Aalto University
School of Business

PERFORMANCE OF SPONSORED IPOS IN THE NORDICS

Master's Thesis
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Abstract of master's thesis

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Abstract

OBJECTIVES OF THE STUDY

The objective of the study is to provide further evidence on the short- and long-term performance of IPOs backed by either a private equity (PE) or a venture capital (VC) sponsor. Private equity has been a growing asset class in the past decade and academia has provided increased attention to the IPOs backed by a financial sponsor. The past results seem to be pointing towards less underpricing and less underperformance of sponsored IPOs (especially PE ones), however the results are somewhat inconclusive. Thus, my thesis is broadening the evidence of sponsored IPOs and increasing the scarce Nordic evidence. Nordics provide an interesting sample of sponsored IPOs as the financial sponsor sector is rather closed, less developed but increasingly active.

DATA

The dataset includes IPOs from the Nordics through a 20-year timespan from January 2000 to December 2019. Nordics include Denmark, Finland, Norway and Sweden and both the main markets as well as alternative exchanges such as First North Growth Market and Oslo Stock Exchange. Total number of IPOs included in the analysis is 483 of which 58 are PE backed, 36 VC backed and 389 are nonsponsored. Abnormal initial return is used in estimating the underpricing of IPOs. For long-term performance, Buy-and-Hold Abnormal Return (BHAR) is used for each of the samples.

RESULTS

The results do not provide evidence on certification effect nor that the sponsored IPOs would be less underpriced compared to nonsponsored IPOs. Some indication of the opposing effect that the sponsored IPOs would be more underpriced is prevailing, but these results are not statistically significant. In the long-term the results indicate that venture capital backed IPOs would be underperforming both the market, and their nonsponsored counterparts. On the contrary, results suggest that private equity backed IPOs would be outperforming the market. The performance of PE backed IPOs is also in par, or better compared to the nonsponsored IPOs, which provide indication that PE backed IPOs would outperform their nonsponsored counterparts in the long-term. These results are also statistically significant.

Keywords Private equity, venture capital, initial public offering, post-IPO performance

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TUTKIMUKSEN TAVOITTEET

Tutkimuksen tavoitteena on laajentaa tietoa pääomasijoittajataustaisten yhtiöiden pitkän ja lyhyen aikavälin tuottokehityksestä pörssilistautumisen jälkeen. Tutkimuksessa pääomasijoitusyhtiöt on jaettu alkuvaiheen pääomasijoitusyhtiöihin (venture capital, VC) sekä myöhemmän vaiheen sijoitusyhtiöihin (private equity, PE). Pääomasijoitussektorin koko on kasvanut viimeisen vuosikymmenen aikana, jonka takia myös tutkimus yhtiöistä, jotka listautuvat pörssiin pääomasijoittajan omistuksessa, on lisääntynyt. Aiemmat tutkimukset ovat osoittaneet pääomasijoittajataustaisten yhtiöiden olevan vähemmän alihinnoiteltuja pörssiin listautuessaan, sekä pärjäävän paremmin pitkällä aikavälillä, kuin muut pörssilistautujat. Tutkimukseni laajentaa tietoa aiheesta, sekä lisää etenkin Pohjoismaista tutkimustietoa. Pohjoismaat toimivat mielenkiintoisena tutkimusaineistona, sillä niiden pääomasijoitusmarkkinat ovat kuin yksi iso yhtenäinen markkina, vähemmän kehittynyt mutta jatkuvasti enemmän aktiivinen.

AINEISTO

Aineisto koostuu 20-vuoden aikana Pohjoismaissa pörssilistatuista yhtiöistä, joiden listaushetki on tammikuun 2000 ja joulukuun 2019 välillä. Pohjoismaihin lukeutuu aineistossa Tanska, Suomi, Norja ja Ruotsi ja siihen sisältyy sekä päälistamarkkinat, että vaihtoehtoiset markkinat kuten First North Growth Market ja Oslo Euronext Access. Kokonaisuudessaan aineisto sisältää 483 pörssilistautumista, joista 58 on PE taustaisia, 36 VC taustaisia, ja 389 muita.

TULOKSET

Tulokset eivät viittaa siihen, että pääomasijoittajataustaiset yhtiöt olisivat vähemmän alihinnoiteltuja listautuessaan pörssiin. Sen sijaan tutkimus osoittaa jopa päinvastaisia tuloksia, mutta nämä eivät ole tilastollisesti merkitseviä. Pitkän aikavälin tulokset viittaavat siihen, että venture capital taustaiset yhtiöt pärjäisivät huonommin pörssissä sekä verrattuna markkinaan, että muihin listauksiin. Tulokset viittaavat kuitenkin siihen, että private equity taustaiset yhtiöt pärjäisivät vähintään yhtä hyvin, kuin muut listautuvat yhtiöt. Nämä tulokset ovat myös tilastollisesti merkitseviä.

Avainsanat Pääomasijoittaminen, venture capital, pörssilistaus, listauksen jälkeinen tuotto

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1. Introduction

1.1. Background and motivation

Initial public offerings (IPOs) have been widely studied in the finance literature. In general, the evidence highly suggests that IPOs are underpriced at the time of the issue and provide substantial initial profits but perform rather poorly in the longer term (Ritter, 1991) and (Loughran & Ritter, 1995). These anomalous patterns have been under an investigation for decades among the academia, and multiple theoretical models have been presented for explaining the behaviour (Rock, 1986), (Welch, 1989) and (Ritter & Welch, 2002). In contrast to this wide evidence of IPO underpricing and lower long-term returns, private equity (PE) and venture capital (VC) backed IPOs do not seem to provide as clear of a pattern. One of the earliest papers investigating initial public offerings backed by a financial sponsor by (Brav & Gompers, 1997) provide evidence that VC-backed IPOs outperformed their nonventure-backed counterparts. As the private equity has been growing as an asset class rapidly since then, it has gained an increased attention also from the academic world.

Private equity and venture capital are not only a growing but also an important investor group for the economy, as they provide financing for early-stage ventures. PE and VC investors have typically 5–10-year investment horizon and after the investment period is over, they need to exit their investments either through an IPO or selling the company. Even though selling the portfolio company rather than taking the venture public seems to be a preferred exit route for a financial sponsor, the sponsors are regularly backing issuing firms. As PE and VC investors invest in multiple companies and act as a pre-IPO owner in multiple ventures, they have an interesting and unique role in the IPO process. As a typical owner generally is a pre-IPO owner only once, PE and VC investors face this role consistently, which might affect the potential agency costs between old and new owners, and further the IPO underpricing as well as long-term performance. Also, (Jensen, 1986) and (Jensen, 1989) argue that private equity investors are able to create value for their portfolio companies which translates into better operational form. Although these benefits are mostly prevailing during the holding period of the financial sponsor, it is reasonable to assume that these practices remain in the company at least some time after the IPO. This effect is likely also since typically PE and VC firms do not fully exit their investments in an IPO but rather do the full exit gradually over time post-IPO.

Regardless of increased attention, academic literature has not been able to provide a unanimous answer on how sponsored IPOs perform in the first few days after trading or in the longer term. For instance, (Megginson & Weiss, 1991) and (Gohil & Vyas, 2015) provide backing evidence for the certification effect of financial sponsors by finding that sponsored IPOs were less underpriced. On the contrary, (Lee & Wahal, 2004) find that sponsored IPOs are more underpriced compared to their counterparts, which they suggest to be backing the grandstanding hypothesis. Also, the evidence on long-term performance of sponsored IPOs is very inconclusive as for example (Brav & Gompers, 1997) as well as (Bergström, et al., 2006) document outperformance of sponsored IPOs, but (Viviani, et al., 2008) and (Hamao, et al., 1998) find no outperformance or even worse performance of sponsored IPOs compared to nonsponsored ones. (Lammi, 2016) investigates a rather small sample of Nordic IPOs and documents underperformance of VC backed IPOs but outperformance of PE backed IPOs. Due to this lack of conclusive evidence, and even more lacking evidence from the Nordics, I aim to increase the knowledge on the performance patterns of the PE and VC backed IPOs.

1.2. Research questions

My thesis provides evidence of how Nordic PE and VC backed IPOs perform on both during the first day of trading (i.e., the degree of underpricing) and in the longer-term. I use a comprehensive dataset of 483 Nordic IPOs, including 58 PE and 36 VC backed IPOs during 2000-2019. The goal of this study is to investigate the certification effect of a financial sponsor in conjunction with the IPO and whether the presence of a PE or a VC firm can reduce the underpricing of the offering. I also investigate the longer-term performance of the IPO companies which were owned by a financial sponsor pre-IPO. I study the long-term performance in various intervals to capture the effects of PE and VC backing at different points post-IPO. The main research questions in this study can be summarized as follows:

Q_1: *Are private equity and venture capital companies able to provide certification to the IPO and therefore reduce the underpricing of sponsor-backed IPOs?*

Q_2: *Do private equity and venture capital backed IPOs perform better in the long-term than their counterparts?*

Additionally, I will examine the potential time variances of these phenomena, as well as different characteristics of the sponsored versus nonsponsored IPOs.

1.3. Contribution to the earlier literature

This thesis contributes to the earlier literature in several ways. First, there is only a little evidence on the performance of private equity and venture capital backed IPOs and their post-IPO performance in the Nordics. According to my knowledge, only one previous master's thesis exists on this topic using Nordic dataset (Lammi, 2016), and he uses significantly smaller sample purely from the Nordics compared to mine. Therefore, I am not only contributing to the minor Nordic research of the sponsored IPOs but also to inconclusive European evidence on the topic.

Second, I am investigating both private equity and venture capital separately but simultaneously in the same study. Multiple prior studies focus on either one of those two while excluding either PE or VC companies. For example, (Barry, et al., 1990), (Dolvin & Pyles, 2006) and (Krishnan, et al., 2011) focus on venture capital companies and their effect on post-IPO performance, while (Gohil & Vyas, 2015) and (Hopkins & Ross, 2013) study private-equity as a whole (including venture capital). Furthermore (Bergström, et al., 2006) focus exclusively on the buyout segment of private equity leaving the typical venture capital firms out. I follow (Levis, 2011) and separate the private equity and venture capital backed companies to be able to investigate these two subgroups simultaneously.

Third, I use a sample of a long timespan reaching from 2000 to 2019. This ensures that the effects are captured from different macroeconomic environments as well as enables the investigation of potential time variance within the effects. The IPO market in general is very much interconnected with the general market environment with IPO activity increasing strongly in good economic times. Therefore, using a long timeframe provides an additional insight into underlying drivers of possible performance differences across the sample.

Finally, I contribute to the more recent branch of research methods on long-term performance by using the buy-and-hold abnormal returns (BHAR) in performance evaluation. Furthermore, I use the skewness-adjusted t-statistic with bootstrapped p-values to test the BHARs of different IPO groups. This according to the recent knowledge provides the most accurate results for the long-term performance evaluation compared to using cumulative abnormal returns (CAR) which was commonly used in more vintage studies. Therefore, my results could provide more reliable results on the broader European IPO PE and VC IPO performance.

1.4. Results

My results do not provide evidence on the certification effect, nor that the sponsored IPOs would be less underpriced compared to nonsponsored IPOs. In fact, in the cross-sectional analysis, PE and VC dummy variables indicate that sponsored IPOs would be more underpriced compared to nonsponsored IPOs. However, these results are not statistically significant and no clear evidence is found on either direction.

With regards to the long-term performance, my evidence suggests that venture capital backed IPOs underperform the market as well as their nonsponsored counterparts. These results are also statistically significant and similar in both equal weighted and value weighted portfolios as well as across the different benchmark indices used. Private equity backed IPOs perform very similarly compared to nonsponsored IPOs 36-months post-IPO using equal weights and the results are also statistically significant. However, PE backed IPOs seem to outperform their nonsponsored counterparts throughout the 36-month time post-IPO when value weights are used, these results are also statistically significant. This points towards evidence of outperformance of PE backed IPOs compared to nonsponsored IPOs.

1.5. Structure of the study

The rest of this thesis is organized as follows. Chapter 2 provides an overview of the prior literature by first giving a background information on the general IPO underpricing and long-term underperformance phenomena. Then the Chapter 2 follows by showcasing the prior evidence specific to the performance of sponsored IPOs. Chapter 3 summarizes the hypotheses tested in this thesis. Chapter 4 introduces the dataset, provides the information on how fundamental operational characteristics differ across the different IPO groups and explains the methods for evaluating both the underpricing and the long-term performance of IPOs. Chapter 5 highlights and discusses the results and finally Chapter 6 concludes and provides suggestions for future research.

2. Prior literature and theoretical framework

Broad international evidence regarding IPOs points towards IPOs generating high initial returns during the first few days of trading but significantly decreasing returns in the longer-term aftermarket. Multiple branches of theory exist behind this pattern of IPO company returns, which fundamentally arises from the asymmetric information between parties in an IPO setting. In sharp contrast to the evidence on IPO company performance in general, companies going public with a private equity or a venture capital sponsor acting as a pre-IPO owner provide a different setting for the company performance. Financial sponsors could be able to provide at least some degree of certification and potentially set up companies in better operational fundaments during the pre-IPO phase.

In this section, I will review the empirical evidence regarding IPO performance, private equity and venture capital value creation models and their role, as well as the current evidence on private equity backed IPOs.

2.1. IPO Underpricing

Underpricing equals securities being priced in a manner that they produce positive (abnormal) returns for the investor in the first day of trading. Positive returns immediately in the first day of trading indicates that the security was not priced at its intrinsic value in the issue and the return generated directly after the issue is not reflecting any new information released to the market. This theoretically leaves "money on the table" as the issuing company could have been able gain more gross proceeds if the share was priced closer to the intrinsic value at the IPO. Regardless of leaving money on the table, underpricing seems to be a general characteristic of the IPO stocks. (Ibbotson, 1975) is one of the most popular papers documenting IPO underpricing, by finding that US IPOs are underpriced by 11.4 percent on average. IPO underpricing has gained a lot of attention from the academia since then, and broad evidence is backing the underpricing phenomenon. For example, (Ritter, 1991) documents that IPOs are underpriced and the firms underperform during the next 3-year period after going public. (Jog & Riding, 1987) provide evidence that Canadian IPOs are underpriced on average, although clear differences exist in the initial performance of individual IPOs. Furthermore, (Chambers & Dimson, 2009) as well as (Lowery, et al., 2010) document underpricing in IPOs and that the degree of underpricing fluctuates over time. In general, the underpricing of IPOs is a broadly documented phenomenon, but different branches of theories exist on explaining these unusually high first-day returns of IPO stocks.

(Jensen & Meckling, 1976) investigated various agency conflicts in the corporate setting, one emerging in the IPO scenario as the existing owners know more about the company than the new IPO investors. Existing owner can assess the true quality of the company better than an outsider, considering investing in the IPO which creates a problem between "seller" and "buyer". These information asymmetries between the parties (issuer, underwriter, and potential investors) can be viewed as a determining factor for the magnitude of the underpricing. The more private information on the company insiders have, the larger the discount investors require in the IPO due to higher risk related to the uncertainty of the quality of the issuing firm. The other way around, if there is a way of reducing the asymmetric information between issuers and the investors, IPO underpricing can be reduced. Generally, reducing the information asymmetry between the issuer and the investors has been the motivation for using underwriters in the IPO process. As underwriters face the IPO situation multiple times and want to keep doing business with the investors (underwrite IPOs in the future as well), they must ensure that the company is not overpriced.

According to the signalling hypothesis, firms can use the underpricing as a tool for signalling to market their quality under the aforementioned asymmetric information. (Welch, 1989) provide an explanation to the underpricing by stating that companies are not aiming to issue equity only once when going public, but rather aiming for future equity issues as well. Due to this, good quality firms are willing to underprice their share in the IPO to get a better price in the future seasoned offerings. After the IPO, the share price of a good quality firm gradually reaches its intrinsic value as the market learns about the quality of the company, which allows companies to issue equity at a reasonable price in the followed equity issues. The signalling hypothesis suggests that IPO firms can reveal their quality through underpricing as only high-quality firms are able to compensate for the losses caused by the IPO underpricing in the future seasoned offerings. (Alvarez & Gonzalez, 2005) provide evidence backing the signalling theory, by using a sample of Spanish IPOs during 1987-1997.

Another popular theory behind the IPO underpricing formed by (Rock, 1986) explains the underpricing by existence of two groups of investors: the informed and uninformed. The informed investors know the quality of the IPO beforehand, and the uninformed investor group can only observe the quality after the issue. Informed investors can choose their participation in an IPO based on the quality of the issuing firm and whether it is priced below or above the true value of the company. As the informed investors are not willing to participate in bad IPOs, the uninformed investors get the full allocation only in bad IPOs and receive no to little allocation in quality IPOs. This would lead to scenario where the uninformed investors are unwilling to participate in IPOs as they realize this winner's curse situation and they on average lose wealth. Firms choose to underprice to compensate the investors (especially the uninformed ones) for the risk that they bear resulting from this adverse selection problem, and IPOs on average must generate positive returns to attract also the uninformed investor group.

Overall, broad academic evidence shows that IPOs in general tend to be underpriced compared to their intrinsic value. Although some degree of underpricing can be rationalized (to avoid the adverse selection problem for instance), companies should have incentive to minimize the underpricing as smaller degree of underpricing increases the potential amount of gross proceeds companies are able to collect from the IPO.

2.2. Long-term performance of IPO companies

The long-term performance of IPOs is heavily interconnected to the initial underpricing of the IPO. Like the underpricing and short-term performance of companies going public, the longer-term performance has been widely studied. (Ritter, 1991) as well as (Loughran & Ritter, 1995) present evidence of a broad underperformance of US IPOs. The evidence is consistent with the theory that firms are able to take advantage of the market timing and issue equity in times when the valuation of the company is peaking. As the company insiders know the intrinsic value and the market sentiment the best, they can utilize this information by timing their equity issue to times when the company is overvalued. This theory would explain the poor long-term performance of IPO firms, as the market learns the true value of the company gradually over time.

(Aggarwal & Rivoli, 1990) further documents this long-term underperformance phenomenon but provide an alternative explanation to the evidence, by suggesting that the IPO market is subject to “fads”. Fad is defined as temporary overvaluation of a security, which is caused by investors being over-optimistic. Fads in general are more likely to occur in an environment where the intrinsic value of the company is harder to estimate. Especially in an IPO setting, it’s hard for an outsider investor to observe the true quality of the company, which exposes IPO companies to the potential fads. According to the fads hypothesis, IPO companies are priced above their true value during the initial enthusiasm directly after the IPO. After this initial enthusiasm ends, the trading volumes of the stock decrease, and the price level of the stock returns to its intrinsic value. Due to this pattern, the long-term performance of IPO companies is modest after the IPO. Fads hypothesis can also be extended as companies might have a tendency to go public near their (industry specific) fads. The markets in general can be seen to have different sensitivity to being subject to fads depending on the macroeconomic and industry specific environment. Also, the company insiders can observe these market conditions the best thus they are able to take the company public near the industry specific fad. Partly overlapping with the earlier theory, company insiders have the ability to utilize the temporary overvaluation periods in their industry and go public during those times, which then explains the poorer long-run performance of the stock in the aftermarket.

Finally, even though the broader academic evidence leans towards long-term underperformance of IPO companies in 1-3 years post-IPO, the results are not completely unanimous. (Brav, et al., 2000) investigate initial public offerings as well as seasoned equity offerings and find that returns of IPO companies are similar to other companies when firms with similar characteristics on size and book-to-market ratios are used as return benchmarks. They argue that firms going public is not the root cause of the underperformance, but rather the IPO company performance emerges from the other characteristics of these companies, which cause the underperformance.

2.3. Private equity and venture capital

Private equity companies can be defined as investment companies investing (external investors') money into companies or assets, which are not traded on a public exchange. Private equity investors can be categorized based on the investment strategies they are using, generally by analysing at which stage of a company's lifecycle private equity firm is seeking to invest in. Venture capital is a sub-class of private equity, which focuses on early stage investing and typically provides equity for the portfolio companies through multiple different rounds. When referring to private equity (PE) later in this study, I refer to private equity companies other than VC companies, which have a unique investment strategy and characteristics compared to general PE firms. For example, portfolio companies of PE firms typically have leveraged capital structure, rather stable cash flows and smaller growth rates than VC backed firms which generally have rapid growth prospect and as a result weaker cash flow.

In the recent years, increasing funds have been flowing into the private equity and venture capital industries, which has also accelerated the investment activity among the financial sponsors. The general performance of the private equity and venture capital funds has received increasing attention among academic literature. Although, the performance of the portfolio companies of PE and VC during their holding period is not directly comparable to how these portfolio companies perform later after the IPO phase, the performance is definitely interconnected. Therefore, I will briefly go through the related literature on PE and VC company performance, focusing on the key value drivers behind the performance, which might be prevailing in the company even post IPO.

2.3.1. Private equity and venture capital value creation models

(Jensen, 1986) and (Jensen, 1989) provide and extensive tools and theories in assessing the value creation of LBOs. He argues that PE companies are able to create value for their portfolio companies through the LBO by higher levels of debt, which acts as a disciplinary mechanism for those companies. Through higher levels of debt, management is unable to extract private benefits from the company as the cash flows are more restricted. Furthermore, he states that the higher level of debt increases the operational efficiency as the scarce resources of the company has to be optimally put in use when the cash flows are restricted. (Acharya, et al., 2013) also study the performance of private equity companies and find that PE houses create value through operational improvement. Their evidence suggests that PE ownership is associated with increase in multiple operational metrics such as sales growth, EBITDA margin and valuation multiple improvement. The results of LBOs value creation is confirmed also by (Lichtenberg

& Siegel, 1990) and (Smith, 1990) who find that LBOs are able to create value through improving the operational efficiency of the companies.

After investing in a portfolio company and potentially creating value through different methods, PE and VC firms need to exit their investments and “cash out” their returns. There are different routes sponsor can divest its ownership in a portfolio company, typically this is done either through selling the portfolio firm to another company (which could be owned by another PE firm) or the company can be exited through IPO. (Strömberg, 2008) analyse 21,000 LBO transactions and document that IPOs account for 13% of total exits, so the IPO exit is definitely less popular among PE firms.

2.3.2. Private equity and venture capital in the Nordics

Although the fund structures, value creation and operational models are very similar among financial sponsors in the US, Europe as well as in the Nordics, there are some differences among the market and legal environment which affect the operations of PE and VC firms.

According to (Spliid, 2013) the large market of investors in the US makes fundraising process different for US sponsors compared to Nordic ones. As the investor universe for domestic Nordic investors is significantly smaller, Nordic PE and VC firms need to commonly raise funds outside the Nordics which provides some difficulties to the fundraising process. (Spliid, 2013) shows that post financial crisis, Nordic private equity firms have increasingly diversified their investor pool to international investors and the trend is largely driven by larger PE firms. There are also differences among the Nordic countries as for instance Swedish sponsors have larger share of international investors compared to Danish ones. Regardless of the underlying uncertainty in attracting international investors, Nordic PE firms have been able to raise funds very successfully in the past.

Nordic sponsors view the whole Nordic region almost as a one domestic universe compared to rest of the Europe. As (Spliid, 2013) states, Nordic investors see the cross-border investments outside Nordics more risky compared to cross-border investments within the Nordic region. This is arising from the common history of the Nordic countries as well as similar welfare systems, taxation and social security. This makes the PE and VC field more familiar to the general public as well as to the investors within the Nordics, compared to US or other markets where more financial sponsors exist as well as large portion of them are multinational and larger firms.

2.4. Sponsored IPOs

The fundamental aspect of why IPOs are underpriced and perform poorly in the aftermarket is the asymmetric information between the parties in the IPO. Therefore, the IPOs are not priced at their intrinsic value either at the time of the IPO or in the direct aftermarket. In contrast to the general evidence of IPO underpricing and poor long-term performance, the performance of sponsored IPOs has been more debatable. Sponsored IPOs is a different setting compared to other IPOs which indicates a potential difference in the performance as well.

2.4.1. Sponsor certification and IPO underpricing

Private equity and venture capital companies use IPOs as a major exit opportunity for their investments, which creates an incentive for the sponsors to keep the "IPO window" open in the future as well. Unlike traditional pre-IPO owners like entrepreneurs or other companies who will likely be acting as a pre-IPO shareholders and insiders only once, PEs and VCs have repeated business in IPOs. This characteristic of financial sponsors as pre-IPO owners decreases the asymmetric information problem between the parties. Even though, sponsors are obviously aiming to maximize their profits, PE and VC companies need to generate positive returns also for the stock market investors to be able to use IPO as a valid exit strategy in the future. Due to this certification effect, financial sponsors theoretically would be able to reduce IPO underpricing as the risk for an outsider to invest in the IPO is decreased.

(Megginson & Weiss, 1991) identify three conditions for an outsider certification to be successful. The certifier needs to have reputational capital at stake, and the value of this reputational capital has to exceed the potential one-time gain which would be achievable from a false certification. Also, issuing firm must bear a cost for the certification services provided by the certifying agent. All these conditions are fulfilled in case of a sponsored IPO so PE and VC firms can be seen to be able to certify the IPO. Indeed, (Megginson & Weiss, 1991) find that venture capitalists can provide certification in IPOs and reduce the underpricing of the sponsored IPOs compared to other IPOs. (Gohil & Vyas, 2015) confirm the certification effect of financial sponsors by using a sample of Indian IPOs, as they find that PE backed IPOs were less underpriced.

Financial sponsors have more information disclosure naturally, which reduces the asymmetric information between different groups of investors. Increased homogeneity among different investor groups (the uninformed and the informed) reduces the adverse selection problem presented earlier[1]. The broader public information prior to the IPO phase reduces the risks for the uninformed investor group as they are able to observe the quality of the company easier ex ante. Naturally this should lead to scenario where financial sponsor can certify the IPO, translated into reduced underpricing.

Regardless of the potential certifying ability of financial sponsors, there is no unanimous evidence for the certification effect of financial sponsors among the financial literature. Although PE and VC firms fulfil many of the conditions from the list provided by (Megginson & Weiss, 1991), still the group of financial sponsors might not be fully homogenous. (Barry, et al., 1990) find evidence that private equity firms can reduce the underpricing and provide certification for the IPO firms, but this is only the case when quality private equity firms and underwriters are involved. Better quality is translated into better monitoring of the company by the financial sponsor. (Barry, et al., 1990) identify five characteristics of the sponsor involvement which increase the certifying role and reduce the underpricing; Firstly, the larger the pool of VCs who own equity in the company and the longer the lead VC has been present in the company's board, the better financial sponsors are able to reduce the underpricing in IPO. This effect is also increased the older the lead sponsor of the company is. Prior experience of the VC (especially the lead sponsor) also has an effect on the level of underpricing. The more prior IPOs the lead sponsor has participated in, the more underpricing is reduced. Finally, the more VCs hold on the company's equity, the more they are able to reduce the underpricing and provide certification.

The quality of the financial sponsors has been further studied in IPO context, and how it affects the certification role of the PE and VC. (Dolvin & Pyles, 2006) and (Hopkins & Ross, 2013) provide evidence on the certification effect of the financial sponsors, and that involvement of quality PE or VC companies in the IPO reduces the underpricing of the IPOs. (Hopkins & Ross, 2013) indicate that multiple factors such as duration of the sponsor involvement, level of the ownership PE or VC retains post-IPO, and the quality of the sponsor all contribute to the certification effect of the sponsor. (Dolvin & Pyles, 2006) however, highlight that regardless of their findings that higher quality PE firms certify more efficiently, quality is a hard function to measure, and the results might be dependent on the measure used for the quality.

On the contrary to the earlier evidence, (Lee & Wahal, 2004) use a sample of IPOs between 1980 and 2000 and find that VC backed IPOs experience larger first day returns than their counterparts, which they argue to be backing the grandstanding theory. Grandstanding theory by (Gompers, 1996) aims to explain why venture capital companies would be willing to accept the underpricing, although their fund returns is directly dependant on how much or little, they are able to underprice their portfolio companies at IPO. As stated earlier, financial sponsors typically create Limited Partnership (LP) fund structures, which have certain lifespans, typically ten years. After the ten-year period, the sponsor needs to liquidate the portfolio companies either through M&A or an IPO. (Gompers, 1996) argues that the majority of the fund returns are made by taking the portfolio companies public and to be an attractive VC company from the investors' point of view, sponsors need to signal that they are able to take their portfolio companies public successfully. Other way around, VC firms which are unable to take their portfolio companies public have major difficulties in raising capital for their future funds. As signalling through taking portfolio companies public plays so important role in raising future capital, financial sponsors are willing to bear the immediate cost of underpricing since it enables them raising additional capital. Furthermore, the theory predicts that younger VC companies would be willing to accept more underpricing as they have not yet been established among the investor community. Finally, (Tykvova & Walz, 2007) find additional characteristics of the underpricing and certification role of financial sponsors. They provide evidence that the certification function of the financial sponsors is not reducing the underpricing, but results in a reduction of firm-specific volatility in the aftermarket. As (Spliid, 2013) shows, the fundraising process of Nordic PE firms is typically harder compared to US PE firms for instance, since Nordic PE firms need to attract foreign investors as the domestic investor group is significantly smaller. This would indicate that grandstanding theory might be stronger among Nordic sponsored firms if these sponsor experience difficulties in the fundraising processes. However, as stated, Nordic PE firms have been very successful in raising funds in the past as indicated by (Spliid, 2013), so the tendency to use underpricing as a tool to create successful IPOs might not be increased among Nordic sponsors.

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[1] Please, see 2.1. IPO Underpricing

The certification role of financial sponsors can be viewed partly overlapping with the underwriter's role. Similar to the underwriters, PE and VC companies are also having repeated business in the IPO market. Roles are also interconnected as PE and VC companies also have access to better resources such as underwriters and auditors, which would amplify or partly explain the effectiveness of certification provided by the sponsor.

2.4.2. Long-term performance of sponsored IPOs

After a private equity or a venture capital company "exits" a company via IPO, the exit is typically not an instant one. Financial sponsors sell major portion of their holding in the target company via secondary issue at the IPO, but the sponsor usually retains at least some equity holding in the company even post-IPO. The full exit of the sponsor is usually gradual over time after the IPO, which might imply additional selling pressure to the stock in the aftermarket. As the certification role of financial sponsor is, at least partly, dependant on the post-IPO equity stake the certifier holds, this decreasing ownership likely decreases the certification function of the sponsor gradually in the aftermarket.

The evidence of long-term performance of sponsored IPOs is rather inconclusive. One of the pioneering papers by (Brav & Gompers, 1997) find that VC backed IPOs outperform their non-VC counterparts, when equal weights are used. The difference in the performance between the subgroups is however driven heavily by the size of the IPOs, and the performance differences reduces significantly when using value-weights. The underperformance of non-VC backed IPOs is driven by the small companies with low book-to-market ratios, which in the sample of (Brav & Gompers, 1997) perform worse regardless being a recent IPO or not.

(Bergström, et al., 2006) also document long-term outperformance of sponsored IPOs by using a sample of IPOs in London and Paris stock exchanges in 1994-2004 and focused purely on the buyout segment of private equity. They find that even though both IPO groups had negative abnormal returns (consistent with the general underperformance of IPOs), the sponsored IPOs had less underperformance in all measurement periods[2]. Further, (Drobetz, et al., 2005) and (Bessler & Seim, 2012) examine European IPOs and document less underperformance of sponsored IPOs in the long-term. (Levis, 2011) add to this evidence of long-term outperformance of sponsored IPOs, but only for the private equity backed issues as he finds that PE backed IPOs perform better than the VC backed and non-sponsor backed ones. He also documents positive and significant abnormal buy-and-hold returns for the PE-backed IPOs during the entire 36-month aftermarket period. While investigating the characteristics of these sponsored IPOs, he indicated that PE-backed IPOs are larger and more profitable, but the results are not driven by the differences in size or B/M ratios at the time of the IPO.

Inconsistent with the evidence above, (Viviani, et al., 2008) use an Italian sample of IPOs between 1995-2005 and find PE participation in an IPO is affecting the company long-run performance negatively. This is against the monitoring function theory of financial sponsors. (Hamao, et al., 1998) also use a Japanese sample and do not find abnormal returns for the sponsored IPOs, apart from the IPOs which are backed by foreign-owned venture capitals. Although they do not find outperformance of sponsored IPOs, the evidence sheds a light on the theory that the quality of the financial sponsor might also influence the long-term performance of the company. Consistent with this approach, (Lange, et al., 2001) document that companies which have higher quality venture capitals as well as top underwriters produced higher returns in the aftermarket. Similarly, (Campbell & Frye, 2006) do not find any outperformance of VC backed IPOs in general, but when further investigating the characteristics of the VC backed companies, they find that VC backed companies which have an above median number of monitoring directors are performing significantly better in the long-term. (Krishnan, et al., 2011) and (Jain, 2001) also investigate how the quality of the sponsor and the degree of sponsor involvement affect the post-IPO performance of the company. They find that reputational and involvement factors both affect the aftermarket performance of the venture. (Krishnan, et al., 2011) use US sample of IPOs during 1993-2004 and find interplay between reputational VC firms and long-run performance of portfolio companies gone public. Their results indicate that financial sponsors which are more reputational[3] are associated with more successful IPOs. Also, sponsors with better reputation are more active in the corporate governance matters even after the portfolio companies went public, which again enhances the performance of those companies. Furthermore, (Jain, 2001) show that long-term commitment of the venture capitalist increases the performance of the VC-backed companies even post-IPO.

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[2] Measurement periods 6 months, 1 year, 3 years and 5 years post-IPO

The theories behind why companies going public with a sponsor backing would have stronger long-term performance often link to better governance and operational readiness of these companies. As discussed above, the PE models indicate that financial sponsors are able to arrange companies in a way that the operational efficiency is increased. This holds mainly through the holding period of the financial sponsor, but it is likely that these structures are prevailing even after the IPO. Overall, markets tend to appreciate companies with efficient governance and operational structures, which would defend the rationale of why sponsor-backed IPOs would have strong performance in the aftermarket.

Financial sponsors are also able to influence the post-IPO ownership structure of the companies they are driving public. Sponsors have contacts and relationships to institutional investors, which increases the appetite of these investors to participate in a sponsor-backed IPO. (Megginson & Weiss, 1991) find evidence that VC backed IPOs celebrate stronger interest from institutional investors than other companies. Further, (Campbell & Frye, 2006) investigate how this characteristic of sponsored IPOs affects their performance in the long-term. They argue that strong institutional ownership in sponsored IPOs makes these companies less exposed to investor sentiment and speculative investors. This would stabilize the aftermarket trading and enhances performance for these companies. Indeed, they find evidence that VC backed IPOs which are associated with an above median share of institutional blockholders have significantly better performance in the long-term.

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[3] Reputational VC is determined by measuring the past market share of IPOs a certain venture capitalists has participated in: The more past IPO experience VC has, the more reputational it is

Additional to attracting strong ownership base of institutional owners, sponsor-backed companies might be able to obtain a broader analyst coverage after the IPO. Broader analyst coverage directly after the IPO can be viewed increasing performance of the PE and VC backed companies going public. Again, (Campbell & Frye, 2006) investigate the analyst coverage of VC-backed firms and find that VC-backed companies which have broader analyst coverage perform better in the long-term.

Financial sponsors can be argued to push overleveraged companies into public too quickly, as the holding period of portfolio companies is rather restricted for the private equity and venture capital companies. This emerges from the general structure of the private equity funds, as they need to provide profits to the fund investors after certain amount of time. (Cao & Lerner, 2009) investigate reverse leveraged buyouts (RLBOs) between 1981 and 2003 and find RLBOs to consistently outperforming other IPOs as well as the market using cross-sectional analyses. They also provide evidence that high leverage of these companies after the IPO is not interconnected with poor performance of the company. Also, financial sponsors often retain equity holding in their portfolio company even post-IPO, so the aftermarket performance of the company has an effect on the financial sponsor's wealth. This can be seen as decreasing the tendency of sponsors to push their portfolio companies to public too early as they are negatively affected by the poor aftermarket performance both reputationally and monetarily.

3. Hypotheses

Based on the previous academic theories and evidence, third party certification in conjunction with the IPO reduces the asymmetric information between parties which translates into less underpricing. According to for example (Megginson & Weiss, 1991) and (Gohil & Vyas, 2015)

I believe that financial sponsors are able to efficiently provide certification in IPO and therefore, the underpricing hypothesis takes the form of:

H_1: *Private equity and venture capital backed IPOs are less underpriced compared to their nonsponsored counterparts*

Next, I believe that the value-add from the sponsors according to the model provided by (Jensen, 1986) and (Jensen, 1989) enhances the fundamental characteristics of PE and VC portfolio companies even post-IPO. In line with broad, although partly inconclusive, evidence of sponsored IPOs long-term outperformance by for example (Brav & Gompers, 1997), (Bergström, et al., 2006), (Levis, 2011) and (Bessler & Seim, 2012) I assume that due to better operational and managerial structures in place, sponsored IPOs will outperform long-term. The long-term performance hypothesis takes the form of:

H_2: *Private equity and venture capital backed IPOs outperform their nonsponsored counterparts in the long-term*

4. Data & Methodology

This section introduces the dataset employed in the study and presents the different methods used for performance evaluation. First part of the section explains the data sourcing methods and presents the summary statistics of the data. Next part deep dives into the different methods used to investigate the performance.

4.1. Sample & Summary Statistics

For my analysis, I use a sample of initial public offerings conducted in the Nordics from January 2000 to December 2019. This long timespan allows investigating the potential time variances across the IPO performance and underpricing across the years. The sample has to be cut into December 2019 to ensure that sufficient time (3 years) has passed from the last issue used in the analysis to be able to investigate the long-term performance of the companies across the sample. For the purpose of this study, the sample includes IPOs from Nasdaq Copenhagen, Helsinki, and Stockholm Official lists as well as Nasdaq First North Growth Market, which is a less regulated stock exchange for small- to medium-enterprises. Nasdaq First North Growth Market includes companies from Denmark, Finland, and Sweden. Similarly, IPOs from Nordic Growth Market, a Swedish exchange for smaller companies, are also included in the sample. For Norwegian companies, IPOs from Oslo Stock Exchange as well as Oslo Euronext Access and Oslo Euronext Growth are included. The latter two are Norwegian equivalent to the First

North Markets in other Nordic countries. Less regulated markets are used in the analysis to broaden the sample as well as ensuring that all types of deals are prevailing in the sample.

I gathered the data of IPOs during the 2000-2019 period from the SDC Platinum database. For identifying the sponsor-backed IPOs, I use the identifier of private equity and venture capital backed IPOs provided by SDC Platinum. I am separating the venture capital companies from private equity companies in general, as venture capital companies have different characteristics compared to PE firms in general, the separate analysis is needed to gather throughout information on the different effects of financial sponsors. The dataset includes pre-IPO sponsor for each of the sponsor-backed IPOs, as well as a classification between venture capital and private equity backing. Since I am using this classification directly from the database, the risk of inaccurate identification between the PE and VC backed IPOs remains.

Exhibit 1 highlights the total amount of IPOs used in the analysis in all of the markets, totalling 483, of which 58 are private equity backed and 36 are backed by venture capital. Sponsored IPOs account for approximately 19% of the total IPOs in the sample. In general, nonsponsored IPOs have significantly lower average and median issue size compared to sponsored IPOs. The significantly lower average issue size for nonsponsored IPOs is driven by large number of small IPOs in this sample, which is also visible through large difference between the mean and median in the NB IPO group. There is also a great difference between the mean and median issue size in the PE and VC IPO groups due to some significantly larger (typically IT sector) portfolio exits for these sponsors. Larger size of sponsored issues could also reflect the large secondary issue portion of the total issue in the sponsored IPOs. As the PE and VC companies are not seen as natural owners for a public company, large pre-IPO owner exit in conjunction with the IPO can be justified in case of financial sponsors. The large secondary issue then inflates the total issue size even though the raised capital might not be significantly larger.

EXHIBIT 1
Descriptive statistics

The sample includes 483 IPOs from January 1. 2000 to December 31. 2019 and consists of 58 private equity (PE) backed and 36 venture capital (VC) backed IPOs as well as 389 nonsponsored (NB) IPOs. Issue size includes the possible primary and secondary issues as well as employee offerings. Issue size is calculated by multiplying the issue price with the number of shares issued. In case employee offering is issued via discount, the discounted share price is multiplied by the amount issued in the employee offering separately.

Variable	Mean	Median	Sample size
Panel A: Nonsponsored IPOs			
Issue size (EURm)	67.7	16.8	389
Market Capitalization (EURm)	572.9	62.3	389
Panel B: Private-equity backed IPOs			
Issue size (EURm)	225.9	137.8	58
Market Capitalization (EURm)	148.6	289.4	58
Panel C: Venture capital backed IPOs			
Issue size (EURm)	121.5	30.3	36
Market Capitalization (EURm)	2260.8	35.6	36

In the exhibit 2 the sample of IPOs is divided based on the year of issuance and the time variance of IPOs is further visualized in figures 1-3. The IPO activity is very much interconnected with the general macroeconomic conditions and trends in the market and the large variance in IPO activity is visible between different years in the sample. First peak year in IPOs in total can be seen right at the beginning of the sample in year 2000, with 31 total new issues during the year. The tech boom peaked at 2000, which boosted the IPO activity strongly during that year. Surprisingly, not any PE or VC backed IPOs was conducted during that year in the Nordics, which might be partly explained by the sponsor market not being as developed in the Nordics back in 2000. After the tech boom crashed in 2001, IPO activity decreased rapidly which can be seen in the sample during 2001-2003. After those years, the IPO window opened again the number of issues increased rapidly again, reaching at-the-time peak in 2007 which was also the peak year for the venture capital-backed IPOs for the whole sample. Financial crisis in 2008 decreased the IPO activity again rapidly, and it took until 2017 for the IPO activity to reach its prior peak levels. After 2010, number of sponsored IPOs was quite resilient, apart from the peak year of 2015 which was the most PE backed IPOs during the whole sample.

EXHIBIT 2

Distribution of volume and issue size across years

The sample includes 483 IPOs from January 1. 2000 to December 31. 2019 and consists of 58 private equity (PE) backed and 36 venture capital (VC) backed IPOs as well as 389 nonsponsored (NB) IPOs. Issue size includes the possible primary and secondary issues as well as employee offerings. Issue size is calculated by multiplying the issue price with the number of shares issued. In case employee offering is issued via discount, the discounted share price is multiplied by the amount issued in the employee offering separately.

	Number of IPOs #				**Issue size EURm**			
	PE	VC	NB	TOTAL	PE	VC	NB	TOTAL
2000	0	0	31	31	0.0	0.0	4331.7	4331.7
2001	0	1	7	8	0.0	31.8	116.3	148.0
2002	4	0	1	5	623.2	0.0	0.2	623.4
2003	0	0	0	0	0.0	0.0	0.0	0.0
2004	1	3	5	9	350.0	43.1	235.7	628.7
2005	1	5	17	23	44.0	323.5	1831.9	2199.4
2006	6	5	26	37	679.7	511.7	1484.8	2676.1
2007	5	8	36	49	559.8	439.1	1407.2	2406.2
2008	0	0	8	8	0.0	0.0	86.5	86.5
2009	0	0	1	1	0.0	0.0	37.7	37.7
2010	5	2	17	24	2182.8	58.0	1520.0	3760.8
2011	2	1	9	12	101.1	7.3	219.2	327.6
2012	0	1	2	3	0.0	56.8	71.0	127.8
2013	0	2	8	10	0.0	32.6	567.8	600.4
2014	7	2	26	35	2481.2	216.2	2142.2	4839.7
2015	13	1	33	47	3074.9	44.1	2382.1	5501.1
2016	4	1	33	38	955.1	2117.8	2605.8	5678.6
2017	6	2	62	70	786.7	464.0	3199.1	4449.7
2018	2	1	40	43	83.8	32.0	2479.3	2595.1
2019	2	1	27	30	1443.0	14.3	1135.9	2593.2
	58	36	389	483	13365.3	4392.3	25854.4	43611.9

The total capital issued seems to also be very much connected to the macroeconomic environment. Naturally, as the number of IPOs increase during economic boom, also the amount of capital raised through the IPOs increase. This showcases that as the IPO activity increases, it is not driven only by small enterprises going public, but also the capital amount being increased. However, during the 2005-2007 period, when the number of IPOs increased significantly, the capital issued did not increase as rapidly especially in the nonsponsored IPO group. There are also some exceptions in the sample where a large amount of capital has been issued, through only a few IPOs. These years are prevailing especially in the PE and VC backed IPO groups, potentially due to some very rapidly growing portfolio companies of these financial sponsors.

There is also some differentiation on the industry distribution between the three groups, as shown in the Exhibit 3. However, the largest industries for all three groups are clearly manufacturing and services as they combined present over 50% of the total IPOs in the sample. Finance, Insurance and Real Estate companies are clearly less represent in the sponsored IPOs compared to the nonsponsored IPOs, which is not surprising considering the nature of the businesses. Similarly, companies in the Transportation, Communications, Electric, Gas and Sanitary service industries are much less frequently having a sponsor backed IPO in the sample. On the contrary, Retail Trade companies are more presented in the sponsored IPOs, especially in the PE backed IPO group. The differences in the industry spread among groups might be reflecting the specification nature of financial sponsor, where these investors focus on a narrow set of industries where they have the most expertise in. Regardless of the specification, the industries are not fully concentrated in the sample, which ensures multiple industries present among each group under investigation.

FIGURE 1: VC Backed IPOs volume and value distribution

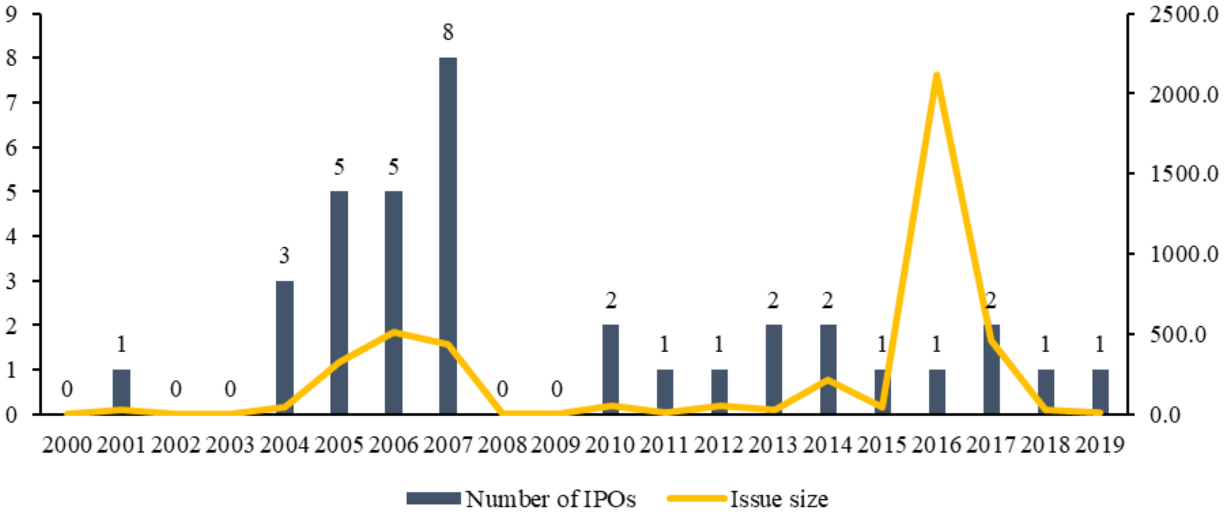

FIGURE 2: PE Backed IPOs volume and value distribution

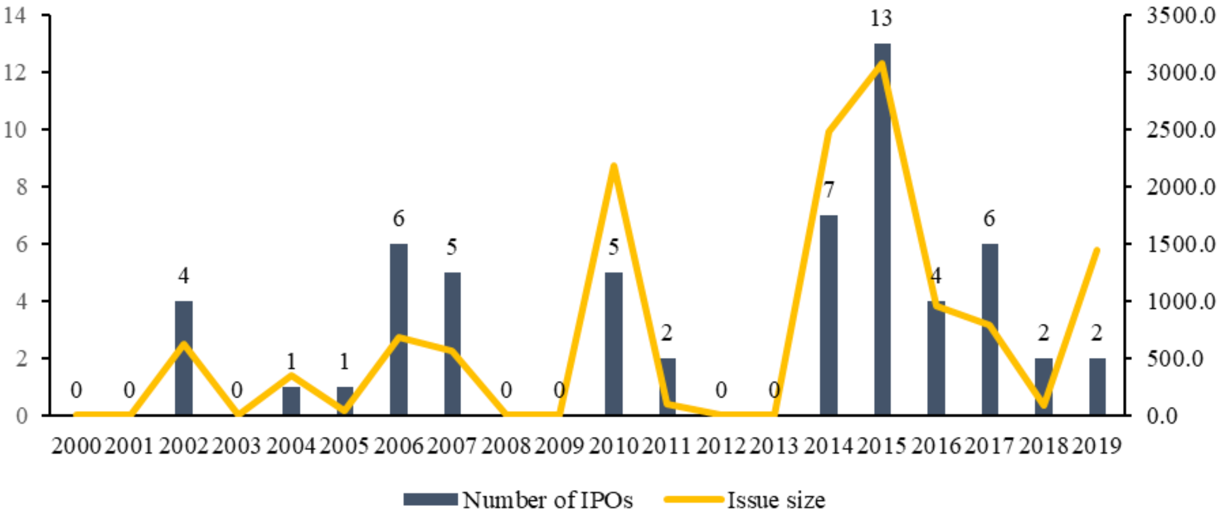

FIGURE 3: Nonsponsored IPOs volume and value distribution

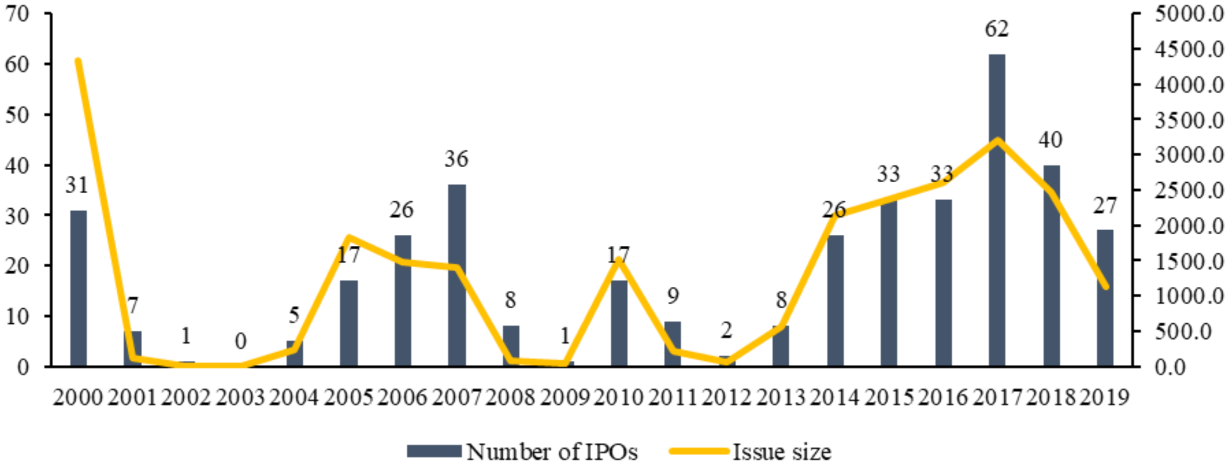

EXHIBIT 3

Industry distribution of the sample

The total sample consists of 483 IPOs of which 58 are private equity (PE) backed, 36 are venture capital (VC) backed and 483 are nonsponsored (NB). Number of IPOs are classified between different industries based on the SIC industry coding. Industry code of each IPO company is attained from the SDC Platinum database. Panel A presents the absolut number of IPOs in each of the industries per different subgroup. Panel B presents the proportional amount of IPOs in each of the industries per different subgroups presented as a percentage.

	Group of IPOs			
Industry	PE	VC	NB	TOTAL
Panel A: Number of IPOs #				
Agriculture, Forestry and Fishing	1	1	2	4
Mining	2	2	17	21
Construction	3	0	7	10
Manufacturing	23	19	116	158
Transportation, Communications, Electric, Gas and Sanitary service	2	2	43	47
Wholesale Trade	3	0	13	16
Retail Trade	7	1	6	14
Finance, Insurance and Real Estate	3	0	68	71
Services	14	11	117	142
Public Administration	0	0	0	0
Total	58	36	389	483
Panel B: Percentage of the IPOs				
Agriculture, Forestry and Fishing	2 %	3 %	1 %	1 %
Mining	3 %	6 %	4 %	4 %
Construction	5 %	0 %	2 %	2 %
Manufacturing	0 %	0 %	0 %	0 %
Transportation, Communications, Electric, Gas and Sanitary service	40 %	53 %	30 %	33 %
Wholesale Trade	3 %	6 %	11 %	10 %
Retail Trade	5 %	0 %	3 %	3 %
Finance, Insurance and Real Estate	12 %	3 %	2 %	3 %
Services	5 %	0 %	17 %	15 %
Public Administration	24 %	31 %	30 %	29 %
Total	100 %	100 %	100 %	100 %

4.2.Methodology

As only a little evidence exists on the performance of sponsored IPOs in the Nordics both in the long-term and the initial day, I use methods for investigating both timespans of the sponsored IPOs. Next, I will go through the methodology for calculating the underpricing and the long-term performance.

4.2.1. Measuring Underpricing

In this study, I use the period during the initial day of trading for the measurement of underpricing. As the first step in calculating the underpricing, I calculate the difference of stock price at the end of the first day of trading and the IPO offer price.

The initial raw return of IPO i, is calculated as follows:

$$r_i = \frac{P_{listing} - P_{offer}}{P_{offer}}$$

Where r_i is the initial raw return, $P_{listing}$ is the closing price of the stock i for the first day of trading, and P_{offer} is the offer price of the stock i in the IPO i.e., the IPO price.

The initial raw return is adjusted by the market movement to capture the effect of underpricing and the abnormal return on the first day of trading. When measuring underpricing, market return is estimated by using MSCI Nordic countries index.[4]

The benchmark adjusted initial return is calculated as follows:

$$ar_i = r_i - r_b$$

Where ar_i is the abnormal return of the stock i over the benchmark index in the first day of trading, r_i is the initial raw return of the stock i and r_b is the return of the benchmark index during the first day of trading of the stock.

After calculating the benchmark adjusted initial returns, the companies are classified into various portfolios for investigating the underpricing of sponsored IPOs. First, I divide companies into portfolios of PE backed, VC backed and nonsponsored IPOs by using the classification presented earlier. Further, by following the methodology of (Bergström, et al., 2006), I construct portfolios based on industry classification and the year of the issue to capture the effects of industry and time variance on underpricing. For each of the portfolios, I calculate both equal weighted and value weighted returns. The equal weighted return for each portfolio is calculated by giving equal weight for each of the companies in the return calculation, regardless of their characteristics or size.

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[4] Please, see section 4.2.3. for detailed information on different benchmark indices

The equal weighted portfolio abnormal initial return is calculated as follows:

$$AR_p^{EW} = \frac{1}{n_p}\sum_{i=1}^{n_p} ar_i$$

Where n_p is the number of companies in each portfolio p and ar_i is the benchmark adjusted initial return for stock i.

I also calculate the value weighted returns for each portfolio by using the market capitalization of each company in the portfolio relative to the total market capitalization of the portfolio as the weight. By using value weights in the construction of the portfolio, I can investigate the effects of the market capitalization to the underpricing and whether potential differences in underpricing is driven by the size of the companies in each portfolio.

The value weighted portfolio abnormal initial return is calculated as follows:

$$AR_p^{VW} = \sum_{i=1}^{n_p} w_i ar_i$$

Where n_p is the number of companies in each portfolio p and ar_i is the benchmark adjusted initial return for stock i. w_i is the weight of the company in the portfolio, defined as the percentage of the market capitalization of company i of the total market capitalization of portfolio p.

4.2.2. Measuring Long-Run Performance

For the long-run performance measurement, I study multiple intervals and timespans after the first day of trading: six months, one year, two years and three years. The first day of trading is excluded from all of the time periods as the investors might not be able to get the allocation (at least fully) in the IPO. Also, first day return pattern might include movement which is not related to the intrinsic value of the company.

In the academic studies, long-run performance is measured using typically one of the two methods: cumulative abnormal return (CAR) or buy-and-hold abnormal return (BHAR). Neither one of these is completely perfect and they both have issues related to the produced results. I am using the BHAR method for the following reasons: Firstly, BHAR has been the method more commonly used in the recent literature since using CAR method might lead to biased outcomes in evaluating long-term returns. Secondly, BHAR method imitates the actual behaviour of the investors' portfolio better in the long-term. However, the BHAR method might produce results which are too positive as its compounding the raw returns of the portfolio. To eliminate this positive skewness, I follow the method by (Lyon, et al., 1999) and (Levis, 2011) and use skewness-adjusted t-statistic with bootstrapped p-values.

For calculating the BHAR, I first generate the raw buy-and-hold returns for each company in the sample by compounding the monthly returns for 6 months, 12 months, 24 months, and 36 months in addition to the first partial month of trading, which excludes the first day of trading.

The compounding returns are calculated as follows:

$$\prod_{t=1}^{T}(1 + r_{it})$$

Where, r_{it} is the raw return for IPO i in month t.

To determine the buy-and-hold abnormal return, I use different benchmark indices to estimate the expected return for each firm. I generate the raw buy-and-hold returns for each benchmark used in the analysis for the same time periods as the IPO returns. I use several benchmark indices for the market return estimation, 1) MSCI Nordic countries, 2) Three different size adjusted benchmarks based on the market capitalization of each individual companies, and 3) Industry benchmarks based on the broad SIC industry classifications of each individual companies.[5]

The raw buy-and-hold returns for benchmarks are calculated as follows:

$$\prod_{t=1}^{T}(1 + r_{bt})$$

Where, r_{bt} is the raw return for benchmark b in month t.

Similar to (Levis, 2011) I calculate the BHARs for each of the IPO samples by using both equal and value weights based on market capitalization. In case a firm in the portfolio is delisted, the BHAR for the following month is either equal or value weighted average of the remaining companies, calculated similarly as in previous month except for excluding the delisted IPO from the portfolio. This implicitly means that the funds from the delisted company are allocated similarly to the remaining companies in the portfolio.

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[5] Please, see section 4.2.3. for detailed information on different benchmark indices

The BHARs are calculated as follows:

$$BHAR = \frac{1}{N}\sum_{i=1}^{N}\left[\left(\prod_{t=1}^{T}(1 + r_{it})\right) - \left(\prod_{t=1}^{T}(1 + r_{bt})\right)\right]$$

Where, r_{it} is the raw return for IPO i in month t and r_{bt} is the raw return for benchmark b in month t as previously stated.

Finally, as (Lyon, et al., 1999) document, the long-term BHARs are positively skewed which leads to negatively biased t-statistics. Further, this indicates that the p-values for lower-tailed tests are smaller than they actually are and the p-values for upper-tailed tests are larger than they should be. To eliminate this bias, I follow (Lyon, et al., 1999) and use the bootstrapped skewness-adjusted t-statistics. I use this method to test the null hypothesis of average BHARs being zero to find the statistical significancy of the results.

The bootstrapped skewness adjusted t-statistic for a sample of n firms is calculated as follows:

$$t_{sa} = \sqrt{n}(S + \frac{1}{3}\hat{\gamma}S^2 + \frac{1}{6n}\hat{\gamma})$$

Where:

$$S = \frac{\overline{BHAR_\tau}}{\sigma(BHAR_\tau)}$$

and

$$\hat{\gamma} = \frac{\sum_{i=1}^{n}(BHAR_{i\tau} - \overline{BHAR_\tau})^3}{n\sigma(BHAR_\tau)^3}$$

and $BHAR_\tau$ is the buy-and-hold abnormal return for sample τ, $\overline{BHAR_\tau}$ is the mean buy-and-hold abnormal return for the same sample and $BHAR_{i\tau}$ is the buy-and-hold abnormal return for security i.

4.2.3. Benchmark indices used

For the analysis of long-term performance, several different indices are used to approximate the expected return, as presented above. These indices are 1) MSCI Nordic Countries 2) size-adjusted benchmark indices based on the market capitalization of different companies, and 3) industry-based benchmark indices based on the SIC industry classification of each company. Next, I will briefly go through these indices separately and why each of these is chosen for the analysis.

First benchmark index is the MSCI Nordic countries, which captures the overall market movement of the Nordic countries i.e., Denmark, Finland, Norway, and Sweden. The index includes a broad range of industries, largest being industrials and health care. MSCI Nordic countries is used to be able to evaluate the performance equally across the whole sample of IPOs and between each subsample.

Next, I use three different size-based indices: 1) STOXX Nordic Small 2) STOXX Nordic Mid and 3) STOXX Nordic Large to estimate the expected return. One of the three indices is used on each individual company based on the market capitalization of the company at the time of the issue.

Finally, I use 9 different industry-based indices from MSCI Europe to estimate the expected return of each company. One of the 9 different industry-based indices is used to estimate the expected return for each individual company based on the SIC classification of the company at the time of the issue.

5. Results

In this section, I present the results for my quantitative analysis and further discuss the evidence from the perspective of my hypotheses. The analysis of the results is divided into three parts: First, I will concentrate on the empirical findings regarding underpricing of the IPOs. Second part provides the results for the long-term performance of the different IPO samples. Third, I perform robustness checks and contemplate the key results from the perspective of financial sponsors as well as investors. And finally, I compare my results to prior Nordic evidence.

5.1. Underpricing

Exhibit 4 reports the results for first day returns of different IPO groups in the sample. For analysing underpricing across the different subsamples, I first calculated the first day returns for the whole sample of 483 IPOs. Panel A reports the results for the whole sample, and the results indicate that both of the sponsored IPO groups would be less underpriced compared to nonsponsored IPOs on equal weighted basis. VC backed IPOs have the lowest underpricing of 14.4 percent out of all IPO groups. However, using value weights in the portfolio formation, underpricing is surprisingly, significantly larger among the sponsored subsamples.

As some of the IPOs are relatively old, insufficient data on the offer price might be included in some individual cases. Furthermore, the large standard deviation across the IPO groups indicates that some of the data on the issue price might not be accurate. I tried to manually search for data to fulfil the insufficient issue prices, but especially for the older IPOs, the data was unavailable for some of the cases. Therefore, to increase the reliability of the analysis and to eliminate the potential distortion emerging from large outliers, I excluded the top and bottom 5 percent of values. Although, excluding values ex post needs to be always critically assessed, I believe that by decreasing the sample, my results are more reliable as the excluded values range from 120% up to 1500% for the top 5% and -74% to -90% for the bottom 5%. These outliers are likely due to data error on the issue price and therefore, not included in the further analysis on underpricing.

Panel B reports the results for this restricted sample, and the private equity backed IPOs show least underpricing across all the subsamples when equal weights are used. The underpricing for both NB and VC backed IPO groups is decreased significantly, and now the venture capital backed IPOs are most underpriced IPO sample. However, when value weights are used, venture capital backed IPOs are again the least underpriced subsample and PE backed IPOs show the largest underpricing across the groups.

Exhibit 5 demonstrates the time variance of underpricing across the whole sample as well as the three subsamples. The exhibit reports the underpricing of IPOs based on the year of issue and then equally weighting the IPOs in each of the years. A large variation exists among the underpricing of all of the IPO groups across different years.

The underpricing among PE backed IPOs seem to vary quite significantly from year to year with the largest underpricing experienced during 2019. Similarly, the underpricing among venture capital backed IPOs seem to vary, but during 2015 - 2017, the VC backed IPOs were underpriced the most. The underpricing among nonsponsored IPO sample has gradually increased over time and during 2000-2009 nonsponsored IPOs were much less underpriced compared to post 2009 period. Previous academic research has shown that IPOs are more underpriced when issued during a period of large volume of IPOs. My data does not seem to provide similar pattern based on the results shown in Exhibit 5.

EXHIBIT 4

First-day returns for the different IPO groups

The whole sample consists of 483 IPOs of which 58 are private equity backed (PE) and 36 are venture capital backed (VC). IPOs range from 2000 to 2019. Underpricing is determined by first calculating the initial raw return of each IPO during the first day of trading by investing in the company at the offer price and selling at the closing price of the first day of trading. The abnormal first-day returns are adjusted by market movements by subtracting the benchmark index return from the initial raw return of each IPO. MSCI Nordic countries index is used as the benchmark index in the calculation. Portfolios are then formed by using both equal-weights and value-weights based on market capitalization. Panel A includes the whole sample and Panel B excludes the top and bottom 0.05 of values aiming to eliminate outliers due to data errors

	Group of IPOs			
	PE	VC	NB	TOTAL
Panel A: The whole sample				
Average (equal-weighted) (%)	23.5	14.4	23.6	22.9
Average (value-weighted) (%)	64.3	64.8	39.8	45.1
Median (%)	3.2	0.6	1.7	1.6
Standard deviation (%)	138.9	70.7	146.5	141.3
Total number of issues	58	36	389	483
Panel B: Restricted sample, top and bottom 0.05				
Average (equal-weighted) (%)	1.2	3.9	3.1	2.9
Average (value-weighted) (%)	7.9	-0.1	6.3	6.2
Median (%)	3.2	0.6	1.7	1.6
Standard deviation (%)	21.4	15.3	26.3	25.1
Total number of issues	54	32	349	435

Exhibit 6 reports the underpricing in each of the different subsamples based on the industry of the company. The companies are categorized into different industries based on the broad SIC code. Among the whole sample, the most underpriced industry seems to be Transportation, Communications, Electric, Gas and Sanitary services, with an underpricing of 6.9 percent.

Private equity backed IPOs seem to be less underpriced in approximately half of the different industries. Among PE backed IPOs, the most underpriced industry seems to be Wholesale Trade with an average underpricing of 19.4 percent. Similarly, Finance, Insurance and Real Estate industry has 12.2 percent average underpricing among PE backed IPOs.

EXHIBIT 5

Underpricing across years

The whole sample consists of 483 IPOs of which 58 are private equity backed (PE) and 36 are venture capital backed (VC). IPOs range from 2000 to 2019. Underpricing is determined by first calculating the initial raw return of each IPO during the first day of trading by investing in the company at the offer price and selling at the closing price of the first day of trading. The abnormal first-day returns are adjusted by market movements by subtracting the benchmark index return from the initial raw return of each IPO. MSCI Nordic countries index is used as the benchmark index in the calculation. Portfolios are then formed by using both equal-weights across the companies. The IPOs are categorized based on the year of issue.

	Underpricing (%)			
Year of the IPO	PE	VC	NB	TOTAL
2000	n.a.	n.a.	-6.4 %	-6.4 %
2001	n.a.	n.a.	-34.4 %	-34.4 %
2002	-43.2 %	n.a.	-36.9 %	-41.6 %
2003	n.a.	n.a.	n.a.	n.a.
2004	10.8 %	-5.5 %	1.7 %	0.3 %
2005	0.2 %	6.0 %	8.3 %	7.5 %
2006	13.7 %	5.9 %	-7.0 %	-2.5 %
2007	-11.8 %	2.0 %	3.6 %	1.5 %
2008	n.a.	n.a.	-1.8 %	-1.8 %
2009	n.a.	n.a.	-14.7 %	-14.7 %
2010	3.3 %	-7.6 %	2.6 %	1.6 %
2011	0.8 %	n.a.	-2.2 %	-1.6 %
2012	n.a.	3.4 %	-16.8 %	-10.1 %
2013	n.a.	-3.6 %	-1.8 %	-2.1 %
2014	7.3 %	5.1 %	-0.3 %	1.8 %
2015	2.2 %	37.0 %	8.0 %	6.9 %
2016	14.8 %	25.4 %	4.5 %	6.5 %
2017	1.8 %	-0.6 %	10.4 %	9.2 %
2018	0.4 %	-4.9 %	6.3 %	5.7 %
2019	18.6 %	-2.1 %	3.1 %	4.0 %
Average	1.5 %	4.7 %	-3.9 %	-3.7 %

Venture capital backed IPOs are less underpriced than their nonsponsored counterparts in most of the industries, except for Retail Trade and Manufacturing. VC backed IPOs in Retail Trade industry experience quite large average underpricing of 19.1 percent, compared to underpricing of 5.2 percent among nonsponsored IPOs in the same industry. The least underpriced industry in the VC backed IPO subsample is the Transportation, Communications, Electric, Gas and Sanitary services, which experienced the largest underpricing among the nonsponsored IPOs.

EXHIBIT 6

Underpricing Across Industry

The whole sample consists of 435 IPOs of which 54 are private equity backed (PE) and 32 are venture capital backed (VC). IPOs range from 2000 to 2019. Underpricing is determined by first calculating the initial raw return of each IPO during the first day of trading by investing in the company at the offer price and selling at the closing price of the first day of trading. The abnormal first-day returns are adjusted by market movements by subtracting the benchmark index return from the initial raw return of each IPO. MSCI Nordic countries index is used as the benchmark index in the calculation. Portfolios are then formed by using both equal-weights across the companies. The IPOs are categorized based on the broad SIC industry code

	Underpricing (%)			
	PE	VC	NB	TOTAL
Agriculture, Forestry and Fishing	-0.6 %	-1.1 %	8.4 %	3.8 %
Mining	-10.6 %	-3.2 %	-0.3 %	-1.7 %
Construction	6.7 %	n.a.	6.2 %	6.3 %
Manufacturing	-6.4 %	5.2 %	-1.4 %	-1.4 %
Transportation, Communications, Electric, Gas and Sanitary service	5.3 %	-3.8 %	7.5 %	6.9 %
Wholesale Trade	19.4 %	n.a.	2.3 %	4.8 %
Retail Trade	5.5 %	19.1 %	5.2 %	6.4 %
Finance, Insurance and Real Estate	12.2 %	n.a.	1.8 %	2.3 %
Services	6.9 %	3.6 %	6.3 %	6.2 %
Public Administration	n.a.	n.a.	n.a.	n.a.
Average	4.3 %	3.3 %	4.0 %	3.7 %

Exhibit 7 reports the results for cross-sectional analysis on underpricing for both samples: the sample with all IPOs (Panel 1) and the restricted sample with top and bottom 5 percent excluded (Panel 2). Underpricing is the dependent variable of the regression, with multiple independent variables including the natural logarithm of issue size and market capitalization at the time of the issue, dummy variables for both PE and VC backing as well as dummy variables for each year and each industry. In the exhibit 7, I present only the statistically significant variables for year and industry dummies, i.e., not every year and industry dummy are included in the table.

The results in Exhibit 7 provide some confirmation to the underpricing phenomenon in general, as the intercept is positive and statistically significant in both of the subsamples. The issue size variable has a negative coefficient, which is in line with previous literature and findings by (Bergström, et al., 2006) for instance. As documented in the earlier literature, larger issues tend to be less underpriced. These results are also statistically significant on the regression performed to the whole sample of IPOs. Market capitalization on the contrary has a positive and significant coefficient indicating that firms with larger market capitalization after the issue are more underpriced.

Private equity backed IPOs have a positive coefficient on underpricing, which is on the contrary to the findings shown in Exhibit 4. However, the coefficient for PE dummy is not statistically significant, so the results cannot be fully interpreted. Similarly, VC backed IPOs have a positive coefficient on underpricing, but the results are again statistically insignificant.

Finally, Year dummy for 2001 shows positive and significant coefficient when the regression is performed to the whole sample, but negative and significant coefficient in the restricted sample. Year dummy 2002 provides a negative and significant coefficient in the restricted sample, but the coefficient is insignificant on the whole sample of IPOs. Both years 2001 and 2002 are years of low IPO volume in the sample, so the negative coefficient would be in line with previous research, which suggests that years with higher IPO volumes experience higher levels of underpricing. Dummy variable for Industry 4, which is the “Manufacturing” industry based on SIC classification has a negative and significant coefficient. This indicates that the companies in the manufacturing industry would experience less underpricing.

EXHIBIT 7

Cross-sectional Results for underpricing

The whole sample consists of 483 IPOs of which 58 are private equity backed (PE) and 36 are venture capital backed (VC). IPOs range from 2000 to 2019. Cross-sectional regression results are reported with underpricing as the dependent variable. Ln issue size is the natural logarithm of the EURm amount issued in IPO, ln market capitalization is the natural logarithm of the market capitalization immediately after issue, PE and VC are dummy variables indicating whether the IPO was backed by a private equity or venture capital firm, Year 2001 and 2002 are year dummies for each year and Industry 4 indicates "manufacturing" industry. Panel (1) includes the whole sample and Panel (2) excludes the top and bottom 0.05 of values aiming to eliminate outliers due to data errors. The exhibit reports the analysis with only the year and industry dummies with statistically significant coefficients.

Variables	**Coefficient**	
	(1) All IPOs	(2) Restricted
ln issue size	-0.116***	-0.012
	(-2.71)	(-1.55)
ln market capitalization	0.124***	0.031***
	(2.78)	(3.64)
PE	0.150	0.003
	(0.711)	(0.08)
VC	0.019	0.029
	(0.078)	(0.63)
Year 2001	1.681***	-0.388***
	(3.16)	(-3.18)
Year 2002		-0.447***
		(-3.59)
Industry 4		-0.058**
		(-2.29)
Intercept	0.439***	0.062**
	(3.30)	(2.38)
R^2	0.034	0.075
# of observations	(483)	(435)

***Significant at the 0.01 level
**Significant at the 0.05 level
*Significant at the 0.1 level

H$_1$: *Private equity and venture capital backed IPOs are less underpriced compared to their nonsponsored counterparts.*

The findings of my analysis presented earlier are inconsistent with **Hypothesis 1**, as the PE and VC backed IPOs do not show less underpricing compared to their nonsponsored counterparts. Private equity backed IPOs show slightly less underpricing when equal weights are used in the portfolio formation, but the phenomenon diminishes when value weights are used, and the effect turns opposing. Similarly, venture capital backed IPOs experience less underpricing in the whole sample using equal weights, but again the effect is opposing when value weights are used. In the restricted sample, the VC backed IPOs show more underpricing on equal weighted portfolios, but less underpricing on value weighted portfolios. As the results are not clear and the cross-sectional analysis does not lead into statistically significant results from the perspective of sponsor certification, my results as a whole do not back the hypothesis that sponsored IPOs would experience less underpricing due to sponsor certification.

The results are inconsistent with (Megginson & Weiss, 1991), (Bergström, et al., 2006) and (Gohil & Vyas, 2015) who document evidence on the certification effect of financial sponsors, and their ability to reduce underpricing. As evidence by (Barry, et al., 1990) suggest, this might be emerging from the quality factors of the sponsors, which are not observable from the sample. This leaves a room for future research to investigate whether the quality of the financial sponsors affect the certification effect in the Nordics, or whether the certification effect is not present.

On the contrary to the hypothesis, my results are partly consistent with the grandstanding hypothesis developed by (Gompers, 1996) and further backed by for instance (Lee & Wahal, 2004). According to the grandstanding hypothesis, the financial sponsors would be willing to accept higher levels of underpricing to signal their ability of successful exits. As discussed earlier, this might be very well be a present phenomenon in the Nordics where the PE and VC scene is not as established as in other parts of the world. This would indicate that financial sponsors in the Nordic might need to be willing to accept higher levels of underpricing as they need to signal more for successful fund raisings in the future. However, as my results do not clearly point to the direction of sponsored IPOs being more underpriced, this hypothesis cannot be fully confirmed based on my results. Again, this is a potential avenue for future research especially using Nordic samples.

5.2. Long-term performance

Exhibit 8 reports the buy-and-hold abnormal returns (BHARs) for the four different portfolios of IPOs: the whole sample (ALL), private equity backed IPOs, venture capital backed IPOs as well as nonsponsored IPOs. BHARs are reported on four different intervals from the time of the issue: 6 months, 12 months, 24 months and 36 months in addition to the first partial month after the issue excluding the first day of trading. Each of the portfolios are formed by using both equal weights as well as value weights based on the market capitalization of each individual company. Exhibit 8 reports the results by using three different benchmark indices as an estimation for the market return: 1) MSCI Nordic countries, 2) three different size benchmark indices based on the market capitalization of each individual companies and 3) industry benchmarks based on the broad SIC industry classification of each company.

Surprisingly, and in contrast to the earlier evidence, all IPOs have a positive and statistically significant BHARs for the period of 36-months post-listing using equal weights in the portfolio formation. These returns are mainly driven by positive BHARs of the nonsponsored IPO sample, which are also statistically significant. The positive BHARs of the nonsponsored IPOs, however, are decreasing significantly when using value weights in portfolio formation except for the industry benchmark. For instance, the 36-month BHAR based on MSCI Nordic countries benchmark decreases from 21.13% to 5.32% when using value weights in portfolio formation instead of equal weights. Nonsponsored IPOs are also generating positive BHARs for the shorter time intervals of 12 and 24 months and the results are also statistically significant. Again, these results are diminished mostly for the value weighted portfolios except for the industry benchmark. This indicates that the positive abnormal returns for the nonsponsored IPOs seem to be driven by smaller IPOs. This is somewhat surprising compared to earlier evidence, as for example (Brav & Gompers, 1997) find that the performance of nonsponsored IPOs is increased when value weights are used in portfolio formation. Compared to this earlier evidence that the underperformance of the control group (NB) would be driven by smaller IPOs, my evidence proposes the opposing relation.

From the exhibit 8, it is visible that the venture capital backed IPOs show clear underperformance compared to other IPO groups. The BHARs for all time intervals reported in the exhibit 8 are negative for the venture capital backed IPOs, however the results are not statistically significant for the most part. The 36-month BHARs range from -19.32 % to -22.89 % in the equal weighted portfolios of venture capital backed IPOs depending on the benchmark index used. Furthermore, the equal weighted BHARs of VC IPOs are negative, and mostly statistically significant (except for SIZE benchmark) 1-year post-IPO. On the contrary to the nonsponsored sample, the performance of the VC backed IPOs does not seem to be driven by the size of the companies as the value weighted portfolios do not provide significantly different results compared to equal weights. Overall, these results indicate that the VC backed IPOs are underperforming compared to other groups.

Panel B reports the BHARs for the private equity backed IPOs, which seem to be opposing to the performance of the venture capital backed IPOs. Using equal weights, private equity backed IPOs are performing quite similar compared to nonsponsored IPOs 36-month post IPO, depending on the benchmark used. Using MSCI Nordic countries index, PE IPOs slightly underperform their nonsponsored counterparts by generating BHAR of 20.10 % compared to 21.13 % of nonsponsored IPOs. Industry benchmark also leads to PE backed IPOs underperforming the nonsponsored IPO sample 36-months post-IPO, although the 36-month BHAR of 19.98 % remains positive. However, PE backed IPOs outperform their nonsponsored counterparts three years after the IPO when size-based (SIZE) benchmarks are used as an estimation of the expected return of the market.

PE backed IPOs outperform the nonsponsored IPOs when value weights are used in the portfolio formation in the 36-month interval. The abnormal returns of the PE backed IPOs seem to be driven by the larger IPOs as the 36-month BHARs are higher using value weighted portfolios in every benchmark category compared to equal weighted portfolios, which is opposing the nonsponsored IPOs. The positive buy-and-hold abnormal returns three years post-IPO are also statistically significant across the benchmarks and portfolio weighting methods among the PE backed IPO subsample.

Using equal weights, PE backed IPOs underperform their nonsponsored counterparts in the shorter time intervals of 6-month 12-month and 24-month. The BHARs are mostly negative during the first two inspection periods but turn positive in the 24-month interval. From Figures 4-6 it is actually visible that the BHARs turn positive almost immediately after the 12-month period post-IPO. The PE backed IPOs are however, underperforming the nonsponsored IPOs during almost the whole 36-month period and partly surpass the NB portfolios only very close to the 3-year mark post-IPO. By value weighting the PE portfolios, buy-and-hold abnormal returns on the shorter intervals are positive throughout the three inspection points. In fact, PE backed IPOs are also outperforming the nonsponsored IPOs on all of the intervals and all benchmark indices when value weights are used. However, these results remain statistically insignificant on the shorter intervals which lacks the reliability of the results.

Exhibit 10 shows the time variation of the abnormal returns for different IPO groups based on the year of issuance. Both equal and value weighted portfolios are presented in the table, and the MSCI Nordic countries index is used as the estimation for the expected return. Among the sponsored IPO groups, the underperformance has been stronger on the IPOs issued during times when the IPO activity has been high. In the PE and VC backed IPO samples, companies conducting IPO in 2004-2007 and 2016-2017 IPO boom periods had a negative BHARs 36-months post IPO. The nonsponsored IPOs in early 2000 and during 2007-2009 period had the largest negative BHAR using both equal and value weights.

The nonsponsored IPOs which were issued post 2012 generated positive BHARs except for the IPOs issued in 2019. This indicates that the nonsponsored IPOs benefitted from the market conditions during 2012-2020 and outperformed the benchmark indices. Venture capital and private equity backed IPOs did not provide such performance in the latter 10 years of the sample, and the 36-month BHARs were mostly negative during that period for the VC backed IPOs. However, BHARs for the PE backed IPOs were mostly positive during the 2011-2019, apart from the 2016 and 2017 period which indicates some similar pattern as for the nonsponsored IPOs.

EXHIBIT 8

Buy-and-Hold Abnormal Returns

The sample includes 483 IPOs from January 1. 2000 to December 31. 2019 and consists of 58 private equity (PE) backed and 36 venture capital (VC) backed IPOs as well as 389 nonsponsored (NB) IPOs. Buy-and-Hold returns are calculated individually for each IPO by first compounding the daily returns of an IPO to monthly returns, which are further compounded for periods of 6-36 months. Abnormal returns are calculated by subtracting benchmark index return from the compounded return of an IPO by using three different benchmarks: 1) MSCI Nordic countries 2) Size adjusted benchmark based on the market capitalization of each company and 3) Industry based benchmarks for each individual company. Left column reports the returns by using equal weights between companies in a portfolio. Right column reports the returns by using value weights where the companies are weighted by using market capitalization. If a company is delisted before the end date of the time period, the funds from the delisted company are distributed to the remaining companies by using same weighing method as previously.

	Equal Weighted			**Value Weighted**		
	MSCI	SIZE	IND	MSCI	SIZE	IND
			Panel A: ALL IPOs			
6	12.2	11.72	13.07	0.97	2.2	3.65
	(1.51)	(1.45)	(1.60)	(0.28)	(0.64)	(1.42)
12	9.06*	8.2	10.88**	5.85	7.91*	8.57*
	(1.76)	(1.59)	(2.15)	(1.50)	(1.82)	(1.93)
24	13.07***	11.76***	17.62***	10.92	16.66**	20.64**
	(2.92)	(2.62)	(4.06)	(1.27)	(1.96)	(2.52)
36	18.02***	16.33***	26.08***	11.95*	17.44**	24.49***
	(2.97)	(2.65)	(4.38)	(1.70)	(2.38)	(4.16)
			Panel B: Private Equity Backed IPOs			
6	-0.92	-0.02	-1.74	3.82	5.18	4.92
	(-0.39)	(-0.14)	(-0.57)	(0.48)	(0.70)	(0.58)
12	-0.73	0.95	-0.82	9.74	12.06	9.6
	(-0.29)	(0.05)	(-0.28)	(0.63)	(0.78)	(0.54)
24	8.1	12.48*	7.87	53.48	59.42	56.54
	(1.04)	(1.73)	(1.06)	(1.50)	(1.64)	(1.45)
36	20.10*	24.01**	19.98**	39.33**	40.45**	39.2*
	(1.89)	(2.50)	(2.01)	(2.11)	(2.56)	(1.78)
			Panel C: Venture Capital Backed IPOs			
6	-8.77	-6.39	-5.74	-12.07	-11.04	-9.51
	(-1.04)	(-0.72)	(-0.69)	(-0.99)	(-0.86)	(-0.73)
12	-15.81**	-13.06	-13.91*	-7.38	-2.37	-5.59
	(-2.07)	(-1.64)	(-1.78)	(-1.03)	(-0.42)	(-0.86)
24	-12.75	-13.62	-8.43	-13.65**	-6.88	-18.93*
	(-0.96)	(-1.02)	(-0.58)	(-2.00)	(-1.28)	(-1.89)
36	-19.49	-22.89	-19.32	-12.92	-8.97	-19.27**
	(-1.13)	(-1.38)	(-1.06)	(-1.43)	(-0.81)	(-2.31)

Panel D: Nonsponsored IPOs						
6	16.11	15.16	17.03*	0.97	2.18	4.14*
	(1.60)	(1.50)	(1.69)	(0.23)	(0.53)	(1.68)
12	12.84**	11.26*	14.94**	5.54*	7.33*	9.19***
	(2.06)	(1.79)	(2.44)	(1.67)	(1.87)	(2.78)
24	16.16***	13.96***	21.45***	-0.31	5.29	12.4***
	(3.06)	(2.62)	(4.21)	(0.10)	(0.81)	(2.77)
36	21.13***	18.77**	31.15***	5.32	12.23	22.94***
	(2.94)	(2.56)	(4.44)	(0.65)	(1.33)	(4.01)

***Significant at the 0.01 level

**Significant at the 0.05 level

*Significant at the 0.1 level

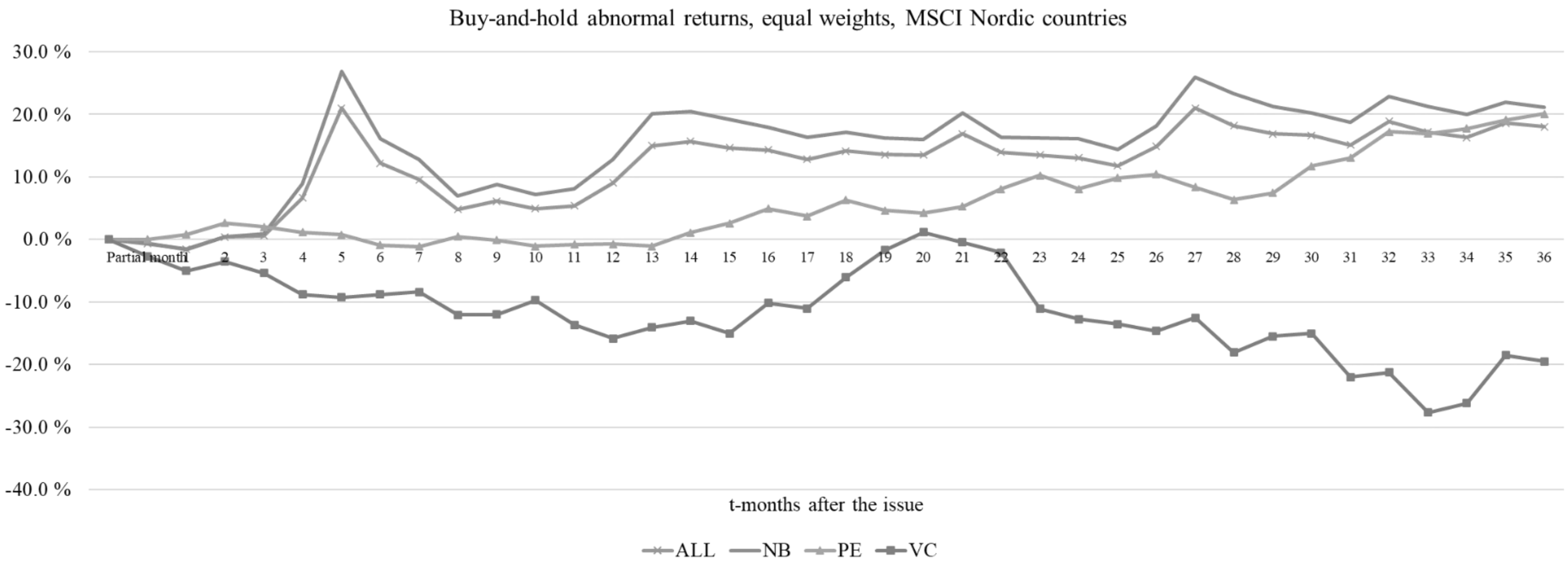
EXHIBIT 9

Buy-and-Hold Abnormal Return Differences

The sample includes 483 IPOs from January 1. 2000 to December 31. 2019 and consists of 58 private equity (PE) backed and 36 venture capital (VC) backed IPOs as well as 389 nonsponsored (NB) IPOs. Buy-and-Hold returns are calculated individually for each IPO by first compounding the daily returns of an IPO to monthly returns, which are further compounded for periods of 6-36 months. Abnormal returns are calculated by substracting benchmark index return from the compounded return of an IPO by using three different benchmarks: 1) MSCI Nordic countries 2) Size adjusted benchmark based on the market capitalization of each company and 3) Industry based benchmarks for each individual company. Left column reports the returns by using equal weights between companies in a portfolio. Right column reports the returns by using value weights where the companies are weighted by using market capitalization. The table reports the differences of each sample compared to the corresponding nonsponsored sample in percentage points. A negative number indicates that the sponsored sample has performed worse compared to nonsponsored counterpart

	Equal Weighted			**Value Weighted**		
	MSCI	SIZE	IND	MSCI	SIZE	IND
Panel B: Private Equity Backed IPOs						
6	-17.03	-15.18	-18.77	2.85	3.00	0.78
12	-13.57	-10.31	-15.76	4.2	4.73	0.41
24	-8.06	-1.48	-13.58	53.79	54.13	44.14
36	-1.03	5.24	-11.17	34.01	28.22	16.26
Panel C: Venture Capital Backed IPOs						
6	-24.88	-21.55	-22.77	-13.04	-13.22	-13.65
12	-28.65	-24.32	-28.85	-12.92	-9.7	-14.78
24	-28.91	-27.58	-29.88	-13.34	-12.17	-31.33
36	-40.62	-41.66	-50.47	-18.24	-21.2	-42.21

Figure 4


Buy-and-hold abnormal returns, equal weights, MSCI Nordic countries

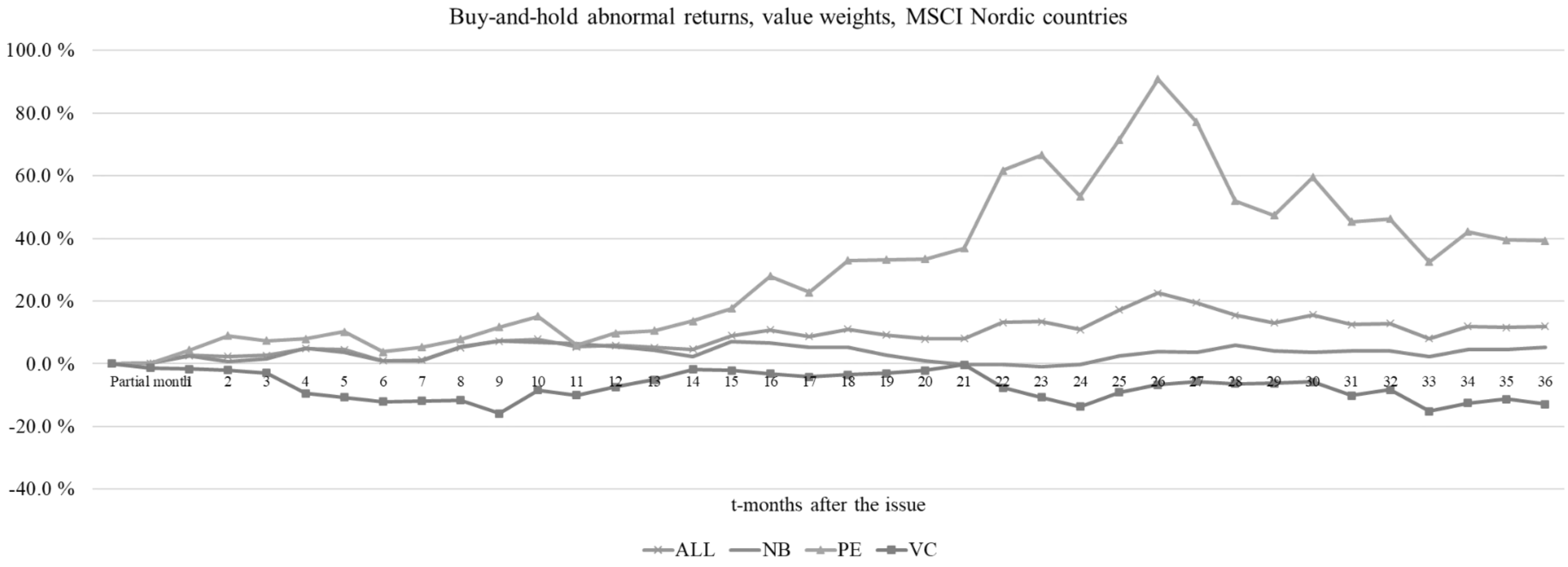
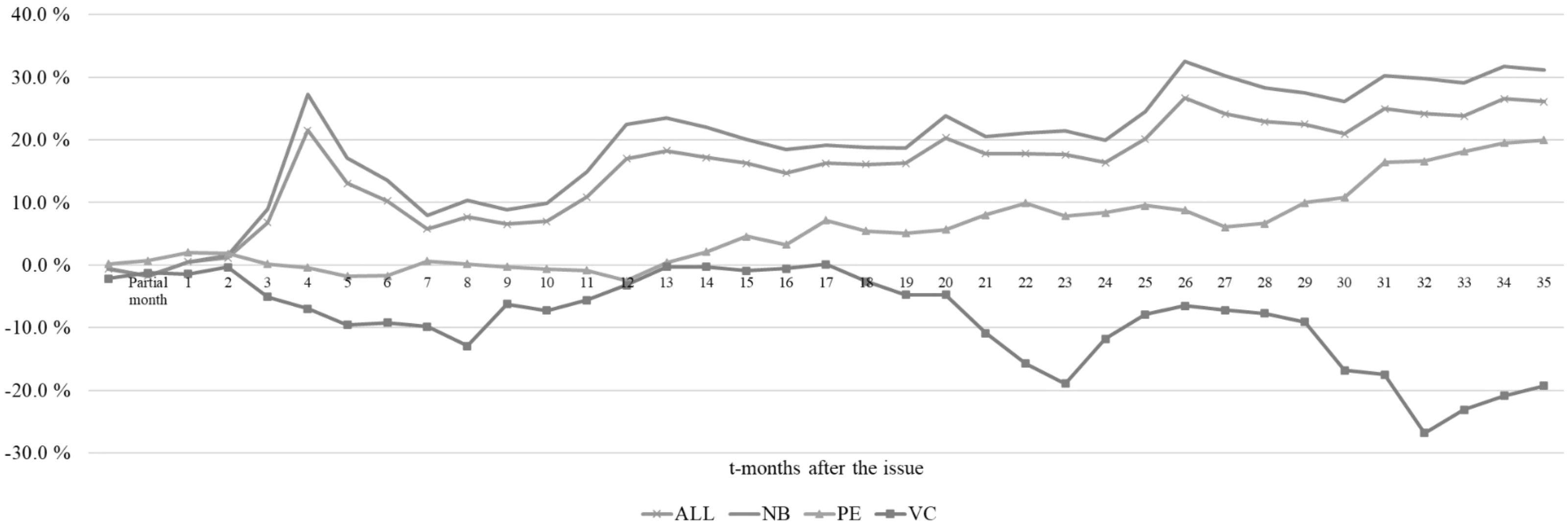

Buy-and-hold abnormal returns, value weights, MSCI Nordic countries

Figure 5

Buy-and-hold abnormal returns, equal weights, Industry benchmarks



Buy-and-hold abnormal returns, value weights, Industry benchmarks

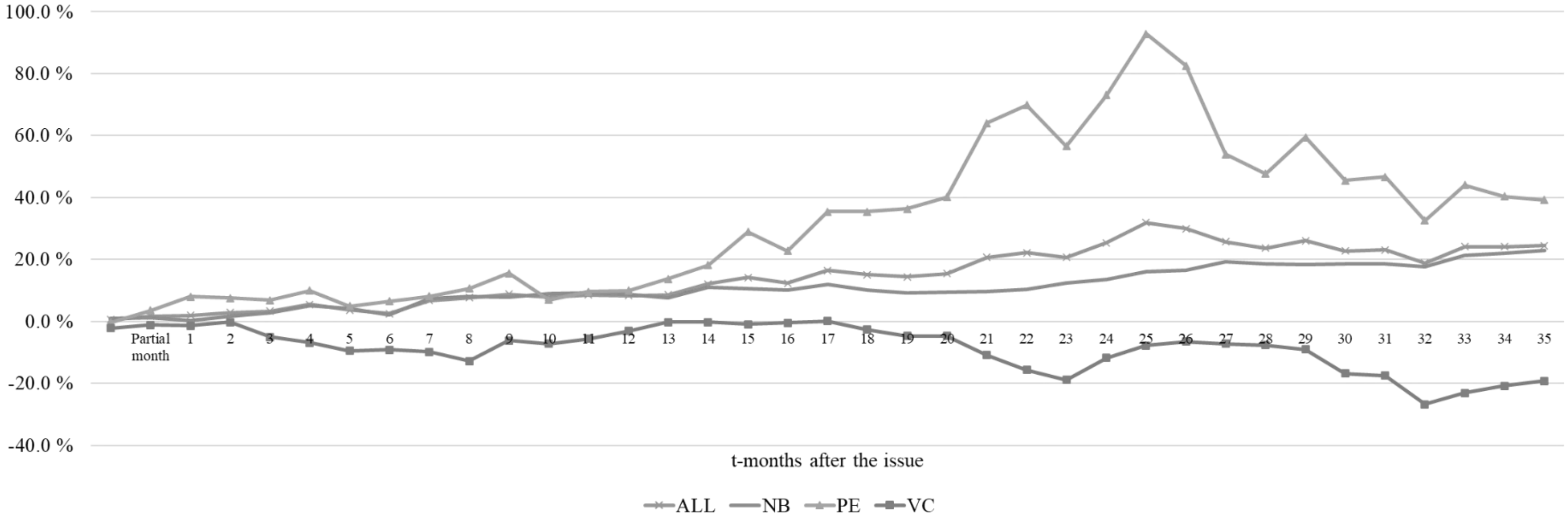
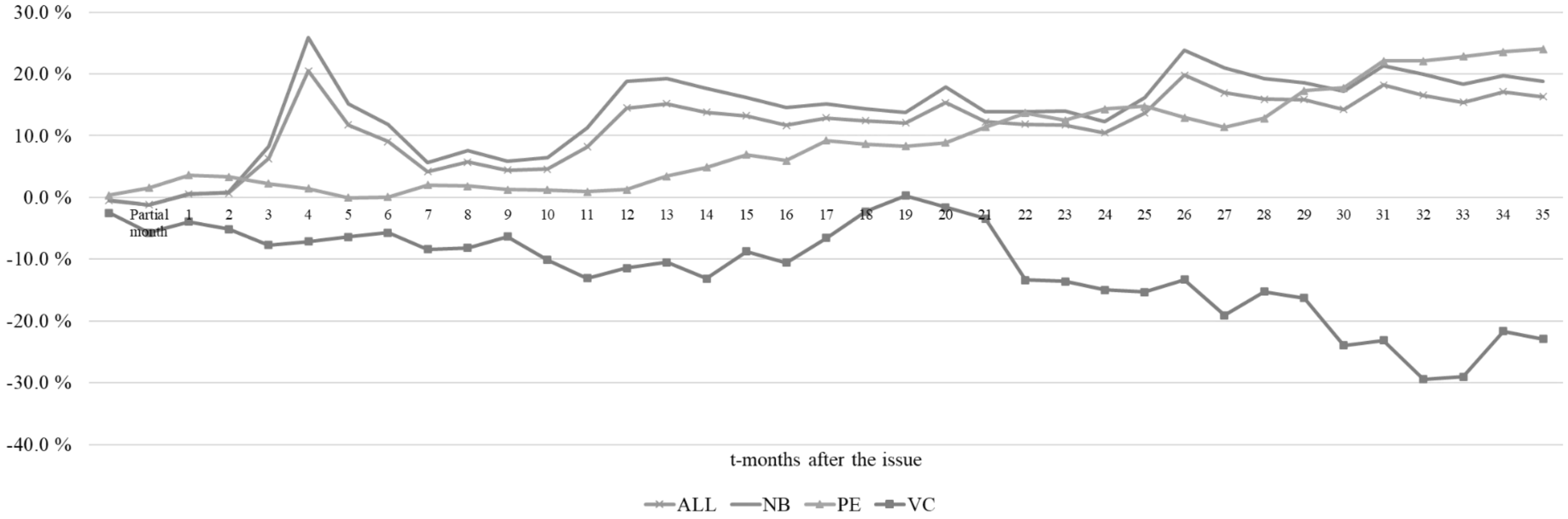


Figure 6

Buy-and-hold abnormal returns, equal weights, Size benchmarks



Buy-and-hold abnormal returns, value weights, Size benchmarks

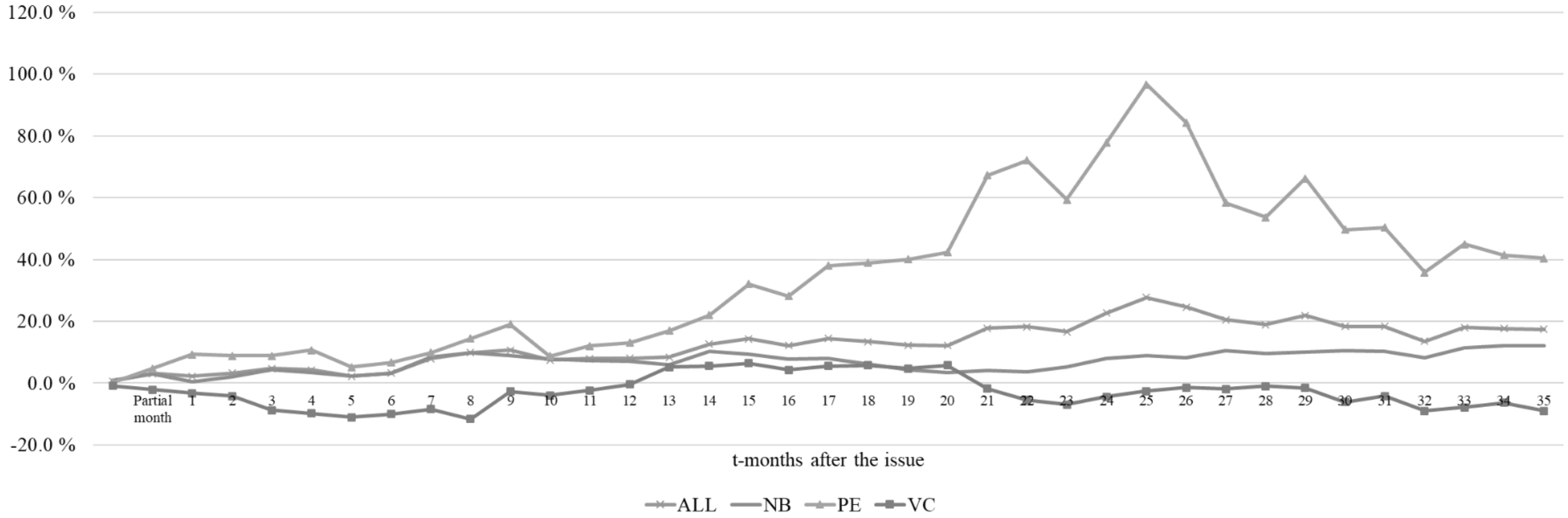


EXHIBIT 10

Three-Year Buy-and-Hold abnormal returns by cohort year of issue (MSCI Nordic countries benchmark)

The sample includes 483 IPOs from January 1. 2000 to December 31. 2019 and consists of 58 private equity (PE) backed and 36 venture capital (VC) backed IPOs as well as 389 nonsponsored (NB) IPOs. Buy-and-Hold returns are calculated individually for each IPO by first compounding the daily returns of an IPO to monthly returns, which are further compounded for periods of 6-36 months. Abnormal returns are calculated by subtracting benchmark index return from the compounded return of an IPO by using MSCI Nordic countries index as benchmark. Left column reports the returns by using equal weights between companies in a portfolio. Right column reports the returns by using value weights where the companies are weighted by using market capitalization. If a company is delisted before the end date of the time period, the funds from the delisted company are distributed to the remaining companies by using same weighing method as previously.

	Equal Weighted				**Value Weighted**			
	PE	VC	NB	ALL	PE	VC	NB	ALL
2000	n.a.	n.a.	-9.3 %	-9.3 %	0.0 %	0.0 %	-6.7 %	-6.7 %
2001	n.a.	n.a.	-41.8 %	-41.8 %	0.0 %	0.0 %	-61.8 %	-61.8 %
2002	-21.2 %	n.a.	-116.7 %	-40.3 %	-29.6 %	0.0 %	-116.7 %	-30.9 %
2003	n.a.	n.a.	n.a.	n.a.	0.0 %	0.0 %	0.0 %	0.0 %
2004	-74.6 %	-73.7 %	193.6 %	86.6 %	n.a.	-65.2 %	125.4 %	117.5 %
2005	-108.7 %	-42.3 %	14.2 %	-4.3 %	-108.7 %	-48.8 %	-11.2 %	-14.3 %
2006	-5.2 %	-40.2 %	1.0 %	-4.9 %	5.1 %	-23.5 %	-1.5 %	-2.1 %
2007	4.1 %	-18.4 %	-10.6 %	-10.2 %	-33.8 %	-32.3 %	-2.8 %	-13.1 %
2008	n.a.	n.a.	-45.0 %	-45.0 %	0.0 %	0.0 %	-53.1 %	-53.1 %
2009	n.a.	n.a.	-112.8 %	-112.8 %	0.0 %	0.0 %	-112.8 %	-112.8 %
2010	-30.9 %	-72.9 %	-9.3 %	-20.0 %	1.5 %	-57.5 %	84.9 %	36.0 %
2011	57.7 %	n.a.	-35.6 %	-21.3 %	55.3 %	0.0 %	-30.9 %	-8.7 %
2012	n.a.	322.6 %	40.6 %	97.0 %	0.0 %	322.6 %	29.0 %	36.2 %
2013	n.a.	-1.8 %	16.3 %	11.8 %	0.0 %	31.2 %	-62.3 %	-61.8 %
2014	85.1 %	-42.8 %	52.7 %	51.1 %	58.0 %	22.1 %	64.3 %	59.7 %
2015	19.2 %	-5.6 %	26.2 %	23.4 %	14.6 %	-5.6 %	48.4 %	28.7 %
2016	-31.3 %	-60.4 %	61.5 %	47.8 %	-25.2 %	11.3 %	14.3 %	6.7 %
2017	-16.3 %	-12.9 %	44.7 %	37.8 %	9.4 %	-57.2 %	19.2 %	12.4 %
2018	321.0 %	54.4 %	52.7 %	64.4 %	347.5 %	54.4 %	47.2 %	53.8 %
2019	84.5 %	46.6 %	-26.6 %	-15.1 %	148.4 %	46.6 %	-31.2 %	24.4 %

H_2: *Private equity and venture capital backed IPOs outperform their nonsponsored counterparts in the long-term*

The finding that venture capital backed IPOs underperform the NB IPOs across the sample is inconsistent with the **Hypothesis 2**. The private equity backed IPOs do not provide as clear results, but the evidence is mostly consistent with the **Hypothesis 2.**

Compared to the evidence of (Bergström, et al., 2006) and (Levis, 2011) I do not document as strong outperformance of PE backed IPOs compared to their findings. However, my results also point towards outperformance of PE backed IPOs as the value weighted portfolios clearly outperform their nonsponsored counterparts. Similarly, when size adjusted benchmark is used as the estimation of the expected return, PE backed IPOs show outperformance in equal weighted portfolios as well.

The outperformance of the PE backed IPOs could be resulting from the strong foundation of the companies generated by the PE model of (Jensen, 1986). According to this interpretation, the operational efficiencies achieved by the PE model would be prevailing in the company even post-IPO. However, this would not completely explain the results since the outperformance is strongest only 3-years post-IPO. Potentially, the market learns about the good quality of the PE backed firms gradually over time, but these conclusions cannot be made solely based on these results.

The underperformance of VC backed IPOs is inconsistent with the earlier findings of (Brav & Gompers, 1997) as they document outperformance of venture capital backed IPOs in the longer-term. However, the results are similar to (Hamao, et al., 1998) as well as (Campbell & Frye, 2006) who find no outperformance of the IPOs which were backed by a venture capital. Similarly, (Levis, 2011) also find positive BHARs for PE backed IPOs, but negative buy-and-hold abnormal returns generated by venture capital backed IPOs. As the underperformance of the VC backed IPOs does not significantly decrease in value weighted portfolios, the performance is not likely driven by the size difference among this group of IPOs.

Overall, the underperformance of VC backed IPOs documented in my research as well as earlier studies could potentially be the lack of value creation that VC firms would be able to provide based on the model of (Jensen, 1986). Compared to PE backed companies, VC backed firms might not have similar operational efficiencies achieved through for example high leverage as PE backed firms.

The underperformance of VC firms might also be emerging from some unobservable characteristics of the VC firms included in the sample. As (Jain, 2001) and (Krishnan, et al., 2011) document, the characteristics of the venture capital firm such as the sponsor involvement post-IPO affects the long-term performance of the sponsored IPO. The relatively small sample of VC backed IPOs included in this analysis might include cases with small amount of involvement which could potentially influence these results. However, this leaves a room for future research on the different characteristics of theses venture capitalists and their quality.

Furthermore, the Nordic VC environment might not be as developed compared to some other countries like the United States for instance, which could explain the differences in the results compared to (Brav & Gompers, 1997) for example. If the venture capital scene is not well developed, it might not be able to produce same benefits compared to countries with more established VC scene. (Megginson & Weiss, 1991) find that the venture capital backed IPOs celebrate stronger interest from the institutional investors, which might be explaining the better long-term aftermarket performance. If the venture capital scene is not as developed, the institutional investors might not be as willing to participate in such IPOs. Again, this leaves some potential for future research in the Nordic market.

Finally, it needs to be noted that although my sample captures a long timespan of 20-years, the sample of Nordic IPOs remains relatively modest especially for the VC backed IPO subgroup.

5.3. Robustness of the results and restricted subsamples

As the characteristics of the companies differ across the different subsamples of IPOs, I follow (Levis, 2011) and restrict the different portfolios based on operational characteristics of the companies to investigate whether the difference in performance emerges from these characteristics. Exhibit 11 reports the results for different portfolios restricted based on the total value of assets, revenue as well as debt relative to total assets.

After restricting the IPOs based on the total value of assets (Panel A), this restricted portfolio consisting of 87.9 percent of the total private equity backed IPOs generate very similar 36-month BHARs compared to the whole sample of PE backed IPOs. While large proportion of the PE backed IPOs fall into the category of companies with the value of assets greater than 40 EURm, only 40.1 percent of nonsponsored IPOs fulfil this restriction. Although significantly smaller percentage of nonsponsored IPOs are included in this category, this restricted sample of nonsponsored IPOs yields a very similar buy-and-hold abnormal return of 20.8 % compared to the whole sample of 21.13%. Also, PE backed IPOs in this category slightly outperform their nonsponsored counterparts as the 36-month BHAR for this group is 20.9 %. VC backed IPOs continue to underperform in this category, although the underperformance is slightly more modest with -17.7 % BHAR. The level of underperformance is however on a similar scale compared to initial results presented in Exhibit 8, which suggests that the earlier results were not emerging from this factor.

Panel B reports the results for portfolios restricted based on the revenue by including only companies with revenue over 10 EURm at the time, or during the year of the issue. Again, almost all of the PE backed IPOs fall into this category which indicates that the PE backed IPOs in the sample tend to be larger both in terms of assets and revenue. PE backed IPOs unsurprisingly generate very similar BHARs as the initial results and underperform their nonsponsored counterparts. Nonsponsored IPOs with revenue over 10 EURm yield higher BHAR compared to the whole sample of NB IPOs of 33.0 %. Venture capital backed IPOs continue to underperform also in this sample with 36-month BHAR of -25.4%. In fact, the underperformance is even stronger among this subsample compared to the whole group of venture capital backed IPOs. In general, the restricted portfolios based on the revenue generate very similar results compared to the whole sample across the different subsamples.

Finally, Panel C investigates the restricted portfolios based on the leverage of each company across the subsamples by including companies with total debt to total assets ratio over 10 %. Again, most of the private equity backed IPOs fall into this category of modestly levered companies, which is somewhat surprising considering the general nature of PE backed companies and their tendency to be highly levered. However, the sample includes mainly larger PE backed companies which might explain the lower levels of debt among these firms. This restricted portfolio of PE companies generates higher BHAR of 26.5% compared to the whole sample 36-month BHAR of 20.10%. Furthermore, the restricted PE backed portfolio outperforms other IPO groups as the nonsponsored IPOs continue to generate 21.1% buy-and-hold abnormal returns which is in line with the previous results. Approximately half of the NB companies have less than 10% total debt to total asset ratio which indicates that the performance of nonsponsored IPOs is consistent across the sample regardless of the levels of debt. Venture capital backed companies continue to underperform and in fact the underperformance is the strongest among this restricted portfolio.

Conclusively, the results seem to be similar to the ones presented earlier in Exhibit 8, which indicates that the performance is consistent regardless of characteristics of companies among different subsamples. However, it needs to be noted that the PE backed firms seem to be larger in terms of assets and revenue compared to other IPO subsamples.

EXHIBIT 11

Restricted results for 36-month BHARs

The whole sample includes 483 IPOs from January 1. 2000 to December 31. 2019 and consists of 58 private equity (PE) backed and 36 venture capital (VC) backed IPOs as well as 389 nonsponsored (NB) IPOs. Buy-and-Hold returns are calculated individually for each IPO by first compounding the daily returns of an IPO to monthly returns, which are further compounded for periods of 36 months. Abnormal returns are calculated by substracting benchmark index return from the compounded return of an IPO by using the MSCI Nordic countries index as the benchmark. The results are restricted based on the value of the total assets, revenue and total debt divided by total assets.

	ALL	PE	VC	NB
Panel A: Assets > 40 EURm				
Avg. Total assets (EURm)	858	688	495	933
36-month BHAR relative to MSCI Nordic countries (%)	19.4	20.9	-17.7	20.8
No. Of IPOs in the category	215	51	8	156
Percentage of IPOs in the category	44.5	87.9	22.2	40.1
Panel B: Revenue over > 10 EURm				
Sales (EURm)	425	690	207	370
36-month BHAR relative to MSCI Nordic countries (%)	26.5	21.8	-25.4	33.0
No. Of IPOs in the category	273	57	19	197
Percentage of IPOs in the category	56.5	98.3	52.8	50.6
Panel C: Total Debt to Total Assets > 0.10				
Total debt to total assets (%)	50.3	47.7	60.5	50.1
36-month BHAR relative to MSCI Nordic countries (%)	18.4	26.5	-30.0	21.1
No. Of IPOs in the category	279	51	19	210
Percentage of IPOs in the category	57.8	87.9	52.8	54.0

As discussed earlier, the differences in performance post-IPO across the different groups of IPOs might be related, not only to operational characteristics of the sponsored companies, but also to valuation prospects on the sponsored companies. Also, the initial reaction during the first day of trading might influence the long-term performance of the issuing firm.

Similar to (Levis, 2011) I perform a multivariate regression with the natural logarithm of the 36-month wealth relative as the dependent variable for each of the four subsamples of IPOs separately. The wealth relative is calculated by dividing the buy-and-hold raw return of each individual IPO by the MSCI Nordic countries index return for the same timespan. Equal weights are used between IPOs when formulating the portfolios. Results for this multivariate regression are shown in Exhibit 12 with multiple explanatory variables. The first day return is the initial underpricing during the day of the issue, as presented in the above analysis. Second, I use natural logarithm of market capitalization immediately after the issue. Third variable is the price-to-book ratio which is calculated by dividing the market value of equity by the book value of equity immediately after the issue. Next, leverage ratio is the ratio of company's debt at the time of the issue and asset turnover defined as the ratio of sales divided by total assets. Finally, a dummy variable indicating a PE and VC backed firms are used in the regression on the whole sample of firms.

Columns (1) and (2) are pointing in the same direction as the earlier results, as the coefficient for PE dummy is positive and negative for the VC dummy. Although consistent with the earlier evidence in Exhibit 8, these results are not statistically significant. The coefficient for the first day return is also negative in each of the eight columns, but statistically significant only for the portfolios of all IPOs and nonsponsored IPOs. This indicates that the unusually high valuation levels during the first day of trading are decreasing the long-term performance as the stock price gradually falls into the correct level as the initial enthusiasm is over.

The coefficient for market capitalization is positive for all of the different IPO groups, which is in line with the performance differences between value weighted and equal weighted portfolios presented in the Exhibit 8. The coefficient is also statistically significant in columns (1) and (7) i.e., the whole sample of IPOs and the nonsponsored IPO group.

The coefficient for asset turnover is also positive and statistically significant at the 1% level, for the groups of nonsponsored IPOs and the whole sample (columns 2 and 8). The coefficients for leverage remain modest across the nonsponsored and PE backed IPO samples, but for the VC backed IPOs, the leverage has somewhat surprisingly a negative and significant value.

Finally, it needs to be noted that even though some correlation exists between different variables presented in the Exhibit 12, one cannot immediately take these as evidence of causality as the variables are endogenous choices of the financial sponsors. Furthermore, the R squared across the different regressions remain relatively low, which indicates that there are potentially some other factors affecting the performance, which might not be present in the current analysis.

5.4. Comparison to prior Nordic evidence

In this section, I will compare the results to the previous Nordic evidence by (Lammi, 2016). Furthermore, I will discuss the results from the perspective of financial sponsors as well as potential investors investing in issuing firms in the Nordics.

Lammi in his master's thesis investigates the PE and VC IPO underpricing in the Nordics as a part of his analysis. However, as the timespan used in Lammi's analysis (2000-2011), the number of sponsored Nordic IPOs is significantly smaller compared to my analysis: 235 of which 29 is VC and 21 PE backed. Although smaller, the sample is partly overlapping with my Nordic sample which makes it interesting to compare the results of Lammi and mine. First, it needs to be noted that in the analysis by Lammi Nordic IPOs are underperforming the market i.e., generating negative BHARs. This means that the IPOs in his sample generate on average lower returns compared to my sample.

Similar to Lammi, VC backed IPOs underperformed nonsponsored IPOs. Equal weighted 36-month BHARs of the VC backed IPOs varied between -16% and -31% in the analysis by Lammi, compared to range of -19% and 23% in my sample. Using value weights, the 36-month BHARs ranged between -12% to -30% in Lammi's sample and between -9% and 19% in my sample. In conclusion, the performance of venture capital backed IPOs is very similar in Lammi's analysis compared to mine. The results are very similar in both absolute terms as well as relative with regards to the nonsponsored IPOs.

The results of PE backed IPOs differ more in absolute terms between our analyses. However, the performance pattern is similar in both analyses. In Lammi's analysis, the performance of PE backed IPOs is negative in 12 months post IPO (ranging from -14% to -22% in equal weighted portfolios and -29% to -41% in value weighted portfolios) but the BHARs increase significantly when more time passes from the IPO. Based on Lammi's results, 36-month BHARs of PE backed IPOs range from -5% to 4% using equal weighted portfolios and -17% to 1% using value weighted portfolios. In my results, the BHARs also increase significantly after more time has passed from the IPO date, ending up in 20% to 24% in equal weighted portfolios and 39% to 40% in value weighted portfolios. Compared to the 36-month BHARs of nonsponsored IPOs in Lammi's analysis, which range from -5% to -17% using equal weights the private equity backed IPOs outperform their nonsponsored counterparts using equal weights. However, using value weights, the 36-month BHARs of nonsponsored IPOs range from -12% to 13% in Lammi's analysis i.e., when using value weights, this outperformance of PE backed IPOs diminish. This is opposing effect compared to my results where the outperformance of PE backed IPOs is more visible in the value weighted samples. However, it needs to be noted that for the PE backed IPOs, the results of Lammi remain insignificant 24-month and 36-month post-IPO.

In conclusion, previous evidence of Lammi is very similar to mine when it comes to VC backed IPOs, both in terms of absolute terms as well as relative to nonsponsored IPOs. However, results regarding the performance of PE backed IPOs point towards outperformance of PE backed IPOs, but are not completely in line with my results. The sample size used in Lammi's analysis for the Nordic IPOs is significantly smaller compared to mine, and the results of PE backed IPOs are not statistically significant for the 24-month and 36-month intervals.

5.5. Further discussion

Overall, my results do not provide clear evidence on how does sponsor involvement affect the underpricing in IPOs. Therefore, I still think that from the perspective of financial sponsors, exiting portfolio firms via IPO is a relevant exit path as the firms do not seem to be experiencing higher than average underpricing. This indicates that PE and VC firms would not leave substantial amounts of money on the table in conjunction with the IPO which backs the IPOs as a relevant exit opportunity. From the perspective of IPO investors, one could not expect higher than average first day returns by investing only in sponsored IPOs. However, my results still confirmed the phenomenon of underpricing and that IPOs in general are underpriced, but based on these results no clear investment strategy could be formed for the first day abnormal returns solely based on the sponsor certification aspects of a company.

As for the long-term performance, investing in private equity backed IPOs seem to be beneficial for the investors in the long-term. My evidence suggests that sponsor backing provides abnormal long-term returns for the sponsored IPOs, which indicates that investing in such firms would lead to a great results. Similarly, this backs IPOs as a relevant exit strategy for PE firms as the companies tend to be performing well in the public markets also in the longer term. This indicates that gradually exiting the firm through selling the shares of the now publicly held company would provide great returns for the PE firm as well. Venture capital firms, as discussed, do not provide such long-term performance. This indicates that solely based on these results, investing in VC backed firms is not beneficial similarly as investing in PE backed firms.

However, this does not fully indicate that IPOs are not a relevant exit strategy for VC firms, as the results might be resulting from the fact that the venture capital scene is not as established in the Nordics which reduces the potential benefits achieved through venture capital backing.

EXHIBIT 12

Three-Year Buy-and-Hold abnormal returns by cohort year of issue (MSCI Nordic countries benchmark)

Natural logarithm of Wealth Relative (WR), based on MSCI Nordic Countries index is used as the dependent variable. The independent variables are the first day return (underpricing), natural logarithm of the market capitalization of the company at the time of the issuance, the price-to-book ratio which is calculated by dividing the market value of equity by the book value of equity, leverage ratio, asset turnover which defined as the sales divided by total assets as well as PE and VC dummies indicating whether the IPO was backed by a PE or a VC firm.

	ALL		**PE**		**VC**		**NB**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
First day return	-0.076*	-0.081**	-0.054	-0.070	-0.179	-0.345	-0.080*	-0.082*
	(-1.87)	(-2.09)	(-0.69)	(-0.85)	(-0.76)	(1.20)	(-1.72)	(-1.85)
Natural logarithm of market cap	0.067**	0.052	0.129	0.137	0.191	0.351*	0.078**	0.047
	(2.15)	1.376	(1.41)	(1.48)	(1.52)	(1.90)	(2.15)	(1.01)
Price-to-book ratio	0.000	-0.016**	-0.063**	-0.065**	-0.095	-0.113	0.000	-0.014**
	(0.23)	(-2.50)	(-2.16)	(-2.20)	(-1.38)	(-1.43)	(0.26)	(-2.09)
Leverage	0.000	0.000	0.000	0.000	-0.006**	-0.008**	0.000	0.000
	(0.60)	(0.88)	(0.24)	(0.315)	(-2.09)	(-2.20)	(0.30)	(0.68)
Asset turnover		0.111***		0.112		-0.060		0.113***
		(3.40)		(0.60)		(0.31)		(3.23)
PE dummy	0.166	0.088						
	(0.960)	(0.53)						
VC dummy	-0.135	-0.310						
	(-0.61)	(1.48)						
Intercept	-0.602***	-0.542***	-0.566	-0.746	-0.583	1.048*	-0.642***	-0.529**
	(-4.30)	(-2.82)	(-1.23)	(-1.36)	(-1.50)	(-1.68)	(-4.05)	(-2.36)
R^2	0.037	0.083	0.048	0.035	0.028	0.057	0.018	0.08
# of observations	(375)	(276)	(52)	(52)	(28)	(24)	(295)	(200)

***Significant at the 0.01 level

**Significant at the 0.05 level

*Significant at the 0.1 level

6. Conclusions

As the size of the private equity and venture capital industry has been increasing during the last couple of decades, academia has given an increased attention to the PE and VC firms. Furthermore, as these financial sponsors are regularly taking firms public by exiting their portfolio companies, studying the performance patterns of these firms has also been under a lens. Regardless of the increased academic attention, no broad evidence on the performance of private equity and venture capital backed firms post-IPO exists in the Nordics.

This thesis fills in this gap in the literature by investigating the performance of Nordic private equity and venture capital backed companies after IPO, by employing a dataset of 483 Nordic IPOs through a long time span of 2000-2019. First part of the thesis focuses on investigating the initial day returns of PE and VC backed firms, i.e., underpricing. On the contrary to the broad academic research by for instance (Megginson & Weiss, 1991), (Bergström, et al., 2006) and (Gohil & Vyas, 2015) my findings do not show evidence on the certification effect of financial sponsors, which would lead to lower underpricing of sponsored IPOs. In fact, I do not find any clear difference in underpricing of sponsored IPOs compared to their nonsponsored counterparts.

Second part of my analysis focused on the longer-term performance of private equity and venture capital backed companies by using buy-and-hold abnormal return (BHAR) based on multiple different benchmarks and time intervals post listing. Similar to majority of previous research, I document outperformance of private equity backed IPOs in the long-term, but my results are not as strong as some of the previous evidence would indicate. As expected, the results largely depend on the benchmark index used as the estimation of expected return. By using equal weights, private equity firms outperform their nonsponsored counterparts 36-months post-IPO when size-based benchmark index is used but provide similar or worse BHARs when MSCI Nordic countries and industry-based benchmark index is used. However, when value weights are used, private equity firms clearly outperform the nonsponsored IPOs and the results are also statistically significant.

On the contrary to the certification hypothesis of venture capitalists, but in line with the results by (Levis, 2011), I document long-term underperformance of venture capital backed IPOs across the time intervals used in the analysis. Although the results are similar (and negative) in most timespans, the results of VC backed IPOs do not experience as strong statistical significancy as the PE backed ones.

Regardless of the long timespan used in the analysis, this thesis suffers some shortfalls. As the IPO activity in the Nordic markets is not as high as in some other areas and countries, especially among financial sponsors, the sample size remains relatively small. Due to this, after a couple of years, a replicating study would be interesting as there has been a significantly increased IPO activity during 2019-2022 in the Nordics.

Overall, my results raise multiple questions on the underlying drivers of these performance differences across the subsamples. The outperformance of PE backed IPOs as well as the underperformance of the VC firms might be emerging from some unobservable characteristics of these companies. As (Levis, 2011) highlights, the performance measurement methodologies used in the analysis might not be able to capture for instance different risk profiles related to different subsamples.

My thesis still leaves room for future research by firstly further investigating the potentially homogenous group of financial sponsors. I already participated in this branch of research by simultaneously analysing PE and VC backed firms, but as (Lange, et al., 2001) as well as (Campbell & Frye, 2006) explained the quality of venture capitalists might affect the long-run performance of the IPO firms backed by VC. Thus, further documentation of the differences between the quality of different venture capitalists and how it affects the long-run performance would be interesting

Similarly, this evidence still does not answer to the question of what are the exact underlying drivers behind the outperformance of PE backed IPOs (and the underperformance of VC backed ones). For instance, does the operational characteristics differ, does the risk levels different (at some aspect that these methods do not capture) and how does the length of the sponsor involvement affect the performance.

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