Innovation and Performance of Companies with a Legacy of Risk Capital Funding

A Swedish Perspective

Abstract

The purpose of this paper is to investigate how R&D investments affect public companies that was backed by risk capital in their early stage. In our research, we investigate whether firms with prior risk capital involvement can better manage investments in R&D and if this effect is observable on a business performance level. The sample contains 280 companies that were listed on the Swedish stock exchange between year 2000-2015. Even though a lot of research has been devoted both to the area of firm innovativeness and to the area of risk capital investor's performance, not much effort has been aimed in combining these two areas of interest. This study will therefore contribute to an additional perspective, combining the fields of innovation and finance. The indicators that was chosen in order to measure business performance are stock price and profitability which allows us to shape a broader view of the subject. The identified problem of this thesis was addressed using a quantitative method where general least squares was applied in order to estimate the effect. The findings indicate that innovation intensity have a positive impact on firm performance in terms of stock price for firms previously funded by risk capital. Nonetheless, this is not true regarding the impact on profitability, where the results instead point to a negative effect of R&D spending in previously risk capital backed firms. This result stress the importance of how business performance is measured, as the effect of R&D give different outcome of stock price compared to profitability.

Key words: *Innovation, risk capital, venture capital, private equity, stock price, profitability, business performance, R&D spending, Sweden*

J.E.L. classification: *A23, C33, G24, O32*

UNIVERSITY OF GOTHENBURG
SCHOOL OF BUSINESS, ECONOMICS AND LAW

Master Thesis in Finance and Innovation & Industrial Management
Graduate School - Spring Semester 2018

Authors: Ingrid Andelid Hjort & Mikaela Bååt
Supervisor: Evangelos Bourelos

Preface

This thesis is a collaboration between the master programme of science in finance and the master programme of science in innovation and industrial management at the university of Gothenburg, school of business, economics and Law. The collaboration enables the study to gain deep insight from the both fields and generate a wide understanding of the topic.

We would like to thank our supervisor Evangelos Bourelos who has continuously supported us with knowledge and feedback in order to improve our thesis. The interesting discussions and challenging questions when we been stuck with a problem has been a huge help, as well as his positive and encouraging attitude during the process.

University of Gothenburg, School of Business, Economics and Law

Gothenburg, June 2018

Ingrid Andelid Hjort
921107-4142

Mikaela Bååt
930523-9080

TABLE OF CONTENTS

1. Introduction

This chapter present the connection between the risk capital market, innovation and performance, which is of importance for the aim of this study. It will also point out the purpose of examining these connections.

Innovation and entrepreneurship have become buzzwords within the field of business but has lately also taken a big part in public debates. The recognized effect of innovation on economic long-term growth have result in an increased attitude to advocate entrepreneurship in terms of start-ups among countries. (Rosenberg, 2004; Fagerberg et al, 2006; Cumming, 2012, Westlund et al., 2011) In Sweden, supporting entrepreneurship has become a prioritized post in the Regional Growth Program, which might explain why Sweden has generated an increased number of start-ups the last decades. Sweden is often mentioned as a country delivering many interesting investment opportunities and Groh et al. (2010) even claims that Sweden is one of the most attractive countries to invest in, due to the access to a well-functioning start-up market.

Risk capital is proven to be an important source of funding in the growing numbers of start-ups and new businesses. Prior studies point out both venture capital and private equity as key drivers in business development and are strongly associated with a significant increase in innovation. (Kortum & Lerner, 2000; Popov & Roosenburg, 2009) Moreover venture capitalists and private equity firms play an important and present role in the exit of their investments through initial public offerings (IPOs). Their primary goal is to realise their investments through an exit, which imply that a successful IPO is in the centre of their interest. Venture capital backed companies therefore, tend to outperform non-venture capital backed firms at IPOs.

Further on, it has been shown that innovation influence the competitiveness of a firm and therefore, also affect its performance. (Neely & Hii, 1998; Rickne & McKelvey, 2013)

Innovation is an important component in the business competitive portfolio and enable firms to build competitive advantages, in order to follow the rapid changes within the business context and retain as well as gain market shares. (Brown & Eisenhart, 1995; Weerawardena et al., 2006) The purpose to innovate can be rather specified, in terms of reduce costs, increase demand or improve ability to future innovativeness.

However, the main objective for innovation investments shared among businesses is to improve the business performance. (Hong & Yu, 2016; Publishing, 2005) The relationship between innovation and performance seems to be of a complex characteristic, where risk capital investors are discussed as playing a central role. In order to investigate these relationships, and examine whether firms benefit from innovation activities this thesis will further investigate the how R&D activities, business performance and risk capital investors are connected.

1.1 Research objectives and problem discussion

Early studies point out innovation as a crucial factor for long-term growth for the society as a whole and these findings have been applied within businesses as an argumentation for increasing innovation activities within firms. However, studies which examine the same relationship between innovation and growth on industry and firm level present more dispersed results.

In order to investigate this inconclusiveness Demirel and Mazzucato (2012) contributed with further insight to the topic, by analysing how R&D is affecting firm growth. They look at the relationship between R&D spending and growth depending on firm size. On an industry level, innovation and development have been confirmed to be strongly associated and Demirel and Mazzucato (2012) support this prior research by showing that R&D spending influence growth positively. Previous research which apply a firm level perspective present results where researchers do not fully agree regarding the impact of innovation on business growth and performance. Some researchers suggest that innovation is determinant for a firm's competitiveness due to its ability to build sustainable advantages (Neely & Hii, 1998; Rickne & McKelvey, 2013).

Furthermore, it has also been results indicating that innovation activities generate increased sales and lead to growth but within other studies, R&D have even shown to have a negative impact on firm growth and performance. Despite this highly discussed topic within the existing literature, not many studies have investigated the impact of innovation on business performance in more sustainable terms. This thesis will measure business performance in terms of stock price and profitability in order to give an understanding of how innovation affect company's performance on the stock market as well as companies' sustainable growth in terms of profitability.

Much research has been devoted both to the area of innovation in businesses and the area of risk capital investment performance, however little effort has been aimed at combining these two areas of interest. There is a positive relationship between venture capital and innovations and the involvement from venture capital investors have shown to have a positive effect on the firms exit value. (Gompers, 1996) Prior research concerning innovation, R&D and venture capital mainly measures innovation in number of patents (Nadeau, 2011). However, it has been discussed whether the relationship between venture capital disbursements and patents give an accurate proxy of the innovation output (Kortum & Lerner, 2001). This study aims to contribute to an emerging literature in the area that investigate the relationship between innovation and business performance and if the involvement of risk capital investors is of any significant matter.

1.2 Contribution

This study is aimed at exploring and enhance the understanding of how innovation and financial measures are connected. O'Sullivan (2006) points out the fact that there are few empirical studies covering both the area of finance and innovation, demonstrating the need for better assimilation of the topics. One explanation to this gap could be that the topics traditionally lay under different academic departments. Though previous research indicate that risk capital investors play an important role in firm's innovativeness, as well on business performance, little research has been devoted to connecting these two areas. The aim study is therefore to further examine whether the involvement of risk capital is of any crucial importance for the relationship between innovation and business performance.

The little research that has been conducted in order to combine the two fields mostly focus on how venture capital can affect the number of patents obtained, but some studies also use the exit value to explain the performance of innovation activities before going public. (Nadeau, 2011) A possible reason for this specification and lack of research in adjacent areas could be that data regarding private companies is scarce and more difficult to come by than data concerning public companies.

Hence, this study will investigate the impact of innovation efforts on the stock price and profitability for companies with a legacy of risk capital funding after listing on the stock exchange. No known studies have previously been conducted covering this specific topic in Sweden. This study will therefore contribute to an additional perspective, combining the fields of innovation and finance. We believe this research is of importance in order to develop a deeper understanding of how innovation influence financial measurements. This could provide companies and investors with knowledge whether innovation investments do lead to enhanced business performance. Since innovation as a business component is increasingly receiving attention, this stresses the importance of measuring innovation activities.

1.3 Purpose and Research Question

The purpose of this research is to examine the effect of innovation activity in terms of R&D expenditure on business performance after an exit through a risk capital backed IPO on the Swedish stock exchange. The study aims to build on two fields of existing literature which both indicate that innovation has a positive impact on businesses competitiveness and that risk capital investors have a positive effect on business performance.

Our research question is:
How do R&D investments affect the business performance in risk capital backed companies after an exit through IPO?

2. Literature Review

In the following chapter, a literature review is presented in order to understand the studied phenomenon in this thesis. It aims to provides knowledge regarding innovation as a concept and its relationship to business performance and risk capital as a funding option. The complexity of measuring innovation will end this chapter and different innovation and performance indicators are presented.

2.1 The anatomy of Innovation

Innovation is becoming increasingly recognized as a field of study, as well as an applied concept within the business context. Furthermore, innovation as a field of study is to a growing extent involved as an essential part of other topics within research today. This results in a broad range of definitions of innovation among researchers. However, researchers within the field agree that innovation create or develop novelty. The degree of newness of the innovation can take a wide range and vary on the type of innovation and is one of things that makes the concept complex. (Gunday et al., 2011) An innovation can be radical and have a breakthrough characteristic or incremental, where the innovation is of a more progressive type (Neely & Hii, 1998).

Joseph Schumpeter (1934) is one of the first researches that influenced the discipline of innovation significantly. He argues that new technologies, in a dynamic process, continuously replace the old ones and the phenomenon is innovation. Innovation can take different expressions and Schumpeter described five different types of innovations in his early work "The theory of economic development"; (1) Introduction of new products, (2) Introduction of new methods of production, (3) Opening of new markets, (4) Development of new sources of supply for raw materials or other inputs, and (5) Creation for new market structures in an industry, also called new ways to organize business. (Schumpeter, 1934) His definitions of the different types of innovations have been widely accepted among researchers and used and developed in later research.

2.2 Innovation and business performance

Innovation is becoming more and more important as a component in businesses today (Brown & Eisenhart, 1995). Schumpeter (1934) did not only lay the foundation for the innovation phenomenon, but he also stressed the importance of innovation for economic development and growth. He argues that economic development emerges through the discontinuous appearance of new constellations.

Further on, he states that innovation drives development, which drives economic growth and profit. The ability to create, manage and capture these new combinations is what enable firms to increase business performance through innovation. (Brown & Eisenhart, 1995)

The key reason to invest in innovation and R&D is to gain competitive advantages and improve the business performance (Gunday et al., 2011). Having innovation as an integrated part of the overall business generate competitive advantages by enabling firms to gasp opportunities in the fast changing business environment. (Gunday et al., 2011) Although firms present different incentives to innovate in terms of lower costs, increase demand or make their processes more efficient, the joint key reason for innovation is to improve the business performance (Gunday et al., 2011; Hong & Yu, 2016; OECD, 2005).

Despite these common assumptions, not all studies within the field demonstrate a positive relationship between innovation and performance. Demirel and Mazzucato (2012) argue that R&D is positively associated with performance and growth on an industry level, but on a firm level, their result differs depending on the size of the companies. The research indicate that small firms are more likely to be positively affected by R&D, where innovation activities lead to firm growth, while R&D in bigger firms could even have a negative impact on the firm's performance. Furthermore, the research by Demirel and Mazzucato (2012) is limited to the pharmaceutical industry. It is common, that studies which aim to investigate the relationship between innovation and business performance focus on industries or companies that are known for carrying out a more R&D intensive strategy, in particular within the pharmaceutical and technology industries (Demirel & Mazzucato, 2012; Nadeau, 2011).

2.3 Early stage financing and IPO exit option

According to the Oxford Dictionary of Finance and Banking (2014), risk capital is capital invested in high risk projects, searching for a high return, as information availability is lower than on the public market. These investments are made by private equity (PE) or venture capital (VC) firms, commonly referred to with the term risk capital which contain various forms of investments.

The common factor is that investments are made into private companies which are not traded on the public stock market. The VC form of funding is a type of PE funding but usually enter the companies in an earlier stage with the purpose of enabling the start-up process, whereas PE funding is directed to aiding troubled firms (Sullivan, 2017). Investors that enter companies in an early stage commonly put much effort into choosing companies according to their investment selection criteria, where innovation factors such as protection of intellectual property, and uniqueness are of importance.

Risk capital investors are not silent partners, instead they act as advice-givers and in some cases, take on managing positions in the firm (Popov & Roosenboom 2009). Exit options of the risk capital firms include Initial Public Offering (IPO) or a Merger or Acquisition (M&A), which represent the risk capital performance. (Nadeau, 2011). Their exit or liquidity marks a key event in the investment story as it is in this stage the first positive cash flow generally appears. For this reason, the exit through an IPO or M&A is the only performance measure from a risk capitalist point of view. (Nadeau 2011; Khalfallah et al., 2014)
However, exit through IPO has historically resulted in a higher value than a private merger or acquisition (Francis et al., 2009).

2.4 The impact of R&D and risk capital on IPO performance

Many researchers within the field have investigated what factors influence a firm's IPO performance as well as its long-term performance after the exit. (Brav & Gompers, 1997; Burghof & Kraus, 2003) However, the risk capital industry and specifically the VC industry is a relatively young industry which is still in need of much development to become a more mature industry. It is therefore important to keep in mind that research within the area may differ, as the industry is constantly evolving. (Da Rin et al., 2011)

R&D investments have been confirmed in prior studies as a factor influencing firm's IPO performance and Heeley et al., (2007) means that innovation activities increase the information asymmetry and influence the value on the IPO market. Aboody and Lev (2002) also present in their earlier study how R&D increase the information asymmetry.

First, they explain that the uncertain characteristic of R&D investments compared to other investments make it more difficult for the public to predict the potential output of R&D investments and its given value. Secondly, R&D figures are often not disclosed to the public and therefore, the effect of information asymmetry remains, even after the company has been publicly introduced. Their result confirm that the extent of information asymmetry associated with R&D is higher than those associated with other financial investment.

The type of funding of young firms, in particular venture capital has also been examined in prior research as a factor influencing the firm performance during and after an IPO. The presence of VC funding when first going public has proven to reduce the effect of agency problems. (Bessler & Kurth, 2007) Moreover, Jensen and Meckling (1976) review the classic principal-agent dilemma which occurs when the ownership and management in the firm is separated. This structure can lead to issues if the incentives of the agent (the manager) and the principal (the owner) of the company are not aligned. More specifically, these costs arise if the agents act in their own best interest, instead of what would be ideal for the owners of the firm. In order to diminish agency costs, offering incentives meant to align the agent's objectives with the principal´s has a proven effect, as well as monitoring actions in order to increase the transparency of the activities of the agent. (Jensen and Meckling, 1976) Except money, risk capital managers provide value-added activities to firms in terms of strategic advices, network opportunities and industry specific knowledge. (Kortum & Lerner, 2001; Cumming, 2012). VCs are also monitoring specialists and take part of the board composition, which give them insight in their portfolio companies. This involvement has a positive signalling effect regarding the business quality to investors and can decrease the effect of agency problems. (Bessler & Kurth, 2007; Burghof & Kraus, 2003; Rindermann, 2004) In most studies, although the literature is relative diluted, risk capital backed firms do outperform non-risk capital backed firms at exit. (Khalfallah et al., 2014) According to lock-up agreement drawn between the risk capital backed firms and the firms providing the risk capital, VC firms as well as PE firms have to maintain a specific interest in the backed firm

after the exit which can explain the increase in post-IPO performance. (Burghof & Kraus, 2003). However, prior literature indicates that when these lock-up agreement expires and risk capital firms no longer have any involvements, the performance of the risk capital backed firms, in terms of stock price, should not differ from other publicly traded firms. (Bessler & Kurth, 2007).

2.5 Innovation indicators

As discussed, innovation is agreed on among firms today as being an important and prioritized activity in order to improve competitiveness as well as business performance. However, prior research confirm that most firms do not track their innovation activities as strictly as they track other business operation activities. (Andrew et al., 2009; Smith, 2009). The mixture of activities that innovation refers and the different definitions of innovations between industries, create a struggle to develop good measurements for innovation. Researchers within the field have struggled to find measurements which can be comparable between companies, sectors and countries. Different measurements are argued to be more or less suitable in different industries and companies, depending on their core business and products. Therefore, the different methods used to measure innovation differ between companies and limits the possibility to analyse and compare the impact of innovation on performance between companies and industries. (Fagerberg & Mowery, 2009)

One of the most common measurements of innovation activities among firms is R&D expenditures. (Hong & Yu, 2016) R&D is a source of innovation and tool for business development. The R&D investments influence a firm's long-term viability and prior R&D expenditures is used to measure a firm's innovativeness. (Hong & Yu, 2016) A reason why firms struggle to measure their innovativeness is the difficulty to define what type of activities and expenditures counts as R&D. A useful classification is whether R&D generate novelty compared to its related activities, where the solution to a problem is not evident to someone acquainted with the basics of the concerned area. For example, education and training are activities where knowledge is acquired rather than created and therefore, not classified as R&D. (Fagerberg & Mowery, 2009)

R&D expenditures measure the investment, or in other words the innovation input, but is less explanatory regarding the output of the investment. (Hong & Yu, 2016) Commonly, R&D expenditures reflect the input, where number of patents, as another R&D indicator measure the output. However, due to sectoral differences, number of patents as a measurement for innovation could be a misleading representation of the actuality. (Hagedoorn & Cloodt, 2003)

In this research, we study a sample of firms across different sectors and therefore R&D expenditures to net sales are suitable in order to measure the innovation activity. By using the R&D expenditure in relation to the net sales it puts the investment input in relation to its output. (Fagerberg & Mowery, 2009)

2.6 Performance indicators

The proved impact of innovation on firm performance have been further examined through different studies. Carayannis and Provance (2008) use three main groups to identify and measure performance related to innovation. The first group of indicators measure the short-term success (output) of business performance in relation to innovativeness. It refers to number of patents, patent rates, numbers of new products etc. The second group refers to the outcome (long-term) of the innovation investment on performance. This group of indicators include financial measurements such as profitability and growth as well as the firm's achievement of dominant design and technical standards. Indicators of the third group present the impact and the sustainable advantages given from the innovation activity, such as status and reputation. (Carayannis & Provance, 2008)

The different ways of measuring the impact of innovation on business performance in studies will have an effect on the results obtained and the conclusions that can be drawn. Much prior research which demonstrate that innovation have a positive impact on business performance have measured performance according to the first group of Carayannis and Provance (2008) classification (patents, numbers of new products) or in terms of IPO exit performance, productivity and sales. (Nadeau, 2011; Klette & Kortum, 2002) However, none of these measurements are very informative regarding the internal financial health of the firms. Therefore, the second group which examine the long-term effect of innovation on business performance in terms of profitability and growth rate is a measurement method more suitable

in drawing conclusions regarding the financial performance of the firm. (Carayannis & Provance, 2008)

Lööf & Heshmati (2006) studies the relationship between innovation and profitability where they find that innovation and profitability have a strong positive relationship. Their result, was however based on a sample where negative figures of profit were excluded. Investments in R&D as well as other investments lead to expanses and negative cash flow which to some extent will affect firm profitability. Another commonly applied performance indicator is stock price. In his study, Eugene Fama (1970) lay the ground for the theory of efficient markets. The theory states that securities markets are highly efficient in reflecting all available information regarding both individual stocks and the stock market as a whole. The strong form of the theory is based upon the believe that news spread quickly, leading to perfectly priced securities as all information is instantly incorporated in the price. For this reason, the financial markets are recognized for being of efficient character, and a suitable measurement for valuing the firm and its performance. (Vega, 2006)

Due to the difficulties to track the innovation investments impact on performance researchers suggest the use of multiple indicators. Prior studies demonstrate different benefits of using multiple indicators when measuring performance and its link to innovation. Some researcher mean that it increases the ability to analyse and capture the economic and qualitative value. (Santarelli & Pierigiovanni, 1996) The use of multiple indicators is also more beneficial when measuring and comparing performance across industries and firms. (Hagedoorn & Cloodt, 2003; Carayannis & Provance, 2008).

3. Methodology

This section will present the theoretical and empirical methods that was used in this study. A description of how the data and the financial measurements was treated will be given, followed by a discussion regarding the credibility of the study.

The aim of this study is to build on existing literature which examine the relationship between innovation and performance. The intent is also to fill gaps in this existing literature. We do this in attempting to answer the question regarding how R&D investments affect business performance in risk capital backed companies, after an exit through IPO. The literature review in the previous chapter demonstrate how complex the relationship between innovation and performance is, as well as the involvement of risk capital investors. Breaking down the research questions by formulating hypotheses enable us to attack the problem from different angles. In order to test if the hypotheses can be supported or not, and to answer the research question, data has been gathered and analysed. The following part of this chapter will present the hypotheses and the manner in which the data was collected in order to arrive at the final result of the study.

3.1 Hypotheses

The hypotheses that are derived by analysing previous research, gaining knowledge of the issues in the field and identifying gaps in the literature are formulated and presented below.

Hypothesis 1: R&D expenditures (to net sales) has a positive effect on the stock price of previously risk capital backed companies after exit.

Hypothesis 2: R&D expenditures (to net sales) has a positive effect on the profitability of previously risk capital backed companies after exit.

Using both stock price and profitability as measurements for business performance enable us to test how R&D activities influence business performance in a broader sense. The first hypothesis focuses on testing the impact of R&D on stock price, which generate knowledge on how R&D affect the market value of the firms.

Contrary, the second hypothesis aim to test the impact of R&D on business performance in more sustainable terms by measure performance in profitability. Profit margin can be argued to be of a more internal character as an indicator of business performance, as it is only affected by the actual actions taken within the company.

3.2 Method of choice

The identified problem of the thesis will be addressed using a quantitative method, where quantitative data is collected and analysed. More specifically, a multivariate analysis model will be applied. The aim of this research is to examine the connection between innovation activities and performance measurements, controlling for variables believed to have an effect on the outcome, which explain the choice of a quantitative research. Furthermore, a quantitative research strategy enables the result of the research question to be generalized.

With the quantitative approach as an agreed research strategy the questions regarding how the research will be designed and what methods will be used to collect and analyse the data. The study takes a deductive approach to connect theory and research, by constructing hypotheses to be tested. This give a linear and clear consecution through the research. Although, the appearance of new ideas from literature and changes in data may have an impact on the execution and have to be taken into consideration. Research including hypotheses usually have an experimental design that examine the cause-effect relationship between the variables. (Bryman and Bell, 2011)

3.3 Data collection

The empirical findings presented in this thesis are based on detailed financial information from a large sample of Swedish firms. The data collection was mainly conducted using Bloomberg. However, the collection process also included analysing and reviewing annual reports and IPO prospects of companies as well as going through the listing pages on Nasdaq Nordic and Aktietorget in order to ensure a sample that is as complete as possible. From this manual approach, we could complete the list of companies that has been listed in Sweden between 2000-2015 and thereafter check if they were PE or VC backed.

For the variables included to test the sample, we used Bloomberg to retrieve data for all variables except GDP and CPI which were extracted from Statistics Sweden. The innovation intensity was measured by the percentage of spending on research and development (R&D) in regard to net sales of each firm.

3.3.1 Panel data

In the case where the data set contains many observations of the same entity over time, structuring the data in panel form is ideal (Baltagi, 2013). This type of structure of the dataset allows for observing the impact of the independent variables; firm's R&D activity and funding type on the dependent variables; stock price and profitability for the same firms over time, including several control variables, where the model is able to take individual heterogeneity into account (Torres-Reyna, 2007). One of the other main advantages when using panel data, is that a large number of observations can be collected and studied in the data set which allows the model to capture more complexity within the units than for instance, a simple cross-sectional data structure could do. The nature of panel data can also deal with omitted variable problematics as both time effects and individuality effects of the units in the sample are being analysed. Furthermore, it can also diminish problems regarding collinearity between the explanatory variables (Hsiao, 2014). When analysing panel data, there are two different approaches; fixed effects or random effects, which will be further elaborated on in section 3.4.

3.3.2 Sample

The sample was obtained by using the "IPO" function in the Bloomberg terminal, then specifying time period, region, offer type and how the company has been funded, in this case: First trading day between 2000-2015, Sweden, IPO, PE and VC funded. We could then export the results to excel, using the option "advanced excel output". This method produced 190 companies with additional information containing ticker name, exchange name, IPO trading date, sector and whether the exit was PE and/or VC funded. However, after comparing this list with the ones on Nasdaq Nordic and Aktietorget it became clear that some IPOs are missing, as not all IPOs are announced to Bloomberg. It was therefore also necessary to go through the listings books on Nasdaq Nordic and Aktietorget in order to complete the sample by matching these lists to the original sample.

This method produced 90 additional companies. For the companies in the sample that was not acquired from Bloomberg, information regarding the ticker name, exchange name, IPO trading date, industry group, and ownership structure was manually collected from the IPO prospects of each company. The final sample contains 280 companies and the variety of industries and funding type among the companies are demonstrated in the descriptive statistics.

3.4 Processing of data

3.4.1 Regression with panel data

When there are reasons to believe that using ordinary least squares (OLS) will result in problems related to the errors exhibiting non-constant variance or correlation, the generalized least squares (GLS) estimator can provide a more suitable option for testing a panel data set (Hayes & Cai, 2007). In our case it is plausible to assume that observations within the entity, such as for instance industrial group and profit margin could be correlated, which explains the approach taken on. In order to validate the choice of model, a Breusch-Pagan lagrange multiplier test (LM) was also run where we were able to reject the null hypothesis that random effect is not suitable. We could therefore proceed with the random effect approach instead of running simple OLS regressions. The GLS estimator is specified as follows:

$$[\sum_{i=1}^{N} \tilde{X}'_i V^{-1} \tilde{X}_i] \hat{\delta}_{GLS} = \sum_{i=1}^{N} \tilde{X}'_i V^{-1} y_i \qquad \textit{[Equation 1 (Hausman, 1978)]}$$

Depending on the errors in the model, either the fixed effect or random effect specification will be applied. As Hausman (1978) showed in his study, this decision can have a significant impact on the estimates of the coefficients as the underlying assumption regarding the omitted variables differ. In order to determine which specification to apply, a Hausman test was conducted, testing the null hypothesis that the difference in coefficients is non-systematic, or random.

More specifically, the Hausman test allows for determining whether "the unobserved individual effect embodies elements that are correlated with the regressors in the model, not whether these effects are stochastic or not" (Green, 2008, p.183). In our case, the Hausman test produced a p-value greater than 0.05 for both models (appendix A), indicating that the random effect approach is more compatible with our data set.

3.4.2 Random effect model

The random effect method assumes that the variation across companies are uncorrelated to the independent variables incorporated in the model. Furthermore, the unobserved variables that have impact on the independent variable are affecting the independent variable randomly (Hausman 1978). Thus, in order to avoid omitted variable bias, it is important to include the variables that can have an impact on the independent variables. In this study, the differences in characteristics between companies such as industry group and firm size are assumed to be correlated to the type of funding received and how high the R&D intensity is, which is why these variables were added to the model.

Moreover, a key advantage of the random effect approach is that time-invariant variables can be integrated in the model, which in our case made it possible to include company specific characteristics, such as industry group and funding type. In the random effect specification, we do not assume U_i to be fixed, but instead that it is drawn from an independent and identically distributed set of data. Ui is assumed to have zero correlation both to X_{it} and ε_{it} (Hausman 1978), making the specification as follows:

$$Y_{it} = \beta X_{it} + \eta_{it,}\ \eta_{it} = \mu_i + \varepsilon_{it} \qquad \textit{[Equation 2 (Hausman, 1978)]}$$

3.5 Variables

Data for the variables was observed during the measuring period 2000-2017. We are interested in how the independent variables, R&D spending to net sales and funding type affect the dependent variables, stock price and profit margin which are measured in percentage change from previous period. In order to test this, control variables were added to the model in order to avoid capturing effects from omitted variables, leading to a misinterpretation of the model.

In order to make sure that the error term is not correlated with our included variables, the following control variables were added to the model: number of employees, BTM (book to market) ratio, firm industry group, year of IPO, year 2008 GDP (gross domestic product) growth rate and CPI (consumer price index) growth rate. These are all factors that are believed to have an impact on the stock price and the profitability of the firms.

3.5.1 Dependent variables

Stock price - Assuming perfect information on the financial markets, stock price will reflect previous and current information as well as future expectations and is therefore a suitable performance measure (Bacidore et al, 1997). In this thesis, we will however also control for this assumption by adding lags to the independent variable, R&D spending to net sales, similar to what previously has been done by for instance, Segerstrom (1991) and Damanpour and Evan (1984).

By measuring the outcome in stock price, the research can also be of interest when evaluate different investment strategies. This approach also allows for investigating if there is a similar increase in return for public investors as you can see reflected in the exit value for the private risk capital investors. The variable was measured in terms of percentage change in comparison to the previous quarter and was obtained from Bloomberg.

Profit margin

By adding profitability as a performance measure, the analysis can become more profound in showing whether the internal health of the company is affected, and if the innovation efforts are efficient. In this model profit margin is used, which is a profitability ratio calculated by taking the firm's net profit divided by sales. (Investopedia, 2018)

According to Carayannis & Provance (2008) profit is a suitable indicator when investigate innovation investments effect on long-term business performance. This is built on the statement that Cordero (1990) made in his study regarding the measurement of innovation performance. He means that innovation should be measured both as input (expenses) and output (revenue) and as profit is a way of measuring the difference between these two, it is a suitable variable to include in our model.

3.5.2 Independent variables

R&D - One of the main inputs for lasting economic development is R&D and technical innovation which is why many countries have incorporated targets measuring this in their long-term strategies (Nadeau, 2011). As this study treats companies from various sectors, with the common factor of initially having been funded by risk capital it may be misleading to measure innovation in number of patents as it can vary significantly depending on the industry. Using data of the firms' R&D spending in relation to net sales will overcome the problems concerning comparability of companies coming from different sectors as well as serve as a proven indicator of economic growth.

This variable is however the most problematic, due to missing data. To deal with the problem we ran diagnostic tests where we could determine that the lack of data was random. In the data set of total 280 companies, there are 189 companies that disclose their R&D to net sales figures. Though the variable is measured as R&D spending to net sales, it will also be referred to simply as R&D or R&D spending for the remainder of this study.

Funding type - While the literature diverges to some extent regarding the impact of risk capital on firm performance, most studies show that risk capital backed firms do outperform non-risk capital backed firms. (Khalfallah et al., 2014) Therefore, a variable distinguishing whether the company is VC and/or PE funded was included in the model.
The variable was also assigned an id in order to construct a categorical variable with four levels taking on the id: 0, 1, 2 or 3, representing Non-VC/PE funded, PE-funded, VC-funded or both PE- and VC-funded. From this specification, we were able to construct dummies for each of the funding types, including one representing risk capital funding containing funding type 1, 2 and 3, i.e. all companies funded by PE, VC or both PE and VC.

Interaction term between R&D and risk capital funding - In order to determine if the level of input in innovation have different impact depending on the type of funding the company have received prior to the IPO, an interaction term was created. The variable is obtained by multiplying the continuous variable R&D with the categorical variable Risk Capital.

This allows us to capture the *additional* effect of R&D spending for the firms that prior to the IPO was backed by risk capital and it is specified as follows:

$$Interaction\ term = R\&D * Risk\ Capital \qquad \textit{[Equation 5]}$$

3.5.3 Control variables

The control variables are such variables which might affect the result but are not of any direct interest. By including them in the model we ensure that they do not influence the relationships between the dependent and independent variables and impact the outcome. (Jaccard & Turrisi, 2003; Upton & Cook, 2014)

Numbers of employees - The number of employees is commonly used to measure the firm size in research and it was discovered already in early research, that this measurement has an effect on the innovation activities of firms (Schumpeter, 1934). Many, such as Robinson (1952), Nelson, Peck and Kalacek (1967) and Hansen (1992) have reached similar conclusions which is why this variable is incorporated in our model.

Book to market ratio - In research conducted by Fama and French (1992, 1995) it is concluded that the book to market ratio (BTM) capture much of the average return on the stock market as it captures the sensitivity to common risk factors in returns. The BTM value is calculated as the firm's book value per share divided by the firm´s market price per share. If the ratio is higher than 1, the stock is undervalued and if the ratio is lower than 1, the stock is overvalued. (Birgham & Ehrhardt, 2013)

Industry - As confirmed in previous research and stated in the literature, type of industry has an impact on investments in R&D. The characteristics of the sector define the importance of R&D as well as the largeness of the R&D expenditures. (Cloodt & Hagedoorn, 2003) Furthermore, profitability also varies depending on which industry it operates within.
Therefore, a industry taxonomy was incorporated in the model, using the Global Industry Classification Standard (GICS) which contains, 11 sectors, 24 industry groups, 68 industries and 157 sub-industries (MSCI, 2018). Based on this, a categorical variable was created where we chose to use the industry group, specified by 4-digit number to structure the company

industry. This is useful as the two first digits explain which sector the company belongs to, which is useful for capturing patterns of industry group belong to a certain sector.

Year of IPO - In order to account for the phenomenon of underpricing, time since entrance on the public market was included in the model. IPO underpricing occurs when the pricing of a stock is set at a lower price than the intrinsic value which leads to a short period of increase in stock price (Loughran & Ritter, 2004). These high return periods and outperformance can often be observed the first 6 months after the IPO, but are then decreasing significantly over the following 18 months (Bessler & Kurth, 2007). Explanations of IPO underpricing are often based on the presence of asymmetric information concerning the deal. It is usually the fact that the issuer of the IPO has access to more information regarding the value of the shares than the investor, which is why firms may underprice its stock (Ritter, 1984). In other words, firms want to encourage investors to take part in the IPO.

Year 2008 - To account for the presence of extreme external events during the financial crisis, a dummy variable representing year 2008 was incorporated.

GDP growth rate - Change in GDP is used in most studies involving stock price. However, its relation to stock price has shown both significant and insignificant results. (Dimson et al., 2002; Fama, 1981). The data is measured as change in real GDP compared to the same quarter the previous year and has been collected from Statistics Sweden.

CPI - CPI measures the average price development, covering the entire domestic consumption, which is a measurement of the rate of inflation in the country. (Statistics Sweden, 2018). Inflation was incorporated in the model as it in previous studies has been found to have a significant effect on stock prices (Quayes & Jamal, 2008). The data is available in monthly form on Statistics Sweden where each data point is measured against the same period the previous year. As quarterly data was not available, the monthly figures have been compounded into quarterly figures by taking the average of the three monthly figures in each quarter.

3.5.4 Model specification

The two models are estimated using GLS as follows:

$$\beta_{\Delta stockprice} = \beta_{R\&D} + \beta_{riskcapital} + \beta_{R\&D*riskcapital} + \beta_{industry} + \beta_{BTM} + \beta_{employees} + \beta_{yearofIPO} + \beta_{year2008} + \beta_{GDP} + \beta_{CPI} \quad \textit{[Equation 3]}$$

$$\beta_{profitmargin} = \beta_{R\&D} + \beta_{riskcapital} + \beta_{R\&D*riskcapital} + \beta_{industry} + \beta_{BTM} + \beta_{employees} + \beta_{yearofIPO} + \beta_{year2008} + \beta_{GDP} + \beta_{CPI} \quad \textit{[Equation 4]}$$

3.6 Endogeneity and criticism

Issues related to endogenous variables are common in quantitative research. In this study, we apply the GLS estimator with the random effect specification in order to obtain estimates from the panel data set. While the GLS estimator is asymptotically efficient under this model specification it is important to exercise caution when assuming that the errors are conditionally independent of the regressors, that is, when assuming $E(\mu_i|X_{it}) = 0$ Violation of this assumption will lead to an inefficient and biased estimator (Hausman, 1978). For instance, in the event of neglecting to incorporate endogenous variables in the model, the error term will be correlated with Xit and the estimated parameters of the variable will not be precise. This means that in case that there are factors affecting stock price and profitability which we have not controlled for, there is an endogeneity issue in the model. However, we have chosen control variables based on the earlier studies such as the BTM ratio and the firm size, as well as economic factor such as GDP and CPI. As we choose a sector wide approach for our study, we also control for differences related to industry or sector in our model.

R&D spending is considered as an innovation input, i.e. it should to be thought of as an innovation indicator (Hansen 1992; Hong & Yu, 2016; Nadeau, 2011). For this reason, we used R&D figures in relation to net sales and also added profit margin to our model. However, changes to profit margin can have many possible explanations, other than investments in R&D. In order to make the inferences of the results more robust, we could have added output measures of innovation, such as number of number of patents, number of new products on the market, sales figures etc. (Carayannis & Provance, 2008).

Nonetheless, this approach could also lead to complications as there is no sector or industry specialization in this study and these types of figures may not be comparable across sectors.

Furthermore, in our research we do not study the long-term effect R&D has on profitability. We made attempts to add lags to the interaction term of R&D and Risk Capital (appendix E) in order to see the effect of R&D spending in following periods. However, we deemed the results non-trustworthy due to lack of significance in the model. A reason for this could be the fact that the R&D variable contain a lot of missing data and when both creating a new interaction term based on it and then adding lags, it leads to even fewer observations.

4. Results

In this chapter, we will present the result of the model and start of by introduce some descriptive figures. Further on, our two models will be presented together with its results.

4 .1 Descriptive statistics

A collection of information about the sample and the variable used in the study is summarized in the following section. The purpose is to give a deeper insight of the sample in order to later analyse the result and enable us to generalize the findings. Parts of the findings in the descriptive statistics are useful/essential to give a broader understanding of the studied phenomenon, research question.

4.1.1 Summary statistics

In table 1 the summary statistics are displayed. If the variable has complete data, there are 7307 number of observations. However, stock price, profit margin, R&D, BTM and employees contain missing data. This is especially true for the variable R&D, where only 4138 data points could be observed, regardless, the mean of R&D spending to net sales is 97.092 SEK. Furthermore, the dependent variables stock price and profit margin have a mean of (-4118.718) and 0.0283034 respectively. All variables describing funding type are dummy variables and hence, take on either the value of 0 or 1.

Variable	Obs	Mean	Std. Dev.	Min	Max
pricechange	7040	.0283034	.3840126	-.9333333	13.08328
profitmargin	6073	-4118.718	236248	-1.83e+07	36142.09
rd	4138	97.09187	1458.487	0	45221.24
riskcap	7307	.2962912	.4566522	0	1
pe	7307	.1974819	.3981262	0	1
vc	7307	.0625428	.2421553	0	1
pevc	7307	.0362666	.1869655	0	1
btm	6509	.9728513	8.270119	.000137	384.6154
employees	6870	1327.286	3918.335	1	32171
industryid	7307	3357.431	1272.47	1010	6010
yearofipo	7307	2006.963	4.327732	2000	2015
gdp	7307	.5430135	.9814144	-3.7	2.4
cpi	7307	1.182332	1.247333	-1.433333	4.3
year2008	7307	.0639113	.2446116	0	1

Table 1. Summary statistics

Figure 1 present the distribution of sectors among the firms in the sample. Consumer dictionary, health care and information technology are the most representative sectors, including 18% each of all firms. 15% of all firms are in the industrial sector. Figure 2 show the distribution type of funding among the firms in total dataset, Companies that has not obtained any risk capital funding are strongly overrepresented in the sample, accounting for 65% of the observations. Firm funded by risk capital represent 35% of the sample, where PE funded firms accounts for 22%, VC backed firms 9% and firms funded by both PE & VC constitute 4%

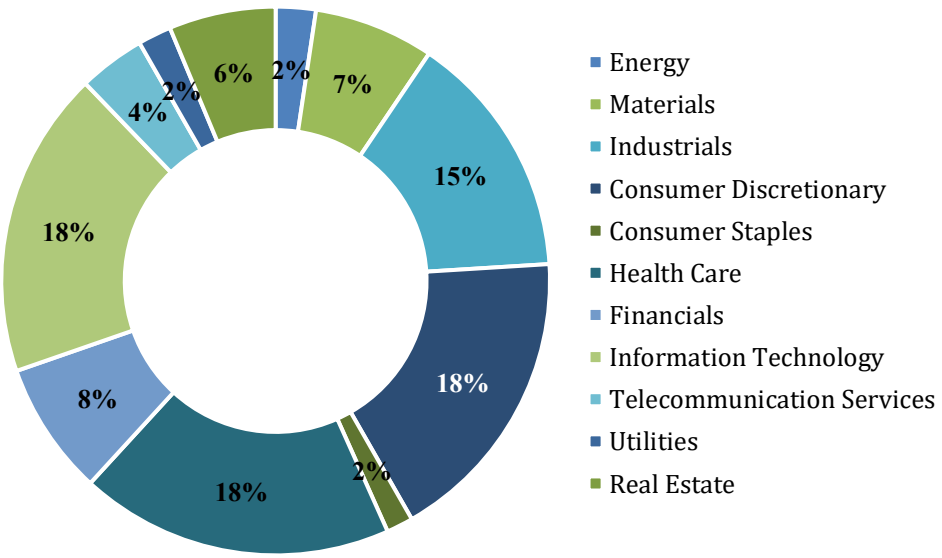

Figure 1. Industry distribution.

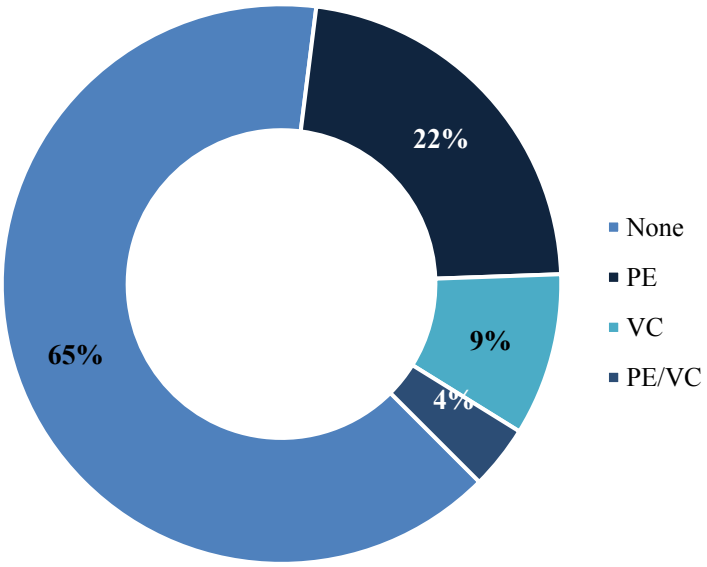

Figure 2. Funding type

4.1.2 Funding type by industry group

VC funding

In the sample of 22 industry groups, only 7 contain companies funded by VC.

Out of these industry groups, the companies active in Pharmaceuticals, Biotechnology & Life Sciences are most frequently funded by VC which is not surprising as it is an industry associated with very high costs in the start-up face and high return if successful (Gompers & Lerner, 1998). The percentage of companies in the industry group funded by VC is 21.9%. The ancillary industry group Health Care Equipment & Services is the secondly most common to receive VC funding with a percentage of 20.2%. The group belongs to the sector Health Care, the same as Pharmaceuticals, Biotechnology & Life Sciences, making it to most important sector in VC funding. Technology Hardware & Equipment is the industry group after the Health Care sector that is mostly financed by VC witch a percentage of 18.4% VC funding. This is followed by Capital Goods, Energy and Media where 12.5%, 5.7% and 4.7% respectively, on average, are companies funded by VC.

PE Funding

In comparison to VC funding, where there a few leaders in obtaining funding, there is only one industry group that stands out; banks. There are 11 banks in the sample which are all funded by private equity, making the funding type in this industry group 100% funded by private equity. Thereafter Transportation, Consumer Durables & Apparel and Retailing are

the three industry group most funded by PE with a percentage of 39.2%, 38.9% and 31.8% respectively. Moreover, Energy, Automobile and components, Insurance and Semiconductors & Semiconductor Equipment are the only four industry groups in the sample that does not have any PE investors listed.

Risk capital funding

As risk capital is used as the joint term for both PE and VC the results will converge to some extent and as we can see, some industry groups have obtained both PE and VC funding. As previously mentioned, banks in the sample have some PE investor in all IPOs, so it is also the industry group that percentage wise receives risk capital most often. Subsequently there are Pharmaceuticals, Biotechnology & Life Sciences (47.1%), Capital Goods (43.9%) and Health Care Equipment & Services (39.5%) where the both Pharmaceuticals, Biotechnology & Life Sciences and Health Care Equipment & Services belong to the sector Health Care. Following Health Care, Information Technology is the sector that risk capital players most often invest in. This sector contains Semiconductors & Semiconductor Equipment, Software & Services and Technology Hardware & Equipment of which the two latter are the two where risk capital investments are present.

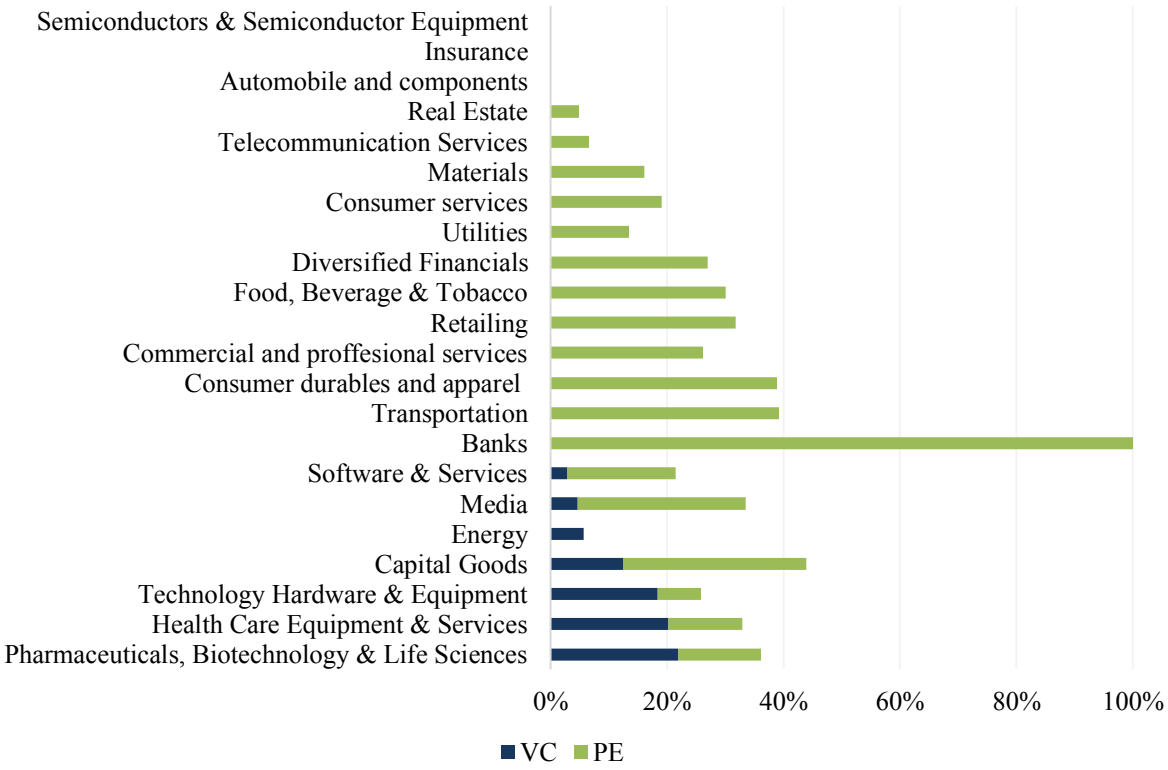

Figure 3. Funding type in sector

4.1.3 R&D spending

Figure 4 illustrates the average R&D spending in each of the 22 sectors. According to our dataset, the energy sector spends the highest amount on R&D with an average of 202 TSEK yearly. The health care sector spends on average 58 TSEK followed by the consumer discretionary sector with an average of 48 TSEK.

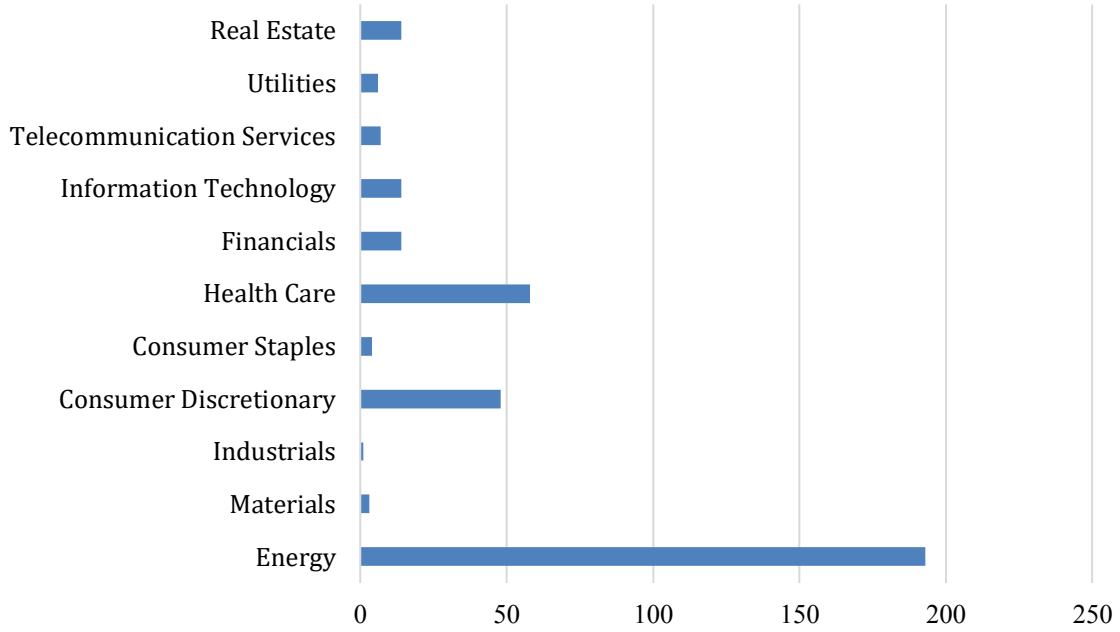

Figure 4. Mean of yearly R&D expenditures to net sales (TSEK)

4.1.4 Profit, Stock price and R&D to net sales

In Table 2, the mean of the three main variables of this study is presented for respective funding. Looking at the average R&D expenditures to net sales for each funding type, we can see that the firms funded by VCs have on average significantly higher expenditures on R&D to net sales. Firms funded by private equity do only present an average R&D expenditure to net sales of 8 TSEK. Firms which are not funded by risk capital show an average of 123 TSEK in R&D expenditures to net sales. This study therefore indicate that firms funded by risk capital do not have higher investments in R&D on average compared to none risk capital funded firms. However, when isolating VC backed firms it is clear that this group on average, spend larger amount on R&D.

	VC	PE	PE & VC	None
Profit margin	-4455	-268	-8206	-5026
Stock price change	0.036	0.023	0.04	0.028
R&D spending	229	8	23	123

Table 2. Average profit margin, stock price change and R&D expenditures to net sales

4.1.5 IPO timeline

Figure 5, to the left show the total amount of IPO, including the groups VC, PE and none risk capital funding. During 2006-2007 the numbers of IPOs was high but in 2008 the numbers started to decrease. Except an increase in 2010-2011, it is first in 2014 that the numbers of IPO are again as many as in 2006-2007.

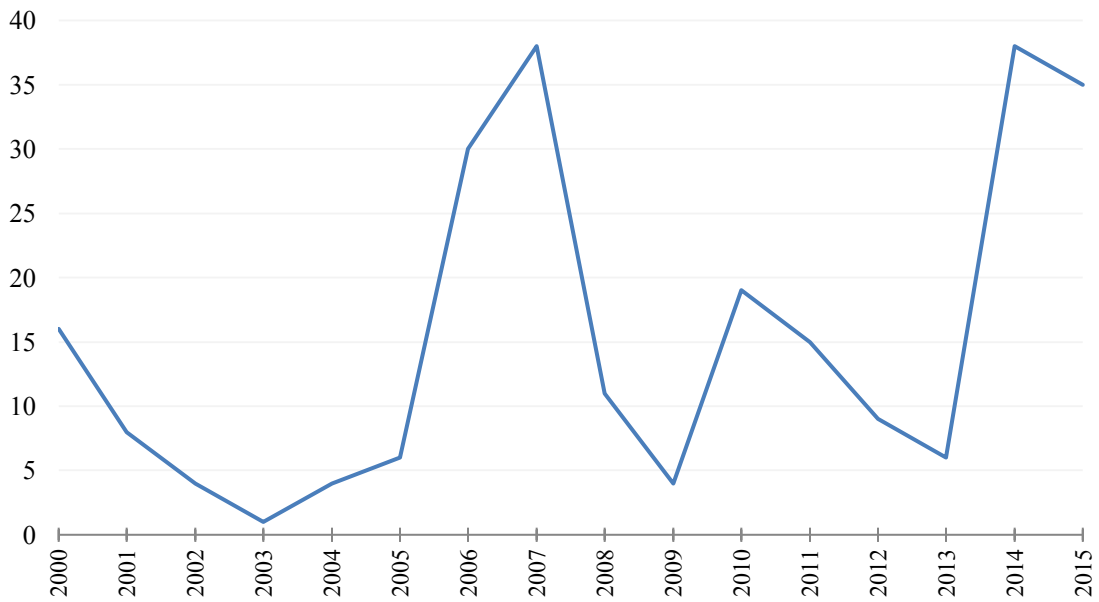

Figure 5. Compound numbers of IPO 2000-2015

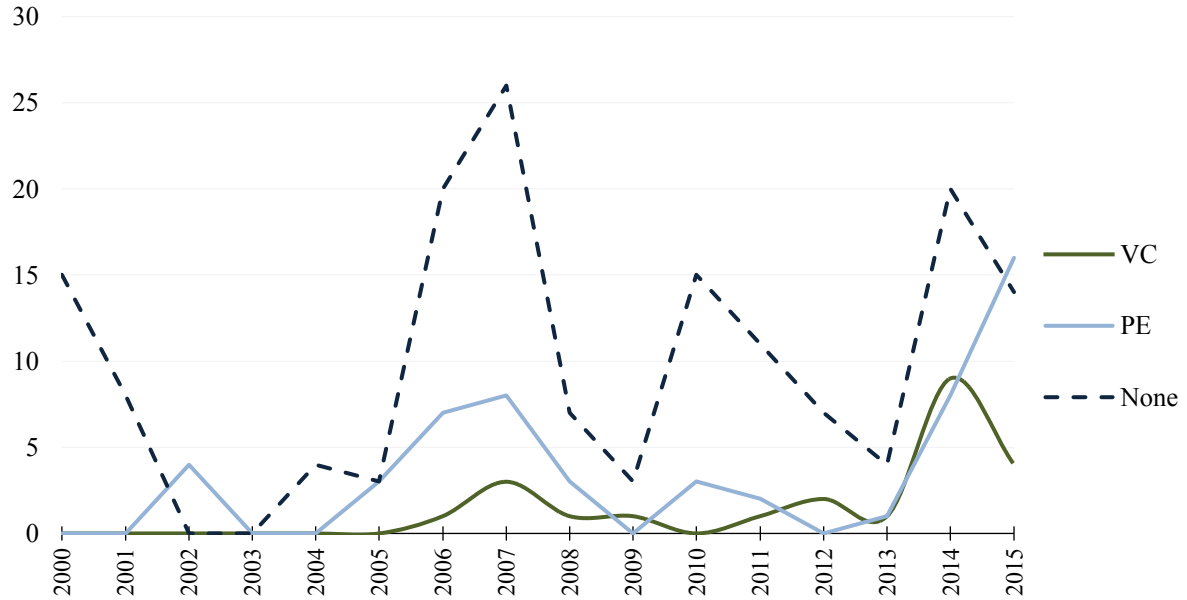

Figure 6. Numbers of IPO 2000-2015 based on funding type

In Figure 6, the numbers of IPOs are separated according to funding type of the firm. The curve for firms that are not funded by risk capital do follow the curve for total IPOs, presented in Figure 5. positively correlated to the total numbers of IPOs. The curve representing numbers of IPOs among firms funded by private equity. The third curve show the numbers of IPO from 2000 to 2015 for firms funded by VC. This curve is not as correlated to the total numbers of IPOs. The numbers of IPOs from venture capital funded firms has been very low compared to the other two groups and have a more stable curve until 2014. We can see that there is a significant increase in numbers of IPOs represented by firms funded by VCs.

4.2. Regression analysis

4.2.1 Stock price

Table 3 show the result of the regression with stock price as the dependent variable. Except including all respective control variables, an interaction variable (R&D*Risk Capital) was included in the regression. The Prob > chi2 of the model is equal to 0.000 implying that at least one coefficient, other than the intercept is different from 0.

The effect of R&D is significant at a 1% significance level and negative, but marginal with on average -0.0002% impact on stock price. The interaction term (R&D*Risk Capital) of R&D and risk capital funding is statistically significant at a 5% significance level, but risk capital funding alone is not statistically significant. The coefficient of the interaction term is positive and indicating an, on average, 0.0113% higher stock price for each unit increase in R&D to net sales, for companies within the risk capital category.

Combining the base effect of R&D spending on stock price with the interaction term, it would indicate that the effect of R&D for companies with prior risk capital backing is on average a 0.011% higher stock price than for non-risk capital backed firms. This is only slightly different from the base effect of R&D as the largest impact originates from the interaction term. Furthermore, when omitting the interaction term from the regression, both R&D and risk capital funding become insignificant (Appendix D). This is suggesting that, of these variables, it is the interaction term that is adding explanatory power to the model. Furthermore, all control variables apart from employees and year of IPO are statistically significant at a 5% significance level.

label	estimate	p	stars	min95	max95
R&D	-2.543e-06	0.00	****	-0.00	-0.00
Risk Capital	.00158391	0.90		-0.02	0.03
R&D*Risk Capital	.00011349	0.01	*	0.00	0.00
Industry	.00001027	0.07		-0.00	0.00
BTM	-.0012934	0.01	**	-0.00	-0.00
Employees	5.790e-07	0.49		-0.00	0.00
Year of IPO	.00106228	0.42		-0.00	0.00
Year 2008	-.09449875	0.00	****	-0.14	-0.05
GDP	.00945077	0.05		-0.00	0.02
CPI	-.02899038	0.00	****	-0.04	-0.02
Constant	-2.1128601	0.43		-7.33	3.10

Table 3. Regression with stock price as dependent variable

4.2.2 Profit margin

Table 4 shows the result of the regression with profit margin as the dependent variable. Except including all respective control variables, an interaction variable (R&D*Risk Capital) was included in the regression. The Prob > chi2 is equal to 0.000 in this regression model as well, implying that at least one coefficient, other than the intercept is different from 0.

We can see that results are similar to the previous model where both R&D alone and the interaction term of R&D and risk capital funding are statistically significant but Risk Capital is insignificant. The effect of R&D is significant at a 1% significance level and negative. More specifically, the average impact of R&D is -0.5358 on profit margin. The coefficient of the interaction term is statistically significant at a 5% significance level but negative in this model, indicating that for each extra unit spent on R&D in relation to net sales for risk capital backed firms, the profit margin is on average -0.549 additionally lower than for non-risk capital backed firms.

Combining the base effect of R&D spending on profit margin with the interaction term, it would indicate that the effect of R&D for companies with prior risk capital backing is, on average, a 1.0849 lower profit margin than for non-risk capital backed firms. However, when removing the interaction term in this model, R&D is still significant and only Risk Capital alone become insignificant (Appendix D). Furthermore, the two statistically significant control variables in this model are BTM and Year of IPO.

label	estimate	p	stars	min95	max95
R&D	-.53580785	0.00	****	-0.57	-0.50
Risk Capital	-168.60081	0.83		-1699.49	1362.29
R&D*Risk Capital	-.54907348	0.02	*	-0.99	-0.10
Industry	-.2663403	0.54		-1.12	0.59
BTM	32.362626	0.04	*	1.80	62.92
Employees	.07762567	0.06		-0.00	0.16
Year of IPO	-170.48564	0.01	*	-300.32	-40.65
Year 2008	340.52603	0.33		-347.45	1028.51
GDP	11.308614	0.87		-126.20	148.82
CPI	-120.58249	0.32		-357.01	115.85
Constant	342290.14	0.01	*	80387.23	6.0e+05

Table 4. Regression with profit margin as dependent variable

5. Analysis

The following chapter present an analysis of the result, where the findings will be compared to prior research. Further reflections connecting to the literature review will be discussed in order to analyse the cause of our result.

The purpose of running two regressions with different outcome variables is to examine the impact of R&D on business performance, both in terms of stock price and profitability. This approach allows us to capture both the internal health (profit margin) of the company and its value on the market (stock price) and analyse if these outcomes point to the same direction. Furthermore, the base of our hypotheses is prior literature indicating that innovation have a positive impact on business performance and that the involvement of risk capital investors is of importance for this specific relationship (Guney et al., 2011; Lööf & Heshmati, 2006; Nadeau, 2011). However, even though we find a find a positive effect of R&D investments on stock price, our result does not fully support the existing research as it shows that R&D do not have a positive impact on firm performance in terms of profitability. What is important to keep in mind though, is that we do not control for which of the firms still have risk capital investors present, but only which of the firms that were backed in the IPO.

Due to our findings, it is interesting to analyse why our result to some extent contradict prior research. Issues arise when comparing existing literature to our results, related to the differences in how innovativeness and business performance are measured. Specifically, several different indicators have been used to analyse innovation activity, as well as business performance. The different classifications and indicators that have been used among researchers leads to complications when comparing findings. In this research, stock price and profitability are used as indicators to measure the business performance and R&D spending is used to measure innovation activity. As we analyse the result we can see that the impact of innovation on business performance differ between the two indicators which point out the difficulties to generate general results for business performance.

When running the first model, we can see that the R&D investments have different effect on business profitability in terms of stock price for firms previously funded by risk capital, compared to non-risk capital backed firms. R&D spending has an additional, positive impact on the stock price for these firms.

Our result therefore indicates that the involvement of risk capital investors, prior to the IPO, are of importance for the posterior performance on the stock exchange.

According to our result, R&D has a negative impact on the stock price for non-risk capital backed firms, but a positive impact on firms funded by risk capital. Innovation and R&D are discussed in existing literature as a factor increasing the risk, due to its unpredictable characteristics. The perceived risk for an investor is therefore raised when investing in firms with a high level of R&D expenditures, which can affect the price as investors are only willing to take on high risk if they are compensated with a lower price. According to Bessler & Kurth (2007) this negative impact of R&D on stock price might be reduced in firms funded by risk capital, as it sends a signal of quality to public investors and increase the incentives of investing in the firm. This argumentation would also support our differing result between risk capital backed firms and non-risk capital backed firms. Based on Fama's (1970) "Efficient market hypothesis" stock price is commonly referred to be a useful measurement for the valuation of the company as the stock price quickly adapts to all new information. Our result does therefore to some extent contradict this theory, as we can see that the sample as a whole is positively affected by R&D spending, in terms of stock price, but negatively affected in terms of profitability for previously risk capital backed firms. We can however not say anything regarding individual firms as these results are drawn from two different models. This result would favour the view of irrational markets, as a premium is paid for previously risk capital backed companies, even though the risk capital backing is not able to enhance the value of the firm, at least not in terms of profitability.

Furthermore, it is typical that the risk capital firm keep rights that allow them to interfere in the business if deemed necessary (Bessler & Kurth, 2007). In their study, Brav and Gompers (1997) show that the benefits of venture capital backing are persistent in the long run, where venture capital backed firms are able to outperform non-venture capital backed firms, for as long as five years following the IPO. Burghof & Kraus (2003) have reached similar conclusions and these results are also consistent with what we find in the first model of this study, as we observe a positive reaction to increased R&D spending in the stock price of previously risk capital backed companies, whereas the stock price of non-risk capital backed companies is negatively affected by R&D.

The second model show the impact of R&D expenditures on business performance in terms of profitability. Our result show that R&D investments do not have a positive impact on firm profitability and therefore, the result are not fully in line with current literature investigating the relationship between R&D and profitability. Lööf & Heshmati (2006) demonstrate a strong association between innovation and profitability in their research. What distinguish our research from theirs is the different methods used, which can explain the differences in the results. In their research, observations with negative profit where excluded, which result in a biased result and indicate that the impact of innovation activity might be overestimated. Our model includes all observations from the original sample and as we can see in the summary statistics (Table 1), the mean profit margin for the total sample is -4118,718 SEK. This indicate that the average of firms in this study have a negative profit and if all firms exhibiting negative profit levels would be excluded from the regression, our results would most likely be different as well.

Furthermore, R&D expenditures to net sales have been used as a measurement for innovation in this research, compared to the Lööf & Heshmati (2006) study, where they use new innovations reaching the market, as an indicator for innovativeness. What innovation indicators are used, is a crucial factor for the conclusions that can be drawn and it can be discussed how comparable different studies measuring innovativeness and business performance are when it is not the same indicators that have been tested. For instance, the discrepancy between our result and this prior study, investigating the relationship between R&D and profitability, is most likely due to the inclusion of both positive and negative figures for profit margin in our research which more mirrors the situation in reality.

To further analyse whether the involvement of risk capital investors have an impact in the relationship between R&D and profitability, we look at the interaction term (R&D*Risk Capital) in Table 4. The result shows an even greater inverse relationship between R&D investments and profitability among the firms funded by risk capital, as higher R&D levels have a negative effect on the profitability. According to Bessler & Kurth (2007), risk capital investors should have a rather positive impact on the firm's profit due to their ability to reduce agency problems. Firms who suffer from agency problems often demonstrate lower profits, but the involvement of risk capital investors in the management of firms have a tendency to align the interest of the management and the owners and therefore, minimize the agency

problem. In this study, there is no sign of such an effect of risk capital investors, at least not in terms of profitability of the firm. However, this study does not investigate the time risk capital final exit from the firm and it can be argued that this could have an impact on the result. As many aspects could be weighed in and the research point to both directions regarding the abilities of risk capital firms to improve business performance, it is a rather complex research area. Therefore, finding consistency in the relation between innovation and firm performance has been a challenge in prior research. What is adding to the complexity of the subject and could help explain the dispersity of results is the rapid evolvement of the industry and the fact that it is still in a dynamic stage where much is still to discover. (Da Rin et al., 2011)

Another aspect worthy to emphasize in this analysis is the differences between R&D spending among different sectors. The companies studied in this thesis represent all sectors, even though consumer dictionary, health care and information technology are the most representative sectors in our sample (Figure 1). Moreover, Figure 4 illustrate what sectors in the study that spend the most on R&D. According to this, the energy sector has the highest R&D expenditures followed by the health care and consumer discretionary sectors. Prior studies within the field mostly focus on certain sectors, in particular the technology and pharmaceutical sectors, which are known for applying R&D intensive strategies. Contrary to this, our research includes all companies that went public on the Swedish exchange between 2000 and 2015 and therefore, we can make inferences of the market as a whole, instead of only studying those with innovation and R&D as their core function.

6. Conclusions and discussion

In this chapter, we conclude our findings by verifying our hypotheses and by answering the research question. The chapter ends with a discussion regarding the delimitations of the research as well as implications and suggestions for future research.

The purpose of this study is to combine prior research, which indicate that both innovation and risk capital funding have an impact on business performance. The study is based on two hypotheses which state that R&D expenditures has a positive effect on the business performance in risk capital backed firms after exit. The first hypothesis measures the business performance in terms of stock price and in the second hypothesis, profitability was used as a measurement of business performance. Analysing these two measurements enable us to draw conclusions regarding both the firms' performance on the stock market as well as the internal health of the firms.

The regression run to analyse the first hypothesis shows that the interaction term (R&D*Risk Capital) have a positive impact on stock price and that this effect is statistically significant. Moreover, when combining the base effect of R&D spending on stock price with the interaction term, it indicates that the effect of R&D in risk capital backed is positive while it is negative for non-risk capital backed firms. According to this finding, our first hypothesis can be accepted. When the impact of R&D on profitability, in firms previously funded by risk capital, was examined in order to test the second hypothesis the result show that R&D investments influence the profitability negatively. Combining the base effect of R&D spending on profit margin with the interaction term, it would indicate that higher R&D spending in companies with prior risk capital backing could lead to a lower profit margin than for non-risk capital backed firms.

These results imply that the R&D investments have a positive impact on firm performance on the stock market for firms previously funded by risk capital. However, the same conclusion cannot be drawn regarding profitability, where the results instead demonstrate that R&D spending in previously risk capital backed firms do not generate any positive effect on the firm's internal business performance. In other words, we find support for hypothesis 1 but not for hypothesis 2. In the analysis work following the construction of the result, we were able to shed more light on our research question in attempting to explain the results we obtained.

The research question set out is “How do R&D investments affect the business performance in risk capital backed companies after an exit through IPO?” As we found conflicting results of the two performance indicators used, the answer to this question is not completely straight forward.

Stock price and the valuation of a company is subject to impact by speculation, where behavioural aspects play a role and could therefore be said to be of more external character as an indicator of business performance. Following this argument, profit margin can be argued to be of a more internal character as an indicator of business performance, as it is only affected by the actual actions taken within the company. It might be easy to assume that the external and internal business performance within the same company should be aligned, but this study points out that this is not the case. Several examples can be observed, for instance, in the recently introduced companies Skype and Spotify there is a large deviation between the fundamentals of the company and the valuation on the stock market. In these cases, a lot of the valuation is built on expectations regarding future earnings rather than how profitable the company currently. In this context, it can therefore be questioned whether the positive reaction to R&D investment on the stock price is really motivated, or if what we observe is an overestimation of the abilities of risk capital investors and the possibilities of the R&D efforts in these firms.

6.2 Delimitations

This study is limited to investigate the risk capital industry. Further on, the study is also limited to Swedish publicly listed firms. This is due to the relatively large number of start-ups in the country, but also due to time restrictions of the research and data availability. The different characteristics among firms and industries lead to the fact that a range of methods and indicators are used to measure innovativeness and there are no “one size fit all” (Groh et al., 2010). As mentioned earlier, number of patents has been a common indicator in measuring innovation activities. Nonetheless, it can be discussed whether it is a suitable indicator when examining innovation activities across industries as the importance of patents vary between industries. Therefore, R&D spending to net sales will be used as an innovation indicator in this thesis.

6.1 Implications and suggestions for future research

As previous research within this specific field is limited, the implications of the study are not certain. The aim of the study is to contribute with knowledge about the effect of R&D on business performance and examine if this effect differs between risk capital backed firms and non-risk capital backed firms. The result indicate that R&D investments do have a positive impact on the business performance in terms of stock price among risk capital backed firms, but a negative impact on firm's profitability. The implication regarding the stock price could be considered of less importance for firm managers, who in general are more concerned about how R&D investments could affect the business performance in terms of profitability.

One could argue that the findings of this study might be more useful as an investment strategy for investors on the public market than for firm managers. The results point out that R&D investments have a greater positive impact on the stock price in previously risk capital backed firms, compared to non-risk capital backed firms. This would indicate that public investors should rather invest in firms with high R&D intensity if they are funded by risk capital, as one is compensated for the riskiness of the R&D investments by a higher stock price compared to firms not funded by risk capital.

As the result show a negative effect on profitability it would indicate that R&D investments do not favour the firm's profitability. However, this study tests the relationship for R&D expenditures as an input and profitability as an output during the same period. As R&D is an investment and like other investments, it influences the short-term profitability negatively. It can therefore be argued that the profitability outcome should be examined the forthcoming period by adding lags in the model. However due to lack of data of R&D spending it was not possible to investigate this relationship in this study, but it would be of interest to conduct this research, using a more complete R&D variable.

As we have all Swedish IPOs from 2000-2015 included in our sample and the only separation we make is risk capital backed IPO and non-risk capital backed IPO we are not able to say which of the companies still have access, even after going public, to the value adding and monitoring services the risk capital investors contribute with. To further study the impact risk capital investors have on profitability after IPO it would be of interest to have a sample distinguishing the firms that are currently funded by risk capital from the ones without any

risk capital present. This approach would allow for a determining if the positive effects on stock price is diminished at the point when the risk capital investors no longer have any involvement, or ties to the company, such as the lock-up agreements. This could also help determine if the negative impact on profit margin originate from a certain funding type.

Furthermore, the results from this study contradict to some extent the theory of efficient markets as we find that R&D expenditures for firms that has gone through a risk capital backed IPO have a positive effect on stock price, but leads to lower profit margin. A lot of research has been aimed at trying to explain the deviations from the theory of efficient markets and in this case, it would be interesting to see what possible factors drive the stock price higher in the sample but impact profitability negatively.
For instance, a study comparing the participation rate in risk capital backed, compared to non-risk capital backed IPOs could perhaps help explain this phenomenon. Under the hypothesis that risk capital firms cannot help overcoming agency costs or aid the internal business performance, it would be of interest to study the reason why risk capital backed firms have a more positive reaction on the stock market to R&D expenditures than non-risk capital backed firms.

7. Appendices

Appendix A

A1. GICS industry index (MSCI, 2016)

Sector		Industry Group		Industry	
10	Energy	1010	Energy	101010	Energy Equipment & Services
				101020	Oil, Gas & Consumable Fuels
15	Materials	1510	Materials	151010	Chemicals
				151020	Construction Materials
				151030	Containers & Packaging
				151040	Metals & Mining
				151050	Paper & Forest Products
20	Industrials	2010	Capital Goods	201010	Aerospace & Defence
				201020	Building Products
				201030	Construction & Engineering
				201040	Electrical Equipment
				201050	Industrial Conglomerates
				201060	Machinery
				201070	Trading Companies & Distributors
		2020	Commercial & Professional Services	202010	Commercial Services & Supplies
20	Industrials	2020	Commercial & Professional Services	202020	Professional Services
		2030	Transportation	203010	Air Freight & Logistics
				203020	Airlines
				203030	Marine
				203040	Road & Rail
				203050	Transportation Infrastructure
25	Consumer Discretionary	2510	Automobiles & Components	251010	Auto Components
				251020	Automobiles
		2520	Consumer Durables & Apparel	252010	Household Durables
				252020	Leisure Products
				252030	Textiles, Apparel & Luxury Goods
25	Consumer Discretionary	2530	Consumer Services	253010	Hotels, Restaurants & Leisure
				253020	Diversified Consumer Services
		2540	Media	254010	Media
		2550	Retailing	255010	Distributors

				255020	Internet & Direct Marketing Retail
				255030	Multiline Retail
				255040	Specialty Retail
30	Consumer Staples	3010	Food & Staples Retailing	301010	Food & Staples Retailing
		3020	Food, Beverage & Tobacco	302010	Beverages
				302020	Food Products
				302030	Tobacco
		3030	Household & Personal Products	303010	Household Products
				303020	Personal Products
35	Health Care	3510	Health Care Equipment & Services	351010	Health Care Equipment & Supplies
				351020	Health Care Providers & Services
				351030	Health Care Technology
		3520	Pharmaceuticals, Biotechnology & Life Sciences	352010	Biotechnology
				352020	Pharmaceuticals
				352030	Life Sciences Tools & Services
40	Financials	4010	Banks	401010	Banks
				401020	Thrifts & Mortgage Finance
		4020	Diversified Financials	402010	Diversified Financial Services
				402020	Consumer Finance
				402030	Capital Markets
				402040	Mortgage Real Estate Investment Trusts (REITs)
40	Financials	4030	Insurance	403010	Insurance
45	Information Technology	4510	Software & Services	451010	Internet Software & Services
				451020	IT Services
				451030	Software
45	Information Technology	4520	Technology Hardware & Equipment	452010	Communications Equipment
				452020	Technology Hardware, Storage & Peripherals
				452030	Electronic Equipment, Instruments & Components
		4530	Semiconductors & Semiconductor Equipment	453010	Semiconductors & Semiconductor Equipment

50	**Telecom-munication Services**	**5010**	**Telecommunication Services**	**501010**	**Diversified Telecommunication Services**
				501020	**Wireless Telecommunication Services**
55	**Utilities**	**5510**	**Utilities**	**551010**	**Electric Utilities**
				551020	**Gas Utilities**
				551030	**Multi-Utilities**
				551040	**Water Utilities**
				551050	**Independent Power and Renewable Electricity Producers**
60	**Real Estate**	**6010**	**Real Estate**	**601010**	**Equity Real Estate Investment Trusts (REITs)**
				601020	**Real Estate Management & Development**

Industry *subgroup* has intentionally been left out as it is outside of the scope of this thesis and excluding the category allowed for improving readability of the table.

Appendix B

B1. Hausman test

```
. hausman fixed random
```

	Coefficients (b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
rd	-3.28e-06	-2.54e-06	-7.39e-07	1.33e-06
rdrisk	.0002903	.0001135	.0001768	.0000635
btm	-.0011303	-.0012934	.0001631	.0002499
employees	-8.73e-06	5.79e-07	-9.31e-06	7.31e-06
year2008	-.0986824	-.0944987	-.0041837	.0065658
gdp	.0089532	.0094508	-.0004976	.0012052
cpi	-.0283642	-.0289904	.0006262	.0013366

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 10.26
Prob>chi2 = 0.1742

Appendix C

C1. Correlation table

	pricec~e	profit~n	rd	riskcap	pe	vc	pevc	btm	employ~s	indust~d
pricechange	1.0000									
profitmargin	0.0233	1.0000								
rd	0.0198	-0.0994	1.0000							
riskcap	0.0002	-0.0148	-0.0197	1.0000						
pe	-0.0014	-0.0007	-0.0425	0.8109	1.0000					
vc	0.0020	-0.0445	0.0551	0.2963	-0.1356	1.0000				
pevc	0.0014	0.0132	-0.0112	0.2819	-0.1290	-0.0471	1.0000			
btm	-0.0353	0.0348	-0.0066	-0.0233	-0.0124	-0.0125	-0.0150	1.0000		
employees	-0.0085	0.0350	-0.0305	0.0584	0.1326	-0.0869	-0.0613	-0.0072	1.0000	
industryid	0.0329	-0.0236	0.0008	-0.1058	-0.1835	0.0301	0.1199	-0.0145	0.0202	1.0000
yearofipo	0.0153	-0.1031	0.0576	0.2205	0.1324	0.2339	-0.0126	-0.0002	-0.2098	-0.0730
gdp	0.0785	-0.0105	0.0194	0.0102	0.0054	0.0424	-0.0322	-0.0122	-0.0142	-0.0018
cpi	-0.1355	-0.0050	-0.0020	0.0082	0.0219	-0.0409	0.0143	-0.0292	0.0498	0.0350
year2008	-0.1091	0.0158	-0.0111	-0.0085	0.0002	-0.0416	0.0229	0.0017	0.0136	0.0096

	yearof~o	gdp	cpi	year2008
yearofipo	1.0000			
gdp	0.0536	1.0000		
cpi	-0.0790	-0.2397	1.0000	
year2008	-0.1012	-0.4103	0.3960	1.0000

Table 2: Correlation between variables

Appendix D

D1. Stock price without interaction term

label	estimate	p	stars	min95	max95
R&D	-9.245e-07	0.66		-0.00	0.00
Risk Capital Funded	.00950247	0.46		-0.02	0.03
Industry	9.345e-06	0.12		-0.00	0.00
BTM	-.00130434	0.01	**	-0.00	-0.00
Employees	2.179e-07	0.78		-0.00	0.00
Year of IPO	.00103416	0.44		-0.00	0.00
Year 2008	-.09371036	0.00	****	-0.14	-0.05
GDP	.00959533	0.05	*	0.00	0.02
CPI	-.02927349	0.00	****	-0.04	-0.02
Constant	-2.0530721	0.45		-7.32	3.22

D2. Profit margin without interaction term

label	estimate	p	stars	min95	max95
R&D	-.54772525	0.00	****	-0.58	-0.51
Risk Capital	-214.8631	0.78		-1726.63	1296.91
Industry	-.26131085	0.55		-1.11	0.59
BTM	32.399059	0.04	*	1.87	62.93
Employees	.07967587	0.06		-0.00	0.16
Year of IPO	-169.70352	0.01	*	-299.72	-39.69
Year 2008	337.42451	0.34		-351.78	1026.63
GDP	11.284322	0.87		-126.20	148.77
CPI	-119.58727	0.32		-356.37	117.19
Constant	340701.19	0.01	*	78429.15	6.0e+05

Appendix E

E1. Profit margin with three years lag on the interaction term

profitmargin	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
rd	-.2822757	.0062878	-44.89	0.000	-.2945996	-.2699518
riskcap	-1631.999	2447.145	-0.67	0.505	-6428.314	3164.316
rdrisk						
--.	1.135234	1.153687	0.98	0.325	-1.125951	3.396419
L4.	-2.006679	.9145796	-2.19	0.028	-3.799222	-.2141361
L8.	-.7207756	1.987018	-0.36	0.717	-4.615259	3.173708
L12.	2.296916	1.988049	1.16	0.248	-1.599589	6.193421
btm	-.1020187	1.444545	-0.07	0.944	-2.933276	2.729238
employees	.0064689	.0096558	0.67	0.503	-.0124561	.0253939
industryid	-1.678856	1.627694	-1.03	0.302	-4.869078	1.511366
yearofipo	-550.9569	395.0756	-1.39	0.163	-1325.291	223.3771
year2008	58.49919	190.8919	0.31	0.759	-315.6421	432.6405
gdp	-68.32724	85.22218	-0.80	0.423	-235.3596	98.70517
cpi	-87.88287	122.6637	-0.72	0.474	-328.2992	152.5335
_cons	1110235	797701.3	1.39	0.164	-453231.3	2673701
sigma_u	11686.432					
sigma_e	4189.3693					
rho	.88612499	(fraction of variance due to u_i)				

References

Aboody, D., & Lev, B. (2000). Information Asymmetry, R&D, and Insider Gains. *Journal of Finance, 55*(6), 2747-2766.

Andrew, J., Haanäs, K., Michael D., Sirkin H., & Taylor A., (2009) Measuring Innovation 2009. The need of Action. *A BCG Senior Management Survey.* The Boston Consulting Group. Boston, USA.

Boquist, J., Milbourn, T., & Thakor, A. (1997). The Search for the Best Financial Performance Measure. *Financial Analysts Journal, 53*(3), 11-20.

Boquist, J.A., Milbourn, T.T. & Thakor, A.V., (1997). The Search for the Best Financial Performance Measure. *Financial Analysts Journal*, 53(3), pp.11–20.

Baltagi, B. (2013). *Econometric analysis of panel data* (5.th ed.). Chichester, West Sussex: John Wiley & Sons.

Bessler, W., & Kurth, A. (2007). Agency Problems and the Performance of Venture-backed IPOs in Germany: Exit Strategies, Lock-up Periods, and Bank Ownership. *The European Journal of Finance, 13*(1), 29-63.

Brav, A., & Gompers, P. (1997). Myth or Reality? The Long-Run Underperformance of Initial Public Offerings: Evidence from Venture and Non-venture Capital Backed Companies. *Journal of Finance, 52*(5), 1791-1821.

Brown, S., & Eisenhardt, K. (1995). Product development: Past research, present findings, and future directions. *Academy of Management Review, 20*(2), 343-378.

Burghof, H. P. & Kraus, T. (2003). Post-IPO performance and the exit of venture capitalists. *University of Munich.*

Cumming, D. (2012). *Venture Capital: Investment Strategies, Structures, and Policies*. John Wiley and Sons, 14, 299-317.

Da Rin, M., Hellmann, Thomas F, & Puri, Manju. (2011). *A survey of venture capital research* (NBER working paper series 17523). Cambridge, Mass.

Demirel, P., & Mazzucato, M. (2012). Innovation and Firm Growth: Is R&D Worth It? *Industry and Innovation,19*(1), 45-62.

Dimson, E., Marsh, P., & Staunton, M. (2002). Long-Run Global Capital Market Returns and Risk Premia.

Dodgson, M., Gann, D., & Phillips, N. (2014). *The Oxford Handbook of Innovation Management* (1st ed.). Oxford University Press.

Dul, J., & Hak, T. (2008). *Case study methodology in business research* (1.st ed.). Amsterdam; Boston; London: Butterworth-Heinemann/Elsevier.

Fagerberg, J. C., & Mowery, D. (2009). *The Oxford Handbook of Innovation*. Oxford University Press.

Fagerberg, J., Mowery, D., & Verspagen, B. (2006). Innovation and Economic Growth. In *The Oxford Handbook of Innovation* (p. The Oxford Handbook of Innovation, Chapter 18). Oxford University Press.

Fama, E., & French, K. (1992). The Cross-Section of Expected Stock Returns. *Journal of Finance, 47*(2), 427-465.

Fama, E., & French, K. (1995). Size and Book-to-Market Factors in Earnings and Returns. *Journal of Finance,50*(1), 131.

Francis, B., Hasan, I., & Siregar, D. (2009). The choice of IPO versus M&A: Evidence from banking industry. *Applied Financial Economics, 19*(24), 1987-2007.

Gompers, P. (1996). Grandstanding in the venture capital industry. *Journal of Financial Economics, 42*(1), 133-156.

Gompers, P., & Lerner, J. (1998). Venture Capital Distributions: Short-Run and Long-Run Reactions. *Journal of Finance, 53*(6), 2161-2183.

Green, B. N., Johnson, C. D. & Adams, A. (2001) *Writing narrative literature reviews for peer-reviewed journals: Secrets of the trade.*

Groh, Von Liechtenstein, & Lieser. (2010). The European Venture Capital and Private Equity country attractiveness indices. *Journal of Corporate Finance, 16*(2), 205-224.

Gunday, Ulusoy, Kilic, & Alpkan. (2011). Effects of innovation types on firm performance. *International Journal of Production Economics, 133*(2), 662-676.

Hagedoorn, & Cloodt. (2003). Measuring innovative performance: Is there an advantage in using multiple indicators? *Research Policy, 32*(8), 1365-1379.

Hansen, J. (1992). Innovation, firm size, and firm age. *Small Business Economics, 4*(1), 37-44.

Hausman, J. (1978). Specification tests in econometrics. *Econometrica, 46*(6), 1251-1271.

Hsiao, C. (2014). *Analysis of panel data* (Third ed.).

Invest Stockholm. (2016, September) Stockholm Startups attract record investment. Retrieved: 07.01.2018. https://www.investstockholm.com/news/stockholm-startups-attract-record-investment/

Investopedia. (2018) Profit Margin. Retrieved: 18.04.2018. https://www.investopedia.com/terms/p/profitmargin.asp

Jaccard, J., & Turrisi, R. (2003). *Interaction Effects in Multiple Regression* (2nd ed., Quantitative Applications in the Social Sciences). Thousand Oaks: SAGE Publications.

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of financial economics*, *3*(4), 305-360.

Khalfallah, M., Moschetto, Bruno - Laurent, & Teulon, Frédéric. (2014). Evaluation of the profitability of companies financed by venture capital (CVC) listed on the French market. *The Journal of Applied Business Research, 30*(2), 313-327.

Klette, Tor Jakob, & Kortum, Samuel. (2002). *Innovating firms and aggregate innovation* (Memorandum / Department of Economics, University of Oslo 2002,2). Oslo: Dep. of Economics, Univ. of Oslo.

Kortum, S., & Lerner, Josh. (2000). Assessing the contribution of venture capital to innovation. *The Rand Journal of Economics, 31*(4), 674-692.
Kortum, S., & Lerner, J. (2001). Does venture capital spur innovation? *Advances in the Study of Entrepreneurship, Innovation, and Economic Growth, 13*, 1-44.

Law, J. (2014). Risk capital. *A Dictionary of Finance and Banking,* A Dictionary of Finance and Banking.

Loughran, T., & Ritter, J. (2004). Why Has IPO Underpricing Changed Over Time? *Financial Management,33*(3), 5-37.

Lööf, H., & Heshmati, A. (2006). On the relationship between innovation and performance: A sensitivity analysis. *Economics of Innovation and New Technology, 15*(4-5), 317-344.

MSCI. (2017*).* Structure and Sub-industry Definitions. The Global Industry Standard. Retrieved: 22.02.2018. https://www.msci.com/gics

Malkiel, B., & Fama, E. (1970). Efficient capital markets: a review of theory and empirical work. *Journal of Finance, 25*(2), 383-417.

Nadeau, P. (2011). Innovation and venture capital exit performance. *Strategic Change, 20*(7-8), 233-252.

Neely, A., & Hii, J. (1998). Innovation and business performance: a literature review. *The Judge Institute of Management Studies, University of Cambridge*, 0-65.

OECD. (2005). The Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data. 3rd Edition. The Organization for Economic Co-operation and Development. Accessed: 2018-02-15. Available at: http://www.oecd.org/sti/inno/oslomanualguidelinesforcollectingandinterpretinginnovationdata3rdedition.htm

O'Sullivan, M. (2006). Finance and Innovation. *The Oxford Handbook of Innovation, The Oxford Handbook of Innovation.*

Pástor, &., Taylor, L., & Veronesi, P. (2009). Entrepreneurial Learning, the IPO Decision, and the Post-IPO Drop in Firm Profitability. *The Review of Financial Studies, 22*(8), 3005-3046.

Popov, A. A., & Roosenboom, P. (2009). Does private equity investment spur innovation? Evidence from Europe.

Publishing, O. (2005). *Measurement of Scientific and Technological Activities, Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data* (3rd ed.). Paris: Organisation for Economic Co-operation and Development.

Quayes, S., & Jamal, A. (2008). Does inflation affect stock prices? *Applied Economics Letters, 15*(10), 767-769.

Rickne, A. & McKelvey, M. (2013). *Innovation Management*. Studentlitteratur, Lund.

Rindermann, G. (2004). Venture capitalist participation and the performance of IPO firms: empirical evidence from France, Germany, and the UK.

Ritter, J. (1984). The "hot issue" market of 1980. *The Journal of Business : B, 57*(2), 215-240.

Robinson, J. (1952). American Capitalism: The Concept of Countervailing Power. *The Economic Journal, 62*(248), 925-928.

Rosenberg, N. (2004). Innovation and economic growth. *Innovation and Economic Growth, 52*.

Santarelli, E., & Piergiovanni, R. (1996). Analyzing literature-based innovation output indicators: the Italian experience. *Research Policy, 25*(5), 689-711.

SCB, Statistical database. (2018). Consumer Price Index. Stockholm: SCB Retrieved: 15.03.2018. http://www.scb.se/en/finding-statistics/statistics-by-subject-area/prices-and-consumption/consumer-price-index/consumer-price-index-cpi/

Schumpeter, J. (1934). *The theory of economic development : An inquiry into profits, capital, credit, interest, and the business cycle* (Harvard economic studies, 46). Cambridge, Mass.

Semuels, A. (2017, 28 September) Why Does Sweden Have So Many Start-Ups? *The Atlantic.* Retrieved: 07.01.2018. https://www.theatlantic.com/business/archive/2017/09/sweden-startups/541413/

Smith, K. (2009). Measuring Innovation. In *The Oxford Handbook of Innovation* (p.). Oxford University Press.

Sullivan, T. (2017). What do venture capital and private equity firms do? Some current and historical examples. *Journal of Business & Finance Librarianship, 22*(3-4), 182-189.

Torres-Reyna, O. (2007). Panel data analysis fixed and random effects using Stata (v. 4.2). *Data & Statistical Services, Priceton University*.

Upton, G., & Cook, I. (2014). *A Dictionary of Statistics* (3rd ed.). Oxford University Press.

Vega, C. (2006). Stock price reaction to public and private information. *Journal of Financial Economics,82*(1), 103-133.

Weerawardena, Jay, O&Amp;Apos, Cass, Aron, & Julian, Craig. (2006). Does industry matter? Examining the role of industry structure and organizational learning in innovation and brand performance. *Journal of Business Research, 59*(1), 37-45.

Westlund, Hans, Rader Olsson, Amy, & Larsson, Johan P. (2011). Economic Entrepreneurship, Startups and their Effects on Local development: The Case of Sweden. In (pp. 451-470).

Yu, & Hong. (2016). Patents and R&D expenditure in explaining stock price movements. *Finance Research Letters, 19,* 197-203.