buyout companies has been quite low over the period, amounting to 4.5 percent of Total Assets in acquisitions and 0.4 percent of Total Assets in divestments. Leverage of the buyouts measured by Net Debt/EBITDA is rather low compared to previous levels reported by the literature and private equity convention with a mean ratio of 0.18. In other terms of liquidity, Current Ratio is not significantly different between the groups although PE firms do have slightly higher mean value. CEO of the company has been changed within the three years of the buyout in roughly half of the companies. Cornelli and Karakas (2011) suggest in their paper that CEO change is more likely in "difficult" companies which in my sample might be present due to the difficult conditions provided by the economic downturn.

The two different specialisation variables paint a different picture of the PE firms. The Index of Comparative Advantage (ICA) suggest that more than half of the PE firms are either or both industry or stage specialised whereas the Herfindahl-Hirschmann-Index (HHI) suggests that on average the PE firms are neither diversified nor specialised in industries or investment stages. Other PE firm variables show that the firms are on average quite experienced as shown by the number of funds and the amount of capital under management as well as that the firms are mostly independent i.e. not affiliated with a bank or other institution. The size of the PE market and its developments were discussed in previous Sections.

The difference between the buyout companies and their peers in terms of age and initial sales and profitability show that the two groups are quite comparable. The only significant difference being the company age, at 10 percent level. However, the data shows that the peer companies have had slightly higher initial sales than buyouts whereas buyout companies have outperformed their peers in terms of initial profitability

6. Methods & variables

This section will first introduce the variables used in this thesis and second the methods used to analyse the variables. Table 9 summarises and provides a short description and a more detailed explanation is given in the following chapter along with justification for the use of these metrics. The second chapter introduces the methods in greater detail and provides mathematical formulas used to analyse the data.

6.1 Variables

As this paper is concentrating on the operational improvements that PE firms are allegedly able to impose on their portfolio companies, the variables that measure this ability are only the best possible proxies. Governance can not be measured itself, however, literature has identified an number of proxies that are used in this paper. Control variables are also introduced to account for other sources of improvement other than governance.

6.1.1 Dependent variables

Growth

The dependent variables used in this thesis measure the companies' performance through three topics: growth, operating performance and return. First, growth is measured by the mean

Table 9 - Variables used in the analysis

Variables	Explanation of the variables
Dependent variables	
Sales growth	Geometric mean growth of sales over the three year period post-buyout
EBITDA margin	Mean operating profitability over the three year period post-buyout. Calculated as EBITDA/sales
EBITDA/Total Assets	Mean return on assets over the three year period post-buyout
ROIC	Mean return on invested capital over the three year period post-buyout. Calculated as (Sales-operating costs)*(1-theoretical tax rate)/(fixed assets+non-cash current assets-short term payables)
CCC	Working capital efficiency measure calculated as mean cash conversion cycle over the three year period post-buyout
NWC/Sales	Mean Net Working Capital/Sales over three years or the holding period
Independent variables	
ICA IND	A dummy variable taking a value of 1 if the PE firm is industry specialised and value of 0 in all other cases, calculated with the Index of Comparative Advantage
ICA STG	A dummy variable taking a value of 1 if the PE firm is stage specialised and value of 0 in all other cases, calculated with the Index of Comparative Advantage
HHI IND	A measure of PE firm's diversification across industries, calculated with the Herfindahl-Hirschmann-Index
HHI STG	A measure of PE firm's diversification across stages, calculated with the Herfindahl-Hirschmann-Index
PE backed	A dummy variable in the whole sample regressions, taking a value of 1 if the company has been acquired by a PE firm
PE affiliation	A dummy variable measuring the background of the PE firm, taking a value of 1 if the PE firm is independent
PE experience	Private equity firm experience measured by the number of funds they are/have been operating (funds' sequence number)

PE size	Total capital committed to the private equity firm, used in Heckman selection regression as a predictor of missing accounts data
PE market	Variable taking account money-chasing-deals, the amount of European private equity investments in the year of the buyout
Initial sales	Initial sales of the buyout company, a measure for winner picking
Initial profitability	Initial profitability measured by EBITDA margin at the year of the buyout, a measure for winner picking
Company age	The number of years of the company being active at the time of the buyout, used in Heckman selection regression as a predictor of missing accounts data
Acquisitions	Acquisitions made by the company within three years of the buyout, a dummy taking a value of 1 if the company has made acquisitions and 0 in all other cases
Divestments	Divestments made by the company within three years of the buyout, a dummy taking a value of 1 if the company has made acquisitions and 0 in all other cases
CAPEX	Change in the ratio of Capital Expenditure/Sales of the company over three years after the buyout
Employment	Change in the ratio of Sales/the number of employees, a proxy for efficiency
CEO change	A dummy variable if the CEO has been replaced within the three years, value of 1 if the CEO has been changed and 0 in all other cases
MSCI	The standard equity price index of Morgan Stanley, measuring the state of the equity markets at the time of the buyout, a proxy for available funding for PEs
Interest rate	12 month Euribor on the time of the buyout, a proxy for funding available for PEs

Sales growth over the three year period after the buyout. Sales growth has been used widely in the literature measuring the post-buyout performance of the PE backed companies e.g. Bergström et al. (2007), Cressy et al. (2007), Boucly et al. (2008), Acharya et al. (2011) and Guo et al. (2011). Furthermore, the amount of sales provides a clear comparison between the buyout and non-buyout companies as reported sales figures are not easily manipulated. In a broad sense, private equity firms approach their portfolio company through improving either (or both) the top-line or the bottom-line. Concentrating on the former, Sales growth thus specifically measures one of the sources of value creation of private equity firms. Possible bias might arise from the fact that in the downturn sales decrease and as the economy picks up speed, sales will naturally raise to their previous levels, not affected by the PE firm. However, this thesis shows, as seen by the Table 8, that PE firms are able to grow sales beyond the capabilities of non-PE backed companies despite the market condition movements.

Operating performance

Second, the operating performance measures concentrate on private equity firms' value creation through improving the bottom-line. The value is created by using the company's resources more efficiently and operating the company with less costs and required capital. The measures for operating performance used in this thesis are EBITDA (Earnings before

interest, tax, depreciations and amortisations) margin (EBITDA over sales) and working capital efficiency, using cash conversion cycle (CCC) and Net Working Capital (NWC over sales) as proxies.

EBITDA margin is also widely used in the literature. Recent examples of using EBITDA margin to study post-buyout performance provide e.g. Bergsröm et al. (2007), Acharya et al. (2011) and Guo et al. (2011). There are also a number of studies using EBIT –based measures such as Cressy et al. (2007) and Nikoskelainen & Wright (2007). However, Nikoskelainen & Wright used EBIT instead of EBITDA only due to data availability issues. Barber & Lyon (1996) identify two reasons why operating income (EBIT) should be used instead of earnings. First, productivity of operating assets is better taken in account through operating income than earnings and second, the capital structure of the company is changed post-buyout and thus having an effect on earnings through interest expenses, but does not have an effect on operating income. However, Bergstöm et al. (2007) argue for the use of EBITDA as price and the level of leverage are commonly quoted in terms of multiples of EBITDA. Barber & Lyon (1996) do not take in account differences in accounting standards which effect on operating performance metrics can be further minimized using EBITDA. Different accounting standards e.g. FAS (Finnish Accounting Standards) and IFRS (International Financial Reporting Standards) allow managing same financial statement items in a different manner. With the two accounting standards listed above, the value of intangible assets in IFRS is estimated through impairment testing whereas intangible assets in FAS are deducted with a straight-line depreciation. EBITDA which is not sensitive to e.g. differences in depreciations and amortisations is a more reliable measure to study companies' fundamental operating performance. In this study, the data set will contain companies using the international accounting standards as well as national standards, as e.g. in Finland it is not required for private companies to report using IFRS. Thus, EBITDA will provide with more accurate comparisons across the countries and companies with varying accounting standards.

Improving the usage of working capital reduces the capital tied in the company and thus in other words, releases capital to be used in areas where it may be utilised more efficiently. Operation efficiency can be thus interpreted through both EBITDA and the use of working capital. According to the literature, private equity ownership creates value through a positive impact on the operating performance of the company as well as through releasing capital from non-performing activities such as divestments or through sale-and-leaseback agreements. Kaplan (1989b), Singh (1990) as well as Berg and Gottschalg (2005) have all found working

capital improvements in buyout companies. The working capital efficiency is estimated through two measures, firstly, cash conversion cycle, which measures the time of capital tied in production and sales before the reimbursement for the output is received from the customer. Thus, if working capital is being managed efficiently CCC could also be negative, indicating the sales have been collected from customers before paying the suppliers. Cash conversion cycle consists of three figures, days inventory outstanding (DIO), days sales outstanding (DSO) and days payables outstanding (DPO), and is calculated as summing DIO and DSO and subtracting DPO. And secondly with Net Working Capital (NWC) over Sales which relates the difference between current assets and liabilities to sales. The NWC measure takes in account a greater amount of balance sheet items and provides a comparable figure to other companies by calculating the figure relative to sales. NWC/sales has also been used by previous literature e.g. Jääskeläinen (2011) who also studied Nordic markets, by using similar variables I am able to extend the previous literature.

Return

Third, the return measures which also concern value creation of PE firms through improving the bottom-line. These measures for measuring operating return include EBITDA/Total Assets and return on invested capital (ROIC). EBITDA/Total Assets is widely used measure to study the effects of PE ownership on return on assets, recent examples of studies utilising the measure include Boucly et al. (2008), Leslie & Oyer (2009) and Guo et al. (2011). The reasoning behind using EBITDA-based measure in return on assets rather than EBIT or earnings is provided in the previous paragraphs introducing the use of EBITDA margin. ROIC has received less attention in the literature, however, recently used by Bergström et al. (2007). The authors argue that theoretically ROIC should yield the most neutral comparison of operating profitability across industries while accounting for profit margins and capital efficiency. However, the authors also recognise the drawback of ROIC, being sensitive to financial reporting standards.

6.1.2 Independent variables

Private equity specialisation

The focus of this thesis is to test the Jensen hypothesis of alleged superior governance of private equity firms which, according to the hypotheses, would create superior performance for their backed buyout companies. Gottschalg & Wright (2008) find some private equity firms being able to repeatedly create value for their buyout companies by focusing on small

number of industries as well as Wright et al. (2009) further supporting their argument. The determinants of superior performance are tested for persistence prior and over the financial turmoil which began in 2008. The main determinants are private equity firm specialisation in industries or in investment stages.

The degree of specialisation is measured with two methods: the Index of Competitive Advantage (ICA) and the Herfindahl-Hirschmann-Index (HHI). First, ICA is adapted from Archibugi & Pianta (1994) and used in the private equity context by Cressy et al. (2007), measuring the PE firm's degree of specialisation across stages or industries relative to other PE firms. It is defined as,

Equation 1 - The Index of Competitive Advantage

$$ICA_{ij} = \frac{C_{ij} / C_{.j}}{C_{i.} / C_{..}}$$

where a dot represents summation over the particular subscript and

C_{ij} represents the number of companies invested in by PE firm *i* in industry/stage *j*
$C_{.j}$ represents the total number of companies invested in by all PE firms in industry/stage *j*
$C_{i.}$ represents the total number of companies invested in by PE firm *i*
$C_{..}$ represents the total number of companies invested in by all PE firms in all industries and stages

The share of private equity firm *i* of all investments in a industry or a stage *j* is represented by the numerator whereas the share of PE firm of all investments in all industries and stages is represented by the denominator. ICA indicates that if a PE firm is relatively specialised the index will amount to greater or equal to one. ICA was calculated for each PE firm in the sample which had made a Nordic buyout within 2003 to 2007. Therefore, dummy variables measuring specialisation were constructed by taking a value of one if the buyout company being acquired was in the stage or industry where the PE firm is specialised according to ICA and zero in all other cases.

Second, the degree of private equity specialisation or diversification across industries and stages is alternatively tested with the Herfindahl-Hirschmann-Index (Hirschmann, 1945 and Herfindahl, 1950). The measure has been recently used in the private equity literature by Ljunqvist & Richardson (2003) and Lossen (2006). HHI is defined as

Equation 2 - The Herfindahl-Hirschmann -Index

$$1 - \left(\sum \text{Capital}_{ij}^2\right)$$

where *i* denotes a particular private equity firm and *j* denotes fraction of capital of the PE firm invested in a stage or an industry.

HHI is thus calculated by squaring the fraction of capital of a PE firm invested in each stage or industry, summing up the results and lastly subtracting the results from one. Therefore, HHI will have a value of zero for a non-diversified PE firm or a value of one for a completely diversified PE firm. The index will be used in this thesis to measure the overall investment focus of a PE firm and whether focusing on a limited number of industries or stages yield superior performance as Gottschalg and Wright (2008) and Wright et al. (2009) suggest.

ICA and HHI have both different approaches to measure specialisation and thus both are included in the paper to be able to have a more comprehensive approach. ICA measures the relative specialisation of a PE firm to all other available PE firms whereas HHI concentrates diversification of the PE firm. Furthermore both measures have provided mixed evidence. Cressy et al. (2007) found using ICA that industry specialised PE firms are able to significantly influence the operational efficiency of their portfolio companies whereas stage specialised firms may have an advantage in growth prospects over peer companies. The study of Lossen (2006) concentrates on returns rather than operational efficiency and suggests by using HHI that stage specialisation would drive higher returns whereas industry specialisation would yield lower returns. Ljunqvst and Richardson (2003) by using HHI find that PE firms tend to specialise by industry but fail to find any significant connection between specialisation and returns.

PE backed

The variable is used in the whole sample regressions, including both the buyout companies as well as their peers. This dummy variable measures whether private equity ownership leads to superior operating performance, taking a value of one if the company is acquired by a PE and zero in all other cases.

PE affiliation

Private equity firm affiliation measures the relation of performance and whether the firm is independent or affiliated with e.g. a bank, government or another institution. The literature suggests that non-independent PE firms have fewer incentives to perform. Botazzi et al.

(2004) conclude that independent venture capital firms are more active owners than other affiliated firms and therefore the portfolio companies are more likely to perform.

PE experience

Wright et al. (2009) suggest based on previous literature that experience of private equity firms is linked with greater performance. The authors base their arguments not only on superior knowledge, but also on the network the firm has built throughout the intermediaries. Therefore, experienced PE firms may have access to a higher number of good deals. Kaplan and Schoar (2005) find a relation between greater performance and higher sequence number of funds, concluding that size and maturity of the firm drives portfolio company performance. The authors also find persistence in performance of PE firms, subsequent funds tend to mimic the previous funds' performance and as a result better performing PE firms are able to raise new funds. Thus, the fund's sequence number is used as a proxy for experience of the firm.

PE Size

Private equity firm size is measured through total capital commitments of the firm in question. PE size is not used as a typical explanatory variable but rather as a predictor of missing accounts data in Heckman selection regressions for the subsample of only PE-backed companies. The variable has been dropped from the regressions, other than the use for Heckman due to collinearity with the Mills ratio. Cressy et al. (2007) argue that larger PE firms tend to take less risk and as a result would be more likely to prefer companies with complete data available to be able to reduce the risk in the acquisition. The authors continue by suggesting that through their established networks these larger PE firms have easier access to better deals than smaller and inexperienced firms. More discussion on the topic is provided in Section 6.2.

PE market, MSCI and Interest rate

The total value of the European private equity market, Morgan Stanley Capital International World Index and Interest rate as 12 month Euribor all are included to account for money-chasing-deals. The literature suggests that under favourable market conditions capital flows for PE investments as well as other investments increase and as a result drives the prices and thus the value of the market higher along with general equity indices. Another consequence of a money-chasing-deal is usually poor performance as competition for good deals increases and PE firms are forced to settle for less attractive investments under the pressure to invest their capital commitments. These variables control the fact that could there be connection

with performance and money-chasing-deals, especially on the variables that show no significant improvement under PE ownership.

Another way to account for the deals is use the interest rate as a proxy. The literature has suggested that favourable credit market conditions allow PE firms to take advantage of mispricing between equity and debt markets. Kaplan and Stein (1993) find that the favourable credit market conditions fuelled the 1980s buyouts and Kaplan and Strömberg (2009) suggest that similar conditions affected the latest wave of buyouts.

Initial sales and profitability

Initial sales and profitability control for "winner picking". These variables control whether the operational performance is due to superior selection abilities through better knowledge and networks or through abilities to monitor the portfolio companies and drive operational improvements. Winner picking has been identified as a source for operational gains as e.g. Wu (1997) found that managers tend to manipulate earnings downward prior to management buyouts and therefore leave "more room" for improvement for PE firms.

Company age

Company age is used in a similar way than PE Size, a predictor of missing accounts data for complete sample Heckman selection regressions. And as a selection variable, collinearity with Mills ratio forced to exclude company age as a typical explanatory variable. Cressy et al. (2007) concluded in their paper that the same predictor, company age or PE size, did not work for both the complete sample and a subsample of PE companies. The authors suggest that company age is directly linked with the stability and survival of the company. Also, companies under financial distress tend to delay or not disclose their accounts data. Therefore, company age may be used as a predictor of missing accounts data.

Acquisitions and Divestments

Both acquisitions and divestments may influence the company performance significantly. M&A activity not only affects the top line but also the operational efficiency if e.g. a poorly performing division is divested. In addition to the above, PE firms use M&A as one driver for company improvement and as such should be controlled as a source for operational improvement gains.

CAPEX

The change in capital expenditure over sales is controlled as previous literature has found that LBOs may increase the current cash flows on the expense of future cash flows. (Kaplan and Strömberg, 2009). Also, Long and Ravenscraft (1993) suggest that CAPEX decreases with LBOs as a result of two factors. First, buyout companies are cash constrained and therefore can not divert cash flows to investments and second, PE firms invest to only value maximising targets. Therefore, CAPEX variable controls for change especially in ROIC.

Employment

Critics of LBOs have argued that productivity and operating improvements in buyouts may arise from employee reductions. On the other hand literature on the employment effects in LBOs has not found such effect. However, in the case especially during hard times such as the financial crisis companies may be more inclined to reduce overhead costs through reducing the number of employees. Therefore, the employment effect is controlled in this paper through the ratio of change in the Sales over the number of employees over the observation period.

CEO change

The CEO change dummy variable measures whether the CEO of the portfolio company has been changed within the observation period. Berg and Gottschalg (2005) suggest that poor performance might be due to an incapable CEO or management in general, therefore changing the CEO may lead to an improvement in company performance. Furthermore, Acharya and Kehoe (2008) found that two-thirds of the CEOs of buyout companies are replaced within four years of the buyout.

6.2 Methods

The statistical tests to measure the performance of private equity backed buyout companies are made in three phases. In the first phase, the buyouts are compared to their peers in terms of operating performance, in the second phase PE specialisation effects are tested by comparing the operating performance of specialised, non-specialised and peer companies and in the third phase the operating performance is tested with regressions against specialisation and a number of control variables.

6.2.1 Operating performance

In the first phase the operating performance differences between PE backed companies and the peer companies are matched through the mean values of each operating performance measure. The mean values for sales growth were intended to be calculated with a geometric mean whereas other measures are calculated using an arithmetic mean. Geometric mean could be applied to the sales figures due to the fact the method better represents growth rates as it is calculated as a product of the sales growth rates. However, as the sample includes also negative growth rates the geometric mean produces a high downward bias in the results. Therefore, the arithmetic mean is applied to sales growth. The matched pair methodology has been previously used in the context of private equity and venture capital by Wright et al. (1997), Alemany & Marti (2005) and Cressy et al. (2007). The first phase is studied through a corrected t-test with a two-tailed null hypothesis of population means being equal. The corrected t-test is applied as the variance might be highly unequal with the two samples being tested. The equation for calculating the means are as follows

Equation 3 - Arithmetic mean

$$AM_{ij} = \frac{1}{n} * \sum_{j=1}^{n} x_j$$

where *i* represents particular company and *j* represents a particular year and

AM is the arithmetic mean
x_j is the operating performance measure in question.

6.2.2 Specialisation benefits

The second phase studies the private equity specialisation effects by separating the sample in to 12 distinct sub-samples. The operating performance of specialised private equity backed companies is tested against non-specialised PE backed companies as well as against peer companies. Both stage and industry specialisation is tested separately with their corresponding methods to calculate the degree of specialisation. A different method, ANOVA, is applied to test specialisation as a more than two means are compared simultaneously. In line with the first phase, a two-tailed null hypothesis is tested whether or not the means of the sub-samples are equal.

6.2.3 Explanatory model

In the third phase two regression models, Ordinary Least Squares (OLS) and Heckman selection, are utilized to test operating performance on specialisation and other variables that

previous literature has suggested to be significant explaining the performance. The methods are adapted from the studies by Cressy et al. (2007) and Nikoskelainen & Wright (2007). The complete equations for the regressions are as follows

Equation 4 – OLS

$$\begin{aligned} OP = \ & \alpha + \beta_1 ICA\ IND + \beta_2 ICA\ STG + \beta_3 HHI\ IND + \beta_4 HHI\ STG + \beta_5 PE\ backed \\ & + \beta_6 PE\ affiliation + \beta_7 PE\ experience + \beta_8 PEmarket + \beta_9 Initial\ sales \\ & + \beta_{10} Initial\ profitability + \beta_{11} Acquisitions + \beta_{12} Divestments \\ & + \beta_{13} CAPEX + \beta_{14} Employment + \beta_{15} CEO\ change + \beta_{16} MSCI \\ & + \beta_{17} Interest\ rate + \varepsilon \end{aligned}$$

where OP is the corresponding operational performance measure used as the dependent variable i.e. Sales growth, EBITDA margin, EBITDA/Total Assets, ROIC, CCC or NWC/Sales and where the independent variables are selected to the model and regression in question from the list above. More detailed explanation on the variables is provided in Section 6.1.

Heckman selection is included to estimate the probability of non-random sample selection. The Orbis database for operational data used in this thesis does not have complete reports on all the companies in the Nordics, therefore, by excluding companies with missing accounts data might create bias in the results. The Heckman selection estimates the bias in the regressions with two stages. First, the selection equation uses the Probit model to estimate the probability of missing accounts data and generates the inverse Mills ratio, a sample selection correlation term. Second, the Heckman regression includes the Mills ratio in the linear regression as an additional explanatory variable, partly replacing the error term and avoids the bias. The Heckman selection thus corrects the model for the bias. Λ 03BB 0314 0342

Equation 5 – Mills ratio

$$\lambda_i^* = \frac{\phi(w_i \gamma^*)}{\Phi(w_i \gamma^*)}$$

Where, w_i denotes the vector of explanatory variables affecting the missing accounts data in the Heckman selection equation i.e. company age or PE size, γ^* the Probit estimate from the first stage of estimation for the coefficient γ, ϕ the density distribution function of the standard normal distribution and Φ denotes the density distribution function.

Following the example of Cressy et al. (2007), I use company age in the total sample regressions and PE firm size in the PE backed buyout subsample regressions to study whether missing accounts data and thus the sample selection bias is significant in the data set. The

authors continue that through the extensive tests of the model the two variables can not be used for both regressions ad the predictor of missing accounts. The authors argue that company age is a major factor in survival and stability of companies. Also, distressed companies tend to delay or not disclose financial statements. Therefore, company age in Heckman selection can be used as a predictor of missing accounts. Justification for using PE size in Heckman selection for the subsample containing only private equity backed buyouts, the authors suggest larger PE firms being more likely to acquire companies with reported financial statements. Without the reported accounts PE firms may not be able to evaluate the viability of the target and thus not willing to invest. Also, larger PE firms through their extensive networks may be favoured over smaller firms in transactions.

7. Analysis and the results

Analysis of the data is divided into two stages where first t-tests and ANOVA are provided to analyse the differences between subsamples and on the second stage regressions are conducted to analyse the data. The whole sample comparisons between buyouts and peer companies were provided in the Section 6. In the first stage the data set is divided into specialised PE buyouts, non-specialised PE buyouts and peer companies for the whole sample as well as for two subsamples of before and during the financial crisis. Pre-financial crisis is defined as buyouts taking place from 2003 to H1 2005 whereas the financial crisis subsample consists of buyouts from H2 2005 to 2007 with roughly equal sample sizes. The second stage consists of regressions of the whole sample with peer companies to find study whether the alleged superior performance of PE companies is present as well as regressions with the PE-backed companies subsample to dig deeper into the specialisation gains.

7.1 Statistical tests of the subsamples

7.1.1 ANOVA

Table 10 presents the results of comparison across subsamples of specialised buyouts, non-specialised buyouts and peer companies. ANOVA tests whether the means of the three groups are the same. The analysis is made for both industry and stage specialisation, calculated with both methods ICA and HHI. The results show that PE firms are able to drive significantly higher sales growth in their portfolio companies than the peers, at 1% level in all cases. It also seems that specialised PE firms have slight advantage over non-specialised firms except in the case of stage specialised by HHI. Specialised firms able to maintain higher EBITDA margin than non-specialised and peers in all cases, whereas the difference between the three groups is

only significant in the case of stage specialised companies. Non-stage specialised buyouts seem to have rather similar EBITDA margins than the peers or even lower in the case of non-stage specialised by ICA. The ratio between EBITDA and Total Assets show that specialised firms are able to drive higher ratios in all cases than peers and non-specialised firms, the differences being significant with stage specialised firms as with the EBITDA margin. However, with EBITDA/Total Assets, peer companies outperform the non-specialised firms in all cases.

Table 10 - Differences between the post buyout performance among specialised PE firm and non-specialised PE firm buyouts and the non-PE backed peer companies

Panel A: Industry specialisation by ICA

	Sales growth	EBITDA margin	EBITDA/ Total Assets	ROIC	CCC	NWC/ Sales	n
Specialised buyouts	32.62%	9.58%	12.44%	4.37%	75.89	18.12%	82
Non-specialised buyouts	29.48%	7.95%	9.17%	13.45%	31.46	11.05%	45
Peer companies	8.72%	5.85%	10.93%	7.08%	68.27	1.19%	127
F-test	10.81***	1.80	0.62	1.17	3.17**	4.74***	

Panel B: Stage specialisation by ICA

	Sales growth	EBITDA margin	EBITDA/ Total Assets	ROIC	CCC	NWC/ Sales	n
Specialised buyouts	31.82%	9.81%	12.12%	6.82%	60.94	17.15%	113
Non-specialised buyouts	28.97%	2.45%	-2.11%	8.78%	77.91	1.21%	14
Peer companies	8.72%	5.85%	10.93%	7.09%	68.27	1.19%	127
F-test	10.74***	3.38**	5.66***	0.02	0.48	5.35***	

Panel C: Industry specialisation by HHI

	Sales growth	EBITDA margin	EBITDA/ Total Assets	ROIC	CCC	NWC/ Sales	n
Specialised buyouts	37.16%	10.08%	14.41%	8.65%	71.53	20.82%	55
Non-specialised buyouts	27.19%	8.18%	8.89%	6.78%	51.45	11.63%	72
Peer companies	8.72%	5.85%	10.93%	7.12%	68.27	1.19%	127
F-test	11.81***	1.90	1.86	0.06	0.85	5.13***	

Panel D: Stage specialisation by HHI

	Sales growth	EBITDA margin	EBITDA/ Total Assets	ROIC	CCC	NWC/ Sales	n
Specialised buyouts	24.82%	14.25%	15.84%	10.05%	53.76	12.09%	47
Non-specialised buyouts	35.44%	5.91%	8.60%	6.14%	63.90	17.69%	80
Peer companies	8.72%	5.85%	10.93%	7.10%	68.27	1.19%	127
F-test	11.90***	7.16***	3.06**	0.23	0.36	4.56**	

The table presents the comparison of the mean values of the variables over three years of the buyout or the holding period in the case the company has been sold within three years. The sample of 127 Nordic PE backed buyout companies and their corresponding peer companies over the course from 2003 to 2007 are analysed using ANOVA. Panels A and B present the figures of industry and stage specialised and non-specialised PE buyouts with their peer companies as indicated by the Index of Competitive Advantage, respectively. Panels C and D present the figures of industry and stage specialised and non-specialised PE buyoyts with their peer companies as indicated by the Herfindahl–Hirschman Index, respectively. ROIC stands for Return on Invested Capital, CCC is the Cash conversion Cycle and NWC is Net Working Capital. *p<0.1, **p<0.05, ***p<0.01

The difference between the groups with ROIC is non-significant in all cases and the figures seem to be in line with each other. The working capital measures show mixed results. CCC seems to be better for stage specialised firms whereas industry specialised firms are

outperformed by the peers and non-specialised companies, although differences not being significant other than in ICA industry specialisation. PE firms, both specialised and non-specialised seem to be significantly outperformed by the peers in terms of NWC/Sales, where the specialised companies are the worst performing.

The previous results where the total sample of buyouts were compared to the peer companies indicated outperformance of buyouts in terms of sales growth and EBITDA margin whereas the working capital figures were insignificant or mixed. Specialisation on the other hand seems to drive higher Sales growth in general, in all cases but one. Furthermore the results show that stage specialised firms may be able to drive higher operating profitability than the counterparts. In terms of these three variables, it seems that specialisation and especially stage specialisation may be able to drive greater performance. In the study of Cressy et al. (2007), where similar test was conducted on Sales growth and EBITDA margin, the authors found that only operating profitability was significantly different between the groups. However, the stage specialised companies had lower profitability than the non-stage specialised.

In the total sample comparisons ROIC was slightly higher for buyouts than peers, although insignificant. The comparison between the subsamples yield somewhat mixed results, however, the ROIC levels seem to be in line with each other. These results are similar as Bergström et al. (2007) who found that buyouts had higher ROIC and higher improvement during the observation period, however, insignificantly. In the literature working capital improvements have been found to be positive and significant with buyout companies, even compared to peers. (Kaplan, 1989b; Singh, 1990; Berg and Gottschalg, 2005; Jääskeläinen, 2011). However these results show somewhat poor performance of buyout companies, where in the cases of stage specialised firms outperform the non-specialised and peers whereas the non-industry specialised firms outperform the other groups 2with the CCC measure. NWC/sales show that working capital management of buyouts is outperformed by their peers.

Based on the results hypothesis five and six may be partially confirmed. Hypothesis five, the industry specialisation, seems to drive sales growth whereas has only a slight positive effect on profitability and return. On the part of working capital management, the hypothesis should be rejected. Stage specialisation on the other hand seems to confirm hypothesis six on sales growth and profitability, whereas having only slight positive effect on return. However, working capital management supports rejection of the hypothesis.

7.1.2 Specialised and non-specialised buyouts on the peer companies

This analysis compares the differences of the specialised and non-specialised buyouts and the peer companies separately as their own groups through t-tests. The results are shown in Table 11. In line with the previous analysis sales growth is significant at 1% level compared to peer companies in all of the subsamples, although non-stage specialisation by ICA provides an exception. Industry specialisation seems to provide significant outperformance in EBITDA measures whereas non-industry specialised firms have similar or even poorer performance than the peer companies. ROIC and the working capital figures are in line with that of the peers for industry specialised and non-specialised firms, as it was the case with the previous analysis.

It also seems that non-stage specialised firms are performing more poorly than non-industry specialised firms as non-industry specialised firms by ICA even produce negative and significant results. In line with the previous analysis ROIC and working capital measures do not provide significant differences among the subsamples.

Therefore, the results thus far suggests that peer company performance is outperformed by the buyouts in terms of Sales growth and profitability, in line with the previous literature, whereas both industry and stage specialisation may provide higher drivers in these measures. However, unlike the previous literature, working capital is not being used more efficiently in the buyout companies, or specialisation does not seem to provide any improvement in the matter. This may be due to the financial crisis which could even out the knowhow of the private equity firms, however, this will be studied in more detail in the following chapters. The results are consistent with the previous analysis and seem to support the hypothesis five and six for both sales growth and profitability. However, in this case also industry specialisation had significantly positive effect on profitability. On other measures the hypothesis are rejected.

7.1.3 Specialised and non-specialised buyouts

Table 12 shows the comparison between specialised and non-specialised PE firms for both methods ICA and HHI. The industry specialised and non-specialised firms' figures were in line with each other except CCC showed significantly poorer performance for ICA industry specialised firms whereas EBITDA/Total Assets were significantly higher for HHI industry specialised than for non-specialised firms. For industry specialisation groups, Sales growth

Table 11 - Comparison of specialised and non-specialised PE firms' buyout companies on the peer companies

Pannel A - Industry special. and non-specialised buyouts by ICA and the peers

	ICA IND			NO ICA IND		
	Buyouts	Peers		Buyouts	Peers	
Variable	Mean	Mean	T-test	Mean	Mean	T-test
Sales growth	32.6%	7.5%	3.61***	29.5%	10.9%	3.24***
EBITDA margin	9.6%	5.5%	1.89***	8.0%	6.4%	0.49
EBITDA/Total Assets	12.4%	9.3%	1.30*	9.2%	13.7%	-1.27
ROIC	4.4%	4.7%	-0.08	13.4%	11.8%	0.19
CCC	75.89	80.51	-0.29	31.61	45.97	-0.75
NWC/Sales	0.18	0.13	0.70	0.11	0.14	-0.40

Panel B - Stage special. and non-specialised buyouts by ICA and the peers

	ICA STG			NO ICA STG		
	Buyouts	Peers		Buyouts	Peers	
Variable	Mean	Mean	T-test	Mean	Mean	T-test
Sales growth	31.8%	8.4%	4.50***	29.0%	11.1%	1.15
EBITDA margin	9.8%	4.9%	2.79***	2.2%	14.0%	-1.79**
EBITDA/Total Assets	12.9%	9.7%	1.66**	-2.1%	19.8%	-2.55***
ROIC	7.4%	5.9%	0.63	8.8%	18.1%	-0.30
CCC	57.70	72.24	-1.10	84.14	36.21	1.26
NWC/Sales	0.17	0.15	0.50	0.01	0.04	-0.15

Panel C - Industry special. and non-specialised buyouts by HHI and the peers

	HHI IND			NO HHI IND		
	Buyouts	Peers		Buyouts	Peers	
Variable	Mean	Mean	T-test	Mean	Mean	T-test
Sales growth	37.2%	4.8%	3.63***	27.2%	11.8%	2.90***
EBITDA margin	10.1%	6.3%	1.47*	8.2%	5.5%	1.11
EBITDA/Total Assets	14.4%	11.1%	1.34*	8.9%	10.8%	-0.64
ROIC	8.7%	7.4%	0.48	6.8%	7.1%	-0.05
CCC	72.39	81.59	-0.48	51.45	58.09	-0.40
NWC/Sales	0.21	0.19	0.25	0.12	0.10	0.37

Panel D - Stage special. and non-specialised buyouts by HHI and the peers

	HHI STG			NO HHI STG		
	Buyouts	Peers		Buyouts	Peers	
Variable	Mean	Mean	T-test	Mean	Mean	T-test
Sales growth	24.9%	8.0%	2.43***	35.4%	9.1%	3.97***
EBITDA margin	14.3%	6.7%	2.68***	5.9%	5.4%	0.25
EBITDA/Total Assets	15.8%	12.0%	1.69**	8.6%	10.3%	-0.59
ROIC	10.1%	7.7%	1.05	6.1%	7.0%	-0.13
CCC	53.76	57.54	-0.23	64.40	74.57	-0.59
NWC/Sales	0.12	0.11	0.21	0.18	0.15	0.36

The table compares specialised and non-specialised PE firms' buyouts and their properties on the peer companies over three years from the buyout or the holding period if the company has been sold within the three years. The sample includes only companies with complete data available for the observation period totalling to 127 observations. Comparisons of the mean values of the variables between the buyouts and peers have been calculated using Welch's corrected t-test. Panels A and B present the comparison between industry and stage specialised and non-specialised buyouts as calculated by the Index of Comparative Advantage, respectively, whereas in Panels C and D specialisation is calculated by Herfindahl–Hirschman Index. Sales growth is the mean growth of sales over the holding period. EBITDA margin and EBITDA/Total Assets are the mean values during the holding period. ROIC is the mean value of Return on Invested Capital over the holding period and CCC is the mean cash conversion cycle over the holding period, a working capital measure. Current ratio shows the mean current ratio over the holding period. Net Working Capital/Sales is a working capital measure and indicated as mean value over the period. The sample sizes for ICA IND, NO ICA IND, ICA STG, NO ICA STG, HHI IND, NO HHI IND, HHI STG and NO HHI STG, 82, 45, 113, 14, 55, 72, 47 and 80 respectively. *p<0.1, **p<0.05, ***p<0.01

and EBITDA measures were higher for specialised companies than that of the non-specialised. For stage specialised firms the results show significantly higher EBITDA measures than that of the non-specialised, HHI stage specialised being more significant. However, HHI stage specialised firms have lower Sales growth than the non-specialised firms. For all the groups ROIC and working capital measures, except for CCC of ICA industry specialised, were in line with each other and produced mixed results.

Table 12 - Differences between specialised and non-specialised PE firms' buyout companies

	Panel A - Industry special. by ICA			Panel B - Stage special. by ICA		
	ICA IND	NO ICA IND		ICA STG	NO ICA STG	
Variable	Mean	Mean	T-test	Mean	Mean	T-test
Sales growth	32.6%	29.5%	0.39	31.8%	29.0%	0.19
EBITDA margin	9.6%	8.0%	0.54	9.8%	2.2%	1.39*
EBITDA/Total Assets	12.4%	9.2%	1.01	12.9%	-2.1%	2.00**
ROIC	4.4%	13.4%	-1.07	7.4%	8.8%	-0.05
CCC	75.89	31.61	2.56***	57.70	84.14	-0.83
NWC/Sales	0.18	0.11	0.91	0.17	0.01	1.26
	Panel C - Industry special. by HHI			Panel D - Stage special. by HHI		
	HHI IND	NO HHI IND		HHI STG	NO HHI STG	
Variable	Mean	Mean	T-test	Mean	Mean	T-test
Sales growth	37.2%	27.2%	1.02	24.9%	35.4%	-1.19
EBITDA margin	10.1%	8.2%	0.66	14.3%	5.9%	2.81***
EBITDA/Total Assets	14.4%	8.9%	1.98**	15.8%	8.6%	2.72***
ROIC	8.7%	6.8%	0.31	10.1%	6.1%	0.71
CCC	72.39	51.45	1.14	53.76	64.40	-0.62
NWC/Sales	0.21	0.12	0.99	0.12	0.18	-0.75

The table compares specialised and non-specialised PE firms' buyouts and their properties over three years from the buyout or the holding period if the company has been sold within the three years. The sample includes only companies with complete data available for the observation period totalling to 127 observations. Comparisons of the mean values of the variables between the buyouts and peers have been calculated using Welch's corrected t-test. Panels A and B present the comparison between industry and stage specialised and non-specialised buyouts as calculated by the Index of Comparative Advantage, respectively, whereas in Panels C and D specialisation is calculated by Herfindahl–Hirschman Index, where e.g. NO HHI IND stands for non-industry specialised firms by HHI. Sales growth is the mean growth of sales over the holding period. EBITDA margin and EBITDA/Total Assets are the mean values during the holding period. ROIC is the mean value of Return on Invested Capital over the holding period and CCC is the mean cash conversion cycle over the holding period, a working capital measure. Net Working Capital/Sales, is a working capital measures and indicated as mean value over the period. The sample sizes for ICA IND, NO ICA IND, ICA STG, NO ICA STG, HHI IND, NO HHI IND, HHI STG and NO HHI STG, 82, 45, 113, 14, 55, 72, 47 and 80 respectively. *p<0.1, **p<0.05, ***p<0.01

Overall it seems that stage specialisation provides drivers for higher profitability whereas industry and stage specialisation both may have a slight advantage over the non-specialised companies in terms of Sales growth and profitability. Working capital and ROIC did not produce any significant or straightforward differences between specialised and non-specialised firms. Consistent with the other results, although less significant, the hypothesis

five and six are supported by these findings in terms of sales growth and profitability, stage specialisation and hypothesis six being more significant.

7.1.4 Buyouts pre and during the financial crisis with the peer companies

The sample selection allowed to study the relation between PE backed and non-PE backed companies pre and during the financial crisis as well as the specialisation effects on both of the time periods. The subsamples are done to study whether the superior performance of PE backed companies and the specialisation benefits persist over difficult economic conditions such as the financial crisis. Table 13 shows the comparison of performance between the buyouts and peer companies pre and during the financial crisis as well as comparison of buyout companies under the same time periods.

The results show that during the financial crisis PE firms' performance not only persisted but became more pronounced compared to pre-financial crisis figures. Sales growth and EBITDA margin being significant whereas pre-financial crisis there was so significant difference between PE backed and their peers' profitability. The other figures show, although insignificant, that PE firms were able to perform slightly better than the peers in terms of ROIC as well as working capital measures under the crisis which was not the case pre-crisis.

Table 13 - Comparison of PE backed buyout companies on the peer companies and on themselves pre (2003 - H1 2005) and during (H2 2005 - 2007) financial crisis

	Panel A				Panel B				Panel C			
	During the financial crisis				Pre financial crisis				During		Pre	
		Buyouts	Peers			Buyouts	Peers			Buyouts		Buyouts	
Variable	n	Mean	Mean	T-test	n	Mean	Mean	T-test	n	Mean	n	Mean	T-test
Sales growth	76	30.8%	4.4%	3.93***	51	32.6%	15.2%	2.48***	76	30.8%	51	32.6%	-0.21
EBITDA margin	76	10.5%	5.5%	1.97**	51	6.8%	6.4%	0.21	76	10.5%	51	6.8%	1.32*
EBITDA/Total Assets	76	10.4%	9.7%	0.25	51	12.6%	12.8%	-0.10	76	10.4%	51	12.6%	-0.80
ROIC	76	8.2%	6.0%	0.34	51	6.8%	9.1%	-0.75	76	8.2%	51	6.8%	0.24
CCC	76	63.63	73.73	-0.60	51	55.56	60.13	-0.25	76	63.63	51	55.56	0.45
NWC/Sales	76	0.15	0.16	-0.14	51	0.17	0.10	1.05	76	0.15	51	0.17	-0.34

The table compares specialised and non-specialised PE firms' buyouts and their properties on the peer companies over three years from the buyout or the holding period if the company has been sold within the three years. The sample includes only companies with complete data available for the observation period totalling to 127 observations and is split between buyouts that dated pre financial crisis (2003 - H1 2005) and during the financial crisis (H2 2005 - 2007). Comparisons of the mean values of the variables between the buyouts and peers have been calculated using Welch's corrected t-test. Panels A and B present the comparison between buyout companies and the peers during and pre financial crisis, respectively, whereas Panel C presents the comparison of the buyouts during the same time periods. Corresponding data for pre-financial crisis buyouts. Sales growth is the mean growth of sales. EBITDA margin and EBITDA/Total Assets are the mean values during the holding period. ROIC is the mean value of Return on Invested Capital and CCC is the mean cash conversion cycle and, a working capital measure. Net Working Capital/Sales is a working capital measure and indicated as mean values over the period. *p<0.1, **p<0.05, ***p<0.01

Buyout subsamples pre and during the crisis shows no highly significant differences in the figures except profitability being on a higher during the crisis, significant at a 10% level. Although being insignificant, the figures suggest that buyouts may have been performing

slightly better pre-crisis than during the crisis, other than EBITDA margin. However, there is a clear difference between buyout performance compared to that of the peers pre and during the crisis. Therefore, during financial crisis PEs were able to influence their portfolio companies in a more profound manner compared to peers although their own performance did not change significantly during the two time periods i.e. the PE performance somewhat constant over time periods whereas the non-PE backed company performance varies with market conditions. These results thus suggest confirming hypothesis seven, has the operational efficiency of buyouts persisted or improved compared to that of the peers over the crisis. The results show improvement in all variables during the crisis compared to pre-crisis times, Sales growth and EBITDA margin being significant.

7.1.5 Specialisation of buyouts on the peer companies pre and during the crisis

Table 14 shows the comparison between specialised and non-specialised firms and their peer companies both pre and during the financial crisis. Comparing industry specialised firms under both time periods suggests that during the crisis, industry specialised firms have managed to grow the difference in performance to that of the peers. ICA industry specialisation shows highly significant differences in Sales growth and in EBITDA/Total Assets where as HHI industry specialisation has highly significant results in sales growth and in both of the EBITDA measures. Pre-crisis industry specialised firms show only significant results at a 10 percent level for sales growth for both methods and EBITDA/Total Assets for ICA, other variables being insignificant.

During the crisis non-industry specialised PE firms manage only to influence significantly and positively on the Sales growth, however, the significance level being lower than that of the industry specialised PEs. The non-industry specialised firms do seem to have slightly better performance in other variables than their peers, excluding EBITDA/Total Assets. In line with the performance during the crisis, only Sales growth is positive and significant for the non-industry specialised subsample pre-crisis. However, ICA method shows that these firms underperform significantly their peers in terms of EBITDA/Total Assets and ROIC also the difference in EBITDA margin being negative. Similar findings, although insignificant, is obtained with HHI method for the same subsample. The results show that the non-industry specialised firms are not able to match the performance of specialised firms and actually underperform in profitability and return compared to peers under good economic conditions.

Table 14 - Difference in means of specialised and non-specialised PE firms' buyout companies and the peer companies pre (2003 - H1 2005) and during (H2 2005 - 2007) financial crisis

	Panel A - Special. companies with their peers pre and during the crisis								Panel B - Non-special. companies with their peers pre and during the crisis							
	Crisis ICA IND		Crisis ICA STG		Pre ICA IND		Pre ICA STG		Crisis NO ICA IND		Crisis NO ICA STG		Pre NO ICA IND		Pre NO ICA STG	
Variable	Diff.	T-test	Diff.	T-test	Diff.	T-test	Diff.	T-test	Diff.	T-test	Diff.	T-test	Diff.	T-test	Diff.	T-test
Sales growth	31.6%	3.42***	27.7%	3.91***	14.4%	1.40*	17.3%	2.29**	15.7%	2.02**	17.3%	0.82	22.1%	2.64***	19.1%	1.29
EBITDA margin	5.3%	1.68**	7.6%	2.87***	2.1%	0.92	1.3%	0.61	4.4%	1.05	-12.3%	-1.78**	-2.1%	-0.46	-9.1%	-0.58
EBITDA/Total Assets	2.4%	0.68	4.6%	1.59*	4.1%	1.51*	1.0%	0.44	-2.6%	-0.46	-25.0%	-2.23**	-7.0%	-1.78**	-14.3%	-1.11
ROIC	-3.1%	-0.49	4.6%	1.23	4.2%	1.08	-2.7%	-0.93	13.1%	0.89	-13.4%	-0.31	-12.9%	-2.56***	0.6%	0.03
CCC	-10.74	-0.49	-16.98	-0.93	5.45	0.26	-11.12	-0.59	-8.80	-0.43	35.30	0.88	-20.90	-0.60	105.73	1.43
NWC/Sales	0.03	0.31	-0.01	-0.07	0.08	0.83	0.07	1.03	-0.09	-0.85	-0.04	-0.19	0.05	0.65	0.02	0.21
	Panel C - Specialised companies with their peers pre and during the crisis								Panel D - Non-special. companies with their peers pre and during the crisis							
	Crisis HHI IND		Crisis HHI STG		Pre HHI IND		Pre HHI STG		Crisis NO HHI IND		Crisis NO HHI STG		Pre NO HHI IND		Pre NO HHI STG	
Variable	Diff.	T-test	Diff.	T-test	Diff.	T-test	Diff.	T-test	Diff.	T-test	Diff.	T-test	Diff.	T-test	Diff.	T-test
Sales growth	39.3%	3.21***	18.9%	2.69***	21.2%	1.69*	14.1%	1.09	15.9%	2.31**	30.2%	3.19***	14.9%	1.80**	20.1%	2.43***
EBITDA margin	8.1%	2.54***	12.0%	2.84***	-3.3%	-0.81	2.1%	0.61	2.4%	0.63	1.3%	0.42	3.1%	1.25	-0.8%	-0.26
EBITDA/Total Assets	5.1%	1.73**	3.1%	1.10	0.5%	0.11	4.8%	1.27	-2.8%	-0.57	-0.5%	-0.11	-0.7%	-0.31	-4.0%	-1.41*
ROIC	2.3%	0.71	1.5%	0.58	-0.4%	-0.10	3.3%	0.88	2.0%	0.18	2.5%	0.26	-3.7%	-0.83	-6.4%	-1.32*
CCC	-4.34	-0.16	1.10	0.05	-18.18	-0.71	-9.84	-0.41	-14.76	-0.69	-15.92	-0.71	4.73	0.18	0.03	0.00
NWC/Sales	0.03	0.19	-0.06	-1.32*	0.02	0.18	0.11	0.80	-0.04	-0.58	0.02	0.16	0.11	1.15	0.05	0.75

The table compares specialised and non-specialised PE firms' buyouts and their properties on the peer companies over three years from the buyout or the holding period if the company has been sold within the three years. The sample includes only companies with complete data available for the observation period totalling to 127 observations and is split between buyouts that dated pre financial crisis (2003 - H1 2005) and during the financial crisis (H2 2005 - 2007). The difference in means is calculated simply by subtracting the buyout company's values with that of the peer company, therefore the percentages are percentage point differences. Comparisons of the mean values of the variables between the buyouts and peers have been calculated using Welch's corrected t-test. Panels A and C present the comparison between specialised PE firms' buyout companies and the peers during and pre financial crisis. Panels B and D present the comparison between non-specialised PE firms' buyouts and the peer companies during the same time periods. Specialisation is calculated in Panels A and B with the Index of Comparative Advantage and in Panels C and D with the Herfindahl–Hirschman Index, where e.g. NO HHI IND or NO HHI STG stands for non-industry or non-stage specialised firm, respectively. Sales growth is the mean growth of sales. EBITDA margin and EBITDA/Total Assets are the mean values during the holding period. ROIC is the mean value of Return on Invested Capital and CCC is the mean cash conversion cycle and, a working capital measure. Net Working Capital/Sales is a working capital measures and indicated as mean values over the period. CAPEX/Sales. The sample sizes are for Crisis ICA IND 51, Crisis ICA STG 66, Pre ICA IND 31, Pre ICA STG 47, Crisis NO ICA IND 25, Crisis NO ICA STG 10, Pre NO ICA IND 20, Pre NO ICA STG 4, Crisis HHI IND 34, Crisis HHI STG 26, Pre HHI IND 21, Pre HHI STG 21, Crisis NO HHI IND 42, Crisis NO HHI STG 50, Pre NO HHI IND 30 and for Pre NO HHI STG 29. *p<0.1, **p<0.05, ***p<0.01

Stage specialisation during the crisis shows highly significant differences between the PE backed companies and their peers. Sales growth and EBITDA margin are both significant at 1 percent level for both methods whereas ICA shows significant results for EBITDA/Total Assets and HHI for NWC/Sales. The other variables also seem to be slightly better or indifferent for PE backed companies. The advantages of stage specialisation seem to diminish during normal economic conditions as the specialised firms show only significant difference in Sales growth for ICA. The insignificant variables indicate, however, that PE firms might have a slight advantage over peers, although insignificant.

Non-stage specialised companies under the financial crisis clearly underperform their specialised counterparts. The HHI method shows only positive and significant differences to peers for the Sales growth variable whereas the ICA method reveals negative and significant differences to peers in terms of profitability. The other variables do not show mixed results. Under pre-crisis economic conditions the non-stage specialised firms' performance seem to be in line with their peers or even underperform, the only positively and significant variable being Sales growth for HHI. Both methods show PE backed companies to underperform in profitability, where HHI shows significant and negative results for EBITDA/Total Assets and ROIC. In line with the results of industry specialised companies it seems that under normal economic conditions the PE companies are not able to make a clear difference in performance to the peers, however, the specialised firms having a slight advantage over the non-specialised firms.

Overall the results show that specialised PE firms are able to slightly outperform the peers under normal economic conditions. However, during the financial crisis the specialised PE firms are able to influence the portfolio companies substantially, making a clear and significant difference to their peers in performance. The non-specialised firms are able to make significant and positive differences to their peers in some of the cases, however, overall their performance is either in line with their peers or underperforming. Based on the results it can be said that specialisation, both industry and stage, has advantage especially under difficult economic conditions and may drive slightly better performance under normal economic conditions compared to the peers whereas the non-specialised companies have no advantage over peers and may even underperform. Therefore, the results suggest confirming hypothesis eight, industry specialisation persistence, on the part of Sales growth and profitability. Hypothesis nine, stage specialisation persistence, is confirmed on the part of

same variables. Also, stage specialised firms may have a slight advantage in working capital management.

7.1.6 Specialisation of buyouts pre and during the financial crisis

The last sub-section compared the performance of specialised and non-specialised PE firms' portfolio companies to their peers. This chapter compares the specialised firms' performance to the non-specialised firms, however, the results might not be as meaningful as the comparison is made on average across all industries i.e. not matched to comparable peers. Despite the shortcoming, it allows to compare the average performance of specialised and non-specialised firms. Table 15 provides the statistics on the issue.

Under difficult economic conditions the two measures gives conflicting results for the difference between industry specialised and non-specialised firms. The ICA method suggests that non-specialised significantly outperform specialised firms in terms of ROIC and working capital management whereas the HHI method shows similar results for working capital, however, suggests outperformance of specialised over non-specialised in Sales growth, EBIDA margin and EBITDA/Total Assets, former and latter being significant. Under the pre-financial crisis conditions the ICA method shows advantage of specialised firms in EBITDA margin, NWC/Sales, EBITDA/Total Assets and ROIC, the latter two being significant whereas the HHI method suggests industry specialised firms to underperform slightly in sales growth and profitability. The results do not suggest any definite conclusions, however, it seems that the performance of industry specialised and non-specialised firms does not differ on average under any economic conditions.

For ICA stage specialised and non-specialised firms under difficult economic conditions the results are in line with above. However, the HHI method suggests that stage specialised firms have advantage over the non-specialised firms under both subsamples. The specialised companies are able to influence the returns and profitability significantly whereas the non-specialised companies are able to drive higher Sales growth. Also, specialised firms seem to have a slight advantage in working capital management.

The results suggest that stage specialised firms may have a slight advantage over non-specialised whereas industry specialisation does not offer any definite advantage in performance. The results for industry specialisation are rather mixed, on average the performance is roughly the same for both PE firm groups. The results show that compared to peer companies specialised firms are able to drive higher performance under both conditions

Table 15 - Comparison of specialised and non-specialised PE firms' buyout companies pre (2003 - H1 2005) and during (H2 2005 - 2007) financial crisis

	Panel A					Panel B					Panel C					Panel D				
During the financial crisis	ICA IND		NO ICA IND			ICA STG		NO ICA STG			HHI IND		NO HHI IND			HHI STG		NO HHI STG		
Variable	n	Mean	n	Mean	T-test	n	Mean	n	Mean	T-test	n	Mean	n	Mean	T-test	n	Mean	n	Mean	T-test
Sales growth	51	34.1%	25	23.8%	0.94	66	31.3%	10	26.9%	0.21	34	40.6%	42	22.8%	1.32*	26	20.9%	50	35.9%	-1.34*
EBITDA margin	51	10.3%	25	10.9%	-0.16	66	11.3%	10	5.1%	1.20	34	12.9%	42	8.5%	1.13	26	18.1%	50	6.5%	2.66***
EBITDA/Total Assets	51	10.8%	25	9.5%	0.26	66	12.4%	10	-2.9%	1.57*	34	14.1%	42	7.4%	1.71**	26	14.4%	50	8.3%	1.67**
ROIC	51	1.6%	25	21.5%	-1.36*	66	7.4%	10	13.4%	-0.15	34	8.0%	42	8.3%	-0.03	26	8.8%	50	7.8%	0.11
CCC	51	82.45	25	25.24	2.55***	66	65.29	10	52.66	0.39	34	85.99	42	45.53	1.61*	26	61.43	50	64.77	-0.14
NWC/Sales	51	0.20	25	0.04	1.38*	66	0.17	10	-0.02	1.05	34	0.23	42	0.08	1.13	26	0.08	50	0.18	-1.06
	Panel E					Panel F					Panel G					Panel H				
Pre financial crisis	ICA IND		NO ICA IND			ICA STG		NO ICA STG			HHI IND		NO HHI IND			HHI STG		NO HHI STG		
Variable	n	Mean	n	Mean	T-test	n	Mean	n	Mean	T-test	n	Mean	n	Mean	T-test	n	Mean	n	Mean	T-test
Sales growth	31	30.1%	20	36.5%	-0.57	47	32.5%	4	34.1%	-0.10	21	31.5%	30	33.4%	-0.13	21	29.7%	29	35.2%	-0.40
EBITDA margin	31	8.5%	20	4.2%	0.94	47	7.8%	4	-4.2%	0.77	21	5.5%	30	7.7%	-0.53	21	9.5%	29	4.9%	1.19
EBITDA/Total Assets	31	15.1%	20	8.7%	1.65*	47	13.7%	4	-0.1%	1.12	21	15.0%	30	11.0%	0.98	21	17.6%	29	8.9%	2.38**
ROIC	31	8.9%	20	3.3%	1.39*	47	7.6%	4	-2.7%	1.00	21	9.8%	30	4.6%	1.29	21	11.7%	29	3.3%	2.38**
CCC	31	65.10	20	39.99	0.93	47	47.04	4	189.05	-2.23**	21	49.28	30	59.74	-0.41	21	44.25	29	64.10	-0.79
NWC/Sales	31	0.16	20	0.19	-0.39	47	0.18	4	0.09	0.84	21	0.17	30	0.17	0.00	21	0.17	29	0.17	0.00

The table compares specialised and non-specialised PE firms' buyouts and their properties over three years from the buyout or the holding period if the company has been sold within the three years. The sample includes only companies with complete data available for the observation period totalling to 127 observations and is split between buyouts that dated pre financial crisis (2003 - H1 2005) and during the financial crisis (H2 2005 - 2007). Comparisons of the mean values of the variables between the buyouts and peers have been calculated using Welch's corrected t-test. Panels A through D present the comparison between industry and stage specialised and non-specialised buyouts during the financial crisis and Panels E through H present corresponding data for pre-financial crisis buyouts. ICA is specialisation as calculated by the Index of Comparative Advantage, whereas HHI is specialisation calculated by the Herfindahl–Hirschman Index, where e.g. NO HHI IND or NO HHI STG stands for non-industry or non-stage specialised firm, respectively. Sales growth is the mean growth of sales over the holding period. EBITDA margin and EBITDA/Total Assets are the mean values during the holding period. ROIC is the mean value of Return on Invested Capital over the holding period and CCC is the mean cash conversion cycle over the holding period, a working capital measure. Net Working Capital/Salesis a working capital measure and indicated as mean values over the period. *p<0.1, **p<0.05, ***p<0.01

whereas on average and across all industries the differences to non-specialised firms' performance is not significant. However, by splitting the samples into further subsamples have decreased the reliability of the results and thus further studies with a larger sample would be required to be able to make more definite conclusions. The results are consistent with previous findings in the study that PE performance does not vary significantly across time periods. However, the results do suggest confirming hypothesis nine, stage specialisation persistence in terms of profitability. Stage specialised companies are able to keep profitability higher than non-specialised companies during pre-crisis conditions and grow the difference during more difficult economic conditions.

7.1 Regressions

This section presents the regression results on the whole sample of buyouts and the peer companies as well as regressions of the subsample of buyouts. The analysis is split into four phases where the first includes the whole sample regressions, the second the PE subsample and third and fourth are conducted similarly than the first two but with the financial crisis subsamples. The regressions are made in the spirit of Cressy et al. (2007) to be able to compare the results across the authors' and this paper's datasets, although expanded beyond testing only Sales growth and EBITDA margin. Heckman selection is included in the regressions to estimate the existence of bias in the sample selection due to missing accounts data. Appendix 1 shows the test on collinearity for the selected variables. Due to high correlation with other variables the following were dropped: CAPEX, Employment, PE Experience and MSCI. Also, PE size and Company age are used in Heckman selection as predictors of missing accounts data and therefore can not be used in the regressions as typical explanatory variables due to collinearity.

7.2.1 Private equity backed buyouts and non-PE backed peer companies

Table 16 shows the regression made for the whole sample of 127 buyouts and their corresponding peer companies and in the case of Heckman regression for 321 companies of which 66 with missing accounts data. The aim of this regression is to study whether the alleged superior performance of PE backed companies exist and is there signs of winner picking or money chasing deals. The OLS regression shows significance for sales growth, EBITDA margin and CCC although the adjusted R-squared for each of the regressions are quite low. The results suggest that PE firms are able to influence significantly on the development of sales as well as on profitability of their portfolio companies. On the other

Table 16 - Regressions of the PE backed and non-PE backed peer companies

Panel A - OLS regression

	Sales growth	EBITDA margin	EBITDA/ Total Assets	ROIC	CCC	NWC/Sales
Constant	0.166**	0.087***	0.170***	0.228***	74.780***	-0.398
PE Backed	0.234***	0.030*	0.002	0.002	-9.480	1.103
Interest rate	-2.074	-1.113	-2.097*	-5.176**	-154.974	21.448
Intial sales	-4.37E-08	1.86E-08	8.38E-09	6.34E-09	-1.66E-05*	-1.94E-07
Initial profitability	-0.107***	0.029**	0.022	0.021	17.9775	-0.943**
Adjusted R-squared	0.108	0.032	0.009	0.008	0.0174	0.007
F-statistic	8.639***	3.072**	1.552	1.484	2.115*	1.469

Panel B - Heckman selection

	Sales growth	EBITDA margin	EBITDA/ Total Assets	ROIC	CCC	NWC/Sales
Constant	-0.419	0.226	0.308	0.147	290.684	-5.613
PE Backed	0.242	0.029	0.002	0.005	-11.727	1.159
Interest rate	-2.255	-0.889	-1.756	-4.909**	115.796	17.158
Intial sales	0.000	0.000	0.000	0.000	0.000	0.000
Initial profitability	-0.106	0.028	0.022	0.021	17.573	-0.932
Lambda (Mills)	1.637	-0.407	-0.414	0.191	-624.736	14.867
Wald chi-squared	3.430	2.290	1.350	5.690	0.360	1.560

Panel A shows the OLS regression on the whole sample of 127 Nordic PE backed buyouts and 127 peer companies from 2003 to 2007. Panel B shows the Heckman selection regression on a larger sample including companies with missing data with a total of 321 companies of which 66 have missing observations. The Heckman selection is used to estimate the bias of missing account data in the sample through company age before the buyout, shown by the Mills ratio (lambda). ROIC stands for Return on Invested Capital, CCC is the Cash Conversion Cycle and NWC is Net Working Capital. PE Backed dummy takes on a value of 1 if the company has been acquired by a PE firm. Interst rate is the 12m Euribor on the date of the buyout, a proxy for market conditions at the time thus used to control money chasing deals. Initial sales and profitability are used to estimate whether winner picking in PE backed buyouts is present. *p<0.1, **p<0.05, ***p<0.01

variables, the PE firms do not seem to be able to drive superior performance. Interest rate variable shows mostly negative signs on the coefficients, EBITDA/Total Assets and ROIC being significant. The negative signs indicate that high interest rates e.g. with the buyouts that endured difficult economic conditions, may lead to poorer performance. Furthermore, significant coefficients for EBITDA/Total Assets and ROIC suggest that the poor performance for these variables might have been due to money chasing deals. During good economic conditions the volume of transactions increase and PEs has pressure to invest high flow of capital commitments which results in less good investments available and buyouts of poorer quality companies. Initial profitability is significant for sales growth, EBITDA margin and NWC/Sales, former and latter having negative coefficients. The results suggest that PE

companies might be able to pick “winners” as in companies that have room for improvement and are able to leverage on the initial performance.

The Heckman selection regression does not support the findings of the OLS regression, however, the results suggest that PE firms might have a slight advantage over the peer companies in terms of the variables other than NWC/Sales, in line with the OLS regression. On the other hand the selection regression confirms the absence of the sample selection bias as lambda i.e. Mills ratio is insignificant in all regressions. Interest rate being negative and significant in the ROIC regression creates more support on the presence of money chasing deals. The findings of Cressy et al. (2007) with 122 UK buyouts from 1995 to 2002 are in line with that of this paper. The authors found PE backing as well as initial profitability being significant in almost all of their regressions, although the authors were testing only Sales growth and profitability. Also, initial turnover was significant in a few regressions contrary to findings of this paper. The regressions seem to support the confirmation of hypotheses one and two, buyouts outperforming their peers in terms of profitability and Sales growth. Hypotheses three and four for return and working capital management are rejected.

7.2.2 Private equity specialisation

The regressions are made for a sample of 127 buyout companies and in the case of Heckman selection 160 buyouts of which 33 with missing accounts data. The regressions of Table 17 are aimed at investigating whether specialisation has influence over operational improvements or do the control variables drive performance. Both ICA and HHI methods are used to determine specialisation and the degree of specialisation, respectively. The OLS regressions show significance in the case of ICA for EBITDA/Total Assets and CCC whereas HHI regressions are significant for sales growth and NWC/Sales. As it was the case with previous regressions, the adjusted R-squares remain low. Heckman selection regressions are significant for Sales growth, EBITDA/Total Assets, CCC and NWC/Sales of which sales growth for both methods and the latter only for HHI. Consistent with the previous regression, lambdas of Heckman regressions remain insignificant indicating selection bias not being present.

The results suggest that industry specialisation by ICA does not have any positive significant effect on the dependent variables, only a negative relation with working capital management through CCC. ICA stage specialisation on the other hand has positive and significant effects on profitability ratios as well as on working capital management through CCC. The HHI

Table 17 - Regression of PE backed buyout companies

Panel A - OLS regression

	Sales growth	EBITDA margin	EBITDA/ Total Assets	ROIC	CCC	NWC/Sales
Constant	0.223	-0.016	-0.071	0.384**	117.773**	5.752
ICA IND	0.064	0.004	0.002	-0.082	53.521***	0.766
ICA STG	-0.070	0.081*	0.154***	0.018	-58.376*	-3.507
PE Affiliation	-0.009	0.046	0.079*	-0.149	2.961	-3.895
PE Experience	0.004	0.001	0.000	-0.001	-0.246	-0.038
Initial sales	-1.03E-07	2.82E-08	1.77E-08	1.65E-08	-1.98E-05	-3.74E-07
Initial profitability	-0.081*	0.009	0.005	0.013	13.987	-0.734
Aquisitions	0.254**	0.004	0.015	0.004	-19.277	1.925
Divestments	0.272	-0.028	-0.039	-0.017	53.862	0.027
CEO	0.021	-0.011	0.022	0.076	-31.274	-0.018
Interest rate	0.823	-0.410	-1.402	-6.115	-561.679	40.823
Adjusted R-squared	0.044	-0.019	0.061	-0.015	0.074	-0.011
F-statistic	1.578	0.767	1.813*	0.808	1.999**	0.864

Panel B - OLS regression

	Sales growth	EBITDA margin	EBITDA/ Total Assets	ROIC	CCC	NWC/Sales
Constant	0.425**	0.123*	0.138*	0.397**	107.726**	5.132
HHI IND	-0.973***	0.012	-0.057	0.084	-25.179	-11.971***
HHI STG	0.675***	-0.177**	-0.107	-0.176	-16.969	10.257***
PE Affiliation	0.063	0.026	0.064	-0.183*	11.322	-2.761
PE Experience	0.005	0.002	0.002	0.001	-0.480	-0.035
Initial sales	-6.17E-08	9.88E-09	-2.77E-09	4.80E-09	-1.66E-05	4.86E-07
Initial profitability	-0.088**	0.010	0.008	0.011	13.331	-0.889
Aquisitions	0.223**	0.000	0.017	-0.002	-26.513	1.445
Divestments	0.311	-0.004	-0.011	-0.002	52.519	0.141
CEO	0.053	-0.009	0.027	0.065	-24.839	0.319
Interest rate	-3.727	0.304	-1.111	-5.538	-368.707	-22.751
Adjusted R-squared	0.169	0.021	0.012	-0.017	0.007	0.061
F-statistic	3.557***	1.270	1.159	0.792	1.086	1.820*

Panel C - Heckman selection

	Sales growth	EBITDA margin	EBITDA/ Total Assets	ROIC	CCC	NWC/Sales
Constant	0.245	0.466	-0.029	-0.081	131.363	6.431
ICA IND	0.068	0.032	0.003	-0.105	56.900***	0.868
ICA STG	-0.060	0.060	0.148***	0.057	-47.832*	-3.230
PE Affiliation	-0.002	0.037	0.076**	-0.126	5.388	-3.698*
PE Experience	0.004	0.000	0.000	0.000	-0.244	-0.039
Initial sales	-1.06E-07	2.31E-09	1.60E-08	3.85E-08	-2.14E-05	-4.56E-07
Initial profitability	-0.080*	0.009	0.005	0.013	14.161	-0.728
Aquisitions	0.256***	0.012	0.015	0.000	-17.625	1.972
Divestments	0.272	-0.022	-0.038	-0.023	53.369	0.028
CEO	0.023	-0.015	0.021	0.084	-28.939	0.038
Interest rate	1.353	-0.302	-1.555	-5.355	-257.964	54.521
Lambda (Mills)	-0.166	-1.307	-0.080	1.084	-110.736	-4.591
Wald chi-squared	17.170*	0.160	19.640**	1.640	17.020*	8.500

Panel D - Heckman selection

	Sales growth	EBITDA margin	EBITDA/ Total Assets	ROIC	CCC	NWC/Sales
Constant	0.509	0.534	0.251	0.277	-79.741	5.387
HHI IND	-0.949***	0.003	-0.053	0.115	-2.585	-11.651***
HHI STG	0.684***	-0.170	-0.103	-0.170	-24.018	10.362***
PE Affiliation	0.080	0.029	0.069	-0.165*	15.311	-2.550
PE Experience	0.005	0.001	0.001	0.001	-0.124	-0.040
Initial sales	-7.04E-08	-1.21E-08	-9.90E-09	6.71E-09	-8.87E-06	4.20E-07
Initial profitability	-0.087	0.011	0.009	0.012	13.885	-0.868
Aquisitions	0.232**	0.007	0.021	0.004	-25.446	1.539
Divestments	0.308	-0.001	-0.011	-0.007	49.047	0.096
CEO	0.057	-0.008	0.029	0.070	-22.576	0.375
Interest rate	-2.645	0.758	-0.729	-4.602	-97.391	-9.976
Lambda (Mills)	-0.42	-1.17	-0.37	0.14	452.07	-3.05
Wald chi-squared	38.390***	0.33	3.63	7.74	0.68	19.020**

Panels A and B show the OLS regression on the whole sample of 127 Nordic PE backed buyouts from 2003 to 2007. Panel C and D shows the Heckman selection regression on a larger sample including companies with missing data with a total of 161 companies of which 33 have missing observations. The Heckman selection is used to estimate the bias of missing account data in the sample through PE firm size i.e. total capital commitments made for the firm, shown by the Mills ratio (lambda). ICA IND is the industry specialisation dummy calculated using the Index of Competitive Advantage whereas ICA STG is the corresponding stage specialisation dummy, taking a value of one in the case of a specialised firm. HHI IND is industy specialisation calculated using the Herfindahl–Hirschman Index whereas HHI STG is the corresponding stage specialisation. ROIC stands for Return on Invested Capital, CCC is the Cash Conversion Cycle and NWC is Net Working Capital. PE Affiliation dummy indicates whether the PE firm is independent or affiliated with e.g. a government or a bank, taking a value of one in the case of an independent firm. PE Experience measures the experience of the PE firm using the fund's sequence number as a proxy. Initial sales and Initial profitability indicate the amount of sales and the level of profitability using EBITDA margin % as a proxy on the year of the buyout, respectively, indicators of PE firms alleged winner picking abilities. CEO dummy indicates whether the CEO of the company has been replaced over the three years of the buyout, taking a value of 1 in the case of the event. Acquisitions and Divestments dummies indicate whether the company has made acquisitions or divestments during the three years after the buyout taking a value of 1 in the case of the event, respectively. Interst rate is the 12m Euribor on the date of the buyout, a proxy for market conditions at the time thus used to control money chasing deals. *p<0.1, **p<0.05, ***p<0.01

method[6], which measures the degree of specialisation rather than being a dummy variable, finds industry specialisation to be highly significant for sales growth and working capital management with both methods as well as has a slight advantage in EBITDA/Total Assets.

HHI stage specialised firms have a slight advantage in terms of profitability ratios and ROIC having negative coefficients and EBITDA margin being significant in OLS regression. However both OLS and Heckman regressions suggest that stage diversification rather than specialisation would drive Sales growth and working capital management. The results suggest that stage specialised companies might concentrate on the profitability whereas non-specialised companies would concentrate their efforts on working capital efficiency and Sales growth.

Comparing the two methods for specialisation suggests that industry specialised companies may have an advantage in Sales growth and profitability whereas working capital management produces mixed results. These results would give support for hypothesis eight in terms of Sales growth and profitability. Stage specialisation on the other hand seems to excel over the non-specialised firms in profitability and ROIC. Stage specialisation suggests not to drive Sales growth and produces mixed evidence on the working capital management, therefore supporting hypothesis nine in profitability and return, however, unlike previous results not confirming for Sales growth.

PE affiliation i.e. independent PE firms do not seem to drive consistently performance in the regressions. For ICA regressions PE affiliation is positive and significant for EBITDA/Total Assets and for HHI regressions negative and significant for ROIC. Slight evidence of winner picking is present in the results as initial profitability is significant for three of four regressions for Sales growth, however, the result is far from conclusive. Acquisitions are significant explaining the Sales growth in all of the regressions although divestments do not drive operational improvements as the theory suggested. CEO change seem to affect positively although insignificantly on Sales growth, EBITDA/Total Assets and ROIC. Evidence on working capital is mixed. Interest rate does not confirm the presence of money chasing deals or suggests that deals made during times of market booms do not perform as well as buyouts made under normal market conditions.

7.2.3 PE buyouts and non-PE backed companies pre and during the crisis

[6] HHI measures the degree of diversification where 0 is completely specialised and 1 is completely diversified. Therefore, a negative coefficient will indicate the benefits of specialisation.

The same regressions as presented above are performed for subsample of companies pre and during the financial crisis to study whether the same effects as found in previous analysis have persisted or will change under different economic conditions. The regressions for the whole sample of buyout companies and their peers are presented in Table 18. OLS regressions include 102 and 152 companies pre and during the crisis samples, respectively. The corresponding sizes for Heckman regressions are 129 and 193, where 26 and 40 have missing accounts data, respectively. The regressions are highly significant for all except CCC for the subsample of during the crisis whereas only for one variable pre-crisis. Adjusted R-square also shows signs of improvement in the during the crisis sample.

The results suggest that PE backed companies are able to significantly make a difference in Sales growth and EBITDA margin during the financial crisis, whereas the companies' performance pre-crisis was comparable to that of the peer companies. The OLS regression suggest that pre-crisis the PE companies are to influence the Sales growth significantly, however, in both regressions EBITDA margins have negative coefficients. On the other hand, during the crisis PE-backed companies seem to improve their performance significantly in all measures compared to the peers, whereas pre-crisis peer companies are outperforming the buyouts; only exception being CCC in the during the crisis regressions.

The interest rate variable is significant and negative in both during the crisis regressions for EBITDA margin and ROIC. This implies that deals made during non-booming economy i.e. lower interest rates enjoy better profitability and return giving more support to the existence of money chasing deals.

Initial sales variable is significant only for EBITDA margin in pre-crisis and for CCC for during the crisis OLS regressions. The results may indicate that high initial sales being a predictor that companies might concentrate on improving the operational efficiency and not on sales growth when sales are already at a high level.

Initial profitability is significant only for pre-crisis CCC in OLS regressions, whereas in during the crisis sample, it is highly significant for all variables except CCC for both regressions. However, sales growth has a negative coefficient. The results indicate signs of winner picking as companies with solid profitability during normal economic conditions are able to perform better during more difficult times. Furthermore, these companies seem to concentrate more on operating efficiency rather than Sales growth.

Table 18 - Regression on the total sample of buyouts and peer companies pre (2003 - H1 2005) and during (H2 2005 - 2007) the financial crisis

Panel A - OLS regression for the sample of companies pre-financial crisis

	Sales growth	EBITDA margin	EBITDA/ Total Assets	ROIC	CCC	NWC/Sales
Constant	-0.17	0.39**	0.33*	0.36	136.69	0.17
PE Backed	0.18**	-0.003552	-0.01	-0.02	-6.13	0.06
Interest rate	13.63	-14.5778	-8.97	-11.85	-3250.21	-2.08
Intial sales	1.16E-07	1.94E-07*	1.35E-07	4.79E-08	-4.12E-05	-4.01E-07
Initial profitability	-0.04	0.00	-0.01	-0.02	17.55*	-0.01
Adjusted R-squared	0.04	0.04	-0.01	0.00	0.00	-0.03
F-statistic	1.94	2.03*	0.86	0.93	1.10	0.35

Panel B - OLS regression for the sample of companies during the financial crisis

	Sales growth	EBITDA margin	EBITDA/ Total Assets	ROIC	CCC	NWC/Sales
Constant	0.06	0.14***	0.16***	0.36***	120.11***	0.16
PE Backed	0.26***	0.05**	0.01	0.02	-10.68	-0.11
Interest rate	0.72	-2.84**	-2.17	-9.08**	-1215.27	1.85
Intial sales	-2.41E-08	1.40E-08	4.48E-09	-2.94E-09	-2.06E-05**	-3.66E-08
Initial profitability	-0.54***	0.22***	0.20***	0.30***	26.18	-0.22**
Adjusted R-squared	0.26	0.26	0.12	0.08	0.02	0.03
F-statistic	13.98***	14.13***	6.06***	4.11***	1.80	2.08*

Panel C - Heckman selection for the sample of companies pre-financial crisis

	Sales growth	EBITDA margin	EBITDA/ Total Assets	ROIC	CCC	NWC/Sales
Constant	0.95	-4.87	-0.85	0.29	1057.50	-5.25
PE Backed	0.18	-0.01	-0.01	-0.02	-9.83	0.06
Interest rate	6.14	-7.08	-3.95	-8.91	-3097.92	-9.87
Intial sales	1.15E-07	1.88E-07	1.35E-07	4.93E-08	-5.64E-05	-4.14E-07
Initial profitability	-0.04	0.00	-0.01	-0.02	17.86	-0.01
Lambda (Mills)	-2.70	14.44	3.04	0.02	-2533.82	15.91
Wald chi-squared	0.23	0.00	0.01	3.76	0.01	0.00

Panel D - Heckman selection for the sample of companies during the financial crisis

	Sales growth	EBITDA margin	EBITDA/ Total Assets	ROIC	CCC	NWC/Sales
Constant	-0.21	0.14*	0.18*	0.19	211.89	0.19
PE Backed	0.26***	0.05***	0.01	0.03	-8.15	-0.10
Interest rate	0.82	-2.46**	-1.73	-8.14**	-859.29	2.29
Intial sales	-2.39E-08	1.41E-08	4.52E-09	-2.7E-09	-2.06E-05	-3.66E-08
Initial profitability	-0.52***	0.22***	0.20***	0.31***	16.17	-0.22**
Lambda (Mills)	0.76	-0.04	-0.10	0.37	-296.95	-0.14
Wald chi-squared	22.48***	56.27***	23.58***	17.02***	1.18	8.73*

Panels A and B show the OLS regressions on the whole sample of Nordic PE backed buyouts and peer companies, pre and during the financial crisis respectively. In the OLS regression the sample size for pre-crisis is 102 buyouts and companies whereas the corresponding figure for during the crisis sample is 152. Panels C and D show the Heckman selection regression on a larger sample including companies with missing data with a total of 129 companies of which 26 have missing observations for pre-crisis sample whereas the sample during the crisis has 193 companies of which 40 have missing accounts. The Heckman selection is used to estimate the bias of missing account data in the sample through company age before the buyout, shown by the Mills ratio (lambda). ROIC stands for Return on Invested Capital, CCC is the Cash Conversion Cycle and NWC is Net Working Capital. PE Backed dummy takes on a value of 1 if the company has been acquired by a PE firm. Interst rate is the 12m Euribor on the date of the buyout, a proxy for market conditions at the time thus used to control money chasing deals. Initial sales and profitability (EBITDA margin) are used to estimate whether winner picking in PE backed buyouts is present. *p<0.1, **p<0.05, ***p<0.01

The results thus support the hypothesis of PE companies being able to create superior performance over non-PE backed companies, although the differences are present only during more difficult economic conditions. During normal times, PE-backed companies' performance is comparable to that of the peers. Also, the results suggest the existence of winner picking as well as money chasing deals. The results thus confirm the hypothesis seven in terms of Sales growth and profitability.

7.2.4 Private equity specialisation pre and during the financial crisis

Tables 19 and 20 show the regressions made for buyout companies pre and during the crisis, respectively, with both specialisation variables ICA and HHI. Continuing from the previous analysis, these regressions measure the PE specialisation effects during normal and more difficult economic conditions i.e. persistence or change. Consistent with the regression above, significance as well as adjusted R-squared both show improvement in the during the crisis sample.

The regressions show pre-crisis industry specialisation having not much effect on the buyouts' performance. Only one regression show positive and significant coefficient for EBITDA margin whereas NWC/sales variables shows poor and significant performance for industry specialised companies. Also, in terms of Sales growth these companies are underperforming, although not significantly. Under more difficult economic conditions these companies seem to increase their underperformance as HHI industry specialisation show negative and significant coefficients for Sales growth and profitability ratios, although working capital management seem to improve slightly. However, ICA industry specialisation shows significantly poor working capital management.

Stage specialisation on the other hand seems to affect positively on working capital management pre-crisis as well as slightly on Sales growth. Profitability in HHI regressions is lower for stage specialised companies, significantly in OLS regression whereas the ICA specialisation suggests slightly better performance in profitability for stage specialised companies. During the crisis working capital performance is diminished as the coefficients lose their significance. Sales growth is positive in all during the crisis regressions and significant in HHI with OLS. Profitability ratios provide mixed evidence as ICA specialisation suggests a significant and positive EBITDA/Total Assets whereas HHI stage specialised companies have negative and significant coefficient for EBITDA margin.

Table 19 - Regression on PE backed buyout companies before the financial crisis (2003 - H1 2005)

Panel A - OLS regression for specialised companies by the ICA method

	Sales growth	EBITDA margin	EBITDA/ Total Assets	ROIC	CCC	NWC/Sales
Constant	1.01	0.72**	0.42	0.41	125.53	-0.27
ICA IND	-0.03	0.03	0.05	0.05	42.31*	-0.17
ICA STG	0.01	0.11	0.11	0.07	-145.78***	0.26
PE Affiliation	0.08	-0.11*	-0.02	0.01	20.60	-0.04
PE Experience	0.00	0.00	0.00	0.00	-1.06	-0.01
Initial sales	-1.72E-07	2.98E-07	1.70E-07	9.90E-08	4.28E-05	-2.75E-07
Initial profitability	-0.04	0.00	-0.01	-0.02	11.41	-0.02
Aquisitions	-0.11	0.02	0.06	0.03	-1.28	-0.08
Divestments	0.56*	-0.03	-0.05	-0.02	70.89	0.16
CEO	-0.15	0.01	0.04	0.05	-86.84***	-0.24
Interest rate	-26.98	-30.81***	-19.62*	-20.33*	2775.25	23.67
Adjusted R-squared	-0.09	0.11	0.10	0.07	0.33	-0.07
F-statistic	0.58	1.63	1.58	1.39	3.42***	0.67

Panel B - OLS regression for specialised companies by the HHI method

	Sales growth	EBITDA margin	EBITDA/ Total Assets	ROIC	CCC	NWC/Sales
Constant	1.23	0.75***	0.53*	0.50*	10.00	-0.18
HHI IND	-0.71	0.38***	0.19	0.10	21.67	1.02**
HHI STG	0.36	-0.31***	-0.22*	-0.18	11.39	-0.92**
PE Affiliation	0.03	-0.09	-0.01	0.01	15.68	-0.04
PE Experience	0.00	0.00	0.00	0.00	-2.02	-0.01
Initial sales	-4.44E-09	1.46E-07	6.86E-08	2.57E-08	9.89E-05	-8.64E-07
Initial profitability	-0.05	0.01	0.00	-0.02	12.86	-0.02
Aquisitions	-0.10	0.02	0.05	0.02	-5.95	-0.07
Divestments	0.58*	-0.02	-0.02	0.01	59.47	0.20
CEO	-0.16	0.03	0.07*	0.07*	-86.72***	-0.24
Interest rate	-28.18	-30.28***	-19.04*	-19.62*	2625.84	22.13
Adjusted R-squared	-0.03	0.23	0.08	0.06	0.14	0.01
F-statistic	0.84	2.48**	1.42	1.31	1.77*	1.04

Panel C - Heckman selection for specialised companies by the ICA method

	Sales growth	EBITDA margin	EBITDA/ Total Assets	ROIC	CCC	NWC/Sales
Constant	1.19	0.72	0.20	0.30	206.47	-1.37
ICA IND	-0.02	0.03	0.04	0.04	50.53	-0.23
ICA STG	0.00	0.11	0.12	0.07	-153.81	0.32
PE Affiliation	0.08	-0.11**	-0.02	0.01	21.50	-0.05
PE Experience	0.00	0.00	0.00	0.00	-1.16	-0.01
Initial sales	-2.00E-07	2.97E-07*	2.04E-07	1.16E-07	2.00E-05	-1.03E-07
Initial profitability	-0.04	0.00	-0.01	-0.02	11.43	-0.02
Aquisitions	-0.11	0.02	0.05	0.03	0.14	-0.09
Divestments	0.56**	-0.03	-0.05	-0.02	76.64	0.12
CEO	-0.15	0.01	0.05	0.05	-88.24	-0.23
Interest rate	-26.05	-30.78***	-20.75	-20.90	3526.81	17.97
Lambda (Mills)	-0.56	-0.02	0.67	0.34	-248.80	3.39
Wald chi-squared	7.05	19.84**	0.94	3.38	5.32	0.26

Panel D - Heckman selection for specialised companies by the HHI method

	Sales growth	EBITDA margin	EBITDA/ Total Assets	ROIC	CCC	NWC/Sales
Constant	2.23	0.56	0.24	0.37	-169.02	-0.21
HHI IND	-0.79	0.40	0.22	0.11	51.26	1.03**
HHI STG	0.33	-0.30	-0.21	-0.17	21.24	-0.92**
PE Affiliation	0.03	-0.09	-0.01	0.01	17.27	-0.04
PE Experience	0.00	0.00	0.00	0.00	-1.94	-0.01
Initial sales	-1.41E-07	1.73E-07	1.08E-07	4.45E-08	1.41E-04	-8.59E-07
Initial profitability	-0.05	0.01	0.00	-0.02	12.18	-0.02
Aquisitions	-0.09	0.02	0.05	0.02	-6.66	-0.07
Divestments	0.64	-0.03	-0.04	0.00	41.39	0.20
CEO	-0.16	0.03	0.07	0.07	-86.48	-0.24*
Interest rate	-21.98	-31.50	-20.81	-20.47	635.86	21.92
Lambda (Mills)	-2.99	0.59	0.86	0.41	530.02	0.10
Wald chi-squared	0.35	1.79	0.55	2.23	0.81	12.99

Panels A and B show the OLS regressions on the subsample of pre-crisis buyouts, from 2003 to H1 2005 whereas Panels C and D show the Heckman selection regressions for the same time period. The OLS regressions have 51 observations and the Heckman selection has 64 of which 14 has missing accounts data. Panels A and C show specalisation calculated by ICA whereas Panels B and D show specialisation by HHI. The Heckman selection is used to estimate the bias of missing account data in the sample through PE firm size i.e. total capital commitments made for the firm, shown by the Mills ratio (lambda). ICA IND is the industry specialisation dummy calculated using the Index of Competitive Advantage whereas ICA STG is the corresponding stage specialisation dummy, taking a value of one in the case of a specialised firm. HHI IND is industy specialisation calculated using the Herfindahl–Hirschman Index whereas HHI STG is the corresponding stage specialisation. ROIC stands for Return on Invested Capital, CCC is the Cash Conversion Cycle and NWC is Net Working Capital. PE Affiliation dummy indicates whether the PE firm is independent or affiliated with e.g. a government or a bank, taking a value of one in the case of an independent firm. PE Experience measures the experience of the PE firm using the fund's sequence number as a proxy. Initial sales and Initial profitability indicate the amount of sales and the level of profitability using EBITDA margin % as a proxy on the year of the buyout, respectively, indicators of PE firms alleged winner picking abilities. CEO dummy indicates whether the CEO of the company has been replaced over the three years of the buyout, taking a value of 1 in the case of the event. Acquisitions and Divestments dummies indicate whether the company has made acquisitions or divestments during the three years after the buyout taking a value of 1 in the case of the event, respectively. Interst rate is the 12m Euribor on the date of the buyout, a proxy for market conditions at the time thus used to control money chasing deals. *p<0.1, **p<0.05, ***p<0.01

Table 20 - Regression on PE backed buyout companies during the financial crisis (H2 2005 - 2007)

Panel A - OLS regression for specialised companies by the ICA method

	Sales growth	EBITDA margin	EBITDA/ Total Assets	ROIC	CCC	NWC/Sales
Constant	-0.03	0.10	-0.07	0.75***	101.50	-0.10
ICA IND	-0.02	0.00	-0.01	-0.10	66.36**	0.05
ICA STG	0.11	0.04	0.14**	-0.13	-17.92	0.10
PE Affiliation	0.10	0.09*	0.09	-0.28*	19.11	-0.08
PE Experience	0.00	0.00	0.00	0.00	0.29	0.00
Initial sales	-6.88E-08	-4.53E-09	-8.13E-09	-3.33E-08	-2.42E-05	-1.75E-09
Initial profitability	-0.67***	0.18***	0.16***	0.42**	33.40	-0.22**
Aquisitions	0.35***	0.04	0.03	0.11	-36.41	0.03
Divestments	-0.08	-0.16	-0.17	-0.17	37.43	-0.04
CEO	0.08	-0.02	0.02	0.08	7.87	-0.01
Interest rate	1.69	-3.65*	-1.69	-10.25	-2166.84	4.37
Adjusted R-squared	0.28	0.16	0.14	0.06	0.04	0.00
F-statistic	3.87***	2.42**	2.22**	1.49	1.32	1.02

Panel B - OLS regression for specialised companies by the HHI method

	Sales growth	EBITDA margin	EBITDA/ Total Assets	ROIC	CCC	NWC/Sales
Constant	0.336728	0.23**	0.12	0.54*	158.61**	0.08
HHI IND	-1.03***	-0.15*	-0.16	0.14	-80.71	-0.19
HHI STG	0.57**	-0.06	0.00	0.01	-15.58	0.03
PE Affiliation	0.19	0.09*	0.08	-0.29*	37.89	-0.06
PE Experience	0.01	0.00*	0.00	0.00	0.44	0.00
Initial sales	-4.39E-08	-1.08E-08	-1.95E-08	-1.97E-08	-2.47E-05	-8.89E-09
Initial profitability	-0.64***	0.15***	0.18***	0.42**	4.07	-0.21**
Aquisitions	0.30**	0.02	0.03	0.10	-50.31	0.03
Divestments	0.00	-0.13	-0.13	-0.15	11.16	-0.04
CEO	0.14	-0.02	0.02	0.07	13.33	0.00
Interest rate	-3.45	-3.46	-1.70	-10.69	-2044.79	4.21
Adjusted R-squared	0.42	0.22	0.12	0.04	0.00	0.00
F-statistic	6.39***	3.10***	2.01**	1.32	0.99	0.98

Panel C - Heckman selection for specialised companies by the ICA method

	Sales growth	EBITDA margin	EBITDA/ Total Assets	ROIC	CCC	NWC/Sales
Constant	0.13	0.43	-0.16	-0.07	49.15	-0.47
ICA IND	-0.01	0.02	-0.01	-0.14	64.89**	0.02
ICA STG	0.10	0.03	0.14	-0.04	-8.73	0.10
PE Affiliation	0.10	0.09	0.09	-0.22	24.98	-0.07
PE Experience	0.00	0.00	0.00	0.00	0.36	0.00
Initial sales	-7.80E-08	-2.46E-08	-2.25E-09	8.79E-09	-2.19E-05	2.03E-08
Initial profitability	-0.67***	0.17	0.16**	0.41	31.67	-0.21
Aquisitions	0.35***	0.05	0.03	0.09	-37.33	0.02
Divestments	-0.08	-0.16	-0.17	-0.19	35.64	-0.04
CEO	0.08	-0.02	0.02	0.10	10.98	-0.01
Interest rate	1.64	-3.08	-2.01	-7.65	-1786.54	3.79
Lambda (Mills)	-0.42	-0.99	0.30	1.66	65.72	1.08
Wald chi-squared	45.53***	0.90	11.50	1.81	12.94	1.11

Panel D - Heckman selection for specialised companies by the HHI method

	Sales growth	EBITDA margin	EBITDA/ Total Assets	ROIC	CCC	NWC/Sales
Constant	0.59	0.48	0.08	0.16	-91.47	-0.35
HHI IND	-1.00**	-0.13	-0.15*	0.19	-64.73	-0.17
HHI STG	0.59	-0.05	0.01	0.02	-14.47	0.03
PE Affiliation	0.20	0.09	0.09*	-0.27*	46.43	-0.06
PE Experience	0.01	0.00	0.00	0.00	1.00	0.00
Initial sales	-6.18E-08	-2.71E-08	-1.84E-08	-5.00E-09	-1.28E-05	1.37E-08
Initial profitability	-0.64***	0.15	0.18***	0.44***	11.21	-0.20
Aquisitions	0.32	0.03	0.04	0.12	-50.03	0.02
Divestments	-0.03	-0.15	-0.14	-0.15	15.50	-0.03
CEO	0.15	-0.01	0.03	0.08	17.34	0.01
Interest rate	-1.93	-2.40	-1.21	-8.61	-1484.61	4.35
Lambda (Mills)	-0.94	-0.85	0.04	0.65	570.32	1.11
Wald chi-squared	22.46**	1.40	22.68***	11.16	0.48	1.00

Panels A and B show the OLS regressions on the subsample of buyouts during the crisis, from H2 2005 to 2007 whereas Panels C and D show the Heckman selection regressions for the same time period. The OLS regressions have 76 observations and the Heckman selection has 97 of which 20 has missing accounts data. Panels A and C show specalisation calculated by ICA whereas Panels B and D show specialisation by HHI. The Heckman selection is used to estimate the bias of missing account data in the sample through PE firm size i.e. total capital commitments made for the firm, shown by the Mills ratio (lambda). ICA IND is the industry specialisation dummy calculated using the Index of Competitive Advantage whereas ICA STG is the corresponding stage specialisation dummy, taking a value of one in the case of a specialised firm. HHI IND is industy specialisation calculated using the Herfindahl–Hirschman Index whereas HHI STG is the corresponding stage specialisation. ROIC stands for Return on Invested Capital, CCC is the Cash Conversion Cycle and NWC is Net Working Capital. PE Affiliation dummy indicates whether the PE firm is independent or affiliated with e.g. a government or a bank, taking a value of one in the case of an independent firm. PE Experience measures the experience of the PE firm using the fund's sequence number as a proxy. Initial sales and Initial profitability indicate the amount of sales and the level of profitability using EBITDA margin % as a proxy on the year of the buyout, respectively, indicators of PE firms alleged winner picking abilities. CEO dummy indicates whether the CEO of the company has been replaced over the three years of the buyout, taking a value of 1 in the case of the event. Acquisitions and Divestments dummies indicate whether the company has made acquisitions or divestments during the three years after the buyout taking a value of 1 in the case of the event, respectively. Interst rate is the 12m Euribor on the date of the buyout, a proxy for market conditions at the time thus used to control money chasing deals. *p<0.1, **p<0.05, ***p<0.01

Independent PE firms seem not to be able to make a difference on non-independent firms, in the pre-crisis sample they seem to significantly underperform in terms of profitability. During more difficult times the independent firms seem to have a significant advantage in profitability, however, lose in terms of return. PE experience does not seem to have any effect on company performance and no change is seen during different economic conditions, only exception being positive and significant EBITDA margin in one of the regressions at 10 percent level in the during the crisis sample.

Initial sales variable is also significant in one of the regressions, under pre-crisis conditions for EBITDA margin. It also seems, although insignificant, that under difficult economic conditions the coefficients are negative contrary to the other subsample. Initial profitability does not seem to affect the performance of the pre-crisis buyouts. However, for the buyouts made in the in the latter half of the time period under review, initial profitability shows highly significant results, negative for Sales growth and positive for profitability, return and working capital management.

The results are consistent with the previous whole sample regressions where winner picking seemed to be present under more difficult economic conditions. High performance will persist, where operational improvements are the key and not Sales growth.

Acquisitions and divestments seem to have contrary effect on company performance under different economic conditions. Under pre-crisis conditions acquisitions seem to have a negative and insignificant relation with sales growth where as positive and insignificant effect on profitability, return and working capital management. Divestments on the other hand have positive and significant effect on Sales growth but negative and insignificant effect on other variables. During more difficult economic conditions the effect on other variables remain the same for both, however, acquisitions have significantly positive effect on Sales growth where as divestment coefficients are negative and insignificant.

CEO change seems to affect positively and significantly on working capital management pre-crisis. However, these effects are diminished under difficult economic conditions. The effect on Sales growth is slightly negative pre-crisis, however, slightly positive during the crisis. Interest rate during pre-crisis conditions is negatively correlated with the variables, other than working capital measures, being significant for profitability and return for OLS regressions. In Heckman selection, the only significant variable is EBITDA margin in ICA specialisation regression. During the crisis conditions the significant relation diminishes, being significant

only in one regression for EBITDA margin. However, the variables remain mostly negative. These results may suggest the existence of money chasing deals, however, the results should be more pronounced for the crisis sample to be able to make definite conclusions on the existence.

These results thus do not support the hypothesis of specialised PE firms being able to drive superior performance. In the regressions of the whole sample of buyouts specialisation was seen to be able to influence positively on portfolio company performance, however, by splitting the sample into two time periods the effects diminished. Also, there was no solid change in performance though specialisation between the two time periods. The subsamples of pre-crisis and during the crisis buyouts suggest that PE firms' performance is quite equal during normal economic conditions and during more difficult times the performance driver is winner picking abilities of the PE firms in terms of profitability. However, the subsamples of these time periods were reduced to quite low levels and therefore are not as accurate. Further study of this topic with a larger sample size would be needed to make definite conclusions of the pre-crisis and during the crisis PE performance drivers. On the basis of these results, hypothesis eight and nine of persistence of specialisation benefits should be rejected.

8. Summary and conclusions

This paper studies the Nordic (Finland, Sweden, Denmark and Norway) private equity backed companies' performance over the comparable non-PE backed companies as well as benefits of PE firm specialisation on the operational efficiency. Also, the data sample of 127 buyouts from 2003 to 2007 with complete accounts data available for three years post-buyout or until the exit allowed to study buyout and peer performance pre and during the economic downturn initiated by the financial crisis in 2007. This thesis has thus contributed on four major areas. First, covering the latest wave of buyouts, second, specialisation benefits, third performance of private equity under different market conditions and fourth, shedding more evidence on Nordic PE markets. The results of this thesis are summarised in Table 21 with the hypotheses.

Table 21- Hypothesis and results of the paper

Hypothesis	Confirmed	On all variables
H1: Sales growth is greater for buyouts than that of the peers	YES	-
H2: Profitability is greater for buyouts than that of the peer companies	YES	NO
H3: ROIC is greater for buyouts than that of the peer companies	NO	-

H4: Working capital is managed more efficiently in buyouts than in peer companies	NO	YES
H5: Industry specialisation drives higher operational efficiency in portfolio companies	YES	NO
H6: Stage specialisation drives higher operational efficiency in portfolio companies	YES	NO
H7: Abnormal performance of buyouts over peers has persisted over the crisis	YES	NO
H8: Abnormal performance of industry specialised firms has persisted over the crisis	YES	NO
H9: Abnormal performance of stage specialised firms has persisted over the crisis	YES	NO

Both the t-test as well as regression on private equity backed companies' operational efficiency over peer companies suggested confirming hypothesis one and two. However, profitability produced significant results mainly for EBITDA margin. Hypotheses three and four should be rejected in the absence of positive and significant advantage for buyout companies over the peers. The results are consistent with the Jensen's (1989) hypothesis of private equity firms' superior governance creating operating performance for the portfolio companies over peers. However, the results are not consistent with Kaplan (1989b), Bergström et al. (2007) and Leslie and Oyer (2009) who all fail to find PE firms to significantly influence sales growth. On the other hand with more recent samples Acharya et al. (2011) and Jääskeläinen (2011) as well as Havu (2007) and Männistö (2009) with Finnish samples find sales growth to be significant. PE backed buyout companies' high profitability is, however, confirmed by Guo et al (2011) and Kekkonen (2004) as well as the above mentioned authors except Leslie and Oyer (2009) and Havu (2007). A number of studies including Kaplan (1989b), Singh (1990), Berg and Gottschalg (2005) and Jääskeläinen (2011) have found either ROIC or working capital management to be significantly higher for buyout companies or have found significant improvement in the measures. This study has failed to confirm private equity firms' outperformance for these variables. The most clear difference in results being with Bergström et al. (2007), Havu (2007) and Jääskeläinen (2011) which concentrated on Swedish, Finnish and Nordic markets, respectively. Bergström et al. (2007) on the other hand had an older dataset only covering Sweden, the study by Havu (2007) included only Finnish LBOs around the IT-boom and Jääskeläinen (2011) concentrated on a shorter time period with different data sources.

This thesis combined two different methods to study specialisation; the Index of Comparative Advantage and the Hirschmann-Herfindahl Index. Both methods were used to test industry

and stage specialisation. The results suggest for both the regressions and t-test that industry specialisation has slight advantages in Sales growth and profitability over non-specialised PE peer companies and a significant advantage over peers. Stage specialisation on the other hand shows significant advantage in profitability in all cases whereas the results indicate significant differences to peers in sales, however, only a slight advantage compared to non-stage specialised PE firms. Therefore the hypothesis five and six should be partially confirmed as significant or slight advantages were found only for Sales growth and profitability. Hypotheses are rejected for return and working capital measures. The previous literature has suggested that industry specialised firms are able to drive higher profitability than non-specialised firms on their portfolio companies as well as tend to be more successful. (Cressy et al., 2007; Gottschalg and Wright, 2008 and Gompers et al., 2005). Cressy et al. (2007) also found that stage specialisation may have a slight advantage in Sales growth whereas no effect on profitability. On the other hand Lossen (2006) found that stage specialisation would result in higher returns which are unachievable with industry specialisation. Ljungvist and Richardson (2003) and Brigl et al. (2008) found industry specialisation not having any influence on performance or returns. The findings presented in this thesis provide support for specialised firms being able to drive higher performance in Sales growth and profitability.

The t-tests and regressions of private equity backed buyout performance over that of the peers pre and during the financial crisis shows that during pre-crisis economic conditions the buyout performance was on average comparable to that of the peers. Also, private equity firms' portfolio company performance across all industries and stages did not change significantly during the two time periods, except during the crisis market conditions EBITDA margin was significantly greater than in pre-crisis conditions. However, under the economic downturn PE companies were able to make a clear difference in performance to that of the peers. Improvement could be seen in all variables, although only Sales growth and profitability being significant. The results thus suggest PE firms being able to create superior performance over non-PE backed companies, although the differences are present only during more difficult economic conditions. During normal times, PE-backed companies' performance is comparable to that of the peers. Therefore, hypothesis seven is confirmed in terms of Sales growth and profitability as PE firm performance persists and improves compared to peer companies under more difficult economic conditions.

The t-test between specialised and non specialised firms on their peer companies revealed no significant differences in performance during pre-crisis economic conditions. However,

during the downturn non-specialised firms' performance is in line with that of the peers or underperforming. Both industry and stage specialised firms are able to make significant difference for their portfolio company performance in terms of Sales growth and profitability compared to the peers, confirming hypothesis eight and nine for these measures. Also, stage specialisation may provide an advantage in working capital management under more difficult economic conditions.

Comparing specialised and non-specialised PE firm performance on average across all stages and industries during both time periods suggest a rather stable development. These results are in line with the previous literature as the studies have found PE firms to perform despite market movements and time periods. The t-test shows stage specialisation to grow difference to non-specialised firms during the recession in terms of profitability, however, in other variables as well as for industry specialisation there was no clear difference in performance between the two time periods. The results thus suggest that compared to peer companies specialised firms are able to drive higher performance under both time periods whereas on average and across all industries the differences to non-specialised firms' performance is not significant. Stage specialisation may have an advantage in profitability. The regression results are mainly in line with the t-test, showing no clear difference between specialised and non-specialised firm performance during the two time periods.

The rather small sample sizes of specialised and non-specialised firms under different time periods do cast doubt on the reliability on the results, a larger sample would be required to make more definite conclusions on the issue. The larger sample regressions show more significant effect for specialisation benefits. The results also suggest that PE firm performance does not differ between the non-specialised and specialised firms on average across all industries and stages whereas more specific comparisons to a hand-picked and matched non-PE backed peer group indicates significant differences in operational efficiency.

The regressions of the different subsamples of PE firms do not show clear specialisation benefits, performance being quite equal during normal economic conditions. However, during the recession the regressions suggest performance being driven by winner picking abilities of PE firms due to the fact that companies with solid profitability at the time of the buyout are able to outperform other companies under the recession. These companies also tend to concentrate on maintaining high profitability and other operational performance on the cost of declining sales. The negative and significant coefficients of interest rate in a number of the regressions also hint the presence of money chasing deals. Buyouts made during the economic

boom, high volumes of PE M&A activity and high interest rates tend to be outperformed by the buyouts made during more stable economic conditions. Also, this effect might be due to the fact that the companies went under the more difficult economic conditions. Cressy et al. (2007) do not find evidence of money chasing deals in their sample with similar methods and suggest also that PE firms are adding value on their portfolio companies and not simply picking winners. The results of this thesis support the findings of the authors as PE firms are able to improve the performance of their portfolio companies, however, their skill and expertise might give them an advantage to also pick better companies.

The literature has suggested that the determinants of the performance and the performance of the PE firms may differ by country. The literature and the results of this thesis do not support that any market area would have specific characteristics in the performance or determinants. However, over all the literature suggests that the findings on private equity are consistent across methods, time periods and geographical areas. More studies on the issue would be needed to make more definite conclusions. Also, due to the lack of specialisation studies on operational efficiency it is hard to determine whether the effects differ by geographical areas. The methods used in this thesis, ICA and HHI, have produced mixed evidence in the previous studies where only either one has been used. This paper show that the methods may give different results under certain subsamples, however, the results seem to be largely similar with the two measures of specialisation. Therefore, it may be concluded that the specialisation effects are consistent across different methods.

The evidence of Nordic private equity markets for the latest wave of buyouts and under the recession suggest:

1. PE firms to outperform the peer companies in Sales growth and profitability
2. Industry and stage specialisation both drive higher performance for Sales growth and profitability, stage specialisation may have an advantage in the latter
3. Under pre-crisis economic conditions PE firm performance is on average comparable to peers. Under crisis conditions PE firms are able to maintain the performance of their buyouts, thus creating clear difference to that of the peers. Specialisation seems to have an advantage during more difficult economic conditions compared to comparable companies.
4. Private equity firm performance across all stages and industries does not seem to largely differ across time periods.

Interpreting the results one should keep in mind the possible bias associated with the study. Although Heckman selection regressions indicated no selection bias to be present which might have arisen due to missing accounts data, there are other possible sources for bias in the sample. The Thomson VentureXpert database is not exhaustive and thus smaller private equity firms might have been omitted. Also, the sample size was decreased to quite low levels in the subsample analysis and thus might not be as accurate as the whole sample analysis. Therefore, a possible future research topic would be to study the effects with a larger data sample for pre-crisis and during the crisis buyouts to make more definite conclusions. Also, previous literature has studied the diminishing effects of PE-backing benefits and it would be interesting to study whether the specialisation gains are diminished after the exit. As previous literature has suggested on the difference of the determinants of performance across geographical regions, further study could be conducted to measure different market areas with the same methods and similar data samples. Also, it would be interesting to see whether specialisation effects would differ across different markets.

9. Appendix

Appendix 1 - Sample correlations of PE backed companies

	Sales G.	EBITDA Margin	EBITDA/ Total	ROIC	CCC	NWC/ Sales	ICA IND	ICA STG	HHI IND	HHI STG	PE Aff.	PE Exp.	PE Size	PE Marke	Initial Sales	Inital Prof.	Comp. Age	Acq.	Div.	CAPEX	Empl.	CEO C.	MSCI	Int. Rate
Sales Growth	1																							
EBITDA Margin	-	1																						
EBITDA/Total Assets	-	-	1																					
ROIC	-	-	-	1																				
CCC	-	-	-	-	1																			
NWC/Sales	-	-	-	-	-	1																		
ICA IND	0.03	0.05	0.10	-0.12	0.21	0.01	1																	
ICA STG	0.02	0.15	0.29	-0.01	-0.07	0.11	0.26	1																
HHI IND	-0.20	-0.10	-0.13	0.01	-0.08	0.17	**-0.38**	-0.16	1															
HHI STG	0.11	-0.26	-0.21	-0.07	-0.08	-0.13	**-0.30**	-0.21	**0.56**	1														
PE Affiliation	0.10	0.06	0.17	0.02	0.10	-0.14	0.10	-0.01	0.01	-0.12	1													
PE Experience	-0.10	0.26	0.22	0.05	-0.05	0.10	-0.17	-0.01	0.33	0.22	0.18	1												
PE Size	0.02	0.13	0.18	-0.16	0.04	0.17	-0.37	-0.05	0.22	0.05	0.11	**0.47**	1											
PE Market	0.07	0.09	0.07	-0.01	-0.10	0.07	0.12	-0.01	-0.11	0.09	0.02	-0.06	-0.05	1										
Initial Sales	-0.06	0.19	0.07	0.00	-0.16	0.06	-0.05	-0.17	0.06	-0.09	0.08	0.32	0.60	0.05	1									
Inital Profitability	-0.01	0.04	-0.05	-0.09	-0.04	0.00	0.05	0.06	-0.06	-0.05	0.07	-0.03	0.00	-0.06	0.02	1								
Company Age	-0.10	0.11	0.04	0.01	-0.13	0.03	0.14	0.05	-0.11	-0.19	0.05	-0.09	-0.03	-0.16	0.02	0.01	1							
Acquisitions	-0.19	0.08	0.05	0.01	0.17	0.12	-0.02	0.12	-0.09	-0.10	0.08	0.13	-0.02	-0.04	0.05	-0.12	-0.12	1						
Divestments	-0.06	0.07	0.09	0.01	0.13	0.07	-0.05	0.06	0.17	0.11	0.08	0.25	0.05	-0.10	-0.01	-0.01	0.03	0.18	1					
CAPEX	0.03	**0.31**	0.16	0.09	0.03	-0.02	0.08	0.01	-0.05	-0.02	0.02	0.03	0.08	0.12	0.01	-0.03	0.02	0.00	0.00	1				
Employment	**0.55**	-0.12	-0.09	-0.15	0.03	-0.24	-0.01	-0.07	-0.04	0.00	0.02	0.11	0.02	-0.15	-0.09	-0.18	-0.03	0.15	0.11	0.01	1			
CEO Change	0.04	-0.05	0.04	0.07	-0.14	-0.01	0.10	0.00	0.11	0.08	-0.05	0.08	0.04	0.14	0.02	-0.14	0.07	-0.10	0.06	0.10	0.09	1		
MSCI	0.02	0.06	-0.05	-0.09	-0.02	-0.02	0.11	-0.04	-0.12	0.04	0.03	-0.05	-0.01	**0.95**	0.09	-0.06	-0.14	-0.03	-0.09	0.17	-0.14	0.13	1	
Interest Rate	0.00	-0.02	-0.06	-0.15	-0.06	-0.04	0.09	-0.02	-0.10	0.11	0.05	-0.04	-0.03	**0.93**	0.08	-0.05	-0.19	-0.02	-0.09	0.06	-0.15	0.11	**0.90**	1

The table presents correlation of variables used in the regressions of the PE backed buyout subsample from 2003 to 2007, including 127 observations. The figures in bold show high correlation. ICA IND is the industry specialisation dummy calculated using the Index of Competitive Advantage whereas ICA STG is the corresponding stage specialisation dummy, taking a value of 1 in the case of a specialised firm. HHI IND is the industy specialisation dummy calculated using the Herfindahl–Hirschman Index whereas HHI STG is the corresponding stage specialisation dummy, taking a value of one in the case of a specialised firm. PE Affiliation dummy indicates whether the PE firm is independent or affiliated with e.g. a government or a bank, taking a value of 1 in the case of an independent firm. PE Experience measures the experience of the PE firm using the fund's sequence number as a proxy. PE Size indicates the total capital commitments made to the firm, a proxy for experience in investments. PE market is the total investments of European PE firms made on the buyout year according to Thomson Venture Xpert. Initial sales and Initial profitability indicate the amount of sales and the level of profitability using EBITDA margin % as a proxy on the year of the buyout, respectively, indicators of PE firms alleged winner picking abilities. Target company age measures the age of the company on the year of the buyout, controlling for the relation of age and possible improvements in the company. Acquisitions and Divestments dummies indicate whether the company has made acquisitions or divestments during the three years after the buyout taking a value of 1 in the case of the event, respectively. CAPEX and Employment measure the changes in the ratio of CAPEX/Sales and Sales/Employees over the holding period proxies for CAPEX stripping and efficiency improvements, respectively. CEO dummy indicates whether the CEO of the company has been replaced over the three years of the buyout, taking a value of 1 in the case of the event. MSCI is the Morgan Stanley Capital International World Index whereas Interest rate indicates the level of the 12 month EURIBOR at the time of the buyout and thus measuring the state of the market.

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