NORGES HANDELSHØYSKOLE
Bergen, Spring 2009

Do Venture Capital backed companies show value added performance?

- A study of growth in Norwegian Venture Capital backed companies compared to benchmarks of non Venture Capital backed comparable companies

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Master thesis – Major in Financial Economics

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ABSTRACT

The purpose of this thesis is to find out if companies that have received Venture Capital funding perform better than they are assumed to perform without. To test this, growth in sales, revenues, assets and employees in each of 71 VC backed Norwegian companies is compared to growth in a benchmark created for each of the VC backed companies. The benchmark is the average and the median of the comparable companies of each VC backed company, selected on the basis of the registered industry code, as well as age, level of revenues and number of employees in 2003. In addition, tests are conducted to check for possible explanations of differences in performance relative to benchmark based on characteristics of the VC backed companies.

The key observation in the tests is that VC backed companies grew significantly more than benchmark in revenues and assets in the three year period from 2003 to 2006. Another unambiguous result is that companies where more than one VC has invested do better compared to benchmark than those where only one VC has invested.

My gratitude to contributors to this thesis:

I would like to thank Carsten Bienz for his supervision and flexibility regarding my timing in writing this thesis. NVCA and MENON have been very helpful and provided me with the information that was necessary for me to conduct my tests, and in particular Knut T. Traaseth, Leo A. Grünfeld and Gjermund Grimsby has helped me. I would also like to thank Ragnhild Kleiven for reading through my thesis and helping with formulations, as well as believing in me and my work.

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Figures and tables

1. PURPOSE OF THESIS AND INTRODUCTION TO VENTURE CAPITAL

1.1 Purpose of this thesis

The purpose of this thesis is to find out if companies that have received investments categorized as Venture Capital (VC) investments perform better than comparable companies. This is done by investigating the growth in sales, revenues, assets and employees. If the results show that VC backed companies grew faster than the benchmark created, it is a positive signal in favor of VC to young companies that consider approaching a VC to get funding. It can also be of importance for the general efficient allocation of risk capital to young companies from society's point of view. In addition to testing if VC backed companies grow faster than benchmark; I conduct other tests to check for differences in the performance versus benchmark based on characteristics of the VC backed companies. I do tests on differences due to industry, age and age when a VC invested, as well as the impact of more than one VC invested.

1.2 Structure of this thesis

I start out with explaining the motivation for this research as well as giving an introduction to Private Equity and Venture Capital. In the second chapter, the broad roles of ownership are introduced. The assumed positive impact of VC on the performance of young companies is presented in chapter 3, seen in light of the roles presented in chapter 2. In chapter 4 the sample and the collection of data is presented, as well as the most similar studies already conducted. Further, in chapter 4 I present possible biases that might explain parts of my results. The tests, the results and interpretation of the tests are presented in chapter 5, followed by a summary of the results and suggestions to further research in chapter 6.

1.3 Motivation and importance of this type of research

The world is in need of the development of new technologies, the invention of new and better drugs, sufficient supply of energy, creation of new jobs and creation of more efficient processes in order to continue to prosper and for us humans to keep living a good life on the planet. Recently there has been an increasing focus on global heating and other environmental issues. Innovations can contribute to a more sustainable environment if the negative impact on the globe is smaller than it would be without the use of these new inventions. A large number of possible contributions to better or continued good lives come from small and young companies run by entrepreneurs. These young firms in seed, start-up or expansion phase need

capital in order to survive, grow and commercialize. If the best young firms survive and become a success, some of these companies may develop new life saving drugs, a better way of producing biofuel, carbon-capture technology or more efficient production methods, which can limit waste and energy use in the process.

There is a need for risk capital for young businesses. In Norway the activity in this field over the last years has been increasing. Venture Capitalists (VCs) are one type of investor that provides risk capital to young companies. Based on characteristics of VC, I believe that this could be a superior type of risk capital and the purpose of this thesis is to bring further knowledge to whether VC is a superior source of risk capital or not. The access to risk capital, together with supply of experience, knowledge and active ownership by business people instead of entrepreneurs makes me believe that these companies should do better. The research done in this thesis is limited to Norwegian companies. If it is true that VC adds value compared to other types of risk capital, we should encourage capital allocation through VCs into young companies as it helps Norway moving forward faster than it would without.

Already in the earliest phases in a company's life cycle access to capital is of utmost importance. *International surveys show that access to risk capital is at least as important as research work in creating new companies* (Jakola 2008).

The need for capital will increase as the young company needs to grow and employ people without enough revenues to cover operating costs and investments needed, so at the start-up and expansion phase this becomes even more important. Private Equity investors do not only provide capital, but also advice, business expertise and their contact network which entrepreneurs seldom have themselves. Jakola (2008) further states that: *Our job is to develop the company by strengthening its expertise in business development, strategy selection and required return.*

The Norwegian government also acknowledges the need for risk capital for entrepreneurs; in the state budget for 2008 NOK 2.2 bn. was budgeted to a new state venture fund. The Norwegian authorities have also supported young firms with capital through different foundations and set-ups prior to this fund. In addition the state has set up Argentum, which invests in Private Equity funds on behalf of the Norwegian state: *Argentum is a government-owned investment company, and is the only investor in Norway who is solely dedicated to investing in private equity funds. Argentum aims, through its investments, to facilitate access*

to international venture capital, and to be a driving force in the development of an internationally competitive private equity environment in Norway. Argentum invests through either established or new fund management structures. (Argentum, http://www.argentum.no/index.php?struct=37&lang=eng)

In addition in the financial crisis package that the government presented January 26, 2009 some of this money was solely to provide capital to young companies (Argentum, http://www.argentum.no/index.php?struct=21&structinstance=2755). Argentum has the responsibility to select the companies that should be allowed to receive capital from this money. This shows a belief that distributing capital to young firms is best done through a fund that selects the best VC firms to invest in, and these VCs select the best young firms to invest in. The two stage selection process as well as the faith that the VCs actually adds value makes sure that the good projects get funding even though it is difficult to raise capital. In addition it makes sure that the support to young firms does not keep companies alive that do not have a long term potential.

1.4 A brief description of Private Equity and Venture Capital

Private Equity (PE) can be defined as: *The portion of the market that pertains to investments in unlisted companies with an active and time-limited ownership.* (Norwegian Private Equity and Venture Capital Association (NVCA) 2009)

PE firms and funds aim to make a company ready to be sold again after some time where they actively user their ownership to make the company fit to reach its potential. The opposite of investing through PE is to invest in a publicly listed company and hold this investment passively. The PE companies often specialize in either industry and/or phase of life cycle in the companies they invest in (Sahlman 1990). It is difficult to have key competencies across all of these and therefore a specialization should be beneficial. A specialized PE firm should therefore sell the portfolio company when their specialized competences no longer add value. A portfolio company is merely a company that has a VC as owner, and to the VC that company is a part of the portfolio of companies it own shares in.

One can divide PE into categories based on the age and characteristics of the companies that are invested in. NVCA (2009) uses seed, start-up/venture, expansion/internalization and buyout/replacement. The first three phases are categorized as VC. The buyout part of PE is more oriented towards mature businesses where one sees a potential that is not being reached

with the current situation. The companies in the buyout/replacement category that PE firms invest in are often optimally run and there can be internal changes or changes in strategy that the PE firm can make to reach the potential of the company. Often, a majority stake is purchased, and financed partly by debt. The buyout/replacement part of PE is often referred to as PE, although the definition of PE that I refer to in my thesis contains both VC and buyout/replacement.

Further on, I will focus on VC: *Venture capital is, strictly speaking, a subset of private equity and refers to equity investments made for the launch, early development, or expansion of a business. Investments in either early-stage companies, when the capital is used for product development, or later-stage, when companies are generating revenue and expect to become profitable in the near future.* (NVCA, 2009)

The data used is mainly VC investments done by the members of NVCA and therefore their definition is important as it defines the members of the organization as well as the authorization of VC backed companies in my selection. I also want to present a more structured and specific definition that better explains features of VC that I believe should be beneficial to the portfolio companies. VC can be defined by five characteristics (Metrick 2006, page 3):

1 *A VC is a **financial intermediary**, meaning that it takes the investors' capital and invests it directly in **portfolio companies**.*
2 *A VC invests only in private companies. This means that once the investments are made, the companies cannot be immediately traded on a public exchange.*
3 *A VC takes an active role in monitoring and helping the companies in its portfolio.*
4 *A VC's primary goal is to maximize its financial return by **exiting** investments through a sale or an **initial public offering (IPO)**.*
5 *A VC invests to fund the internal growth of companies.*

By providing active ownership, the VC structure should provide higher returns than if investors invested directly in the portfolio companies themselves. Venture Capitalists (VCs) are not interested in investing in companies to help them survive; the goal is a high return generated through an exit after some years of active ownership. The focus of the VC is the internal growth and value creating inside the portfolio company, and through that the VC

should be able to make the company attractive enough to be sold or listed on the stock exchange. The exit will hopefully give a high return to the initial investment. The dedication of the partners and employees in the VC should help the portfolio company grow into a success and the investors of the VC should get a high return.

As mentioned above, VC can be divided into three categories (NVCA 2009). An outline of the differences between the three phases can be seen in the box below.

Figure 1: Typical characteristics of companies that VCs invest in, sorted by phase

	Seed	**Start-up/venture**	**Expansion/internalization**
Revenues	Zero	Very low	Growing
Risk	Very high	High	Medium to high
Product	Under development	Almost ready/ready	Ready to commercialize

Seed: A seed investment is done in a very early stage and often before any revenue is created and a final product is not developed. There might still be technological risk in this phase.

Start-up/venture: The start-up/venture investment is concerned with expanding and commercializing. The product is often already developed and only needs adjustments and the right customer base to be ready for commercializing. At this point, the company has often started to make some revenues.

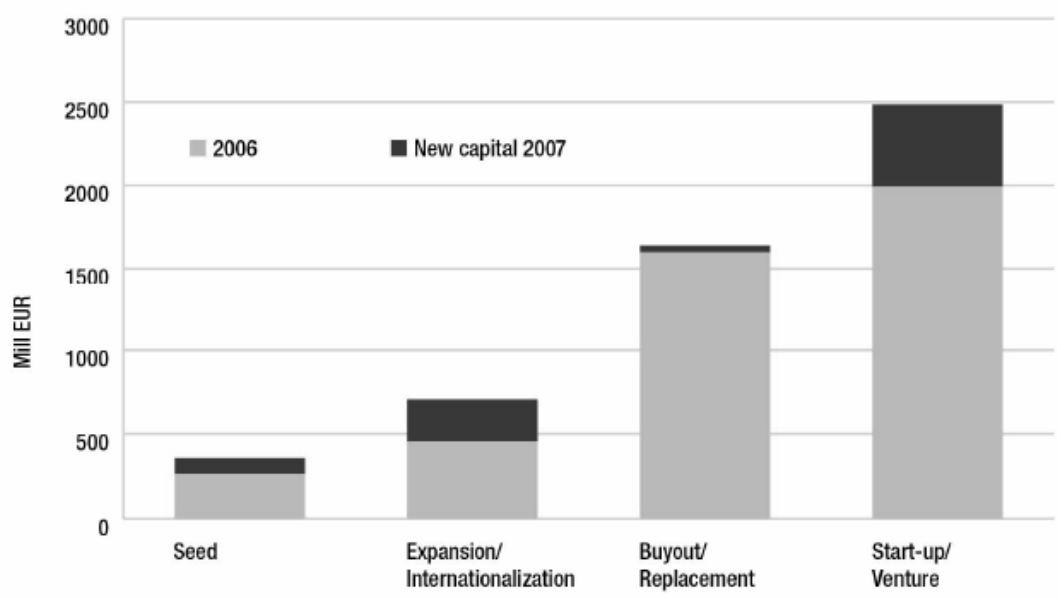
Expansion/internalization: This phase corresponds with an investment which is done in a company that is not in the venture phase, but still not considered mature enough to be a buyout. When considered in the expansion the company has often reached a positive result. In my data collection I see that both typical buyout firms and typical start-up/venture firms invest in this category. Buyout specialized firms invest more in the internalization and other types of changes the company is facing. While venture firms often tend to invest in the pure growth of these types of companies, differing from the firms that receive start-up/ venture capital in age and revenues at the time of the investment.

1.5 Private Equity in Norway

I would like to present features of this industry in Norway at the time being. In 2009 so far this industry is also very much affected by the financial crisis and the liquidity problems that many companies experience. The figures below do not reflect this situation. Further on, the information below is not of importance to interpret the results in this thesis, but will give an impression of the reach of this industry. Potential gains for the Norwegian economy by increasing the allocation of capital through PE will be discussed in this chapter. There are gains associated with allocating capital this way if it is true that PE is beneficial to portfolio companies, the investors in PE funds and society in general. In that manner, the results in this thesis can provide further information to the efficient capital allocation.

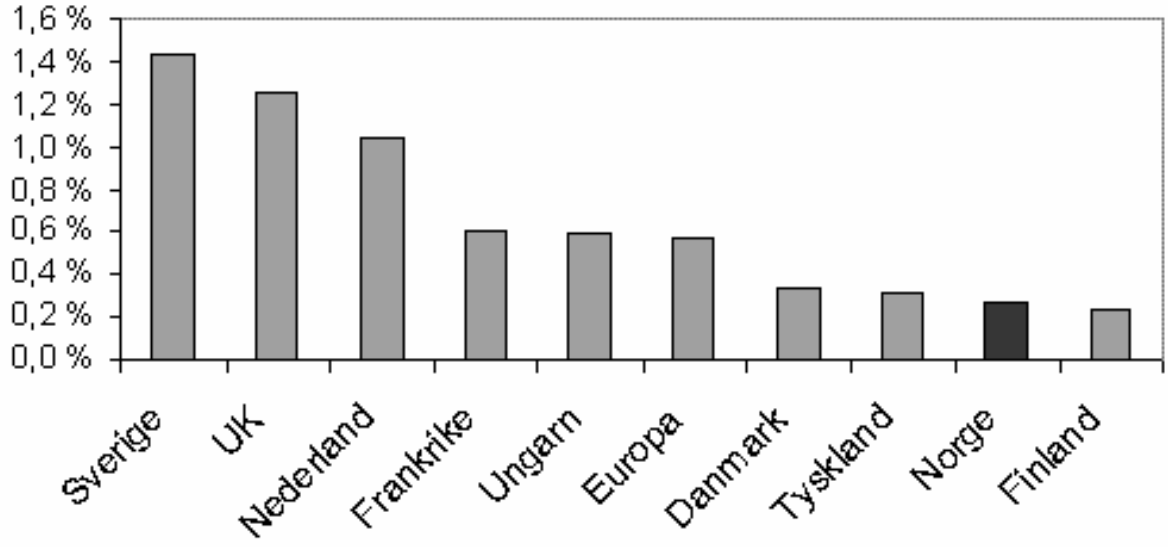
The start-up/venture is the largest section within PE in Norway and buyout/replacement is the second largest. To illustrate the size both absolutely and relatively in Norway I would like to show the capital under management here.

Figure 2: Capital under management in Norway 2007 (MENON/NVCA 2008)



There are 110 active owner funds in Norway and 54 management companies which manage a committed capital of EUR 6.7 billion (NVCA 2008). In the recent years there has been substantial growth in capital committed to this sector. In Norway unlike in most European countries the venture segment dominates. Almost half of the capital is invested in venture funds.

Figure 3: Invested amount in private equity as percentage of GDP in 2006 (Argentum, EVCA 2007)



The countries above from left to right translated into English are: Sweden, UK, the Netherlands, France, Hungary, Europe, Denmark, Germany, Norway and Finland.

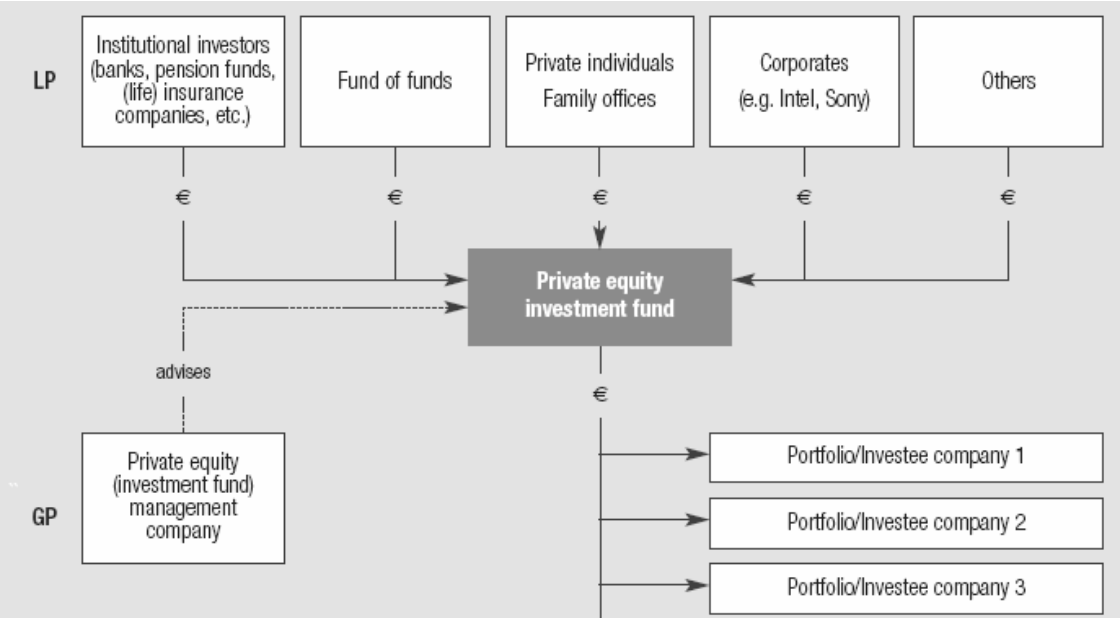
Norway seems to be lagging behind the European average and our neighbors Sweden. Some of this difference might be explained by the fact that we, in Norway, are highly dependent on oil. From this industry we have been getting huge profits which make our GDP higher than it would be without. If Norway did not have a substantial oil sector, there would maybe be a higher percentage of GDP invested in PE in Norway.

If one on the other hand looks beyond the nearest future, our oil reserves will be extracted and we will have to have companies like Nokia, Sony Ericsson, Ikea or others that can use the competence of the Norwegian people to employ the people, create tax revenue for the government and help keep our nation wealthy. Norway has one of the highest educated populations in the world (Norgesuniversitetet 2003), and therefore we should be able to take advantage that competence to create value. If one believes that PE is beneficial for efficiency and growth in the economy Norway should be more in line with other European countries. Further PE could help create and develop possible growth engines in the Norwegian economy.

1.6 Fund structure

Often, PE firms are following a fund structure (Bienz 2007). The description of the fund structure is based information found in Bienz (2007), Høegh-Krohn (2008), Sahlman (1990) and EVCA (2007). A PE company, called general partner (GP), manage one or more funds. The funds have a limited life, normally around 10 years. In these funds, investors, called limited partners (LP), invest until the fund is closed, i.e. when the desired amount of capital is raised. The total capital raised in a fund is referred to as committed capital. The GP on behalf of the funds invests this capital into companies, called portfolio companies, and sell them before the defined life of the fund is over. When the life of the fund is over and the portfolio companies are sold, the money is paid back to the investors of the fund, hopefully with a high return for the investors. The typical fund structure is illustrated below.

Figure 4: Typical fund structure Private Equity (EVCA 2007)

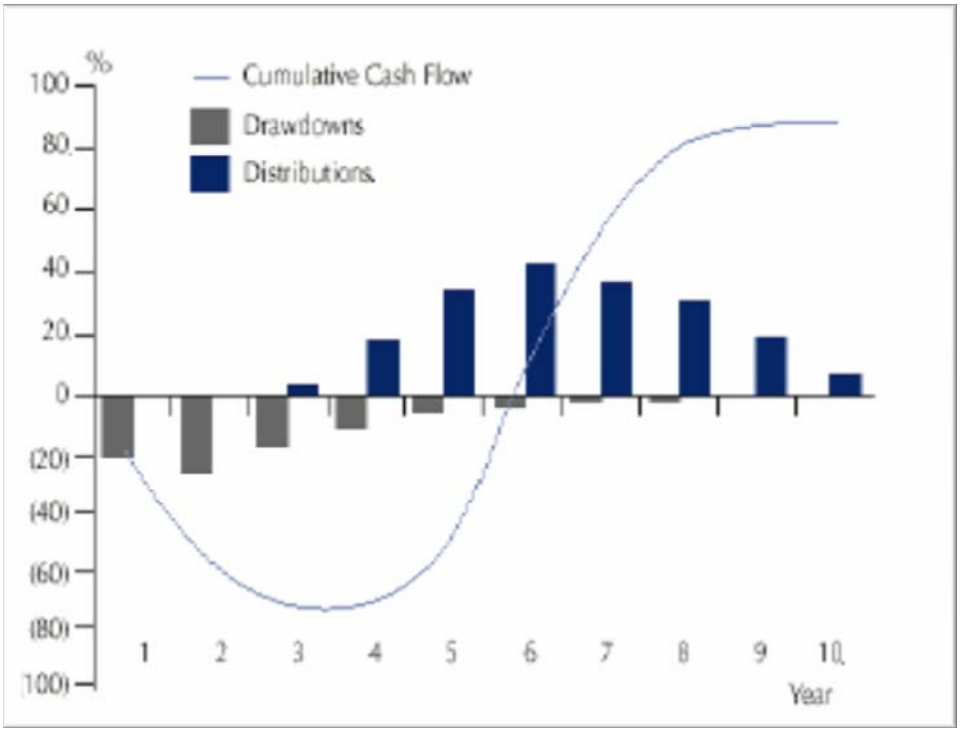


This figure shows a typical fund, where the GP manages the fund, the LPs invest into the fund. The GP on behalf of the LPs invest the committed capital in the fund in portfolio companies.

In the early years of the fund, the GP search for the best portfolio companies and invest in these. In the middle of the fund's life, the GP tries to maximize the value of the portfolio companies through active ownership. And finally in the last years of the fund's life, it searches an exit from the portfolio companies through a sale or listing on the stock exchange.

This is illustrated in the figure below. To have a clear exit strategy is important already before investing in a company, in order to ensure that the probability of a successful before the fund is dissolved is high enough to make actually make the investment.

Figure 5: Typical annual cash flows to investors in a PE fund (Høegh-Krohn 2008)



When dissolving the fund at the end of its life the goal is to pay back the invested amount less the management fees plus a high return to the limited partners. The PE firm receives a management fee which is a percentage of the committed capital plus a certain percentage of profits called carried interest, often above a certain return called preferred interest. The management only gets their carried interest after the investors have received some minimum return. The management fee is often paid every year, but can be reduced over time as the investment period ends.

To illustrate how this can be organized one can look at this simple example I constructed: A fund charges a management fee of 2%, and the fund managers receive 20% of return after preferred interest of 10 %. If the preferred interest is on a per year basis and the length of the fund is 10 years that means that at the end of the fund, value up to 2.6 ((1+10%)^10) times of the committed capital is reserved only for the investors. The value above 2.6 times committed capital is split 20/80 between managers and investors. There can also be a claw back clause in

the contract which means that after the LP gets his preferred interest the GP gets all up to the point where it is distributed with 20/80 of total profits, and profits above this is following 20/80.

In Norway there are big groups that have PE sections that do not follow the typical fund structure. I believe that the incentivizing of the employees in these firms is linked to the performance of the portfolio companies, like the PE firms that follow a fund structure. The link between performance and payment is very important to attract the best qualified professionals to manage the capital. It also makes sure that the efforts are high; if the team does not succeed it will receive less payment than it could in another industry and position, but if it succeeds then payment needs to be higher than for the payment that one could get in a similar type of position in another industry (Høegh-Krohn 2008).

1.7 Investor perspective

Private individuals might have difficulties to get access to PE funds due to a rather substantial minimum investment amount (Høegh-Krohn 2008). The best PE firms can also be selective to which LPs it wants to have. If there is oversubscription, meaning that the number of investors and the amount they want to invest is greater than the size of the PE fund the PE firm will have to choose which investor to have as LPs.

Kaplan and Schoar (2003) find return persistence in funds raised by PE partnerships. The GPs that manage a fund with a high return relative to the average in PE is likely to also achieve a high relative return with the next fund. This indicates that there is more skill than luck involved, and that the skills vary across firms. Thereby it is easier to predict performance of PE funds based on the GP, relative to other PE funds and to some extent absolute performance.

In asset management it is often recognized that one should have some percentage of total capital allocated to PE. This asset class has a high expected return as well as a high risk and low correlation with other asset classes and give investors a higher possible return for the same risk taken, compared to not having any capital allocated to PE (Høegh-Krohn 2008). 58% of European pension funds are invested in PE (Høegh-Krohn 2008). Individuals can get access to PE through pension funds or other type of funds. Another aspect of PE that an investor needs to consider is that PE is an illiquid asset group. The funds are not listed nor traded frequently and to sell the shares of a fund can be very difficult and one should be

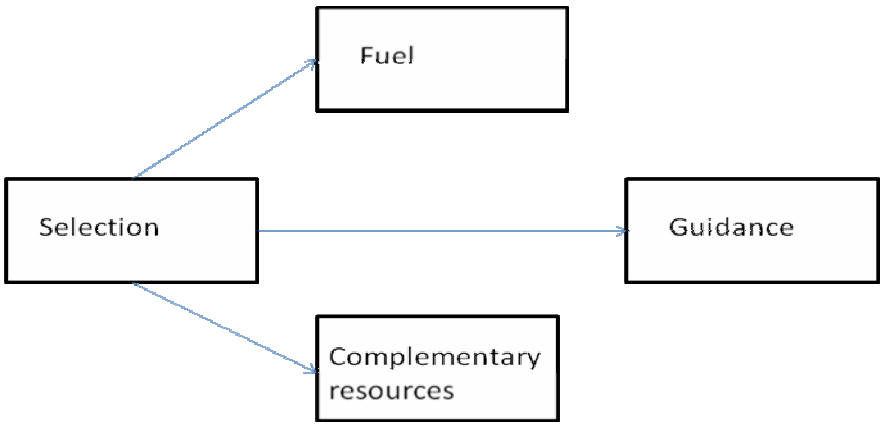
prepared to be able to get paid back all capital and return before the end of the fund (Høegh-Krohn 2008).

The return of the investment should always be considered, but is not always easily available when one wants to do comparisons (Bienz 2007). Return being the difference between invested amount and amount received at the closure of the fund, and this should be compared to other alternatives. The management fees and the carried interest should be kept in mind. The carried interest has to be investigated; there might not be preferred interest, which decreases the expected return to an investor. There is also the possibility that the committed capital is not what the PE firm computes the profits and returns from, but rather from the capital that the PE firm invests in portfolio companies. And the invested amount will be lower than the committed capital, due to the management fees. If this is the case, the managers in the PE firm will get more of the value of the fund and the investors less. In my research this part has no influence, but for those that are thinking about investing in this asset class this is the single most important issue.

2. THE ROLE OF OWNERSHIP

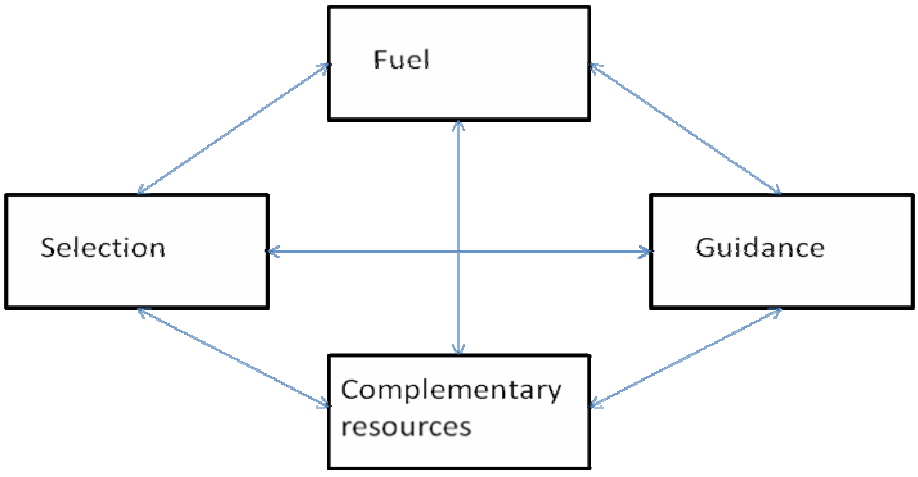
Grünfeld and Jakobsen (2006) explain four value adding roles that owners can and should make use of. The roles are selection, fuel, complementary resources and guidance.

Figure 5: The owners' value-adding roles (Grünfeld and Jakobsen 2006)



The first step in ownership is to start the ownership, i.e. make a decision whether to invest or not in the company under evaluation. Owners can govern the fuel in the company through issues and dividends. In addition owners guide and control the management to make sure the company is maximizing the owners' value. An owner should also either possess or be able to bring in other resources besides financial resources, which are not already in the company. When talking about competence in ownership it is important to execute the different roles so that they enforce each other, this is referred to as second degree owner competence (Grünfeld and Jakobsen 2006).

Figure 6: Second Degree owner competence (Grünfeld and Jakobsen 2006)



The description of the four different ownership roles is presented by Grünfeld and Jakobsen (2006) in their Norwegian book. I do not quote them directly as a direct translation into English does not necessarily give the best presentation. I present the main features and importance of each role based on their writings.

2.1 Selection

An investor has to select where to invest her capital. The companies and projects invested in should add value, meaning that the sum of discounted expected cash flows needs to be larger than the alternative cost of the capital that is invested. The capital should be distributed to the projects where the risk adjusted return is highest. In order to have a high level of selection competence, the owner has to be good at evaluating and forecasting how the project or company will perform. Owners should take active part in deciding which investments a company should undertake and which it should not. Thereby selecting the course of the company, and hopefully the course that has the best return is selected. Selection is also a matter of timing, of when to enter and exit. Another part of selection is to be able to take into account if there are differences in expected value of a company depending of which owners it has. This can make a difference when it comes to what one is willing to pay for a company.

2.2 Guidance/control/monitoring

Being an owner makes one entitled to decide what the company should do; all that is not delegated to others are up to the owners to decide. The company has a vision that justifies its existence, to achieve this vision, the company forms a strategy. Finally the strategy is implemented and put into operation by the managers. Owners should take active part in defining the vision and the strategy as it is their return that is influenced by the success or failure of the strategy. Even though most of the strategy work and the implementation are done by the managers in the company, the owners can influence the decisions. Through the board of directors, owners can provide guidance as well as control and evaluate the strategy and operations. This way the owners take an active part in the management of the business, which is logical because it in the end is their money that is at risk. It is also important to make sure that the managers do not pursue other goals than those that benefit the owners; this is up to the owners to decide as they pay the salaries of the managers.

2.3 Fuel

Grünfeld and Jakobsen (2006) present capital as the accelerator and the brake of the business. Capital can be injected through share issues and drained through dividends. Capital can also be supplied through borrowing capital. Because the loan and interests has to be repaid before the shareholders can get their money, the risk of the shareholders increase with the level of debt. However, if the company is believed to deliver a return above the interest on the loan, bringing in debt capital will increase the return for the shareholders and could be welcomed by owners even if it increases risk.

Especially when expanding and growing, capital injection is important. The company needs to make investments, but often it does not have the capital to finance it internally. Expanding companies are often young companies that are not making profit that can be reinvested in new capacity. It is expensive to expand capacity, and in addition growth often take place in new markets where the fight for market share with the incumbent firms can make expansion even more costly.

2.4 Complementary resources

The success of a company has a clear link to the resources it possesses. The resources need to match the critical success factors of the industry that the company operates within. An owner can increase the value of his company by supplying it with important resources that are missing. Young companies often do not reach their potential due to lack of right resources. Entrepreneurs are often very good at the product level, but in order to succeed commercially other skills are needed. Entrepreneurs do not always possess these skills. Owners should bring in new employees with the right competences for the company. These competences should help the company to be better at knowing how to market the product, where to sell, which suppliers to use and how to establish the good relationship with suppliers and clients etc. In a production perspective, to bring in competence can lower costs through increased efficiency in operations. The success factors and the needed resources vary across age, industry and other characteristics of the company.

3. WHY SHOULD VC INVESTED COMPANIES DO BETTER?

The features and methods described in this chapter do not necessarily apply for each VC Company or VC investment. The characteristics of the way the VCs try to focus on value creation can in principle be used by all owners, but VCs are known to frequently use the methods I mention. In the course *IPO and Venture Capital* at NHH (Norwegian School of Economics and Business Administration) (Bienz 2007), several of these methods have been presented as often used by VCs. The presentation of the features of VC and the reasons for the value adding is built on Bienz (2007), Høegh-Krohn (2008), Chang (2007), Sahlman (1990), Grünfeld and Jakobsen (2006) and Grünfeld and Jakobsen (2007).

3.1 Selection

3.1.1 Selection process

Before investing in a young company the VC has thoroughly screened and evaluated the company. The company's business idea has to have a significant value creation potential and there has to be a high probability of being able to exit through a sale or a listing on the stock exchange within a few years. The business model has to show a good chance of being a success and providing a comparative advantage. Further, the resources needed by the young company should match the capabilities of the VC to increase the probability of a high return for the VC.

Most companies that are evaluated are not invested in, therefore the selection process is assumed to make the companies that actually are invested in perform better than comparables. 3500 firm/investment evaluations was conducted by Norwegian PE companies in 2006, but only 158 new companies was invested in and 245 follow-up investments were made that year (Høegh-Krohn 2008). In respect to the performance this indicates that only the best prospects of success get VC investment. Under the assumption that the investment process, the analytical skills and the experience of the VCs are excellent and relevant to be able to select the companies that have best chances of success.

Kaplan et al. (2007) prove that successful companies do not change business idea. They look at VC backed firms that go public, and almost none of them change business line even though management turnover is substantial. The evaluation of the business plan and the industry the company operates in, as well as positioning within the industry is very important for the future success of a young company. The VCs ability to evaluate business ideas and business

lines is therefore crucial in order to make a successful investment decision. If the VCs are assumed to be better at evaluating different business ideas potential success, there should be a better performance by those companies where a VC has invested due to the selection of the companies with the best business ideas.

3.1.2 Contractual terms the entrepreneur has to accept

To avoid moral hazard, overcome adverse selection problems, hold-up problems and limit the possibility of being stuck with an investment that the VC wants out of, the entrepreneur often has to accept unfavorable contractual terms (Bienz 2007). If the entrepreneur accepts these terms, it sends out a very strong signal that she believes in herself and the future prospect of the company. Acceptance of unfavorable contractual terms also signals that the entrepreneur will put maximum effort into the company as the consequences of failure can be severe to the entrepreneur (Bienz 2007). When I use the term entrepreneur I assume that the entrepreneur stays on in the company after a VC invests as well as having an important role in the daily management.

When discussing contractual elements I do not include all of the elements that VCs often use, and I do not go into detail on those I present. I present some of the elements I believe is most important and give an impression of why it makes me believe that the VC invested company should perform better than comparables. The key interpretation of the contractual elements with respect to future expected relative performance is the strong signal the entrepreneur sends out by accepting unfavorable terms. I also treat some of the most incentivizing methods used more thoroughly, such as vesting and staging.

Moral hazard refers to the problem that the entrepreneur might not work hard enough to maximize value, and to overcome this possible problem the entrepreneur should be motivated to maximize value (Bienz 2007). Moral hazard can be overcome by making the entrepreneur's payment largely in options, so that the payment she will get is almost only dependent on choosing the actions that can maximize value, even though there might be more risk involved. If the entrepreneur owns a larger share of the company instead of being paid in options, the entrepreneur has the right to a certain portion of dividends and a potential sale. Even if the effort is not directed towards maximizing value, the entrepreneur can still receive a nice payoff. The entrepreneur can be rewarded through a yearly salary of a considerable amount, this way he will get the same no matter how the company performs. To make a large part of the compensation of the entrepreneur an option should incentivize value maximizing.

Alternatively this financial incentivizing can be done by giving an increasing share of the profits or ownership percentage with the size of the profits (this is explained further under the subject vesting under guidance/control/monitoring) to the entrepreneur. By rewarding the entrepreneur this way compared to a fixed salary or fixed ownership stake, he will be left with a significantly smaller compensation if the company does not become a success. Without a true belief in the potential of the company and a desire to work hard to maximize value, an entrepreneur will not agree on these types of contracts.

Even though the VC does the best possible investigation before investing, the entrepreneur will still know more about the company, this is referred to as adverse selection (Bienz 2007). If the entrepreneur knows that the prospects are not as good as she has been able to convince the VC that they are, the entrepreneur will not accept the terms of a contract that has several unfavorable terms if the company becomes a failure (Sahlman 1990). The VC will with these types of contracts limit this problem.

The hold-up problem refers to the fact that the entrepreneur could block decisions that would benefit the VC economically (Bienz 2007). The VC can overcome this by using vesting, staging and also to have rights that favor the VC over the entrepreneur in terms of exit. The entrepreneur might have to accept that she cannot sell her shares without the VC receiving the same offer for its shares. There can also be other contractual elements that make sure the entrepreneur does not leave the company or benefits economically without the VC having the same possibilities.

The VC will often make sure that there is a right to force the entrepreneur to sell if certain conditions arise (Sahlman 1990), for instance if another company wants to buy all shares for above a defined predetermined price. Another contractual element that the VC might demand is the right to force the entrepreneur to buy the VCs shares under certain conditions. Typically when the company neither becomes a success or a total failure, this is important as the VC does not want capital locked in for a long time in a small scale company.

3.1.3 Compensation in VC firm

Like already briefly explained in chapter 1.5, the compensation of the partners and employees in the VC firm is closely linked to the performance of the fund. This create incentive to an excellent analysis in the selection process.

For future compensation of the managers in the VC firm, the selection of portfolio companies is also important. The best firms tend to have high performance over time, and to get a new fund fully subscribed will be much easier when having a good record of high performing funds (Høegh-Krohn 2008). If the employees in the VC firm plan to stay in the firm and the partners plan to stay in the industry for a while it will be very important that the portfolio companies perform well.

3.1.4 Characteristics of the employees in the VC firm of impact on selection

To be employed in a VC firm requires excellent analytical skills. In addition, senior employees and partners will often have experience from young companies, management or specific industry knowledge and preferably more than one of these (Høegh-Krohn 2008). To have a team that possesses the experience and skills best fitted to evaluate the probability of success for a young company, should make the companies that the VC actually invests in perform better than comparables.

3.2 Guidance/Control/Monitoring

This section contains several elements that should improve the performance of the portfolio company which I have decided to categorize under guidance/control. Both why the VC should be good at guiding and how cooperation can be improved. As well as the methods to make it very likely that the entrepreneur provides a high effort directed to maximize value without direct intensive monitoring and control.

3.2.1 Incentive program both in the VC firm and in the portfolio firm

Like already mentioned the partners and employees in the VC firm normally have a payoff that is closely linked to the performance of the portfolio companies. This should make them eager to provide a high effort and take interest in actively monitoring and guiding the company in direction of maximizing value. The VC also often uses incentive schemes to the key employees in the portfolio company, like the founder and the CEO (Bienz 2007). This should make the company willing to accept more control and get a healthy cooperation dedicated to maximizing value.

3.2.2 Vesting

Vesting is also discussed in the selection part under contractual elements. *In VC transactions, managerial stock ownership and option claims are typically granted over time, in a process called vesting* (Metrick 2006; p.555). Vesting means that the entrepreneurs or managers

ownership stake increases over time with the profits or value of the company, or other parameters the parties agree upon. Vesting provides a financial incentive to do well and letting the VC take part in the control of the company to make value increase. It can also work as an incentive if the entrepreneur wants to stay with the company for a long time and align the interests of the VC and entrepreneur in maximizing the value of the company.

3.2.3 Board representation

VCs often take a significant ownership share and therefore place their own people on the board (Sahlman 1990); to a VC it is also preferable to possess the position of chairman of the board. The board is the supervising organ that shareholders have. The most important long term decisions are made by the board and it is therefore important for the VC to hold seats in the board, this way the VC is able to monitor and provide guidance to the management (Grünfeld and Jakobsen 2006).

3.2.4 Characteristics of VC partners and employees with impact on board membership and general advising

The partners of the VC firm are considered to be experienced professionals and often have substantial knowledge about the specific industry that the portfolio firm operates in (Chang 2007). The track record and analytical skills should also be very good, and the VC partners should be very qualified decision makers and advisors to the daily management of the company (Høegh-Krohn 2008). The VC has very often also led companies through the same process of professionalizing and maturing into success a number of times earlier.

3.2.5 Staging

The term staging refers to the way that capital often is injected to portfolio companies. All the capital a VC plans to invest is often not provided initially (Sahlman 1990). Instead some is provided initially, and then the rest can be provided in stages after certain milestones have been reached. Examples of such milestones are; a well functioning proto type developed, a product launched to the market or revenues have reached a certain level. The VC gives the entrepreneur incentive to work hard and to speed up the time to commercializing when using staging. This can be very important if there is significant advantage by being first mover in offering a new product or service to the market.

VC is associated with significant reduction in the time to bring a product to market (Hellmann and Puri 1999). Whether staging is the reason for this is not clear, but it is

plausible to assume that the use of staging could play a role. In addition the VC protects at least some of its money in case the company does not become a success or the entrepreneur is not as good as assumed. The risk is decreased for the VC, but increased for the company and the entrepreneur.

3.3 Fuel

3.3.1 Staging

In terms of efficient capital allocation, staging can be thought of as a way to help this. When the likelihood of success increases, the VC pushes the accelerator by investing more capital. If the likelihood of success decreases the VC press the brakes and do not inject more capital.

3.3.2 Contractual terms

If the company operates a long time without any signs of improvement, the VC can have a right to put its shares to the entrepreneur and withdraw at least with some capital that the entrepreneur has to pay for the VCs share (Sahlman 1990). This capital can then be used in other companies that have a greater chance of success.

3.3.3 Credibility with banks and investors

A VC is believed to bring credibility and therefore having a VC as an owner makes access to capital easier. This capital can come from lenders or other co-investors, both other VCs and other investors. VC backed companies acknowledge that having a VC as owner brings credibility and financial contacts, which both are important contributions to the company (EVCA 2002). The VC is often older than the portfolio company and can show a reputation as being trustworthy, which the entrepreneur herself might not have due to lesser experience in bringing in capital. If assuming that the VC has a goal to remain in the line of business, I believe it will have an incentive to act honestly towards corporation partners. If not acting trustworthy, the VC will have difficulties to bring in capital from banks and co-investors in the future. The entrepreneur does not necessarily have the same future punishments to be concerned with, and therefore a VC could increase credibility.

3.4 Complementary resources

3.4.1 Skills in the team

Entrepreneurs are often very good at product development and may be good in leadership in a small scale. However, the entrepreneur might not possess the right competences needed to

commercialize the company into success. The VC team often has experience in both young firms growing into a larger organization and the critical issues within the industry that the company operates (Chang 2007). Contrary to have a personal owner, to be owned by a VC can bring in a larger specter of potential resources that the company does not possess itself. The VC owner will have more than one person's competence to rely on. These facts should make the VC a competent owner when it comes to bringing in resources that the company is lacking.

3.4.2 Bringing in new key employees through network and name

The VC often has a reputation that the portfolio company can gain from when it comes to attracting new key employees to the company. Without the VC as an owner, the company itself might lose out on these employees. In addition, the VC will through the career of the employees often have knowledge of some people that have the right competence and therefore easier be able to find the right competence, and possibly easier attract them. Hellmann and Puri (2000) find that the VC plays an important role in professionalizing the company. Portfolio companies are more likely to bring in new CEOs and do so faster than comparable companies. The VC invested companies are also more likely to faster appoint a Vice President of Sales and Marketing. Hellmann and Puri (2000) argue that the VC actively builds up human capital and is good at doing so compared to other types of owners.

3.4.3 Network to put company in touch with good partners

The VC partners and employees have through their work experience been in touch with possible useful partners to the portfolio company (Chang 2007). Through other portfolio companies they have an even broader network. Examples of partners are clients, suppliers, technology cooperators or other types of links, all partnerships working together for mutual benefits. Sometimes the VC can bring portfolio companies together and help both of them to become even better than if they had separate owners and no linkage. The partners that a company is working with can make a difference to the performance of the company. To have a supplier that can deliver very high quality custom made parts at affordable prices, will make a great difference in high tech companies that depends critically on components produced by others. Pettersson and Sjöblom (2006) find that VC backed companies report that having a VC as owner brings credibility when dealing with customers and suppliers.

4. PRESENTATION OF DATA SET, PREVIOUS RESEARCH AND POSSIBLE BIASES

In this chapter I will first introduce the variables used to identify if VC backed companies perform better than benchmark. Secondly there is a description of the sample of data. In this chapter I also present research that has benchmarked VC backed companies in similar ways that I do. Finally I explain possible biases that my data set can have, which should be kept in mind when interpreting the final results of my tests.

4.1 Input

To test if ownership in the young firm has influenced performance I compare growth in each VC backed company to the growth of a group of comparable companies. I use growth in sales, total revenue, total assets and number of employees to test if VC backed companies perform better than comparables. These variables are common to use in these types of studies, Pettersson and Sjöblom (2006), MENON (2007) and Alemany and Marti (2005) use revenues, assets and employees. I use the same variables as the other studies, both due to the implicit validation of the variables that comes from the previous usage, as well as the availability of the registered values in income statements and balance sheets. I present an interpretation to why the variables used could be relevant to find out if VC backed companies perform better than benchmark. I have collected financial information from the years 2003 and 2006.

In addition to the variables used I have collected earnings before interest taxes depreciation and amortization (EBITDA) numbers. My idea was that VC also could have a positive impact on the level of operating costs relative to operating income. However, there are few companies that have positive values in both 2003 and 2006 for this variable and I decided to leave this variable out of the tests. Besides the few valid observations that made me decide to leave out EBITDA, there is another aspect of the development in EBITDA that makes results difficult to interpret. Growth ambitions are considered costly and companies with this ambition in the start-up/venture phase should invest heavily, as a consequence EBITDA will decrease over the next few years (Grünfeld 2009). Because I have collected companies of different age, where VC investments have taken place in anytime between 1998 and 2004, it is difficult to say if an increase in EBITDA is a positive sign or not.

R&D is expected to be heavily invested in by VCs (EVCA 2002). Therefore I would have liked to include R&D expenses in my selection, to see if a VC investment triggers innovation

and therefore is more likely to succeed in the long run. Unfortunately, the reporting of these variables are neither consistent nor easy accessible.

4.1.1 Sales and revenues

Revenues are crucial in order to survive and generate profits. First, a company needs to make revenues to cover its costs. Secondly, investors expect the company to give back a return to the initial investment; therefore the company should generate profits after some years. Sales should represent the core activity of the company and are considered the least subject of manipulation (Kinserdal 2008). Sales revenues are income from sold goods or services and do not leave subjective choices in auditing as it should be the sum of the prices paid for all goods or services sold during a year (Kinserdal 2008). Sales are chosen because it should reflect how the company is performing its core business and should contain only revenues from operations.

I include both sales and revenues because the categorization of revenues in the income statement is not consistent across companies and industries in my selection. License revenues can be recorded as sales in some companies and other revenues in other companies. License revenues can be a substantial part of total revenues for many young companies. Technology licensed or licenses for drugs can be examples of this.

4.1.2 Assets

Assets are chosen because it reflects the capacity, both in terms of production assets as well as mere financial capacity. There are three ways to grow in assets; through internally generated earnings, from a share issue where investors provide the capital or through borrowing where lenders supplies capital (Brealey et al. 2006). All these three ways of expanding capacity should be viewed as positive signals for the future of a young company. Normally raising of further equity is interpreted as a negative signal (Johnsen 2007), but I would argue that young companies show strength by being able to attract capital when knowing how difficult it is to obtain risk capital for young companies. To be able to retain earnings and further invest it in the company reflects that the company is doing well and that the board of directors believes that it will continue to do so. To be able to raise more capital indicates that the capital providers believe that the company will be successful in returning the capital with interest in the future.

4.1.3 Employees

Growth in the number of employees indicates an increase in activity level and also an expectation of a high activity level in the future. It is assumed that an increase in activity requires more employees. Further, to hire new employees also signals a projection of future activity level that requires approximately the current number of employees at any given point in time. However, this variable is the most uncertain in terms of providing clear answers. Some companies can have several employees in the research phase, but after a breakthrough the need for employees will decrease. Such a company can still be considered a success as it will generate revenues from licensing its patent and possibly also contribute to society through taxes paid on profits and the usefulness of its patent.

The reporting of the number of employees that I have registered in my selection can also be a source of uncertainty. I have chosen the last reported number of employees before January 1, 2007 in Ravn. These numbers do not always correspond with the salary costs, sometimes there has been paid out salary in a year where a company does not have any employees and other times there are zero salary payments even when there are employees registered. The problem in this case is the reporting from the companies or the registration by Ravn. I have not adjusted for this, but it needs to be kept in mind when interpreting the results.

4.2 Description of sample

I limit the scope of the thesis to Norwegian companies and collect the data from the database Ravn, which contains financial information about most Norwegian companies. The VC backed companies used are collected through a list provided by MENON Business Economics and from searching in Thomson Financial's VentureXpert database. MENON is a research and advisory consultancy company, and has a large database which contains most information about PE firms and their investments in Norway. NVCA and MENON work closely together and MENON does research on behalf of NVCA.

The companies selected were mainly in the phase of start-up/venture when initial VC investments were made. To get a large sample of data should be easier in this phase than the other phases of VC, as most capital is allocated within this phase in Norway (figure 2). To increase my selection, and because of often small differences between expansion and venture, I also include companies categorized in the expansion/international phase done by VCs who also invest in the start-up/venture phase.

The data collection has been done by collecting financial information from 2003 and 2006, and computing the average cumulative growth in this three year period for all companies and variables. I assume that I only need to collect data from the start and the end of the period to analyze the development in the period. None the less there will be companies reporting much lower or much higher values in the variables in 2003 or 2006 than the trend indicates. Therefore, I assume that across my groups of companies and against the benchmarks, these deviations from trends will be evened out and therefore the results obtained are valid. I started the data collection in July 2008, and therefore 2006 is the last year in my sample. Even in the beginning of 2009, Ravn did not have the financial data for all companies in 2007 yet.

I use both the average and the median of the comparable companies to create a benchmark to each VC backed company. Using the average will take into account that inside the selection some companies will do much better and some will do a lot worse than the rest. Therefore it can be advantageous to use the average as it can be said to reflect the true expected performance of the VC backed company. On the other hand it can be argued that it is wrong to let so-called extreme values influence the benchmark to compare the performance of a VC backed company. Therefore, I test the growth of each VC backed company against both average and median of comparable companies.

The comparable companies are chosen by applying the search tools that Ravn gives me. The industry code of a comparable company has to be the same as that of the VC backed company. If there are few comparables in a VC backed company's benchmark, companies that operate within more than one industry code have also been included in the benchmark. Secondly I try to match the comparables to the VC invested company by identifying companies as similar as possible to the VC backed company in the year 2003 in terms of age, revenues and number of employees. The accuracy of the benchmark varies a lot, due to differences in the number of companies actually operating within the industry code. The number of companies established within the relevant industry code at certain periods of time is also very different across industry codes. Originally, I had an ambition to collect at least five comparables to each VC invested company, but to have more precise comparables and not to decrease my selection further, I chose to set the minimum number of comparables to three. To the best of my knowledge none of the comparables has ever received a VC investment. Although I cannot guarantee this as I have only used publicly available information and MENONs data to make sure the comparables qualified as comparables.

All my data are collected by searching up a VC backed company that satisfy the specifications and transfer the values in the income statement and balance sheet to Microsoft Excel. After that I use Ravn's search option to find as similar companies as possible by using my criteria. In order to obtain a reasonable number of comparable companies for each VC backed company, I decrease or increase the range of difference accepted from the VC invested company's values.

I have not considered the fact that the company's fiscal year might vary from the calendar year and therefore the fiscal years of all comparable companies might not be the same. I do not believe this should have a real impact and therefore do not make any adjustments.

I want to look at long term performance of the companies and try to minimize the bias towards the best investments. The companies in the selection either have a VC as owner today or have been exited in 2003 or later. If I had allowed for companies that were exited earlier, the VC effect would in my opinion likely be too distant. In addition, if the initial investment and the exit happened a long time ago, chances are that the future prospects have changed even more than if it the exit happened recently. Further on, the companies in the selection have received their first VC investment no later than 2004. To make sure that there is some opportunities to make active ownership matter, and rule out investments that solely take advantages of mispriced companies, I do not allow for companies in my selection where the VC exits the same year as the first investment. However, due to relatively few observations and the fact that I want to obtain an as much as possible unbiased selection, I do not want to limit the ownership period too much. On one hand it seems plausible to assume that the VC gets rid of the bad portfolio companies faster than the good ones, as soon as it shows signs of being a failure, to limit the loss. On the other hand it is far more difficult to sell the bad companies than the good companies and therefore the bad ones could be held longer.

Some of the VC backed companies have been purchased and integrated, and some of these have changed their names, but from MENON I also received the organization numbers and therefore was able to locate also a number of these companies. I have not tried to adjust for effects that might arise if a company was purchased by a foreign company and integrated. These effects might come from the company selling the acquirer's products and there will possibly also be efficiency gains that will reduce assets and employees in Norway. Because I

want to look at long term development of the young company itself, I still find it valuable to include these cases, although it will be unknown how the exact links to VC are.

All together the final data set consists of 71 companies. Companies have been removed from the sample due to missing values, too few comparables found, lack of information about industry code or other difficulties in obtaining a valid result. I also removed companies where the links between a current group, the companies in the group and the original VC backed company were very indistinguishable.

4.3 Other similar studies

There has been several studies conducted that has very much bias in the sense that the performance of VC backed companies are compared to a group which is not comparable in age, and often with very strong bias towards successful VC backed companies, for instance only using VC backed companies listed on the stock exchange. The similar studies list below includes studies that try to compare the VC backed companies to similar companies and that try to avoid biases in similar ways that I do myself.

4.3.1 Venture Capital, a source of added value?

In this Swedish master thesis, Erik Pettersson and Erik Sjöblom compare one group of young Swedish companies that have received VC funding with a group of young Swedish companies that have not. In addition, they conduct interviews with eight entrepreneurs of companies that have received VC to try to identify what a VC contributes with.

To be included in the group of VC backed companies, the VC has to have an ownership share between 20 and 50% in the portfolio company; the entrepreneur has to own at least 20% and the VC needs to have owned the company in at least 4 years. They try to make sure that the comparables had growth ambitions in the start of the period they investigate. They also make sure the comparable firms have not received VC funding by getting confirmation from them. Both groups contain about 25 companies after removing those that has growth above 1000%. They use growth in revenues, assets and number of employees in the period from 2001 to 2004, and use the cumulative annual growth to decide if there is significant difference.

They found that revenues growth on average is significantly larger at the 99% level for the portfolio companies than the average for the group of comparable companies. For employees and assets there is almost no difference between the two groups. The interviewed

entrepreneurs state that the organization changes when a VC enters the company, to make sure to organize the company towards maximum value. The VC also complements the portfolio company through strategic advice and gives the company credibility in relations with others. In addition the VC plays an important role in monitoring and governing the portfolio company, in this thesis it is compared to the way a parent monitor and govern its child.

4.3.2 Unbiased estimation of economic impact of venture capital backed firms

Luisa Alemany and José Martí have in this working paper from 2005 used the Spanish database of professor Martí, which contains all VC investments after 1988 in Spain. They investigate growth in employment, sales, growth margin, total assets, net intangible assets and corporate taxes paid. They investigate over 300 VC backed companies and compare them to a control group. The control group consists of one comparable company to each VC backed company, done by matching.

They analyze average annual growth from the year of the first VC investment and 3 years ahead, because the average holding period is four years for VC backed companies. The comparable company has to be in the same region as the VC backed and have the same activity code, the same range of sales and finally, if several companies match the parameters, they select the company closest in age to the VC backed firm.

Further on they divide these into three groups depending on the earnings; start-up, growth and late stage. The difference between start-up and growth is if the company has broken even yet. Late stage bears more similarities to a buyout.

They find no significantly better growth for late stage, but for start-up and growth they find significant differences on 99% level for all variables except assets and employment in the start-up phase. They also find a positive relation between the cumulative VC investment and growth over time.

4.3.3 Value creation and active ownership funds in Norway

MENON and NVCA conducted a research in 2007 on Norwegian companies. They conducted an econometric analysis of employment growth and value added growth for all Private Equity invested portfolio companies. To describe value added, EBITDA plus salary costs are used by the writers. They control for size, industry, add-on investments, economic cycle and extreme values. They find that both employment and the value added growth are higher in Private

Equity backed companies than for other firms if considering a 5 year period. Employment is higher for 1, 3 and 5 years, while value added growth is only higher for 5 years, which can be explained with the high investment level that Private Equity investors emphasis in the start of their ownership. Further on the employment growth in both start-up/venture and expansion/internalization is 40% higher than the one in the buyout segment if considering the 5 year period.

Further on in the article *Private Equity: Kompetent kapital med samfunnsøkonomiske gevinster?* (Private Equity: Competent capital with economic gains to society?) In the book *Hvem Eier Norge?* (Who owns Norway?) Grünfeld and Jakobsen explain the data analysis of Norwegian companies' value creation done by Lasse B. Lien at NHH. They find that companies with PE financing grow three times as fast in the period 2000-2004 in terms of value creation than other companies. This is adjusted for industry, size and age.

4.4 Possible impact from the role of selection

For a VC investment to take place, the owners of the future portfolio company, often the entrepreneur, need to be willing to sell to the VC and accept the terms the VC demands from the company. Further on, the VC has to be willing to provide funding, meaning that the company shows a good probability of a high return on the investment. There are two parties that mutually need to select or more correctly put; accept each other. Therefore it might be that my results are driven by acceptance, and it can be in either way, but it needs to be clarified and the reader can make up his or her own opinion. If there was a way to separate the factors that drive results, the impact of selection and value adding it would be very interesting to isolate.

4.4.1 Who does the VC select?

The VCs invest only in a few of all the companies that are being evaluated (Høegh-Krohn 2008). Most of the companies that are evaluated want the VC as an owner themselves. The VC is on average believed to be able to invest in the better of these companies (chapter 3.1). If they are not able to select the best investment opportunities, all potential advantage of VC should come from managing the owner role superiorly. The VC firms are assumed to be able to outperform a random selection of possible companies that would like to receive VC funding with the companies that actually managed to receive VC funding.

My research does not try to single out what part of difference in growth comes from the selection and what part that comes from the other capabilities of the VC as an owner. Selection is a part of owner competence and I expect the VC to be good at selection as well as the other owner capabilities.

The Ministry of Trade and Industry in Norway calculates that only five percent of all the around 24 000 companies that are established each year can be categorized as growth companies (NVCA 2009). Growth companies mean that these companies have the potential to be a future substantial employer. In my selection of comparables it is plausible to assume that there are a number of companies that are not among these five percent from each year. This fact should be kept in mind when interpreting the results I get. These five percent of companies established each year are more likely to be screened by a VC and more likely to seek a VC as investor. Growth is expensive and therefore a company with high risk and in need of capital will seek risk accepting and competent owners.

Grünfeld (2009) identifies growth engines in the Norwegian economy. The categorization of growth engines refers to a potential significant value contributor in the economy. The companies identified as growth engines are chosen from the characteristics of the companies that PE firms invest in. To exemplify what this means I present the criteria in the venture category of the characteristics of a portfolio company at the time a VC invests. The companies are from three to ten years old, have between two and thirty million Norwegian Kroner (NOK) in revenues, have had a yearly revenue growth of minimum 20% the last three years and have had a negative development in EBITDA the last three years. In Norway there are around 10 000 growth engines and around 1800 of them are considered to be in the venture segment. There are other characteristics for the other phase investments. As most VCs will invest in the growth engines I would like the comparables to be among these, but it is unlikely that all the comparable companies are among this group. All the VC backed companies I have collected may not be within the growth engine categorization either.

I have used industry code to choose comparables, although some of those industry codes are broader than others. An example of a broad industry code is *development of standard software*, within this category there are certain areas where companies within this industry code are more likely to do well than others. It can be argued that the VC should be able to select the best sectors within an industry code and therefore it should have been a more

narrow comparable selection. However, it serves in a way as a way of testing the selection skills of the VCs also inside an industry code. But it should be kept in mind that the similarity of a chosen comparable and the VC backed company vary.

4.4.2 Who selects the VC?

A possible bias in my results will come from the companies that have not received VC funding. Would all of them have the same ambitions of growth as those chosen by VCs? Would all of the comparable companies welcome a VC as investor? Do only the best companies receive VC funding, or is it so that the best companies can get funding from wherever they want and therefore are not willing to have a VC as investor?

It is plausible to think that the most ambitious companies with the best prospects of growth want to have a VC as an owner. The VC should have the experience needed to help the company reach its ambition, as well as providing resources that the company does not possess itself. If this is true, I would expect a higher growth in the VC backed companies than others, because the VC selects the best prospects of growth from the selection of the best growth possibilities.

The other possibility is that the best companies do not consider VC funding. The loss of control and ownership share is not considered necessary. Even though young companies have a high risk, the best companies have lower risk than others and therefore more easily and cheaper get access to other sources of capital than VC. The typical example would be that banks actually are willing to give loans to the best of the young companies, and thereby the owners do not need to bring in new owners and have their ownership share diluted. Another issue would be if the entrepreneurs do not consider risk capital providers to be different in terms of value adding. If this is the case, the only concern is to get the capital as cheap as possible, which seldom is the case with VC (Bienz 2007). The best companies would then not have received VC funding.

If companies that the VC wants to have in its portfolio do not want to have the VC as an owner, it should reduce the likelihood of finding that VC backed companies grow faster. In my comparable companies, I have no indication whether a VC has considered investing in the company and/or the owners/managers of the comparable companies have considered VC funding.

Optimally I would like to know ambition of each company in the year 2003, or even better, in the year the VC invested, so that I could benchmark better. In order to single out effects it should be interesting to look at which companies the VC has evaluated versus VC backed companies, evaluated companies versus not evaluated companies and VC backed companies versus not evaluated companies.

Sometimes I have come across some companies in the comparables that look a lot like one man establishing a company and never have any other ambitions than to be more than a typical one man consulting company, and receiving his salary to the company instead of to his personal bank account. However, it is difficult to single out the initial ambition of such companies, and to be consistent with my own approach I include companies as equal as possible in the end of 2003 based on quantitative approach provided by Ravn.

4.5 Survival bias

I want to get an impression of how survival bias might influence my selection of data. The chance of bankruptcy is considered to be larger the less developed the company is. Therefore I chose to look at all companies categorized as start-up/venture by MENON, further on I only include those that have indicated year of investment, and the investment has to be done in 2004 or before. After that I try to find information about the companies in Ravn, based on name and organization number. I will exclude foreign companies and note year of bankruptcy too.

I would expect a somewhat substantial number of firms actually to go out of business. The result shows that 5 out of 78 companies went bankrupt, one in 2006, one in 2007 and three in 2008. This suggests that my selection is not much affected by survivorship bias with a bankruptcy rate of only 6.4%. Only 37 % of companies established in 2001 were still in business in 2007 (Statistics Norway, http://www.ssb.no/naeringsliv/, 2009). These numbers also include companies that do not have shares, but where the owners are personally liable. If compared to this number I would say that VCs are able to single out companies more likely to survive, or able to make companies better fit to survive.

The problem in my collection with respect to bankruptcy, even if it happens later than 2006, is that Ravn removes the industry code some time after bankruptcy. And the line of business is the most important thing when choosing comparables. My selection can be biased due to removal of the worst performing VC backed companies from the selection due to bankruptcy.

Likewise, the comparables can also be biased because the worst performing comparables have gone bankrupt and therefore cannot be identified. Which one of these effects that is strongest in my results is difficult to say. Due to the significantly lower bankruptcy level in VC backed companies I believe that even if I could include all bankrupt VC backed companies and comparable companies it would give more or less the same as the results I get, or the results will move in the favor of the VC backed companies.

The companies found through VentureXpert are not a part of this test, but I would expect more or less the same result. Amongst these companies, there are at least three companies that I would have liked to include in my selection, but cannot due to bankruptcy. There are possibly some bankruptcies among the expansion investments, but it is believed to be smaller (Ref, statistics Norway's statistics, i.e. the likelihood of bankruptcy decreases with age). If I had looked at the seed investments it would probably be an even higher rate of bankruptcy among VC backed companies.

4.6 Reporting bias

The data collected through VentureXpert is based on voluntarily submission, and therefore the companies that I have been able to collect from here might be the best investments that VCs have made. MENON has the majority of VC investments after 1997, but also here it is based on reporting by the members of NVCA, where not all VC firms are members. The coverage is better on the more recent investments made, both because of the expansion of the number of members of NVCA and the fact that the members does not necessarily report historical investments, but are assumed to report investments at least from the day they became members of NVCA. However, because I am also dealing with the older segment of their database, there can be some positive reporting bias here also. There might not be any bias from reporting, but it should be kept in mind that there might be.

5. PRESENTATION OF TESTS AND RESULTS

The results of the tests conducted to check if VC backed companies experience higher growth than benchmarks, are presented in this chapter. First the result of a test of the percentage of VC backed companies that do better than their benchmarks is presented. Secondly, t-tests that test if the extra growth in the VC backed companies can be concluded to be significant are presented. The t-tests not only take into account if a VC backed company grew more than benchmark, but also the size of the difference in growth. In the end of this chapter I present further testing of the differences in growth between the VC backed companies and their benchmarks based on characteristics of the VC backed companies. This is done for different industries, differences in age, difference in age when the company first received VC funding, a simple test for survival bias and possible differences if more than one VC has invested in a company.

The description of the data collected has already been presented in chapter 4, before presenting the results a description of formulas used to be able to compute the tests are presented, followed by the description of the tests. The growth numbers used are calculated with the cumulative average growth formula:

(1) $Growth\ (G) = (Q_{2006}/Q_{2003})^{(1/(2006-2003))} - 1$ (Møen 2007)

After doing this for each of the VC backed companies and the comparable companies, I create a difference in growth between each VC backed company and the average and the median of its comparable companies:

(2) $Difference = G_{Portfolio\ Company} - G_{Benchmark}$

This difference can be viewed as a difference in difference estimator. The difference in difference (DID) estimator is defined as the difference in average outcome in the treatment group before and after treatment minus the difference in average outcome in the control group before and after treatment (Albouy).

(3) $DID = (\bar{y}B,2 - \bar{y}B,1) - (\bar{y}A,2 - \bar{y}A,1)$ (Albouy)

Normally the difference in difference estimator is used in a regression to predict outcome for the treatment group based on the effects in the control group in the period plus the effects of the treatment. For the estimator to be correct the additive structure has to be correct, as well

as the error term on average needs to be zero and uncorrelated with other variables used in the regression (Albouy). I do not try to estimate a correct percentage point value added by VC funding, but that is the interpretation of the average per year percentage points higher growth experienced in VC backed companies. My aim is to test if this difference in difference can be concluded to be significantly greater than zero, which is done by doing a t-test on the average difference in difference. I do this both for the average difference in difference between each VC backed company and its benchmark, and for the average growth of all VC backed companies compared to the average growth of all benchmarks.

The way I use the difference in difference in my first t-test is: (Value 2006 VC backed – Value 2003 VC backed) – (Average/median (Value 2006 Comparable company – Value 2003 Comparable company)). Instead of using the values themselves, I use the annual growth rate (formula (1)). I treat and use the terms difference in growth and difference in difference equally further on in this thesis. The difference in difference can be used on each of the VC backed companies like I do here, or on an aggregate level like I do later on when I compare only the groups.

The growth in a company can be explained by a number of characteristics, like the economy, the industry code, age and other explanatory factors such as ownership. I create a benchmark for the expected growth that each VC backed company should expect to have in the period. Therefore the results I get indicate the difference in growth that comes from having received a VC investment. Later on, I also show differences in the difference in difference based on other characteristics of the VC backed companies.

If there is a better development in the VC backed companies, the difference in difference should on average be larger than zero. I expect VC backed companies to grow faster, based on the characteristics described in chapter 3. Hereunder especially selection skills, skills in active ownership as well as wide use of contractual terms that encourage value creation. I conduct a hypothesis test, where the null hypothesis is that there is no difference in growth between VC backed companies and benchmark. The alternative hypothesis is that there is a significant difference in growth between VC backed companies and benchmark.

To find out if there is a significant enough positive differences in differences to conclude that VC backed companies grew more, I assume a binominal situation where there is a likelihood of 50% of a VC backed company growing faster than comparables. This can be compared to

flipping a coin, there is a 50% likelihood of heads and tail and in the end one expects it to be around 50% heads and tails if one flips the coin enough times. (Møen 2007)

(4) *Share of positive differences in differences > $p + k * \sqrt{(p\ (1-p)/n)}$, $p = X/N$ and p is the expected to be 0.5. Assuming that the results are approximately standard normal distributed, the percentage of positive difference in difference that I need to observe has to be above $p + k * \sqrt{(p(1-p)/n)}$. Here p is equal to 0.5 and k will be equal to the z-value for the significance level one wants to test.* (Møen 2007)

Further on it is important to have an idea about the size of the difference in differences. If the positive differences in differences are very large and the negative differences in differences are very small, it indicates a good on average performance by the VC backed companies. This way, it would be possible to prove that VC backed companies perform better, even though the share of positive differences in differences is not large enough to claim a better performance by VC backed companies.

Table 1 shows the average of the 71 or 69 differences in differences between each VC backed company and its benchmark, which is either the average or the median growth of the comparables in the benchmark (formula (2)). Note that this average difference in difference is the same whether I compute the average of the difference in difference for each VC backed company or subtract the average of all benchmarks from the average of all VC backed companies. The interpretation of difference in difference estimator (formula (3)) will therefore be the same and is not treated in the section where I compare the groups.

The VC backed companies on average experienced about 15 percentage points higher sales growth than benchmark, about 14 percentage points higher growth in revenues, around 10 percentage points higher assets growth and approximately 1.5 percentage point higher growth in the number of employees (table 1, two pages below). All of the variables show an on average higher growth in the VC backed companies than benchmark. The interpretation that can be made is that these percentage points are what one can expect a VC backed company to grow on top of the benchmark growth. Under the assumption that the growth in a VC backed company can be explained and projected by the growth in the benchmark I have created plus a certain percentage point added growth (DID).

To decide whether I can state that the VC backed companies grew more than their benchmark I conduct a t-test that takes into account the variability of the difference in differences. This

test takes into account that it is not just whether the difference in growth from benchmark is positive or not that should be considered, but also the size of the difference in difference. The null hypothesis is that on average there is not a statistically significantly higher growth in VC backed companies than in their benchmarks. The alternative hypothesis is that there is a higher growth and it cannot statistically be a coincident that the VC backed companies grew faster than their benchmark.

(5) $T = (x-\mu)/\sqrt{(S^2/N)}$ (Møen 2007)

X refers to the average of the values that one wants to test, in my case the differences in growth, and μ refers to the value that one wants to test the significantly difference from, in my case zero. S refers to the standard deviation of x and N is the number of observations of differences for each variable. The t-value that the test returns explains the number of standard deviations away from μ that x is. The number of standard deviations away from μ has a certain probability of achieving an x value between the t-value and μ. If the probability of obtaining the actual t-value or higher is very low, it can be concluded that the x is statistically significantly different from μ.

(6) $S_x = \frac{1}{n}\sqrt{\sum_{i=1}^{n}(X_i - \overline{X})^2}$ (Lillestøl 1998)

$\overline{X}$ refers to the average of the observations in the standard deviations formula.

Further on I use a z-test to find out if the differences are statistically significant. Using the z-test I assume that my selection is representative for the whole population of such comparisons between VC backed companies and their benchmarks and that the whole population is large and therefore will be normally distributed:

(7) $Z = (x-\mu)/\sqrt{(S^2/N)}$ (Møen 2007)

The z value will have to be larger than 1.96 for the difference to be statistically significant at the 95% level, that is that the probability that it is a coincident to obtain this result in the sample is smaller than 5%. The z value needs to be larger than 2.58 for the difference to be statistically significant at the 99% level. (Lillestøl 1998)

5.1 Results and conclusions for differences in growth between VC backed companies and benchmark

Table 1: Difference in growth from benchmark summary

The table below shows the difference in yearly average cumulative growth in the VC backed companies from their benchmarks from 2003 to 2006. It shows the average difference in difference from the average and median of comparable companies, standard deviation and also the highest and lowest of the observed differences in growth. This table also shows the results of the significance tests and the share of VC backed companies that grew more than their benchmarks from 2003 to 2006.

	Sales		**Revenues**		**Assets**		**Employees**	
Comparable companies	*Avg*	*Med*	*Avg*	*Med*	*Avg*	*Med*	*Avg*	*Med*
Average difference in difference	0.153	0.155	0.138	0.138	0.093	0.116	0.016	0.018
Stdev	0.682	0.683	0.352	0.348	0.372	0.388	0.275	0.248
Highest difference in difference	4.269	4.232	1.315	1.296	1.176	1.338	0.870	0.729
Lowest difference in difference	-1.358	-1.327	-0.641	-0.617	-0.576	-0.459	-1.009	-1.000
Observations	69	69	71	71	71	71	69	69
T/Z value	1.866	1.881	3.316	3.351	2.107	2.510	0.484	0.587
Stat sign 95 %	No	No	Yes	Yes	Yes	Yes	No	No
Stat sign 99 %	No	No	Yes	Yes	No	No	No	No
Positive differences	42	43	43	42	38	39	36	37
Share positive diff	0.609	0.623	0.606	0.592	0.535	0.549	0.522	0.536
Stat sign 95 %	No	Yes	No	No	No	No	No	No

Around 60 % of the companies that have received VC funding grew faster than comparable companies in terms of sales and revenues. In terms of assets and employees only slightly more than half of the VC backed companies grew more than their benchmarks. Even though this is not as convincingly, what can be interpreted from this is that there seems to be a better development of efficiency in terms of the revenues/assets and revenues/employees in VC backed companies. On the other hand, I had expected to find larger positive difference in

difference in terms of assets and employees, especially when knowing that I had to leave out about five companies due to bankruptcy. I cannot obtain the industry code for companies that has gone bankrupt some time ago, and therefore cannot create a proper benchmark for these companies. Consistent with the findings of Petterson and Sjøblom (2006), it looks plausible to assume that revenues growth is stronger in VC backed companies than other similar young companies.

First I want to test if a large enough number of VC backed companies outperform benchmark (formula (4), p=0.5, k=1.96 (page 42), n= 71/69). This is done with the percentage positive differences in differences and tests if it proves to be significantly plausible that VC backed companies grew more than benchmark. 62 % of differences in differences would have to be positive in sales and number of employees in order to conclude with 95% probability that it actually is higher growth in VC backed companies. In terms of revenues and assets, 61.6% of the differences in differences need to be positive in order to conclude with 95% significance level that VC backed companies grow more than benchmark from 2003 to 2006. Thus, I can only conclude that sales against the median of comparables is statistical significant on a 95% level. Even if not significantly proven, the results strongly indicate that in terms of sales and revenues VC backed companies grow more than benchmark. (See table 1 above for the share of positive differences in differences)

The t-test with 70 degrees of freedom requires only slightly higher needed t-values than the normal distribution z-values to conclude with 95 or 99 % significance. It requires t-values of 1.99 for 95% probability and 2.65 for 99% probability. The conclusion is the same whether I use the t-test or the z-test.

There is a statistically significantly higher growth in total revenues and total assets in VC backed companies than benchmark in the period 2003 to 2006. The null hypothesis is rejected in these two variables and I can conclude with proven higher growth in VC backed companies. Revenues are significant at 99% level and assets at 95% level, both against the average and the median of comparable companies. I find it strange that sales and revenues provide very different significance levels although they have approximately the same average difference in difference. The difference in difference in sales includes some extreme results which make a significant impact on the standard deviation (table 1). There are not similar extreme results in the revenues growth. It is the result of different categorizing of revenues in

the beginning versus the end of the three year period examined that drives these results. A couple of VC backed companies have had a large share of other revenues relative to sales in 2003, but not in 2006, the benchmark companies have not had the same type of change in other revenues relative to sales revenues. The comparables are chosen on the background of revenues in 2003, not sales, and that explains this difference.

I get more or less the same results when comparing the growth in VC backed companies to the average and median of comparable companies, but often the difference in difference when using the median of the comparable companies is slightly higher. This indicates that there are larger strongly positive than strongly negative growth observations among the companies in the benchmarks.

The results the difference in difference in revenues is consistent with the results that Petterson and Sjøblom (2006) obtained in Sweden. I expected this result due to the effect of selection done by the VC and the effect of having a competent owner such as a VC (chapter 3). The benchmark is expected to contain some companies that are not potential successes and some companies without growth ambitions strengthened my expectations (chapter 4.4), and the result is thus not a surprise. To have as convincing results as 99% significance level is none the less a very strong indication that the growth in revenues is higher in VC backed companies than comparable companies with other types of owners.

Some of the VC backed companies have been exited, and that could influence the results in my tests. Some might argue that the results from the tests therefore are not fitted to say something about the impact of VC to growth in young companies. In my opinion, the skills of the VC in shaping the company so that it attracts competent owners should influence the performance positively, even after the VC has left the company. The VC has an interest in the performance of the company also after exit. In order to attract investors to new funds, my impression is that it is valuable to have well known, good performing companies on the list of realized investments. In their webpage, VCs often tell about successful former portfolio companies. The effect of a VC's shaping of the organization prior to an exit is also expected to last for some time after the VC has left the company. Based on these arguments and the discussion in chapter 4.2 about the data set and what I want to measure, I believe that the data set is well fitted to say something about VC effect in performance of young companies.

In terms of growth in assets, the VC backed companies also convincingly outperform their benchmarks. This serves as a proof that VC backed companies are better at getting further funding from investors or lenders and/or better at making earnings and investing it further in assets than benchmark companies. If investors inject more capital into a company, it represents a belief in the future performance of the company and that should be a positive sign for the young company (chapter 4.1). In order to get a loan, the debt suppliers will have to believe that the company is able to repay the debt and interest (chapter 4.1). To be able to grow in assets through internal profits also is a very positive sign that the company is managing its operations very well (chapter 4.1). Capital provided through internal generation, through loans or share issues all indicate that the period and the future have better prospects for the VC backed companies than benchmark. Another possible explanation that one could argue is a negative signal in terms of an increase in assets is capital injected because of a liquidity problem. Such problems can arise due to poor performance or from circumstances outside the company's control. However, rational owners should not inject the liquidity needed if the payoff from doing so is expected to be smaller than not doing so (Johnsen 2007). Summarized, I find it plausible to conclude that the statistically significant result in difference in difference in assets strengthen the conclusion from growth in revenues; that VC has a positive impact on the long term performance of companies.

Unlike the results in revenues and assets, the difference in difference in the number of employees is not statistically significantly positive. The result may be influenced by the inconsistent reporting of number of employees inside Ravn (chapter 4.1.3). The results that I have found are not necessarily negative in terms of the impact of VC; it can indicate a greater efficiency in terms of revenues/employees, where VC backed companies do better than benchmark.

5.2 Test with VC backed companies against benchmarks, treated as groups

To check the robustness of my results, I conducted another test, the t-test applied on two groups. This test for one group against another group is defined by this formula (Møen 2007):

$$(8)\ T = (Average\ X_1 - Average\ X_2) / \sqrt{((S_1^{2/}N_1)+(S_2^2/N_2))}$$

The first group is the VC backed companies. The second group is the benchmarks. I assume that the two groups are similar except for the VC funding that one group has received. This test compares all VC backed companies against all the benchmarks, different from the first

test, where I compare each VC backed company strictly to its benchmark and use those differences in differences in the test. The comparable group results are smoothed when compared to Alemany and Marti (2005) and Petterson and Sjøblom (2006), where the second group consist of comparable companies and not of averages or medians of comparable companies.

Table 2: Summary of test with groups compared

This table shows the average growth in the three groups from 2003 to 2006. The first group is all VC backed companies and the second and third group is the benchmarks. Therefore the number of observations is the same in all three groups.

		Sales	Revenues	Assets	Employees
Average growth					
	VC backed	0.288	0.285	0.264	0.067
	Avg comp	0.135	0.146	0.171	0.051
	Med comp	0.133	0.147	0.149	0.050
St dev					
	VC backed	0.686	0.388	0.397	0.244
	Avg comp	0.167	0.172	0.128	0.111
	Med comp	0.120	0.136	0.120	0.086
Highest observed growth in group					
	VC backed	4.265	1.629	1.444	0.729
	Avg comp	0.764	0.994	0.566	0.347
	Med comp	0.591	0.954	0.555	0.442
Lowest observed growth in group					
	VC backed	-1.000	-0.500	-0.290	-1.000
	Avg comp	-0.153	-0.199	-0.035	-0.251
	Med comp	-0.135	-0.079	-0.002	-0.206
Observations					
	VC backed	69	71	71	69
	Avg comp	69	71	71	69
	Med comp	69	71	71	69
T/Z value VC backed group against benchmark group…					
	Avg comp	1.804	2.983	1.877	0.497
	Med comp	1.847	3.107	2.348	0.563
Stat sign 95 %					
	Avg comp	No	Yes	No	No
	Med comp	No	Yes	Yes	No
Stat sign 99 %					
	Avg comp	No	Yes	No	No
	Med comp	No	Yes	No	No

The table above shows the results from the t-test of groups compared (formula (8)). This test shows statistical significance in revenues against both average and median of comparable companies at 99% level and assets against the median of comparable companies at 95% level. The results in this test are similar to the results in the basic test, but now there is not statistical significant difference in assets versus average of comparables. This robustness check indicates that my results are valid and robust. In addition, this test has a value with respect to a comparison to the tests done by Alemany and Marti (2005) and Petterson and Sjøblom (2006), because it is the same test (formula (8)).

I observe somewhat lower t-values when using groups rather than differences in differences (table 1), except for sales against median of comparable companies and employees against average of comparable companies. The lower t-values are explained by a higher standard deviation used in this test than in the first test (tables 1 and 2). The difference in difference between each VC backed company and its benchmark does not vary as much as the growth itself, which is why the standard deviation is higher in this test with groups. The standard deviation is lower when I compare each VC backed company only to its benchmark, as the benchmark is believed to express expected growth due to other factors than the VC funding and thereby be more similar across VC backed companies than growth itself.

5.3 Growth in VC backed companies compared relative to the growth in benchmark

Up until this point, this thesis has assumed that the added growth of having received funding from a VC is expressed additive in terms of per year percentage point growth. If the effect of VC should be more or less equal across different industries, age groups etc, I would expect the relationship to be expressed as a function of the growth in the benchmark rather than adding a certain percentage point extra growth across all VC backed companies. If the growth is expressed as a function of growth in benchmark, it is in my opinion easier to get an impression of the impact of VC. I find it advantageous to be able to see the relative impact and it easier to generalize and understand results when they can be made into ratios.

An exemplification of the benefits of the relative difference testing is the comparison of two VC backed companies and how they would be ranked in terms of performance. If one of them grows 20% and its comparables have an average growth of 10% it reflects a difference in difference of 10%. The second VC backed company grows 40% and its comparables have an

average of 20% growth, resulting in that the second one will be ranked as twice as good as the first VC backed company in difference in difference. However, relatively both these companies will do equally well, with twice as high growth as their benchmark.

(9) *Relative difference = Difference in growth (DID) / Average or median growth of comparables*

This test requires that both the VC backed company and the average or median of the comparable group need to have positive growth from 2003 to 2006. This test will therefore be biased in one way or the other depending on which of the VC backed and the benchmark that benefits from the removal of several differences in differences. The growth in a VC backed company can be expressed as multiplying one plus the relative difference with the growth in its benchmark. This test can be used as a robustness check and also as an indication of how much better a company is expected to perform if it receives VC funding than it would without VC having received VC funding.

Table 3: Relative difference summary

The table below shows the relative difference in growth between VC backed companies and their benchmarks (formula (9)). Otherwise it is the same as table 1, in terms of information and layout.

	Sales		**Revenues**		**Assets**		**Employees**	
Comparable companies	*Avg*	*Med*	*Avg*	*Med*	*Avg*	*Med*	*Avg*	*Med*
Average relative difference	30.34	4.92	3.20	3.95	2.57	16.24	3.38	1.45
Stdev	171.05	18.76	13.61	11.85	5.27	79.16	11.27	3.06
Highest relative difference	1149.64	130.74	100.21	78.08	31.37	562.63	65.52	12.65
Lowest relative difference	-7.34	-0.99	-3.73	-0.99	-1.71	-2.53	-1.00	-1.00
Observations	46	51	55	58	52	53	41	34
T/Z value	1.203	1.874	1.746	2.541	3.517	1.494	1.920	2.751
Stat sign 95 %	No	No	No	Yes	Yes	No	No	Yes
Stat sign 99 %	No	No	No	No	Yes	No	No	Yes
Positive differences	32	39	36	40	38	39	22	20
Share positive diff	0.696	0.765	0.655	0.690	0.731	0.736	0.537	0.588

The table above shows the average relative difference in growth between the VC backed companies and their benchmarks as a ratio of the growth of the benchmark. The average for all of the variables examined shows that the VC backed companies on average experience at least 150% higher growth than benchmark. Note that especially in sales there are some results that gives a very high average relative difference, these results are over a thousand times better than comparables.

I also conduct tests for statistical significance on these values (formulas (5) and (7). In terms of relative difference, the VC backed companies show better results than in the original test, the lowest t/z value is 1.2, which gives a probability of around 25 % that it can be a coincident to obtain these results (Lillestøl 1998). There is statistical significance on 95 % level for revenues against the average of comparables and 99% level for employees against median and assets against average of comparables. I am surprised to see that also the number of employees grew faster in the VC backed companies, with the most convincing numbers of all variables in this test. This difference in results in employee growth is most likely explained by the ruling out several values from the selection.

After having removed the differences in differences that did not fulfill the requirements for calculating a relative difference, the percentage of positive relative differences was higher than in the original test. Thus indicating that the results that are obtained in this test are positively biased in favor of the VC backed companies compared to the original selection. Table 3 can be compared to table 1 to see the difference in the results from the t-test in this chapter and the original t-test in chapter 5.1.

Depending on standard deviations and bias these results are varying a lot, however all these results indicate that VC backed companies do better when both the benchmark and the VC backed company has had a positive development from 2003 to 2006 in the variables chosen. This test and the t-test conducted on the groups give similar results to the original test in terms of indicating that a positive impact of having received funding from a VC.

5.4 Test of survivorship bias impact on the result of differences in differences

To control some for the potential survivorship bias mentioned in chapter 4.5, I do a test where I include two negative differences in differences of 90% in all variables and three negative differences in differences of 60%. The 90% negative ones indicate a bankruptcy before the

period and the 60% in a year or two after the period has ended. A complete failure that early for the VC backed companies, with this huge negative difference in growth, might be too high though. I have collected data on one company that went bankrupt in 2008 that actually had a positive growth of 93 % in revenues during the period. This test is not based on any specific real numbers, but serves merely as a robustness check of results. Interpretation should be done carefully and the reader can think of this results as over or under exaggerating based on own points of view. (See appendix 1 for the whole description of the results when adding the survivorship bias test)

The results of this test show that there is no statistical significance, although I observe a t-value of 1.78 for revenues. Even with this pessimistic trial of including bankrupt companies there is a positive average difference in difference in three of the variables and especially in revenues. The difference in difference in employees is now on average negative. In respect to this, one should note that the volatility in the difference in difference in employees is smaller than for the other three variables in the original selection (table 1). Thus indicating that the huge negative differences in differences in the number of employees added might be less realistic than in the other three variables. I did not include the percentages of positive and negative differences as they are around four percentage points lower for all variables and therefore not particularly interesting to look at in this context.

It should also be noted that I cannot obtain numbers of comparable companies that have gone bankrupt some time ago, as they will not show industry code either. If these were included I would expect several of the averages and medians of the comparable groups to be lower also. If these were included, it should make all the VC backed companies in the sample show better results. Taking this into account, this test is not needed, although it can serve as a robustness check of the results.

5.5 Test for influence of age on the performance of VC backed companies

The purpose of this chapter is to check whether the age of the VC backed company has an influence in the difference in growth from the benchmark. This test gives information to whether the benefit of having received VC funding increases with age or decreases. It might provide information to whether a company should consider approaching a VC or not, but that is further treated in chapter 5.6. This is the first of the tests that check if the results for the

average extra growth that the VC backed companies experience relative to their benchmark vary across the VC backed companies based on characteristics of the VC backed companies.

When I conduct my tests for age and age when the VC invests I use a simple regression to estimate the increase or decrease in the difference in difference due to age of VC backed company:

(10) Difference in growth = a +bx

This is done by applying the ordinary least square regression (OLS):

(11) $Y = \overline{Y} + R_{XY}(S_Y/S_X)(X - \overline{X})$ (Lillestøl 1998)

R_{xy} is the correlation-coeffisient between Y and X. and defined by this formula; where S_{XY} is the covariance between X and Y.

(12) $R_{XY} = S_{XY} / (S_X * S_Y)$ (Lillestøl 1998)

(13) $S_{XY} = \frac{1}{n} \sum_{i=1}^{n} (X_i - \overline{X})(Y_i - \overline{Y})$ (Lillestøl 1998)

Where b is the difference quotient, which indicates the value that the difference grows with one larger x. X in this case is the age in 2003, and the age when the first VC investment took place in the other test later on. Please note that all regressions returns numbers, a result of 0.01 in difference quotient means that for each year older than zero a VC backed company is, there is a one percentage point higher difference in difference growth.

Table 4: Difference quotients for age in 2003 in the difference in difference

	Sales	*Revenue*	*Assets*	*Employees*
Average	-0.005	-0.007	-0.005	0.000
Median	-0.009	-0.011	-0.008	0.000

All values except employees indicate a higher difference in difference the younger the VC backed company is. The differences between the VC backed companies are not large; on the most the decrease in difference in difference is 1.1 percentage points in yearly growth per year older than zero the VC backed company is (revenues against median of comparable companies). The result can be explained by three factors other than young VC backed companies simply perform better than older VC backed companies. For one, older

comparable companies are more likely to be successes as most companies that go bankrupt do so rather quickly after establishment. In Norway, only 58% of established enterprises survive the first year and only 37% survive the first four years (Statistics Norway 2009). Secondly, VCs normally invest in fairly young companies and therefore it is more likely that the younger companies have the VC as an owner the whole three year period, and this could have a positive impact. If one assumes that a VC is better for growth than any other owner, this positive impact can be an explanatory reason. The third possible explanation is that young companies could be expected to grow more than older companies. It might be true that even though the relative difference between a VC backed company and benchmark is the same, for instance 3 to 1, the difference in difference will decrease with the age of the VC backed company. The simple regression might also be too simple to identify such a relationship, and therefore the correct relationship might not be this way. This test does however give an indication to that younger VC backed companies have a higher difference in difference from its benchmark than older VC backed companies.

5.6 Test for influence of age when first VC investment on performance of VC backed companies

I also test whether the age when the company received its first registered VC investment has some impact on the difference in difference (formula (10)). This test can show young companies when it is most beneficial to approach a VC relative to not approaching at all. Also here one need to keep in mind that VC backed companies is owned by a VC for anything between none and all of the three years examined. The ownership in the period could have an impact that is not addressed in this thesis.

This test cannot be conducted in a consistent manner on my whole data material as I have collected data from two sources. These sources classify the investment phase somewhat differently, as well as the data collected from MENON does not state whether the company has obtained a VC investment in the seed phase. Therefore, I do a test with only the VC backed companies that MENON has registered as start-up/venture investments.

Table 5: Difference quotients age for first VC investment only start-up/venture category in the difference in difference

	Sales	*Revenue*	*Assets*	*Employees*
Average	-0.003	-0.002	-0.004	-0.008
Median	-0.010	-0.012	-0.005	-0.007

All variables indicate a higher difference in difference the younger the VC backed company was at the time of the first VC investment. The result here is similar to the ones with the regression against age. However, in this regression the difference in difference in employees also decreases with the age of the company when a VC first invested. This indicates that the advantage of VC is larger in the beginning of the company's life. Before stating this as a clear fact I have to acknowledge that there can be other factors that explain the results. The age argument of the comparable group in chapter 5.5 can be thought to explain some of this result. If all of these companies received the first VC investment in the same year, the age argument would have an impact on the results in the difference quotients in this regression. All of the companies used in this regression equation are invested in between 2000 and 2004 and indicate that the age argument can be an explanation. This way the younger firms will have a benchmark with an average lower quality than the older companies and therefore the difference in difference will be better for younger companies. The fact that they are invested in at around the same time can indicate some correlation between age in 2003 and age when first VC investment was made. In addition the argument that younger companies grow more than older thereby also might be of relevance to interpret these results (chapter 5.5). Keep in mind that even though all of these show the same indications, the differences in values are very small and thus might not give any particular knowledge or conclusions.

Another explanation of the results can be that a VC is willing to invest earlier the better the prospect of a company is. Arguments for this would be that the companies with best prospects do not need to prove itself for as long a period of time to attract investors and thereby the VC investment will happen earlier. In addition, it is a significant limitation to this test that seed capital can matter, but this I do not have the data to draw any conclusion on. Regardless of reason, it seems to be good for long term performance relative to benchmark have a start-up/venture investment by a VC as early as possible for a young company with growth ambitions.

As a curiosity I have included the description and t-test results for only the VC backed companies categorized as start-up/venture investments by MENON and compared it to the result of the whole selection. With only 33 observations there is still statistical significantly better performance by VC backed companies in the growth in revenues. In this group the average positive difference in assets growth is smaller, but higher for sales growth. Even with this few observations I still get statistically significant results for revenues growth. (See appendix 2 for a summary of the results from the start-up/venture selection)

To explain these results I present a potential relationship hypothesis. All young companies will have to establish a certain amount of capacity to operate, but only some will grow enough in revenues to make the effort of this established capacity worthwhile. As the companies mature, only the best companies can expect to be able to grow even further in revenues and thereby, only the best companies need to expand capacity. Assuming that VC backed companies are among the most successful companies it can explain why I find that the VC backed companies in the start-up/venture phase had smaller difference in difference in assets and employees than all VC backed companies. These companies might not have reached the age where the originally established capacity is not enough anymore, and that capacity is more or less the same as the benchmark even though VC backed companies have higher revenues growth than benchmark.

5.7 Tests for differences in VC backed companies performance due to industry differences

It would be interesting to know if VC backed companies perform better relative to benchmark in certain industries than others. If there are differences here it might indicate that VC works better in some industries than others, or that the VCs ability and advantage in selecting the best companies is better in some industries than others. For both companies that consider VC funding, VCs themselves and investors that allocate capital through VCs could make use of this type of information to make decisions about funding and positioning.

I would expect that VC should have a stronger impact in industries where there is a typical race to launch a new technology or other types of industries with a clear first mover advantage. If the VC really makes the probability of success in a clear first mover advantage situation or in a patent race, then on average there could be larger differences than in a more differentiated market situation.

When interpreting results it should also be kept in mind that some VCs are specialized in one industry. The VCs might be of different quality, as they are assumed to be because the good ones stay among the best over time (chapter 1.7). Therefore, the two or three best VCs in Norway potentially invest in the same industry; this industry therefore might show better results than others.

5.7.1 Difference in performance of VC backed companies based on broad industry association

The data collected has an industry definition; however MENON and VentureXpert do not have the same categorization. I have made *Life Science & Biotech* categorization from MENON and the *Biotechnology* categorization from VentureXpert into the same industry, *Life Science & Biotech*. VentureXpert also uses a category of *Medical/Health* that has one recorded company that I include in the *Life Science & Biotech* category.

Further on MENON has the broad category of *ICT* (Information and Communication Technologies), whereas VentureXpert uses *Internet Specific*, *Computer Software and Services*, and *Computer Hardware*. I do not want to compare more specific groups against the broad group that contains also some of this category. I therefore group all these as *ICT* for the general comparison and after that I will do a comparison between the twelve companies categorized as *Internet Specific*, *Computer Software and Services* and *Computer Hardware*. Even though this is a very small sample it might show indications of differences also inside the *ICT* category.

In addition to these two categories I include *Oil & Energy* as an own group. It contains seven companies and other specific industries contain only maximum two companies. There are two companies that are in the category *Industrial/Energy*; after a quick research on the web I include one of them in the *Oil & Energy* group and the other one in the *Other Sectors* group. The *Other Sectors* group contains categories with one or two companies in, as well as those categorized as *Other Sectors* or unknown.

It should be noted that these broad categories might not be consistent with the industry code that Ravn uses a company is registered in. There might be a company listed in the same industry code as another company, but these two companies can operate within different broad industries. Within each industry code the VC should be able to choose or lead the company in the right industry. I also conduct a test on the industry codes from Ravn to see the

performance when the comparables are definitely within the same categorization as the VC backed companies.

There is a clear overweight of VC backed companies in the ICT category. It represents around half of the selection. Therefore this is the single most important driver of the overall results. (See appendix 3 for a table with complete information of the differences between broad industries)

Figure 6 present a graphical illustration of the difference between industries in the added average percentage point growth that a VC backed company experienced relative to its benchmark from 2003 to 2006. Figure 7 shows the difference between industries in the share of VC backed companies that grew more than benchmark. (The difference in difference against the median can be found in appendix 4, and the percent positive differences in growth against median can be found in appendix 5.)

Figure 6: Average percentage point difference in growth between VC backed companies and their benchmarks, sorted by broad industry

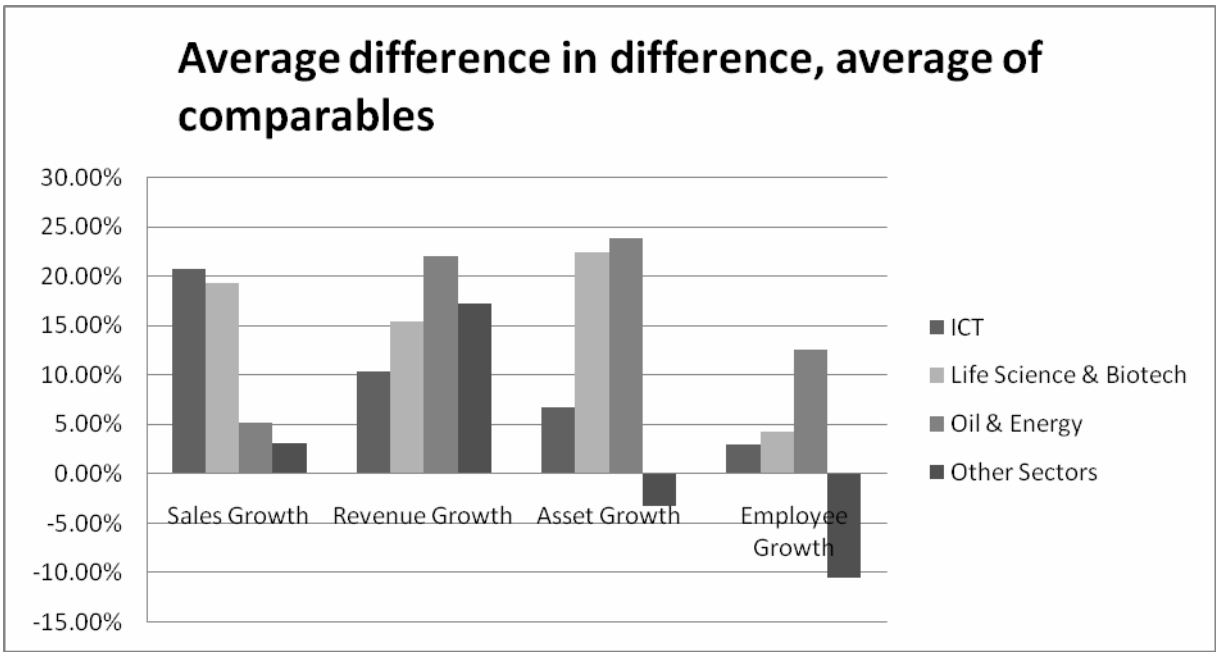
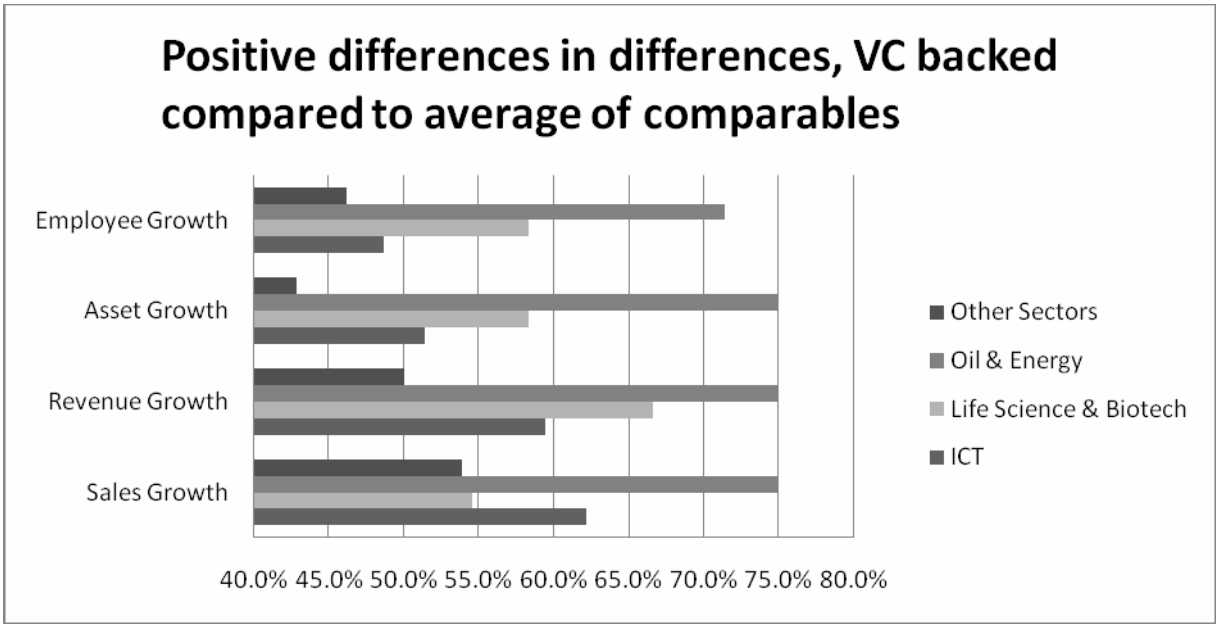


Figure 7: Percent positive differences in growth VC backed companies compared to benchmark, sorted by broad industry



The *Oil & Energy* sector seems to do very much better in differences in differences than the other sectors. This can partly be explained by the very good years for the oil industry with high energy prices and high level of activity in Norway. The first argument to support this view is if one assumes the relative difference in difference to be the same across industries, the companies where the benchmark has the highest growth should experience the highest difference in difference too (chapter 5.5). The comparable companies in the benchmark do not necessarily operate within the *Oil & Energy* industry, and that can also explain this large difference.

ICT does better than *Life Science & Biotech* and *Other Sectors* in sales growth in terms of. In assets and employees growth, the *Oil & Energy* sector does very well. In assets and employees, *Life Science & Biotech* does better than *ICT,* while *Other Sectors* actually grew less than benchmark.

Life Science & Biotech seems to be more assets and labor intensive than *ICT* and *Other Sectors*. Under the assumption that there is a more or less equal advantage of VC across industries. In *Life Science & Biotech* there seems to be more revenues categorized as other revenues than sales. The *Other Sectors* results might have more efficiency gains as it decreases in terms of assets and employees relative to benchmark, but increases in revenues.

Oil & Energy might not be completely valid because of comparables, but that other than that the companies in *ICT* do well in sales and revenue, while *Life Science & Biotech* does best of the other categories than *Oil & Energy*. In *Life Science & Biotech* companies are often involved in research where breakthroughs need to be done rapidly for the company to be successful, and therefore success depends on the resources that can make this happen (Grünfeld 2009). *Other Sectors* proves to be less successful, but with a question mark due to possible efficiency gains. Summarized *Oil & Energy* together with *Life Science & Biotech* seems to be the categories where VC provides the largest advantage.

5.7.2 Difference in performance of VC backed companies within the computer industry

The observations I have within the *Internet Specific, Computer Software and Services* and *Computer Hardware* can be used to see where inside the computer industry VC seems to have the best impact. This needs to be interpreted with care due to very few observations. Also bear in mind that especially the companies collected through VentureXpert, where all these companies have been found, are entirely voluntary reported.

Although *Computer Hardware* has very few observations and therefore should almost be ruled out it still seems to be a category where VC backed companies seemingly does well. Also *Internet Specific* is a category where VC has a positive impact. In *Computer Software and Services* there seems to be no real difference between VC backed and benchmark. Therefore within *ICT* it seems to be in *Computer Software and Services* that VCs have the least to offer to the young companies. Alternatively it can be that it is very difficult for the VCs to select the best ones here. Therefore it looks more favorable for companies within *Internet Specific* and *Computer Hardware* to bring in a VC relative to companies within *Computer Software and Services.* (See appendix 6 for a summary of results)

5.7.3 Difference in performance of VC backed companies based on industry codes

This test ensures that the comparable group really is comparable. Here the comparable companies are defined within the same five digit industry code as the VC backed company. I include industry codes with more than two VC backed companies from my sample. Note that interpretation of the ones with only two registrations should not be lead to any conclusions due to few registered companies. I still include them to see if there are indications, such as clear negative or positive deviations on both registered companies. There are five industry codes with four or more registered VC backed companies. These five can be used to see if VC

works better within some industry codes than others. The other industry codes with only one registered VC backed company are totally excluded from this sample to this test.

To label the graphs would take too much space inside my graphs; therefore I include the industry codes in a separate table. Unfortunately, Ravn is a Norwegian database that does not have a translated version. I will therefore try to translate the industry code names myself and it might not be the correct description in an English speaking country, but hopefully it will illustrate what kind of category it is for the not Norwegian readers. When the term other is used it is to illustrate that within the main category it is more specified industry codes than the one listed here and the company does not qualify to be in one of those groups. (See appendices 7 through 13 to see the differences between the industry codes used by Ravn)

Table 6: Data labeling list industry code differences test English (Ravn translated)

Number	Industry code and description
1	33200 Production of metal goods other
2	29240 Production of machines and equipment to general use other
3	32100 Production of electron pipes and other electronic components
4	33200 Production of measurement-/control instruments-/-equipment, except industrial process governing system
5	64230 Operator activity on Internet
6	72210 Development of standard software
7	72220 Other consultancy-activity within system- and software
8	72300 Data processing
9	73100 Research and development work within science and technology
10	74209 Other technical concultancy-activity
11	74300 Technical testing and analyses

Group number 6, *development of standard software* is twice as large as the next two big groups and therefore makes the largest impact on the whole sample. I will focus on the four large groups when commenting, 6, 7, 9 and 10, but also comment on very negative or positive results in the smaller groups.

The groups 1, 3 and 11 stands out as the worst categories, where none of the VC backed companies do better than benchmark in sales and revenues. All these industry codes have only two companies and should be interpreted carefully. Especially in *production of metal goods*

the two VC backed performed poorly. The big positive deviations are in groups 5, 7 and 8. The largest group, number 6, also does very well in sales and revenues. Of the large groups, the two software related, 6 and 7 do better than the more technology related 9 and 10 in terms of number of positive difference in differences, but in terms of average difference in difference group 9 is better than group 6. In *other consultant-activity within system and software* (7) all seven VC backed companies grew more than comparables and stands out as the best industry code for VC backed companies. (See appendices 10 and 11 for a graphical illustration of this)

In terms of assets and employees, groups 1 and 11 still underperform compared to benchmark. Group number 7 again stands out as the best one. And the other three big groups seem to do more or less the same as comparables, but group number 6 is the one performing poorest of the four big, and 9 and 10 seem to do slightly better than comparables.

The two technology related industry codes might have a need to grow in capacity to make breakthroughs, while software related companies have a larger emphasis on selling more per capacity unit to perform well. But in overall performance *other consultant-activity within system and software* clearly stands out as the industry code where VC has the best impact. This can indicate that the VCs are relatively better skilled in the critical success factors in this industry code than in other industry codes. It might also be that the best VCs in Norway invest within this industry code. Companies operating within this industry code should be more positive to receiving VC funding than others, assuming that all young companies are more or less equal before a VC investment. With respect to the interpretation here, it might be the case that this industry code has several established companies that are a one man consultancy activity with no further growth ambitions, which should make the difference in difference higher.

5.8 Impact of more than one VC invested in the VC backed companies performance

I believe that if more than one VC invests in a company, that company should do better than the companies where only one VC invests. The results from this test can be useful for VCs, as an indication to whether cooperation is useful, and to the young companies attitude towards bringing in more than one VC is beneficial for growth. To test this I use the information collected from MENON and VentureXpert, separating the VC backed companies into two

groups, one with those where only one VC has invested and another one where more than one VC has invested. In this part of the thesis, I first present the arguments that make me believe that more than one VC should be positive for the performance relative to benchmark. After that I present some counterarguments to my belief. And in the end I present the results.

If more than one VC invests, it might indicate that there is a greater chance of success. If a young company attracts more than one VC it indicates good prospects for the future and thereby indicating good performance after the investment. It has been evaluated as very good by more than one VC, which is a strong signal of good future performance.

The young company may need more capital and other resources that VCs other than the initial VC can provide. Therefore it can be interesting for VCs to share risk and join competencies in their portfolio companies. There can be limitations to how much capital that can be invested into each portfolio company and therefore it can be a good substitute to bring in another VC rather than cooperating with other types of capital providers. It might also be that a fund has invested all its capital, but would like to invest more in a company due to a high probability of a very high return on the whole investment if doing so. Therefore it would be attractive to invite others to become an owner in the portfolio company despite a dilution of ownership.

On the other hand it could be that a VC keeps the best prospects of success to itself and only bring in other investors to the second best prospects instead. This can be an explanation, but I expect that the VC backed companies with more than one VC should do better. The main argument for my opinion is that if one has an ambition to stay in the industry the other VCs will find out if they are only invited to the less attractive portfolio companies. Therefore they will not invite a VC that they feel tricked by to be a co-investor in own good portfolio companies. The VC might lose out on substantial return if it is forced to exit too early or a situation where it is not able to raise the needed capital to make a portfolio company a success. If the VCs could support each other in these cases there would be higher profits for everyone involved in such cooperation. Mutual trust and mutual benefit from cooperation, as well as the VC backed company being evaluated as very good by more than one VC should make only the best chances of success have receive funding from more than one VC.

I conducted a simple test to see if the VC backed companies that have received funding from more than one VC do better than those VC backed companies where only one VC has invested. Like all other tests the difference in difference is the underlying numbers for the test.

Figure 8 shows the average difference in difference for VC backed companies with one and more than one VC invested. Further, figure 9 shows the share of positive differences in differences for VC backed companies with one and more than one VC invested.

Figure 8: Average percentage point difference in growth in the VC backed companies compared to the growth of the benchmark companies, one vs. more than one VC

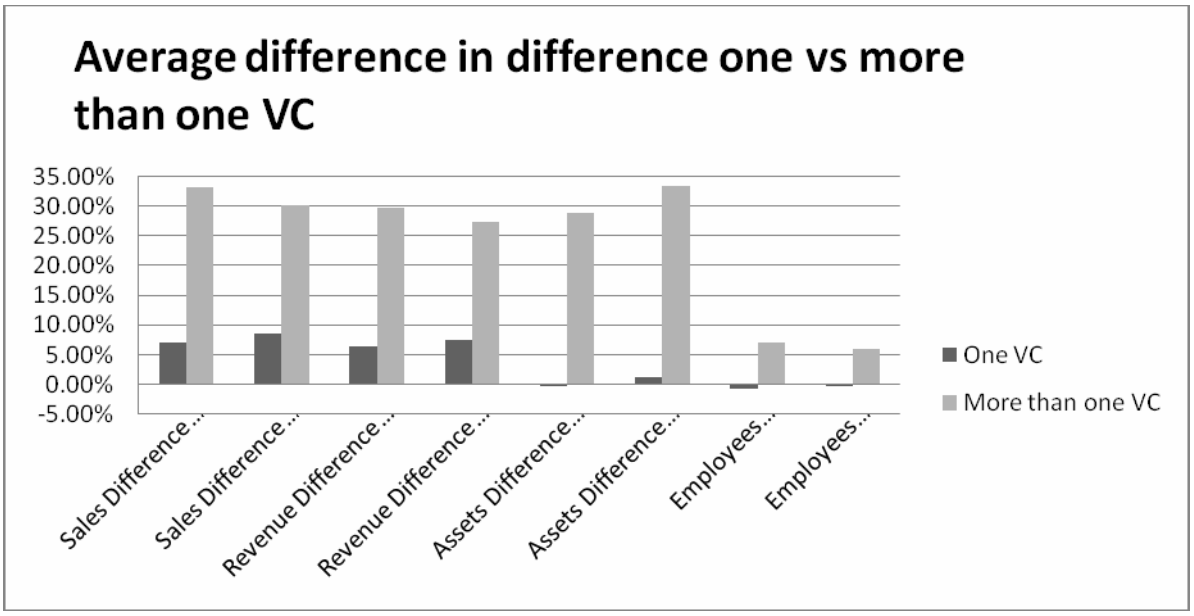
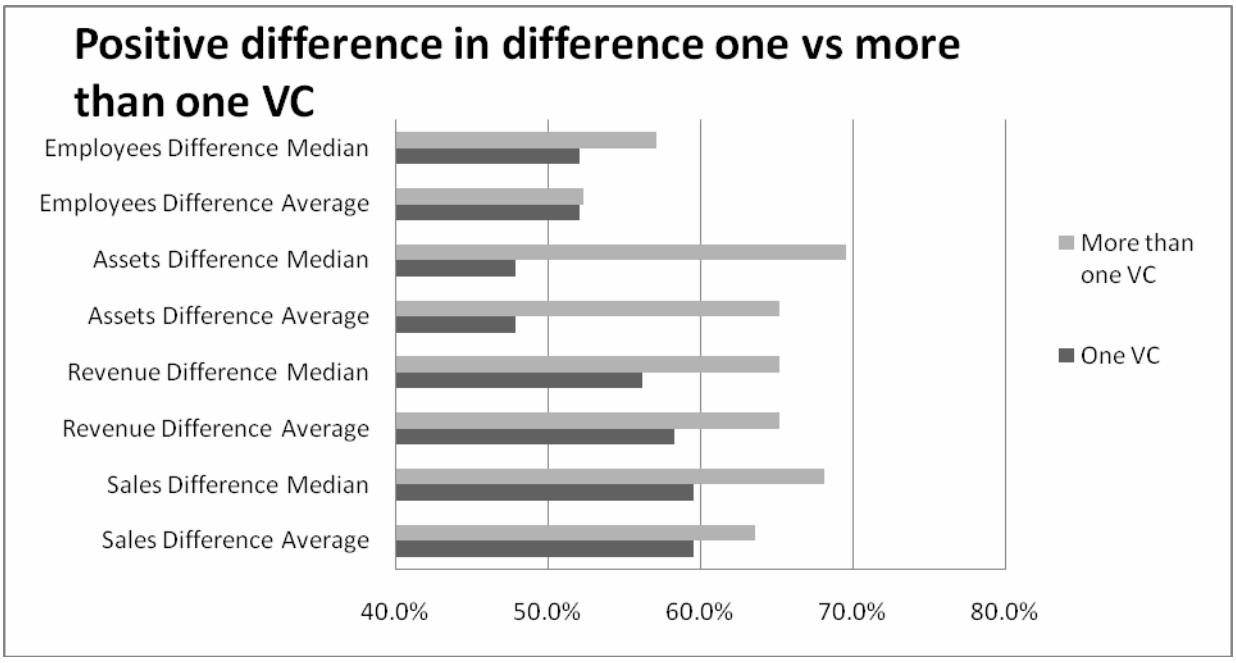


Figure 9: Percentage of VC backed companies that grew faster than benchmarks, one vs. more than one VC



The results of this simple test clearly shows that if more than one VC invests in a company it is likely to do better than a company where only one VC has invested. Especially when looking at assets growth it is a much higher average difference in difference if more than one VC has invested. If the VC backed company is owned throughout the three year period it is expected that bringing in another VC within this period will increase assets due to the extra capital invested. This could explain some of this difference. In terms of difference in difference in revenues and assets, companies where more than one VC has invested do significantly better than companies where only one VC has invested (see appendix 14).

Brander et al. (2002) investigate how syndication, meaning that VCs join forces and invest in a company together, influence return on investments in Canada. They observe that syndicated investments have higher returns than none syndicated and then they test two hypotheses to why it is this way. They test whether syndication is beneficial due to a second opinion or due to value added from syndication. Their conclusion is that the value adding effect is stronger than the selection that comes from having more than one evaluation. This knowledge indicates that the result of my test here comes mainly from joint competence. Further on this can be said to indicate that the competence of a VC as an owners might dominate the selection effects also in the general interpretation of the results in chapter 5.1.

6. CONCLUDING REMARKS AND FUTURE POSSIBLE RESEARCH

6.1 Summary of results

The average young company is expected to experience higher growth in revenues than benchmark if it has received an investment by a VC. This indicates that young companies with a growth ambition can increase the probability of growing into success if it gets VC funding. If capital allocation to young companies should be conducted on the basis of helping the companies with highest growth potential reach their potential, my results indicate that this capital should be allocated through a VC. To future benefits and creation of value to society a greater share of capital could advantageously be allocated through VC. However, the results I have obtained do not say anything about the invested amount and return to invested amounts. A t-test shows that VC backed companies grew statistically significant more than benchmark from 2003 to 2006 in revenues and assets. Revenues growth is significant at 99% level and assets growth at 95% level. The t-test was conducted on the differences between each VC backed company's growth and the growth in its benchmark. The t-test on groups, with the VC backed companies as one group and the averages or the medians of the comparable companies as the other group, show similar results as the original test. A t-test of the relative difference in growth also shows that the VC backed companies grew faster than comparables, although this is positively biased because of the removal of several values.

Around 60% of the VC backed companies did better than the benchmark I created in terms of sales and revenues growth and between 50 and 55% do better in terms of assets and employees growth. I cannot state clearly whether this result and the results of the t-tests comes from selection skills, the skills of the VC at being an owner or in some cases the possible benefits in growth in the company after the VC has exited.

Interpretation of the results needs to be conducted with the knowledge that the comparables chosen might not necessarily be the best comparables to that company, but is chosen merely based on observable information in the database Ravn. The results should also be interpreted in light of possible biases from reporting, survival and selection. The results still show that there is a positive effect of VC in terms of growth for the companies that have received a VC investment when compared against similar companies in terms of industry code, revenues and number of employees in 2003.

Simple regressions with the age of the VC backed company indicate that the difference in growth from benchmark is greater the younger the VC backed company is. This is true for all variables except employees. To have a start-up/venture investment as early as possible also seems beneficial for the growth compared to growth of benchmark companies. However, young companies might be expected to grow more and therefore the relative difference might be the same for younger and older companies. The benchmarks of the older VC backed companies are expected to be better due to the fact that the bankruptcy probability decreases over the years as only the best companies survive over time.

The tests of differences between industries show that the VC backed companies in the *Oil & Energy* sector and the *Life Science & Biotech* sector does better compared to benchmarks. Within *ICT,* VC backed companies does well in terms of sales and revenues. VC backed companies in *Other Sectors* does not do better than comparable companies. Within *ICT,* the VC backed companies do better in *Internet Specific* than *Computer Software and Services*. The comparable companies are chosen based on industry codes in Ravn and results might be driven by which broad industry category the comparable companies actually operate within, which not necessarily is the same as the VC backed company's broad industry. Especially in the VC backed companies in the *Oil & Energy* sector this can be the case, due to the very good conditions in oil related businesses in the years I look at. Looking at the industry codes themselves, one of the four industry codes that contains seven or more VC backed companies stands out as where VC backed companies clearly do best. The category *other consultant-activity within system and software* performs best against benchmark. Within this industry code VCs seem to be able to provide the largest advantage.

A test shows that companies where more than one VC has invested did better compared to benchmark than companies where only one VC has invested. The most plausible explanation for this is that the combined competence of more than one VC could be better than the competence of only one VC (Brandner et al. 2002). Moreover, it is also plausible to assume that only the best prospects of success will attract more than one VC. In order for a second VC to invest, the VC backed company has to be evaluated another time by a new VC and therefore it is assumed to have a larger probability of success. Further on, if a VC brings in other VCs it should only invite them into the best companies due to continuous corporation with mutual benefit depends on trust.

6.2 Further possible research in this field

Other tests with basis in my data set can be done. Further research based on performance of VC backed companies in light of VC characteristics can be done. An example of such research done on the characteristics of VCs is one that shows that experience gives higher growth, but the performance of portfolio companies will decrease with the number of investments (Alemany and Marti 2006). From 2007 on, MENON has gathered information about number of employees, so it would simplify the work of obtaining characteristics of VCs some in the future.

In my selection I have chosen comparable companies based on observable numbers in Ravn. However, not all of those are necessarily companies that VCs would consider to invest in. One can test the VCs ability to develop the growth engines in Norway and only comparing VC backed companies to other possible growth engines. There might still be selection effects, but the comparables will actually be possible investments to a VC. If someone should want to do this I believe that NVCA and MENON will be helpful with supplying data and also give advice to how the actual testing can be done.

My data collection can be expanded to a longer period in order to observe long term effects on the data set. It can be interesting to identify the survival capabilities of VC backed companies versus others in times of financial crisis and liquidity difficulties and worse times in the economy in general than in the period that I examined. Further on, the data I have collected can be used to test the difference in difference based on a regression model, by adding additional information and exporting it to a statistical program. Should someone want to build on my work for other research I will be happy to share the data I have collected if NVCA gives permission.

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Appendix

App 1: Summary of results survivorship bias tested

	Sales		**Revenues**		**Assets**		**Employees**	
Comparable companies	*Avg*	*Med*	*Avg*	*Med*	*Avg*	*Med*	*Avg*	*Med*
Average difference in difference	0.094	0.096	0.082	0.082	0.039	0.061	-0.034	-0.032
Stdev	0.696	0.697	0.404	0.400	0.414	0.431	0.327	0.306
Highest difference in difference	4.269	4.232	1.315	1.296	1.176	1.338	0.870	0.729
Lowest difference in difference	-1.358	-1.327	-0.900	-0.900	-0.900	-0.900	-1.009	-1.000
Observations	74	74	76	76	76	76	74	74
T/Z value	1.166	1.181	1.771	1.782	0.831	1.228	-0.888	-0.908
Stat sign 95%	No	No	No	No	No	No	No	No
Stat sign 99%	No	No	No	No	No	No	No	No
Positive differences	42	43	43	42	38	39	36	37
Share positive diff	0.568	0.581	0.566	0.553	0.500	0.513	0.486	0.500

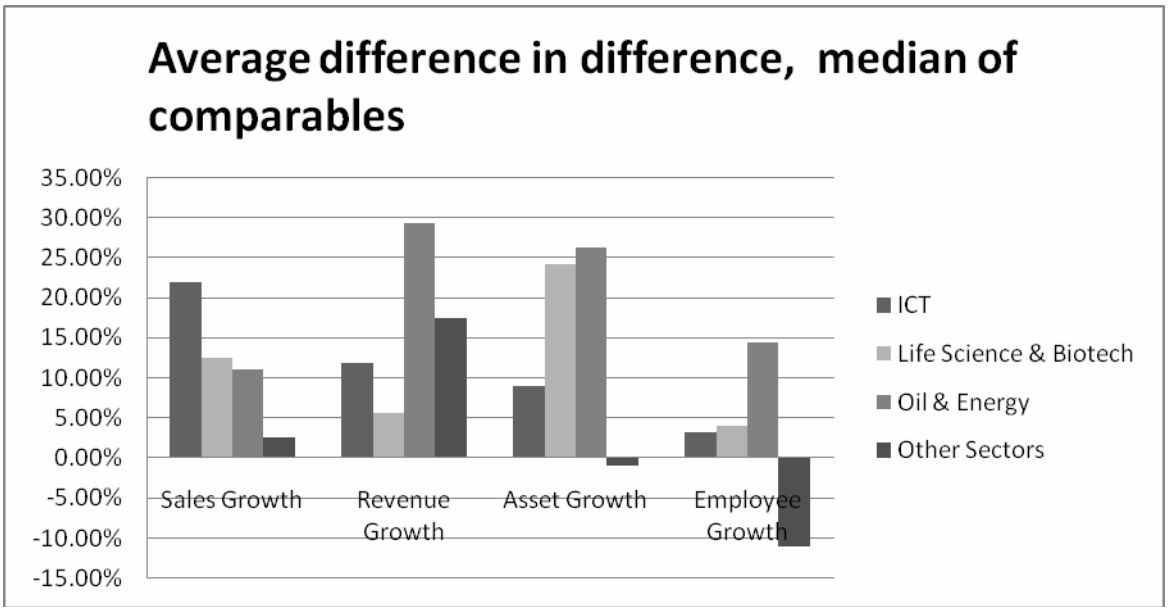
App 2: Summary of results only start-up/venture category

	Sales		**Revenues**		**Assets**		**Employees**	
Comparable companies	*Avg*	*Med*	*Avg*	*Med*	*Avg*	*Med*	*Avg*	*Med*
Average difference in difference	0.192	0.192	0.124	0.125	0.026	0.056	0.024	0.008
Stdev	0.808	0.806	0.296	0.299	0.338	0.353	0.321	0.292
Highest difference in difference	4.269	4.232	1.315	1.296	0.778	0.798	0.870	0.729
Lowest difference in difference	-1.358	-1.327	-0.540	-0.511	-0.576	-0.459	-1.009	-1.000
Observations	33	33	33	33	33	33	32	32
T/Z value	1.364	1.367	2.410	2.393	0.437	0.918	0.417	0.164
Stat sign 95%	No	No	Yes	Yes	No	No	No	No
Stat sign 99%	No	No	No	No	No	No	No	No
Positive differences	22	21	20	19	17	18	15	17
Share positive diff	0.667	0.636	0.606	0.576	0.515	0.545	0.469	0.531

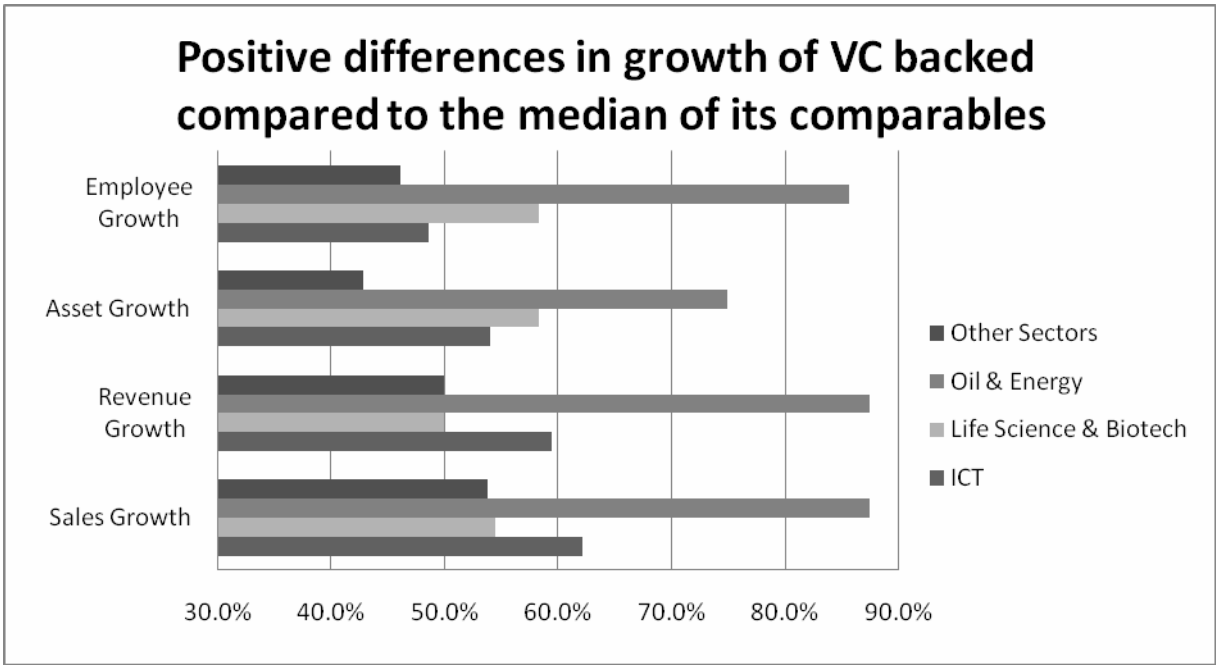
App 3: Summary of results broad industry

	Sales		Revenues		Assets		Employees	
Comparable companies	Avg	Med	Avg	Med	Avg	Med	Avg	Med
Average difference in difference								
ICT	0.207	0.219	0.103	0.118	0.067	0.090	0.029	0.031
Life Science & Biotech	0.192	0.125	0.154	0.056	0.223	0.242	0.043	0.040
Oil & Energy	0.052	0.110	0.220	0.292	0.237	0.263	0.125	0.143
Other Sectors	0.031	0.026	0.172	0.175	-0.032	-0.009	-0.105	-0.110
Stdev								
ICT	0.747	0.738	0.320	0.312	0.310	0.315	0.244	0.216
Life Science & Biotech	0.851	0.875	0.350	0.342	0.511	0.554	0.221	0.193
Oil & Energy	0.639	0.654	0.277	0.306	0.397	0.447	0.121	0.127
Other Sectors	0.303	0.303	0.479	0.457	0.355	0.351	0.351	0.372
Highest difference in difference								
ICT	4.269	4.232	1.315	1.296	0.707	0.739	0.870	0.729
Life Science & Biotech	2.451	2.381	0.995	0.844	1.176	1.338	0.412	0.238
Oil & Energy	0.828	0.960	0.828	0.959	0.790	0.919	0.271	0.308
Other Sectors	0.602	0.684	1.300	1.193	0.936	0.904	0.668	0.442
Lowest difference in difference								
ICT	-0.693	-0.463	-0.641	-0.462	-0.404	-0.426	-0.485	-0.515
Life Science & Biotech	-0.885	-1.098	-0.476	-0.617	-0.262	-0.287	-0.407	-0.429
Oil & Energy	-1.358	-1.327	-0.074	-0.066	-0.353	-0.331	-0.045	-0.032
Other Sectors	-0.555	-0.513	-0.540	-0.511	-0.576	-0.459	-1.009	-1.000
Observations								
ICT	37	37	37	37	37	37	37	37
Life Science & Biotech	11	11	12	12	12	12	12	12
Oil & Energy	8	8	8	8	8	8	7	7
Other Sectors	13	13	14	14	14	14	13	13
Share positive diff								
ICT	0.622	0.622	0.595	0.595	0.514	0.541	0.486	0.486
Life Science & Biotech	0.545	0.545	0.667	0.500	0.583	0.583	0.583	0.583
Oil & Energy	0.750	0.875	0.750	0.875	0.750	0.750	0.714	0.857
Other Sectors	0.538	0.538	0.500	0.500	0.429	0.429	0.462	0.462

App 4: Average percentage point difference in growth between VC backed companies and their benchmarks, sorted by broad industry



App 5: Percent positive differences in growth in VC backed companies compared to benchmark, sorted by broad industry



App 6: Summary of results computer industry

	Sales		Revenues		Assets		Employees	
Comparable companies	*Avg*	*Med*	*Avg*	*Med*	*Avg*	*Med*	*Avg*	*Med*
Average difference in difference								
Computer Hardware	0.207	0.289	0.199	0.303	0.049	0.078	0.221	0.213
Computer Software and Services	-0.108	-0.067	-0.134	-0.068	0.144	0.132	-0.069	-0.018
Internet Specific	0.246	0.258	0.191	0.204	0.307	0.341	0.093	0.105
Stdev								
Computer Hardware	0.072	0.190	0.004	0.150	0.211	0.249	0.022	0.011
Computer Software and Services	0.464	0.348	0.417	0.346	0.473	0.473	0.173	0.120
Internet Specific	0.505	0.498	0.379	0.377	0.292	0.307	0.259	0.170
Highest difference in difference								
Computer Hardware	0.258	0.424	0.201	0.408	0.198	0.254	0.236	0.221
Computer Software and Services	0.305	0.336	0.305	0.336	0.681	0.685	0.143	0.145
Internet Specific	1.137	1.161	0.778	0.833	0.707	0.739	0.490	0.351
Lowest difference in difference								
Computer Hardware	0.155	0.155	0.196	0.197	-0.101	-0.098	0.205	0.205
Computer Software and Services	-0.693	-0.463	-0.641	-0.462	-0.264	-0.279	-0.228	-0.135
Internet Specific	-0.268	-0.260	-0.247	-0.230	0.051	0.047	0.490	-0.110
Observations								
Computer Hardware	2	2	2	2	2	2	2	2
Computer Software and Services	4	4	4	4	4	4	4	4
Internet Specific	6	6	6	6	6	6	6	6
Share positive diff								
Computer Hardware	1.000	1.000	1.000	1.000	0.500	0.500	1.000	1.000
Computer Software and Services	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.250
Internet Specific	0.667	0.667	0.667	0.667	1.000	1.000	0.667	0.667

App 7: Data labeling list industry code differences test Norwegian

Number in Graphs	Industry code
1	28750 Prod. av metallvarer ellers
2	29240 Prod. av maskiner og utstyr til generell bruk ellers
3	32100 Prod. av elektronrør og andre elektroniske komponenter
4	33200 Prod. av måle-/kontrollinstr./-utstyr, unntatt ind. prosesstyr.anlegg
5	64230 Operatørvirksomhet på internett
6	72210 Utvikling av standard programvare
7	72220 Annen konsulentvirksomhet tilknyttet system- og programvare
8	72300 Databehandling
9	73100 Forskning og utviklingsarbeid innen naturvitenskap og teknikk
10	74209 Annen teknisk konsulentvirksomhet
11	74300 Teknisk prøving og analyse

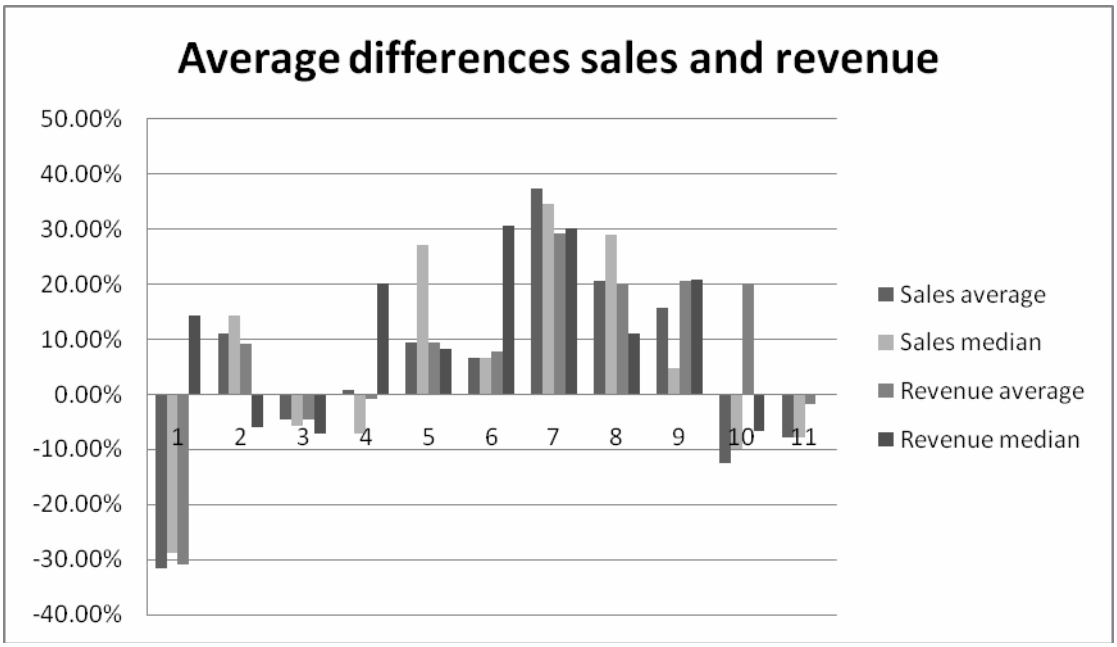
App 8: Number of observations in industry codes

Number in Graphs	Sales	Revenue	Assets	Empl
1	2	2	2	2
2	2	2	2	2
3	2	2	2	2
4	4	4	4	4
5	2	2	2	2
6	15	15	15	15
7	7	7	7	7
8	2	2	2	2
9	7	8	8	8
10	7	8	8	7
11	2	2	2	2

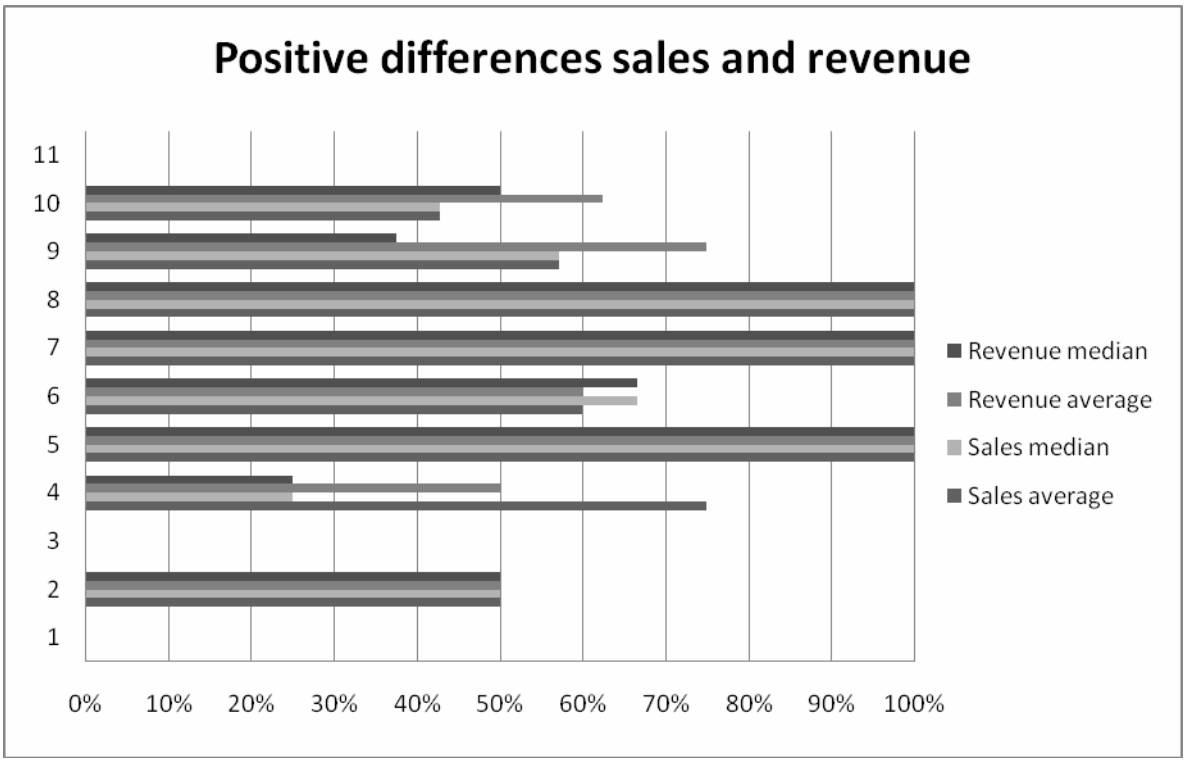
App 9: Summary of results for industry codes with more than four companies registered

	Sales		Revenues		Assets		Employees	
Comparable companies	*Avg*	*Med*	*Avg*	*Med*	*Avg*	*Med*	*Avg*	*Med*
Average difference in difference								
4	0.007	-0.072	-0.008	-0.072	-0.221	-0.181	0.184	0.112
6	0.065	0.067	0.078	0.083	0.042	0.054	-0.029	-0.001
7	0.374	0.346	0.293	0.305	0.342	0.351	0.182	0.155
9	0.158	0.049	0.206	0.110	0.320	0.338	-0.087	-0.056
10	-0.126	-0.098	0.202	0.209	0.140	0.159	0.028	0.030
Stdev								
4	0.154	0.120	0.180	0.131	0.290	0.247	0.324	0.226
6	0.226	0.230	0.231	0.230	0.312	0.321	0.163	0.150
7	0.357	0.391	0.246	0.268	0.371	0.378	0.171	0.124
9	1.132	1.130	0.661	0.620	0.619	0.670	0.325	0.304
10	0.607	0.622	0.172	0.219	0.179	0.228	0.134	0.144
Highest difference in difference								
4	0.106	0.048	0.230	0.079	0.071	0.094	0.668	0.442
6	0.433	0.442	0.358	0.382	0.681	0.685	0.238	0.273
7	1.137	1.161	0.778	0.833	0.707	0.739	0.490	0.351
9	2.451	2.381	1.300	1.193	1.176	1.338	0.216	0.238
10	0.448	0.488	0.990	0.917	0.936	0.904	0.254	0.308
Lowest difference in difference								
4	-0.222	-0.233	-0.188	-0.232	-0.576	-0.459	-0.013	-0.065
6	-0.268	-0.260	-0.286	-0.251	-0.404	-0.377	-0.249	-0.225
7	0.114	0.069	0.086	0.070	-0.353	-0.331	-0.061	-0.051
9	-0.885	-1.098	-0.641	-0.617	-0.264	-0.287	-0.768	-0.680
10	-1.358	-1.327	0.990	-0.089	-0.183	-0.156	-0.123	-0.134
Share positive differences								
4	0.750	0.250	0.500	0.250	0.250	0.250	0.750	0.750
6	0.600	0.667	0.600	0.667	0.533	0.533	0.400	0.400
7	1.000	1.000	1.000	1.000	0.857	0.857	0.857	0.857
9	0.571	0.571	0.750	0.375	0.500	0.500	0.500	0.500
10	0.429	0.429	0.625	0.500	0.625	0.625	0.429	0.571

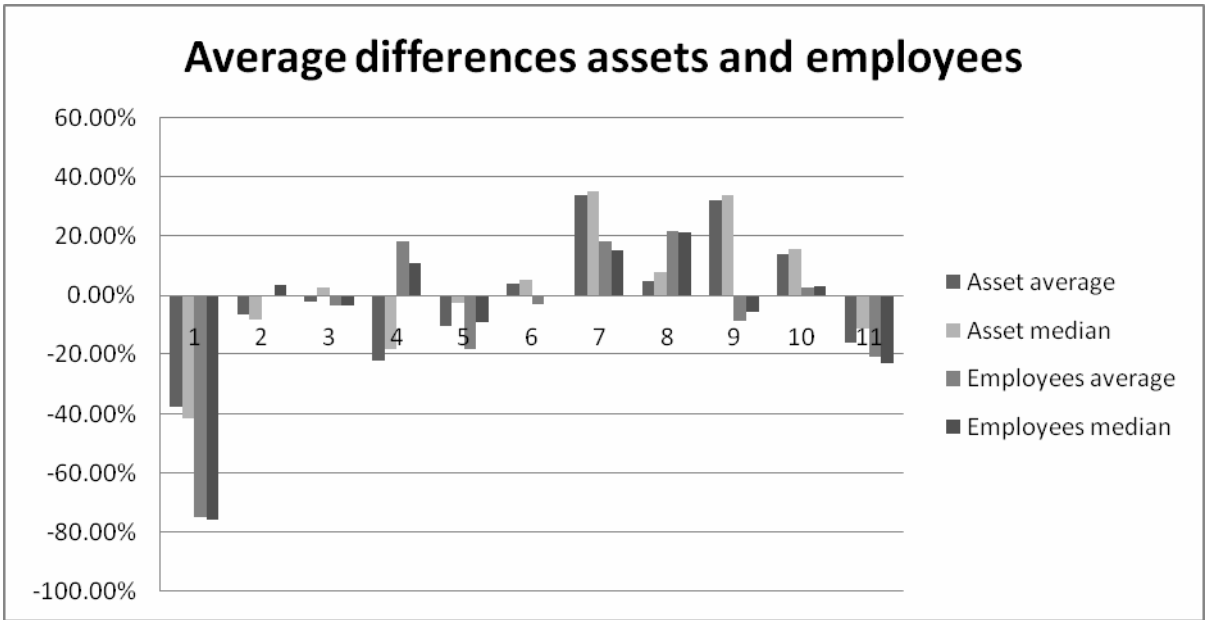
App 10: Average difference in difference in sales and revenues sorted by industry codes



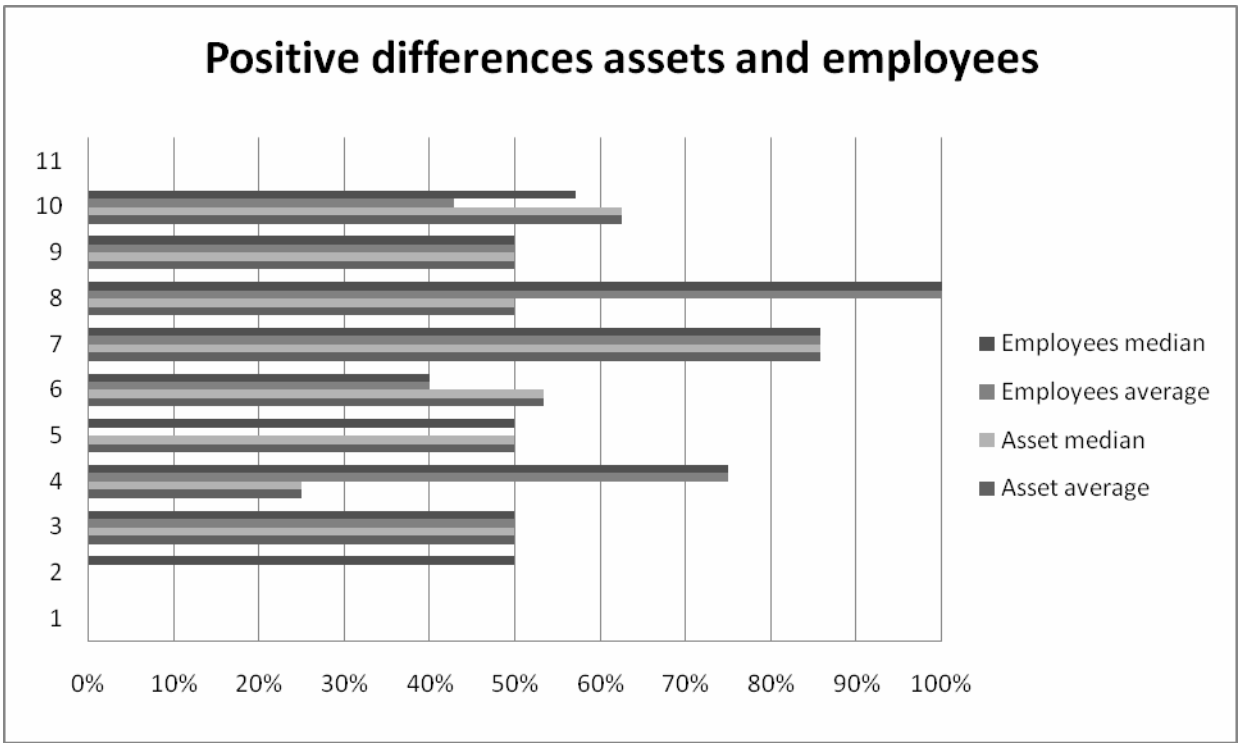
App 11: Positive difference in differences sales and revenues sorted by industry codes



App 12: Average difference in differences in assets and employees sorted by industry codes



App 13: Positive difference in differences in assets and employees sorted by industry codes



App 14: Summary of results more than one VC vs one VC invested

The T/Z value is obtained using the same formula that the groups compared test used (formula (8)). The first group is the average difference in difference in companies where more than one VC has invested. The second group is the average difference in difference in companies where only one VC has invested.

	Sales		**Revenues**		**Assets**		**Employees**	
Comparable companies	*Avg*	*Med*	*Avg*	*Med*	*Avg*	*Med*	*Avg*	*Med*
Average difference in difference								
One VC	0.071	0.086	0.063	0.074	-0.001	0.012	-0.008	-0.001
More than one VC	0.330	0.301	0.295	0.272	0.288	0.332	0.071	0.060
Stdev								
One VC	0.503	0.501	0.285	0.290	0.312	0.320	0.239	0.223
More than one VC	0.952	0.964	0.428	0.421	0.416	0.435	0.344	0.300
Highest difference in difference								
One VC	2.451	2.381	0.995	0.844	1.081	1.105	0.668	0.442
More than one VC	4.269	4.232	1.315	1.296	1.176	1.338	0.870	0.729
Lowest difference in difference								
One VC	-1.358	-1.327	-0.641	-0.617	-0.576	-0.459	-1.009	-1.000
More than one VC	-0.885	-1.098	-0.123	-0.134	-0.262	-0.205	-0.768	-0.680
Number of observations								
One VC	47	47	48	48	48	48	48	48
More than one VC	22	22	23	23	23	23	21	21
Share positive differences								
One VC	0.596	0.596	0.583	0.563	0.479	0.479	0.521	0.521
More than one VC	0.636	0.682	0.652	0.652	0.652	0.696	0.524	0.571
T/Z value groups compared	1.203	0.984	2.361	2.035	2.952	3.147	0.957	0.836
Sign 95%	No	No	Yes	Yes	Yes	Yes	No	No
Sign 99%	No	No	No	No	Yes	Yes	No	No