UNIVERSITY OF GOTHENBURG
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# SWEDISH PRIVATE EQUITY

## A study on performance of Private Equity owned companies in Sweden

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# Abstract

This thesis aims to study the possible superior performance of Swedish companies owned by Private Equity firms. This is achieved through constructing a panel dataset consisting of portfolio companies of the ten largest Swedish Private Equity firms and comparing their performance with companies derived from a small cap stock market index. In our results, we find indications supporting an overperformance of the companies owned by a Private Equity firm relative to the public benchmark. However, it is still difficult to derive the true explanatory variables explaining why this occurs and by which magnitude the Private Equity companies overperform.

# List of Abbrevations

| | |
|---|---|
| GP | General Partner |
| LBO | Leveraged Buyout |
| LP | Limited Partner |
| OMXXSCPI | Stockholm Stock Exchange Small Cap Index |
| PE | Private Equity |
| PE-owned | Company owned by a Private Equity firm |
| VC | Venture Capital |
| RoA | Return on Assets |
| RoCE | Return on Common Equity |
| SVCA | Swedish Private Equity & Venture Capital Association |

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# I. Introduction

In this thesis we aim to contribute to the knowledge about private equity (PE) performance in Sweden, where the presence of private equity has been especially strong since the 2000s (SVCA homepage December 19 2017). Despite this, no research has been made about Swedish PE-performance since Bergström, Grubb and Jonsson (2007), even though thorough research has been made on the American market regularly since the 1980s. The majority of the previous empirical research find results indicating on a superior over-performance of the PE-portfolio companies and funds relative to publicly traded companies. However, this superior performance has been questioned by later research. In order to investigate this on the Swedish market, we have constructed a panel dataset. The dataset consists of 48 portfolio companies from the ten largest Swedish PE-firms and 62 public companies from the Swedish small cap stock index OMXXSCPI, sampled over the time period 2007-2016. Through performing three regressions using Return on Assets, EBITDA margin and Return on Common Equity as dependent variables, while controlling for leverage level and turnover, we will be able to examine the operational performance of Swedish private equity portfolio companies relative to the sampled publicly traded companies

The PE-industry has grown rapidly since the 1980s, but even though it is a salient part of the everyday global business enterprise, there is only limited understanding of the mechanisms of the PE-market. As a consequence, it has been difficult to draw any strong conclusions about the performance of the PE-owned companies. The matter of uncertainty makes studies like this important in order to raise the awareness on the subject of PE and its possible superior performance, which as a matter of fact has been questioned by later research from the 2010s. The uncertainty of operational performance of PE-owned companies was thoroughly underlined by Harris, Jenkinson and Kaplan (2014). Even though their study showed tendencies on superior performance of the PE-portfolio companies, Harris *et al.* (2014) remarked on

the dramatic historic cycles of the PE-market. According to the researchers themselves, this makes the performance results questionable as well as illustrates the limited understanding of the PE-industry. Similar to the results of Harris *et al.* (2014) Kaplan and Sensoy (2015) and Guo, Hotchkiss and Song (2011) also found positive results on average for the PE-portfolio companies in their studies. However, they also question the theories and research made on the PE-market since their results differ dramatically from the research made in the 1980s.

Research on the superior performance of the PE-market during the 2000s found that PE-owned companies overperformed relative to publicly traded companies. Nevertheless, several studies were questioning what PE-firm characteristics are able to explain this "superior performance". For example, Kaplan and Strömberg (2009) thoroughly investigate the mechanisms derived from the theories behind the superior operational performance of PE-owned companies. The authors find that PE-firms increased the performance of the individual companies relative to publicly traded companies, however, they did not necessarily exhibit superior performance. A strand of other American research on the possible superior performance of PE during the 2000s came to the same conclusions, *e.g.* Kaplan and Schoar (2005) and Phalippou and Gottschalg (2009). Furthermore, the same results were found on the Swedish PE-market by Bergström *et al.* (2007). This research is unique since the absolute majority of the research has been conducted on the American market, using the S&P 500 as a public benchmark. Despite that Bergström *et al.* (2007) also found evidence of PE overperformance on the Swedish market, the authors likewise remark on the complexity of the PE-industry. In short, they find no key determinant explaining superior PE-performance, which is in line with the approach of the American research during the 2000s.

It was during the 1980s that the PE-industry was properly culminated and therefore studied for the first time. As previously mentioned, the research of

PE-performance during the 1980s differ significantly from studies made post 2000s. Kaplan (1989a) found dramatic superior operational performance gain of at best 80.5% over the lifespan of the sampled PE-funds compared to the S&P 500 (measured in net cash flows), and Smith (1990) found similar results of 71% in operational performance gain. Several other studies from the late 1980s and early 1990s support these findings as well, *e.g.* Baker and Wruck (1989) and Lichtenberg and Siegel (1990). Comparing the performance results found in the 1980s with the ones of the 2010s, the dramatic difference and uncertainty brought up by researchers become comprehensible. For example, Guo *et al.* (2011) find a 14,3% performance gain (measured in net cash flow) and Harris *et al.* (2014) an overperformance of 18% over the lifetime of the PE-funds.

There are two conclusions to be drawn from previous research. (1) An indisputable majority of the research made from the 1980s until today find signs of private equity overperformance, although in varying degrees. This was summarized by Cumming, Siegel and Wright (2007), stating that there is a general consensus across different time periods, methodologies and measures that PE-ownership tends to enhance the operational performance of the individual companies they own. However, there are still some empirical studies dismissing the idea of PE-firms achieving any type of superior performance (Guo *et al.* 2011). It should also not be forgotten that some of the PE-companies completely fail in creating superior performance and go bankrupt (Jensen 1989). This excludes them from the research, making the results slightly skewed. (2) The key determinants behind superior operational performance of PE-companies are still not properly assessed. The theories behind PE-performance determinants were introduced during the boom of the PE-market in the 1980s by Jensen (1989), the same time as the research of PE-performance was properly initiated. These theories are still applied by researchers today, and are based on the PE-firms aptitude of three different sets of changes in their acquired firms: Governance-, Financial- and

Operational engineering (described in further detail below).

Measuring operational performance using three accounting measurements; Return on Assets (RoA), EBITDA-margin and Return on Common Equity (RoCE), we expect to find overperformance of the sampled PE-companies relative to the public benchmark, as in line with the results derived from earlier research. In our results we find significant values supporting a potential overperformance of PE-portfolio companies compared to the public benchmark. However, it is difficult to assert exactly which variables explain this result and by what magnitude the PE-owned companies overperform, which is also similar to the conclusions of earlier research. Furthermore, an increase in turnover turned out to have a positive effect on operational performance, while leverage appeared to be negatively correlated with our dependent variables.

With our results, this study contributes to the knowledge of PE-performance on the Swedish market. Since Swedish research is scarce, and the latest study was written ten years ago (Bergström *et al.* 2007), Swedish PE-performance is currently a subject of great uncertainty. Also, no Swedish PE-study has ever benchmarked against public companies, which has been done in the majority of the PE-performance research, especially on the American market (Harris *et al.* 2014, Kaplan & Strömberg 2009, Higson & Stucke 2012, Guo *et al.* 2011, *etc.*).

The rest of the thesis is organized as follows. Firstly, we describe how the PE-industry works and the different types of transactions they engage in. We also provide a theoretical description. Thereafter, we describe the calibration and choice of the econometric model, followed by our results. Then we discuss and analyze our results and our research question in relation to previous empirical studies. Lastly, we conclude by giving several suggestions for future research.

## 1.1. Private Equity Firms

PE-firms consists of several investment advisors and professionals. With a wide range of skills and expertise, these advisors analyze the different sectors of the market for possible investment opportunities. The PE-firms manage numerous PE-funds in order to realize these investments, in which they are General Partners (GPs). Limited Partners (LPs) are investors committed to provide a certain amount of capital to pay for the investments of the PE-firm. Typical examples of these institutional investors are corporate and public pension funds, wealthy individuals or insurance companies, which are the ones providing the majority of the capital to the fund(s) (Kaplan & Strömberg 2009).

It is custom that the PE-firms (GPs) contribute with 1 % of the total capital, and act as managers of the fund(s) and its investments (the different portfolio companies) in which the LPs have a limited authority (Kaplan & Strömberg 2009, Heed 2010, Kaplan & Schoar 2005). However, there are general guidelines and basic covenants in the fund agreement that must be followed by the GPs. Commonly, there are restrictions on how much capital one portfolio company can be invested with or what kind of securities the investment will be made in. Also, the fund itself typically has a fixed life for about ten years with the first five years to invest the fund's capital and the last five years to return all of the LPs share of the capital.

The fund managers' share is composed of several different fees and interests. A percentage of the committed capital is calculated as an annual management fee as well as a percentage of the capital employed when the investments are realized. Deal and monitoring fees are also a common way of PE-firms to charge for their services, but the carried interest of 20 % of the earnings of the fund is the biggest contribution to the GPs share (Kaplan & Strömberg 2009). This is why successful PE-firms can earn a substantial amount of money from making successful private equity investments.

## 1.2. Private Equity Transactions

There are many different kinds of PE-transactions, *i.e.* different strategies and approaches of PE-firms to acquire companies to their funds. Type of transaction depends on how the fund managers choose to finance the acquired company. A leveraged buyout and a venture capital investment are the two types of transactions being used in this study.

### *1.2.1 Leveraged Buyout and Venture Capital*

A leveraged buyout (LBO) is commonly financed with 60 to 90 % debt. This high level of leverage is typically arranged by a bank since the debt usually includes a senior or secured loan portion. The loan portion is today commonly bought by the institutional investors (the LPs). The leverage is used to cover the purchase of the majority of the company's equity and the capital from the fund(s) is used to acquire the remaining percentage of the purchase price (Kaplan & Strömberg 2009, Sahlman 1990). A critical part of the LBO is therefore played by the leverage level of the target company since its assets often are used as a security for the debt financing.[1]

The structure and governance of a Venture Capital organization (VC) is very similar to a PE-firm. The GP and LP relationship is of the same characteristics were the VC act as GP, and their funds have the same fixed life as the PE-firms'. There are however two major distinctions when it comes to fees and the financial structure of a VC transaction (Sahlman 1990). Firstly, VCs seldom charge the portfolio companies but instead rather focuses on the LPs. Second and most importantly, the maturity- and debt level of the target firms is what above all differs a VC transaction from a LBO. While PE-firms use leverage to acquire the equity of a portfolio company during a LBO, the VC use its fund of investments, which is due to the different choice

[1] Due to several tranches of debt and hence, the complexity of a leveraged buyout, most of the research of LBOs ignore its financial debt structure (Kaplan & Strömberg 2009, Axelson, Jenkinson, Strömberg & Weisbach 2013), which is why this study also wont examine it further.

of acquired companies. VCs are targeting early stage companies, while LBOs often consists of more mature companies with a high degree of debt capacity. Targeting companies with a more modest growth rate and stable cash flow are therefore more common in LBO transactions, relative to the traditional VC-model which focuses on companies with a high growth potential (Sahlman 1990).

## 1.3. The Performance of Private Equity

"Superior" operational performance of private equity companies compared to other companies can be generated in numerous ways according to theory and earlier research. Studies show that this creation of operational performance is based on the PE-firms application of three different sets of changes in their acquired companies: Governance-, Financial- and Operational engineering. These three theories were introduced by Jensen (1989) when the research about the PE-market were properly culminated and are still being used in modern research.

### *1.3.1 Governance Engineering*

One of the central aspects of Governance Engineering on the possible superior value creation of PE-firms is the issue of Asymmetric Information. PE-firms are expected to have superior information on future portfolio company performance, which could imply consistent favorable portfolio performance. Kaplan and Strömberg (2009) points out that managers with a possibility of closer monitoring will use this knowledge to deliver superior results, even though this is a source of insider information according to private equity critics.

Management stakes is also part of Governance Engineering theory, which is said to facilitate both strategic and operational improvements of PE-portfolio companies. Management stakes gives the portfolio company the opportunity to reduce misalignment between management and shareholders' incentives

by increasing the managements' equity stake of the portfolio company. The personal costs of inefficiency and personal benefits are thereafter expected to be higher which could result in lower agency costs (reduced misalignment) (Bergström, *et al.* 2007, Kaplan & Strömberg 2009, Kaplan 1989b, Jensen 1989). Governance Engineering also refer to how the PE-firms choose to control the boards of their acquired company investments. The boards of PE-portfolio companies are in general smaller than their publicly owned industry peers and are on average meeting more frequently, creating a more effective bureaucracy (Kaplan & Strömberg 2009).

*1.3.2 Operational Engineering*

A great deal of organizational restructuring, known theoretically as Operational Engineering, takes place after a company is acquired by a PE-firm. One measure of this form of engineering is cost reduction programs, which are commonly incorporated in order to improve operational effectiveness. Enhanced operational effectiveness is also said to be achieved by three other changes: (1) reducing of or by repositioning working staff, (2) strengthen or replacing the management staff and (3) introducing corporate refocusing. In fact, studies have shown that after a company is acquired by a PE-firm, one-third of the CEOs are replaced within three months while two-thirds are replaced during the first four years (Acharya, Gottschalg, Hahn & Kehoe 2013). These measures of Operational Engineering are supposedly creating better mechanisms of communication due to less bureaucracy and sharpened strategic focus (Bergström *et al.* 2007, Kaplan & Strömberg 2009).

Bergström *et al.* (2007) introduces the matter of Parenting as one of the central aspects of Operational Engineering. Parenting refers to the possibility of the PE-firm offering management and industry expertise to the current management of the portfolio company in order to add value to their investments. In other words, a way to improve the performance of the portfolio company. This is the reason why many of the PE-firms are industry focused

and have their own base of employees of operational- and industry expertise (Kaplan & Strömberg 2009).

*1.3.3 Financial Engineering*

The subject of Financial Engineering concerning PE-portfolio companies is foremost related to the acquired company's leverage levels. Increased leverage is in theory supposed to have a strong effect on increased returns, a theorem introduced by Modigliani & Miller (1958). Through increasing the debt of the target company the managers will be pressured to reduce the "free cash flow" and make more optimal decisions, *i.e.*, not waste money. Since higher debt levels will increase the risk of bankruptcy, it is also a way to motivate the management of the acquired portfolio company to work harder and more efficiently (Jensen 1989, Kaplan & Strömberg 2009, Axelson, Strömberg & Weisbach 2013, Bergström *et al.* 2007). Further, the increased leverage in LBOs creates the opportunity to interest tax deductions. These tax shields may increase cash flows, making them available to the providers of capital (Guo *et al.* 2011).

*1.3.4 Other factors generating operational performance*

Several other factors to achieve higher operational performance of PE-portfolio companies have also been discussed in earlier research. For example, growth potential of the acquired portfolio company, often measured in turnover, is theorized to affect the strategy of the PE-firm during and after the transaction (Berger & Udell 1998). Furthermore, the size of the PE-funds has increased since the original boom of the PE-market during the 1980s, making researchers interested in a possible correlation between fund size and performance. Fund size is therefore a relatively common metric to use when measuring performance (Harris *et al.* 2014, Lopez-de-Silances, Phalippou & Gottschalg 2015).

Due to the fixed life of a PE-fund, timing of exit is another important aspect of the LBOs' and VCs' investment process (Kaplan & Strömberg 2009,

Nowak, Knigge & Schmidt 2004, Axelson *et al.* 2013). This is closely linked to the speculations about PE-firms taking advantage of arbitrage on the debt- and equity market, which have given rise to theories about booms- and busts in the PE-market. In short, this theory builds on misalignment between the equity- and debt market, where mispricings makes the cost of debt low relative to equity. In a scenario as such, PE-firms could borrow at a rate lower than the given risk and thereby create value by borrowing (Kaplan & Strömberg 2009, Acharya, Franks & Servaes 2007, Maeseneire & Brinkhuis 2012, Axelson *et al.* 2013). Private equity cyclicality implicitly means that there will be more transactions and higher leverage levels in target companies during times of low interest rates, concluding in more favourable results (*i.e.* when debt markets are favourable).

# II. Calibration

## 2.1. Time frame, Independent variables and Operating metrics

Striving for comparability with earlier research (Bergström *et al.* 2007, Higson & Stucke 2012), the time frame of choice is ten years (2007-2016). Nevertheless, we chose to exclusively study the holding period of the PE-transactions respectively and thereby using a less complicated event window by not adding an extra six month observation post exit year.[2]

When selecting the metrics of operational performance and the independent variables, we also strove for comparability with earlier research to create a reliable analysis of the results. However, several of the measurements derived from the theories of Governance- Operational and Financial Engineering are difficult to value and measure accurately. They are also difficult to collect due to the severe lack of data availability. The PE-market exhibits low transparency (Heed 2010), although, under Swedish law, all of the joint-stock companies having any account made public need to deliver audited annual reports to the Swedish Companies Registrations Office (see Årsredovisninglag [1995:1554] 8 sec. 3 § and Bokföringslag [1999:1078] 6 sec. 2 §). Nevertheless it was still difficult to sample independent variables since many of them were either not available or would severely decrease the size of our dataset. Initially, the aim was to investigate the effects of management stakes, leverage levels, fund size and turnover. This study will only measure for the effects of leverage levels and turnover as two of the possible explanatory variables[3] to operational performance. Leverage measures how large a company's debt is in relation to its equity, where a higher value implies on higher debt. Turnover measures the amount of sales for the individual company. Also, a PE-dummy will be added which illustrates the difference in

[2] Also, more recent studies occasionally use an event window with t-1 and t+1 (or t+2) of the holding period in order to investigate the changes in operational performance from public to private, which we chose not to do.

[3] For a description for these variables, please go to Appendix C.

intercepts between the PE-portfolio companies and the benchmark consisting of publicly traded companies.

After studying prominent research on the subject of operational performance of PE-portfolio companies (Bergström *et al.* 2007, Guo *et al.* 2011, Kaplan & Strömberg 2009, Axelson *et al.* 2013) our operational performance metrics of choice are[4]:

- EBITDA-margin
- Return on Asset (RoA)
- Return on Common Equity (RoCE)

These will be used as dependent variables in three individual regressions. EBITDA-margin, RoA and RoCE are expressed in percentage, where a higher value indicates on a higher performance of the individual company. All of the operating metrics as well as the independent variables were collected on a yearly basis from the databases Retriever and Bloomberg.

## 2.2. Data collection

### *2.2.1 PE-dataset*

When preceding the sampling of the PE-dataset, the main restriction of geographical emphasis on Sweden was set in order to limit the sample. Through collecting solely Swedish private equity portfolio companies acquired from Swedish PE-firms, this study is in line with the approach of Bergström *et al.* (2007). Through considering the ten largest Swedish PE-firms, we manually collected the dataset from sampling the completed PE-transactions during the chosen event window (2007-2016). This originally resulted in a sample of total 76 PE-transactions.

[4]For a description for these variables, please go to Appendix C.

Certain adjustments of the first raw dataset were deemed necessary to improve the sample which implied that companies and specific years of data had to be excluded for three reasons. Firstly, numerous measurements were not available, which made it necessary to exclude those companies that did not report any of the chosen operating metrics. Secondly, adjustments were made to extremum values and individual years without any financial ratios, which were both excluded; we deemed these deviations significant enough to motivate this correction due to them being prominent anomalies and outliers. Thirdly, we made the largest alternation to our PE-sample in order to raise comparability with its benchmark in terms of sector. From observing the different sector-weights in both the PE- and benchmark dataset, we decided to exclude the sectors of Technology and Communications since these two sectors were strongly represented in the benchmark, but rare among the PE-companies. The two sectors of Financial and Real Estate companies were also excluded due to extreme metrics.[5]

All of the adjustments concluded in a sample of 48 PE-portfolio companies with no single PE-firm holding more than ten of these companies. This is yet again in line with Bergström *et al.* (2007) who used 79 PE-transactions. Similar size of PE-dataset has also been used by Acharya *et al.* (2013) and Kaplan and Strömberg (2009) with 59 and 43 PE-companies respectively.

The PE-dataset consists of two different PE-transactions; LBOs and VCs. We do know that the majority of the PE-portfolio companies were acquired by a PE-firm through an LBO, but we cannot tell with absolute certainty how many or which ones.

Overall, the following four conditions were thereby set on the PE-portfolio companies in order to be included in the dataset:

[5] The chosen accounting measures for Finance and Real Estate are not comparable with other sectors.

1. Private equity transaction performed by an Swedish PE-firm
2. The portfolio company had to be Swedish
3. Private equity transaction to be completed between 2007-2016 (acquisition and exit)
4. Accounting data available for at least one of the operational metrics and all of the explanatory variables

*2.2.2 Benchmark dataset*

We decided to use the companies consisting of the OMXXSCPI as a benchmark, which is a stock market index consisting of 88 small cap companies noted on the Stockholm Stock Exchange. This benchmark was chosen in order to achieve best possible comparability in the total dataset, where these companies were found to be much more similar to our PE-portfolio companies in terms of size, liquidity and leverage than any other Swedish stock market index. Besides economic intuition, the decision was also supported by Higson and Stucke (2012) that criticized the frequent use of S&P 500 (or large cap stock market indices) as benchmarks in previous private equity research (*e.g.* Kaplan & Schoar, 2005; Kaplan & Strömberg, 2009; Harris *et al.* 2014).

The same alteration on the benchmark dataset was performed in order to raise comparability with the PE-dataset in terms of sector. As in the PE-dataset, the sectors Technology, Communication, Financial and Real Estate were excluded. The sectors of Energy and Utilities were also ruled out since none of these were represented in the PE-dataset. After this adjustment, 62 benchmark companies remained.

After combining the two datasets, it resulted in a full sample consisting of 110 companies, as illustrated in Table I below.

*Table I: Total Dataset*

| PE | Benchmark | Total |
|---|---|---|
| 48 | 62 | 110 |

This table shows the total amount of companies in the dataset

*2.2.3 Critical evaluation*

The lack of data availability as well as the exclusion of variables and years could be seen as a possible selection bias in our PE-dataset. Observing both sector and size of the excluded companies, we controlled for this. No specific sector or neither larger or smaller companies were excluded to a larger extent due to lack of data.

We also identify the choice of studying PE-portfolio companies as a possible selection bias since these companies have been carefully selected by professionals at PE-firms searching for investment opportunities. Despite that this potentially can result in a upward bias for PE-owned companies in our dataset, it is dismissed by Kaplan (1989a) as small. Further, survivorship bias is another possible restriction to our dataset, *i.e.* a possible overestimation of historical performance (Bergström *et al.* 2007). We are aware that the PE-dataset is not necessary a representative comprehensive sample of the existing Swedish PE-market today since there are funds being closed and some of the acquirements go bankrupt (Jensen 1989). These are not visible for us, leaving the existing and often well performing funds and PE-transactions in the forefront to investigate. Bergström *et al.* (2007) states that bankruptcy is rare in Sweden and we are therefore not worried that survivorship bias will severely skew our result.

The choice of accounting measures as dependent variables could also serve as a limitation for two reasons. (1) There are several ways of calculating these metrics, making it possible to present favourable estimations for different sectors respectively.[6] (2) Accounting measurements regarding operating metrics as RoA, EBITDA-margin and RoCE are considered to be sector specific. Even though the original dataset included 164 companies and over 1 200 observations, it was still not sufficiently large to control for differences in sectors. We managed to partially solve this issue through ensuring that the sector-weights in our two datasets match each other as well as possible. This was done in order to prevent the model from being biased from one of the groups having a overrepresentation of a specific sector compared to the other.

[6]EBITDA is also a non-general accepted accounting (GAAP) measurement, making the estimated EBITDA even more fragile.

Furthermore, when investigating the performance of different companies, researchers often choose between using *e.g.* EBITDA-margin and EBIT (earnings before interest and taxations). Some argue that EBIT may be more appropriate to use when comparing companies across different sectors. Nevertheless, since the majority of the research made on the PE-market have been using EBITDA-margin, we chose to use the same approach.

# III. Methodology

After thoroughly investigating what methods previous empirical studies with similar aim and research question have chosen, we came to the conclusion that a regression using panel data is the most appropriate method. Since we constructed an unbalanced panel dataset that contains repeated observations of our chosen variables over the same units (our companies), collected over our ten year time frame, this choice of method allows us to to consider both cross-sectional changes between companies and changes over time (Verbeek 2012).

The aim of this thesis is to study the operational performance of Swedish PE-owned companies compared to publicly traded companies. In order to calibrate an econometric model fitting this aim, the following three hypotheses were stated:

$H_1$ *The operating performance of the private equity portfolio companies measured in Return on Assets (RoA) has improved during their holding period compared to the public benchmark*

$H_2$ *The operating performance of the private equity portfolio companies measured in EBITDA-margin has improved during their holding period compared to the public benchmark*

$H_3$ *The operating performance of the private equity portfolio companies measured in Return on Common Equity (RoCE) has improved during their holding period compared to the public benchmark*

Further, controlling for two of the theories behind the superior operational performance of PE-companies, we also included two variables that measure leverage and turnover. Two additional hypotheses were therefore stated:

$H_4$ *An increased leverage is associated with an improved operational performance*

$H_5$ *An increase in turnover is associated with an improved operational performance*

## 3.1. The Random Effects Model

Following the construction of the hypotheses, the calibration method of choice in order to answer them were set to be a Random Generalised Least Squares (GLS) effects model (commonly regarded as just random effects). This resulted in an econometric model (1):

$$(1) OM = \alpha + \beta_1 PEdummy_i + \beta_2 LeverageLevel_{it} + \beta_3 (\log) Turnover_{it} + U_{it} + E_{it}$$

Where OM is one of the Operational Metrics (RoA, EBITDA-margin and RoCE) and the PE-Dummy is the dummy variable for the 48 private equity companies. The LeverageLevel as well as the (log)Turnover regressor are the two independent and possible explanatory variables of choice when controlling for the effects of operational performance. This equation has mainly been inspired by Bergeström *et al.* (2007) regarding the choice of time window, application of accounting data and dependent variables.

When interpreting the coefficients of a random effect regression, the beta ($\beta$)-values are a matrix-weighted average of the between and within estimators. The beta-values therefore include both the within-company and between-company effects. An interpretation of a $\beta$ is therefore the average effect of the variable $x$ over $y$ when $x$ changes across time and between companies with one unit. Considering that several other possible variables of interest is not included in the model, we will in our results be more interested in

the direction (positive or negative) and significance level of our coefficients rather than the actual estimated value of each parameter.

Justifying the choice of Random GLS effects model was done through performing the Breusch-Pagan Lagrange Multiplier (LM)-test that confirmed that a Random GLS effect model was of correct choice, with a Prob > chibar2 of 0.00 for all the regressions. The choice between Random- and Fixed effects model was not decided through the standard of the Hausman-test, but instead on the basis of our model containing a time invariant variable (the PE-dummy). Also after performing a White's test, the standard errors were corrected for heteroskedasticity.

## 3.2. Descriptive Statistics

Table II shows the correlations for the variables used in the model, excluding the dummy variable. Please observe that the matrix shows correlation values for both the treatment and the benchmark group. As expected, the three dependent variables all exhibit positive correlation with each other, while the strongest can be found between RoA and RoCE. Turnover and Leverage appears to be weakly negatively correlated with both RoA and RoCE. Besides that, the rest of the variables in the combined dataset shows a positive correlation in different degrees.[7]

[7] Even though RoA and RoCE exhibit a very strong positive correlation, we chose to still use both of the variables in our regressions in order to use the same approach as earlier research.

*Table II: Correlation matrix*

| | EBITDA-margin | RoA | RoCE | Turnover | Leverage |
|---|---|---|---|---|---|
| EBITDA-margin | 1 | | | | |
| RoA | 0.6402 | 1 | | | |
| RoCE | 0.5569 | 0.9236 | 1 | | |
| Turnover | 0.0325 | -0.0227 | -0.0334 | 1 | |
| Leverage | 0.0016 | -0.0266 | -0.0383 | 0.1667 | 1 |

This table shows the Correlation matrix of both the dependent and independent variables in our model.

Further, Table III shows the average and the median values for the three dependent variables in the dataset for the PE-firms and the Benchmark.

*Table III : Average and Median values of the dependent variables*

| | EBITDA-margin | | RoA | | RoCE | |
|---|---|---|---|---|---|---|
| | Average | Median | Average | Median | Average | Media |
| PE | 0.088 | 0.094 | 0.038 | 0.032 | 0.117 | 0.100 |
| Non-PE | 0.052 | 0.062 | 0.022 | 0.034 | 0.042 | 0.073 |

This table shows the average and median values of all three dependent variables in both the PE and Non-PE (public benchmark) dataset.

Even though we excluded the most extreme values from the dataset, the average between the two groups still deviate slightly from each other. In other studies, it is therefore more common to focus on the median. When doing so, one can observe that the two groups have more similar values, despite that the PE-portfolio companies exhibit higher median values for EBITDA margin and RoCE. In Appendix D we have also included three graphs that illustrates the distribution of these dependent variables in our dataset.

# IV. Result

In Table IV the GLS Random Effects regressions for all three dependent variables are presented in three regressions respectively.

At the end of the table, the measurement rho ($\rho$) is stated. Rho shows the fraction of the variance in the error due to the individual-specific effect, known as the intra-class correlation. If rho approaches 1, then the between specific effects dominate the idiosyncratic error. Being larger than 0.50, all of the regressions are not completely idiosyncratic, *i.e.* most of the variation is not explained by individual specific effects but in between effects. For example, the intra-class correlation for EBITDA-margin is 0,755, meaning that 75,5% of the variation in the regressors are explained by the variation between all of the 104 companies, while 24,5% of the variation is explained by the individual company's change over time (within-effect). This result is in line with our approach since we want to investigate the differences between the two groups of companies and not the individual companies' change over time. However, the values of sigma U ($\sigma_u$) and sigma E ($\sigma_e$), does not exhibit large differences in any of the three regressions, suggesting that there is some degrees of unexplained variation in the dependent variables, both in between- and in within effects.

Also presented in Table IV are three different types of R-squared; within, between and overall variation. We find that EBITDA margin and RoCE regressions have similar between- and overall R-squared values, indicating on a somewhat higher explanatory power than in the RoA regression. Also, N represents the number of observations while n states the number of companies. These numbers turned out to be very similar over all three regressions.

From observing the parameters, the overall picture is that each coefficient is significant and in the same direction across all three dependent variables,

using a ratio of significance of $0.01 > p < 0.05 > p < 0.1$. As expected, the coefficient values for RoCE is stronger in magnitude than for RoA. This is due to the fact that RoA is calculated with the individual firm's total assets (debt and equity), in the denominator, when RoCE only has the equity in the denominator.

Starting with the variable log(Turnover), we observe that an increase in turnover has a positive significant effect on operating performance in all three regressions. This result was expected and confirms Hypothesis 5. In all of the three regressions, the parameter of LeverageLevel indicates that higher debt has a strong significant negative effect on the levels of operating performance for all companies. Therefore, it is not possible to confirm Hypothesis 4, which states that an increased leverage is expected to have a positive effect on our chosen dependent variables. We tried estimating another model regarding the theories about leverage in relation to PE-companies. Through including an interaction-variable of the PE-dummy and LeverageLevel, we isolated the possible effect leverage might have had on the two different company groups separately. This model did not turn out significant, dismissing the interaction term completely.

*Table IV: GLS random effects result*

| | Return on Assets | EBITDA-margin | Return on Common Equity |
|---|---|---|---|
| PE | 0.036** | 0.068*** | 0.105*** |
| | (0.018) | (0.024) | (0.036) |
| Leverage | -0.160*** | -0.083*** | -0.249*** |
| | (0.027) | (0.026) | (0.060) |
| Log(Turnover) | 0.019*** | 0.033*** | 0.034*** |
| | (0.004) | (0.006) | (0.008) |
| Constant | -0.140*** | -0.350*** | -0.277** |
| | (0.050) | (0.075) | (0.100) |
| N | 601 | 672 | 599 |
| n | 99 | 104 | 99 |
| $R^2$ within | 0.086 | 0.054 | 0.041 |
| $R^2$ between | 0.040 | 0.110 | 0.110 |
| $R^2$ overall | 0.032 | 0.069 | 0.062 |
| $\sigma_u$ | 0.077 | 0.118 | 0.156 |
| $\sigma_e$ | 0.066 | 0.067 | 0.149 |
| $\rho$ | 0.576 | 0.755 | 0.520 |

This table reports GLS random effects regressions where the dependent variable is operational performance - as measured by RoA, EBITDA-margin and RoCE - and the explanatory variables of turnover and leverage. See Appendix C for detailed explanations of all the variables. Standard errors are reported in brackets. This table also shows the estimated $R^2$, rho, and sigmas. ***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

The PE-dummy, which illustrates the mean difference of our three dependent variables of the private equity-portfolio companies and the benchmark group consisting the public companies, is the most important parameter in this study. The PE-dummy is both positive and significant, indicating that the PE-portfolio companies actually did perform better than our benchmark. This movement of the beta-values are consistent throughout all three regressions, which thereby confirms Hypothesis 1, 2 and 3 and can best answer our research question regarding the performance of private equity on the Swedish market.

In order to test the robustness of the result, we ran several other regressions with different variable combinations. In all of these regressions, the coefficients remained in the same direction as in Table IV. This was true even if we ran a simple regression or any other possible combination of the independent variables. We also tested these different combinations with Pooled OLS regressions and through including the extremum values and sectors from the original dataset of 1 200 observations.[8] We therefore believe that our result in Table IV is robust. Furthermore, we also tested for multicollinearity through using a variance inflation factor (VIF) command in STATA. We could thereafter conclude that our result does not have a problem with multicollinearity.

[8] Please find these regression outputs in the Appendix.

# V. Conclusion and Discussion

## 5.1. Performance of Swedish Private Equity

In this thesis, our aim was to contribute to the knowledge about private equity performance in Sweden through investigating the possibility of superior operational performance of PE-portfolio companies relative to a public benchmark. As previously mentioned, this is a subject addressed with uncertainty in later research. Performing three regressions of the GLS Random Effects Model using panel data, accounting for leverage level and turnover, our results showed significant signs indicating on overperformance of the sampled PE-companies compared to the publicly traded benchmark.

We showed that an increase in turnover had a positive and significant effect on our three operational metrics. Several other studies have in different ways included turnover growth in their analysis (Bergström *et al* 2007, Berger & Udell 1998). In accounting terms, an increase in turnover is often a positive indication for the well being of a company. It suggests, for example, that the company's goods are either sold in stores or used in production. This result on our operational metrics was therefore not surprising.

Leverage appeared to have a significant negative effect on all three dependent variables, indicating that an increase in debt is associated with reduced operating metrics. This result was not expected since a higher debt level is theorized to motivate the management of the acquired portfolio company to work harder and more efficiently (Jensen 1989). However, investigating leverage levels as a determinant to higher operational performance on the PE-market[9] has showed varied results in earlier research. While Maeseneire and Brinkhuis (2012) amongst others find that higher levels of leverage correlate with higher operational performance, there are still research finding the opposite conclusion, *e.g.* Axelson *et al.* (2013) and Kaplan and Strömberg

[9] This effect of leverage is also theorized to positively affect companies in general (Modigliani & Miller 1958).

(2009). Also, Bergström *et al.* (2007) could not find any significant effect on the influence of leverage when measured in EBITDA-margin on the Swedish market. Guo *et al.* (2011) theory about the changes in PE-transaction mechanisms could possibly explain why leverage may have a different effect on operational performance of the PE-market today than in the 1980s. This can at least partially explain why earlier studies such as Jensen (1989) and Kaplan (1989a) found positive effects on leverage. With this in mind it is not strange that we found a negative effect from increased leverage in our sample. Therefore, we cannot fully assert what effect leverage truly has on operational performance of PE-portfolio companies, even though our fourth hypothesis was rejected.

Our three main hypotheses, and overall research question regarding the superior performance of PE-portfolio companies, was answered through observing the estimated PE-dummy in our regressions. The parameter turned out to be both positive and significant for all three operating metrics. This suggests that the PE-portfolio companies actually did overperform the public benchmark on the Swedish market, which is in line with several empirical studies performed in the American market (Kaplan & Schoar 2005, Higson & Stucke 2012, Harris *et al.* 2014, Guo *et al.* 2011). As mentioned earlier, we cannot however state how much the PE-companies did overperform the public benchmark since the explanatory variables are too few. It is not economically intuitive to expect an *e.g.* 10 % overperformance in RoCE just from including the effect of leverage ratio and turnover. In other words, it is possible that if we had been able to include variables such as management stakes, industry and fund size, the parameter value of the PE-dummy could have dropped. Therefore, stating that we find a 10 % increase in the operational performance of PE-companies is not a realistic conclusion. Nevertheless, through observing the direction of the coefficients and their significance-level respectively, it provides an overall picture of the possible overperformance. Although not the economically sensible degree of it.

Still, through placing our results of PE-overperformance in relation to previous empirical research, a couple of interesting observations can be drawn. Starting from Jensen (1989) and Kaplan (1989a) until the latest research like Higson and Stucke, (2012) Harris *et al.* (2014) among others, it is possible to state that the vast majority of the studies find signs of PE-overperformance relative to a public benchmark. Despite that the "degree of overperformance" has decreased over the years, the overall picture of overperformance is quite similar. Our thesis therefore contributes to the existing research through also presenting results indicating on a PE-overperformance on the Swedish market. At the same time, our study as well rejects the briefly mentioned research claiming that there is no overperformance of PE-companies at all (Guo *et al.* 2011).

Even though our result is in line with much of the previous research, we still do not know why this is occuring. In other words, the problem of quantifying the theories regarding "superior" private equity performance presented by Jensen (1989) still remains. As a consequence, we cannot derive the true explanatory factors, or key determinants, that best explain the overperformance relative to the benchmark consisting of public companies. This has also been a commonly encountered issue in the majority of the previous research (Bergström *et al.* 2007, Higson & Stucke 2012, Cumming *et al.* 2007, Harris *et al.* 2014 *etc.*).

One factor that we completely excluded from our regression was the effect of risk. This, since Harris *et al.* (2014) and Higson and Stucke (2012) underlined the complexity of correctly acknowledging the risks of the PE-market, or measuring it. Still, if we "theoretically" account for the risks involved in PE-markets it might, at least intuitively, answer why researcher so often find a PE-overperformance relative to public markets. Assume that an investor has two choices; either to invest in a PE-fund or a public stock market index. Considering the highly illiquid nature of the PE-investment (the commitment

risk), it seems economically sensible that an investment in PE yields some sort of premium relative to public markets (Higson & Stucke 2012). Therefore, we observe that PE-portfolio companies tend to outperform publicly traded companies. Nevertheless, this is a pure speculation, and we have yet to see any research article that thoroughly address these types of risks in PE-investments.

Considering the risks of the PE-market, it is important to acknowledge that the private equity industry is still very young and under a constant change (Higson & Stucke 2012). The returns and behaviour of PE-firms has also been proven to be very cyclical (Kaplan & Strömberg 2009, Nowak *et al.* 2004, Axelson *et al.* 2013). Since PE is proven to exhibit macroeconomic cyclical influence, connecting our results to specifical market changes in Sweden could possibly make our interpretation more thorough. For example, Sweden has during our chosen time period experienced both the global financial crisis 2008-2009 and the Euro crisis. Therefore, placing our- or any other study out of its historical context should be done with caution since conclusions about returns, deriving explanatory variables or any other factor regarding PE-firms can possibly be highly dependent on what country or which year that the data is collected from.

The main finding of this study is thereby that there is a high probability of overperformance by PE-companies relative to public companies. However, it seems to be very cyclical and time dependent, and it should not be forgotten that the downfalls in the PE-market are not observed in the performance research, making the conclusions possibly slightly skewed. The key determinants behind this overperformance as well as the magnitude of the overperformance cannot be determined, which, speculatively, also may be the reason behind the possible continuing overperformance.

## 5.2. Future research

In this study we constructed the sector weights for both the PE-portfolio companies and the benchmark. This was performed in order to increase comparability between the groups and to prevent a sector bias in our complete sample. Although, it would have been interesting to actually control for differences in sectors. In order to do so, the sample size had to be increased, which can be difficult since data for PE-transactions is so scarce. During this thesis process, we encountered the Argentum Centre for Private Equity, which is a research centre focused on PE, based at the Norwegian School of Economics in Bergen. Argentum has a database that contains all the PE-transactions in the Nordic region. We strongly recommend that future research try to access their database in order to obtain a sufficiently large sample size, and therefore be able to control for what sectors or industries the companies are active in, which has been shown to have an effect in other studies (Kaplan 1989a). From the Argentum database, it is also possible to differ from what type of transaction that has been done, *i.e,* either a LBO or a VC. This is interesting since much of the empirical studies actually differs between these two transactions that PE-firms engage in (Guo *et al* 2011).

Another interesting task for future private equity research on the Swedish market is to use the method of Public Market Equivalent (PME) introduced by Kaplan and Schoar (2005). With the PME-method it is possible to compare how much a PE-fund investor earned with what the investor could have earned from a equivalent investment in the public market (in the case of Kaplan and Schoar, the S&P 500). This method has, in our best knowledge, only been tested on American data (Higson & Stucke 2012, Harris *et al.* 2014). Therefore the application of PME on the Swedish market could serve to fill a research gap about PE-performance when benchmarked on, for example, the OMX30 Stockholm. In order for this to be possible, the researcher first needs to have access to actual cash flow data from the funds that the PE-firms use to finance their investments.

## 5.3. Final reflection

Due to the secretive nature of PE-firms, every possible explanatory factor is of interest. New research of the Swedish PE-market is indeed both much welcomed and needed. We would like to finish this thesis by reminding once again of how strong the presence of the PE-industry actually is in Sweden. In fact, there are currently over 800 Swedish companies owned by a PE-firm, which employs around 4 % of the domestic labor force (SVCA, homepage, December 19 2017). Also, as previously mentioned, the most important institutional investors in PE-funds are *e.g* pension funds and insurance companies. In other words, the PE-industry is here to stay and we are all, at least in some way, affected by it. Therefore, it is in our best interest to know how the portfolio companies are performing.

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* * *

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# Appendix

## A. Econometric Assumptions

By using a General least squares (GLS) Random effects regression model, we are making four major assumptions:

1. *Unrelated effects.* Individual-specific effects are random variables that are uncorrelated with the explanatory variables of all periods of time (past, current and future) of the same individual. This means that there is no correlation between the chosen independent variables and the error term. $E[U_i|X_{it}] = 0$

2. *Effect variance.* There is constant variance of the individual specific effects. This means that the correlation between any observations for the same individual is the same and equals to rho ($\rho$), i.e. the first and last observation for a company has the same correlation as between the first and second. This is often called exchangeable or uniform correlation.

3. *Identifiability.* All of the regressors are not perfectly collinear, does not have zero variance and does not have many outliers.

4. The $\alpha$ is uncorrelated with all of the regressors.

## B The Random Effects (RE) regression

- (1) $Y = \alpha + \beta_1 X_{1i} + \beta_2 X_{2it} + \beta_3 X_{3it} + U_{it} + E_{it}$
- (a) $RoA = \alpha + \beta_1 PEdummy_i + \beta_2 LeverageLevel_{it} + \beta_3 \log(Turnover)_{it} + U_{it} + E_{it}$
- (b) $EBITDA - m\arg in = \alpha + \beta_1 PEdummy_i + \beta_2 LeverageLevel_{it} + \beta_3 \log(Turnover)_{it} + U_{it} + E_{it}$
- (c) $RoCE = \alpha + \beta_1 PEdummy_i + \beta_2 LeverageLevel_{it} + \beta_3 \log(Turnover)_{it} + U_{it} + E_{it}$

The PE-dummy controls for the treatment group (private equity companies). This means that the LeverageLevel-regressor controls for the relation between the two sets of companies' leverage levels effect on their operational performance. The logged variable Turnover also estimates both the PE- and public companies' size-effect on their operational performance. The U-term represents the between company-errors, while the E-term the within company-errors.

Since we are investigating the different companies' behaviour across time as well as the cross sectional differences between companies consisting of two different types of entities, we have to use the Random Effects regression to compute our econometric estimate due to the dummy-variable. If we would use a Fixed-effects panel data regression instead of the random effects model, we would not be able to use the dummy. Since the majority of previous theses have used the Pooled OLS option rather than panel regressions of fixed or random effects, we performed a Breusch-Pagan Lagrange Multiplier (LM)-test. All of the individual regressions of the three dependent variables (EBITDA-margin, RoA and RoCE) showed that we should use a random effects model. The usual Pooled OLS can give consistent estimators of $\beta_j$, but as its standard errors ignore the positive serial correlation in the composite error term, they will be incorrect, as will the usual test statistics.

When interpreting the coefficients, the beta-values are a matrix-weighted average of the between and within estimators. The beta-values therefore include both the within-company and between-company effects. An interpretation of e.g. B3 is the average effect of Leverage over RoA when Leverage changes across time and between companies with one unit.

# C. Operating metrics and other variable equations

$$\text{EBITDA-margin} = \text{EBITDA} \div \text{Total Revenue}$$

EBITDA margin is a common metric to use when evaluating the operating profitability and cash flow of a company. It consists of EBITDA (Earnings before interest, tax, depreciation and amortization) divided by Total Revenue, and therefore gives a company's operating performance in percentage.

RoA=Net Income÷Total Assets

Return on Assets (RoA) gives investors an indication of how profitable a company is in relation to its total assets.

RoCE = (Net Income - Preferred Dividends) ÷ Common Equity

Return on Common Equity (RoCE) is equal to the amount on net income returned as a percentage of the common equity.

Leverage-level ratio = Total Debt ÷ (Total Equity + Total Debt)

This leverage ratio illustrates how large a company's Total Debt is in relation to its Total Equity. Through having (Total Equity + Total Debt) in the denominator, this ratio varies between 0 and 1. A value of 0 implies that the individual company has zero debt, and increases as the company take on more debt.

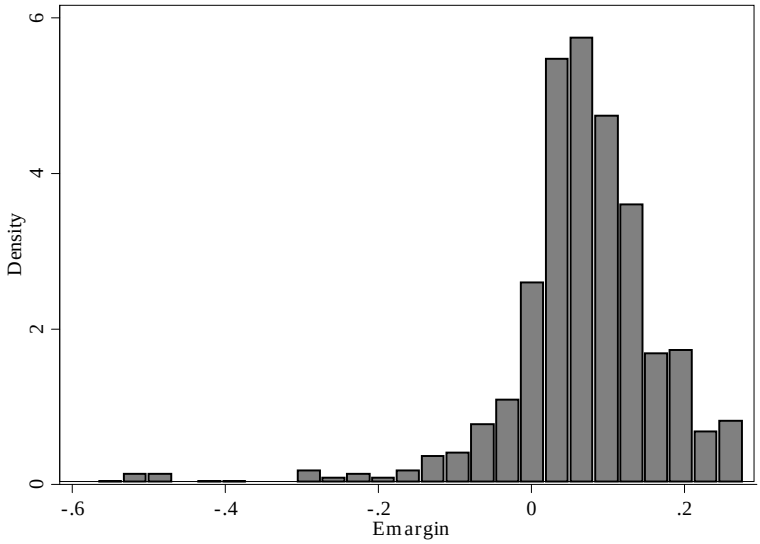
log(Turnover) = log(sales of the individual firm)

Turnover with a log specification.

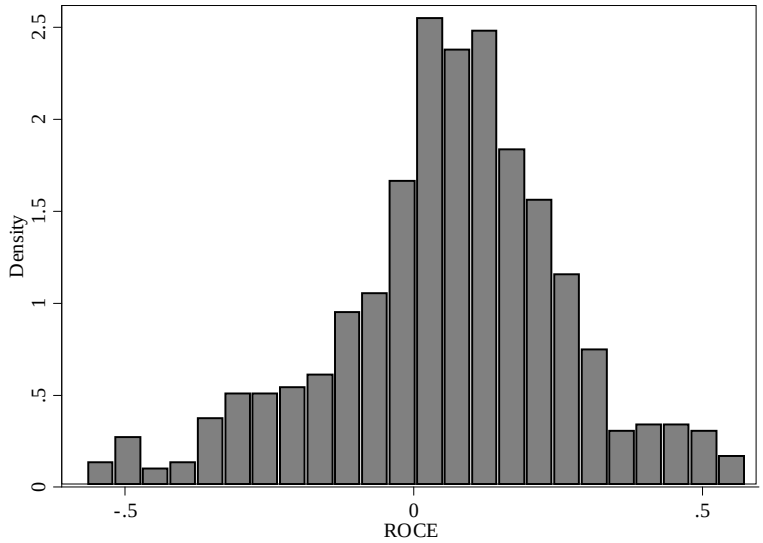
PE-dummy

A dummy variable where the value 1 implies that the company is owned by a Private Equity firm.

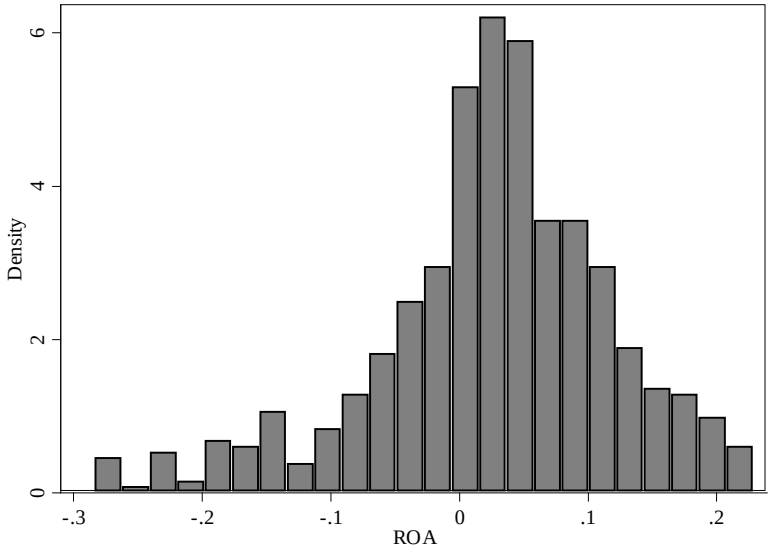
# D. Distribution of Operating Metrics




Graph I: Distribution of EBITDA-margin




Graph II: Distribution of Return on Common Equity




Graph III: Distribution of Return on Assets

# E. Robustness Checks

*Table V: Robustness checks - Pooled OLS regressions*

| | Return on Assets | EBITDA-margin | Return on Common Equity |
|---|---|---|---|
| PE | 0.028*** | 0.048*** | 0.094*** |
| | (0.008) | (0.009) | (0.018) |
| Leverage | -0.057*** | -0.045** | -0.141*** |
| | (0.020) | (0.022) | (0.004) |
| Log(Turnover) | 0.014*** | 0.019*** | 0.030** |
| | (0.003) | (0.003) | (0.006) |
| Constant | -0.137*** | -0.183*** | -0.270*** |
| | (0.038) | (0.044) | (0.076) |
| N | 601 | 672 | 599 |
| $R^2$ (adj) | 0.039 | 0.065 | 0.061 |

This table reports Pooled OLS regressions where the dependent variable is operational performance - as measured by RoA, EBITDA-margin and RoCE - and the explanatory variables of turnover and leverage. Standard errors are reported in brackets. This table also shows the estimated adjusted $R^2$. ***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

*Table VI: Robustness checks. Random Effects - Return on Assets*

| RoA | Check 1 | Check 2 | Check 3 |
|---|---|---|---|
| PE | 0.028* | | 0.020 |
| | (0.016) | | (0.017) |
| Leverage | -0.129*** | -0.153*** | |
| | (0.039) | (0.027) | |
| Log(Turnover) | | 0.018*** | 0.011*** |
| | | (0.004) | (0.004) |
| Constant | 0.091*** | -0.118** | -0.129** |
| | (0.026) | (0.053) | (0.055) |
| N | 603 | 601 | 607 |
| n | 99 | 99 | 99 |
| $R^2$ within | 0.0689 | 0.0865 | 0.0068 |
| $R^2$ between | 0.0001 | 0.0234 | 0.0620 |
| $R^2$overall | 0.0430 | 0.0185 | 0.0260 |
| $\sigma_u$ | 0.080 | 0.077 | 0.077 |
| $\sigma_e$ | 0.060 | 0.066 | 0.069 |
| $\rho$ | 0.587 | 0.577 | 0.552 |

This table reports GLS random effects regressions where the dependent variable is RoA and the explanatory variables of turnover and leverage (used in different combinations in order to test for robustness). Standard errors are reported in brackets. This table also shows the estimated $R^2$, rho, and sigmas. ***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

*Table VII: Robustness checks, Random Effects - EBITDA-margin*

| EBITDA-margin | Check 1 | Check 2 | Check 3 |
|---|---|---|---|
| PE | 0.057** | | 0.063*** |
| | (0.025) | | (0.024) |
| Leverage | -0.055** | -0.079*** | |
| | (0.026) | (0.026) | |
| Log(Turnover) | | 0.032*** | 0.029*** |
| | | (0.005) | (0.005) |
| Constant | 0.067*** | -0.309*** | -0.356*** |
| | (0.022) | (0.073) | (0.074) |
| N | 672 | 672 | 676 |
| n | 104 | 104 | 104 |
| $R^2$ within | 0.0120 | 0.0541 | 0.0345 |
| $R^2$ between | 0.0288 | 0.0458 | 0.1250 |
| $R^2$overall | 0.0226 | 0.0279 | 0.0652 |
| $\sigma_u$ | 0.120 | 0.121 | 0.117 |
| $\sigma_e$ | 0.068 | 0.067 | 0.067 |
| $\rho$ | 0.760 | 0.760 | 0.751 |

This table reports GLS random effects regressions where the dependent variable is EBITDA-margin and the explanatory variables of turnover and leverage (used in different combinations in order to test for robustness). Standard errors are reported in brackets. This table also shows the estimated $R^2$, rho, and sigmas. ***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

*Table VIII: Robustness checks, Random Effects - Return on Common Equity*

| RoCE | Check 1 | Check 2 | Check 3 |
|---|---|---|---|
| PE | 0.097*** | | 0.087** |
| | (0.037) | | (0.035) |
| Leverage | -0.190*** | -0.235*** | |
| | (0.058) | (0.061) | |
| Log(Turnover) | | 0.033*** | 0.024*** |
| | | (0.008) | (0.008) |
| Constant | 0.140*** | -0.220** | -0.276** |
| | (0.040) | (0.109) | (0.109) |
| N | 601 | 599 | 605 |
| n | 99 | 99 | 99 |
| $R^2$ within | 0.0320 | 0.0410 | 0.0056 |
| $R^2$ between | 0.0270 | 0.0484 | 0.1168 |
| $R^2$overall | 0.0240 | 0.0241 | 0.0430 |
| $\sigma_u$ | 0.165 | 0.161 | 0.155 |
| $\sigma_e$ | 0.149 | 0.149 | 0.151 |
| $\rho$ | 0.549 | 0.541 | 0.513 |

This table reports GLS random effects regressions where the dependent variable is RoCE and the explanatory variables of turnover and leverage (used in different combinations in order to test for robustness). Standard errors are reported in brackets. This table also shows the estimated $R^2$, rho, and sigmas. ***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

# F. PE portfolio companies

| **PE-firm** | **Company** | **Sector** |
|---|---|---|
| EQT | Atos Medical AB | Health Care |
| EQT | AcadeMedia AB | Consumer Services |
| EQT | Dometic Group AB | Consumer Discretionary |
| EQT | Granngården AB | Consumer Discretionary |
| EQT | TitanX Holding AB | Consumer Discretionary |
| Priveq | El-Björn AB | Industrials |
| Priveq | MYBW AB | Consumer Discretionary |
| Priveq | Mediplast AB | Health Care |
| Priveq | Silex Microsystems AB | Industrials |
| Priveq | Unisport Scandinavia AB | Industrials |
| Priveq | San Sac AB | Industrials |
| Priveq | Carmel Pharma AB | Health Care |
| Priveq | Assemblin Ventilation AB | Industrials |
| Procuritas | TPPG AB | Materials |
| Procuritas | Däckia AB | Consumer Discretionary |
| Procuritas | Osby Glas AB | Consumer Discretionary |
| Accent | Scandic Hotels AB | Consumer Discretionary |
| Accent | RenoNorden AB | Industrials |
| Accent | Mont Blanc Industri AB | Consumer Discretionary |
| Accent | ÅR Packaging AB | Materials |
| Accent | Bergteamet AB | Materials |
| Accent | Hööks Hästtransport AB | Consumer Discretionary |
| Accent | Autotube AB | Consumer Discretionary |
| Accent | Troax AB | Industrials |
| Accent | Crem International AB | Industrials |
| Accent | Flextrus AB | Industrials |
| Credelity | Qleanair Scandinavia AB | Industrials |
| Nordic Capital | Nefab Packaging Sweden AB | Materials |
| Nordic Capital | Thule Sweden AB | Consumer Discretionary |

| | | |
|---|---|---|
| Litorina | Ocay Sverige AB | Consumer Discretionary |
| Litorina | Sveba-Dahlén AB | Industrials |
| Litorina | Grolls AB | Consumer Discretionary |
| Litorina | Eton AB | Consumer Discretionary |
| Litorina | Semantix Tolkjouren AB | Consumer Discretionary |
| Litorina | Textilia Tvätt och Textilservice AB | Consumer Discretionary |
| Litorina | Pahlén AB | Industrials |
| Ratos | Biolin Scientific AB | Health Care |
| Ratos | EuroMaint Rail AB | Industrials |
| Ratos | Mobile Climate Control Sverige AB | Industrials |
| Ratos | Flokk AB | Consumer Discretionary |
| Segulah | Etraveli AB | Consumer Discretionary |
| Segulah | Scan Coin AB | Consumer Discretionary |
| Segulah | Kronans Droghandel Apotek AB | Health Care |
| Segulah | Skandinavisk Kommunalteknik AB | Industrials |
| Valedo | Akademikliniken HJ AB | Health Care |
| Valedo | Perten Instruments AB | Industrials |
| Valedo | Nytida Solhaga Sverige AB | Health Care |

# G. OMXXSCPI (benchmark) companies

| **Company** | **Sector** |
|---|---|
| Mr. Green Co AB | Consumer Discretionary |
| Alligator Bioscience | Health Care |
| NGS Group | Consumer Discretionary |
| Saniona AB | Health Care |
| Christian Berner Trade Tech AB | Consumer Discretionary |
| Bactiguard Holding AB | Health Care |
| NeuroVive | Health Care |
| Arctic Paper | Materials |
| Sportamore Publ AB | Consumer Discretionary |
| Episurf Medical AB | Health Care |
| Boule Diagnostics | Health Care |
| Moberg Pharma | Health Care |
| Dedicare | Consumer Discretionary |
| MQ Holding AB | Consumer Discretionary |
| Electra Gruppen | Consumer Discretionary |
| GHP Special Care | Health Care |
| C-Rad | Health Care |
| Endomines AB | Materials |
| Odd Molly | Consumer Discretionary |
| CellaVision AB | Health Care |
| Wise Group AB | Consumer Discretionary |
| Rejlerkoncernen | Consumer Discretionary |
| Uniflex | Consumer Discretionary |
| BE Group AB | Materials |
| MedCap | Health Care |
| Swedol | Consumer Discretionary |
| NOTE AB | Industrials |
| RNB Retail & Brands publ | Consumer Discretionary |
| BioInvent International | Health Care |

| | |
|---|---|
| Studsvik AB | Industrials |
| Feelgood Svenska | Health Care |
| Beijer Electronics | Industrials |
| Duroc | Industrials |
| Poolia | Consumer Discretionary |
| Midsona | Health Care |
| CTT Systems AB | Industrials |
| Malmbergs Elektriska | Consumer Discretionary |
| ProfilGruppen | Industrials |
| Venue Retail | Consumer Discretionary |
| Consilium | Industrials |
| Björn Borg | Consumer Discretionary |
| Trention | Consumer Discretionary |
| Lammhults Design | Consumer Discretionary |
| Semcon AB | Consumer Discretionary |
| Svedbergs i Dalstorp | Consumer Discretionary |
| SinterCast AB | Industrials |
| Rottneros AB | Materials |
| Viking Supply Ships | Industrials |
| Icta | Consumer Discretionary |
| KABE | Consumer Discretionary |
| Bergs Timber | Materials |
| Bong AB | Materials |
| Concordia Maritime | Industrials |
| Elos | Health Care |
| Active Biotech | Health Care |
| XANO Industri | Industrials |
| Avega Group | Consumer Discretionary |
| StjärnaFyrkant | Consumer Discretionary |