LONG-RUN PERFORMANCE TRENDS OF PRIVATE EQUITY-BACKED IPOS

EVIDENCE FROM THE NORDICS

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Long-Run Performance Trends of Private Equity-Backed IPOs: Evidence from the Nordics

Abstract:

This study examines the long-run performance, measured as the 36-month buy-and-hold abnormal return, of private equity-backed initial public offerings (IPOs), and compares it to the long-run performance of non-backed IPOs. Using a sample of 130 IPOs listed on the four main exchanges in the Nordics from October 2006 to December 2016, we first show that private equity-backed IPOs, on average, are larger, use more leverage, and have higher asset turnover than non-backed IPOs. Then, we empirically confirm that private equity-backed IPOs experience significantly better long-run performance than non-backed IPOs. These results remain robust using both parametric and non-parametric tests. Finally, using a cross-sectional regression, we show that long-run performance is positively correlated with market capitalization, leverage, and asset turnover respectively. In conclusion, we find that the superior performance of private equity-backed IPOs is related to the fact that these IPOs are larger, more leveraged, and have better operating performance compared to non-backed IPOs.

Keywords:

Initial Public Offerings, Long-Run Performance, Private Equity

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1 Introduction

Over the past two decades, the Nordic private equity (PE) industry has blossomed and emerged as an important part of the Nordic capital markets (Spliid, 2013), and, in recent years, PE firms have become especially engaged in initial public offerings (IPOs) (Argentum, 2018). Along with these transactions, public interest in PE activities has increased. In particular, the high profits and aggressive strategies employed by PE firms have become topics of controversy. Whereas research suggests that PE firms add substantial value to their portfolio companies (Jensen, 1986), critics still claim that PE firms only create short-term value (Le & Robson, 2018). In this paper, we study the potential long-lasting effects of PE activities by comparing the long-run performance of PE-backed IPOs with that of non-backed IPOs.

Using a contemporary sample of 130 Nordic main market IPOs, we examine differences in long-run performance and specific IPO characteristics between PE-backed and non-backed IPOs. Long-run performance is defined as the buy-and-hold abnormal return (BHAR) over a 36-month period after flotation. More specifically, we focus on the following research questions: Do PE-backed IPOs in the Nordics experience better long-run performance than non-backed IPOs? If so, what company characteristics are associated with this superior performance?

First, we examine differences in IPO characteristics between PE-backed and non-backed IPOs. The results show that PE-backed IPOs are significantly larger, use more leverage, and have higher asset turnover than non-backed IPOs. We also find that PE-backed and non-backed IPOs experience similar first-day returns, indicating similarities in investors' initial risk assessments.

Second, we look at the long-run performance of the full sample, as well as the PE-backed and the non-backed IPOs respectively. Contrasting a significant weight of existing literature, we find no conclusive evidence in support of general underperformance. However, we observe that PE-backed IPOs outperform their benchmarks, while non-backed IPOs show signs of underperformance. Focusing on the observed differences in performance, we then confirm that PE-backed IPOs experience greater long-run performance than non-backed IPOs. The results are statistically significant at the 10% level and remain robust using both parametric and non-parametric tests.

Finally, we use a cross-sectional regression to examine the correlation between specific IPO characteristics and long-run performance. The results confirm that PE backing is positively related to long-run performance. Moreover, the results show that market capitalization, leverage, and asset turnover are positively correlated with long-run performance. The positive correlation between market capitalization and long-run performance is most prominent. This relationship is statistically significant at the 1% significance level for both the full sample and the non-backed IPOs. In conclusion, we find evidence suggesting that the superior long-run performance of PE-backed IPOs is related to the fact that these IPOs have higher market capitalization, are more leveraged, and have higher asset turnover than non-backed IPOs.

While multiple studies examine IPO characteristics and long-run performance, academic literature is mainly focused on the US (Brav & Gompers, 1997; Cao & Lerner, 2009; Loughran & Ritter, 1995; Ritter, 1991) and, more recently, larger European countries (Bergström et al., 2006; Jaskiewicz et al., 2005; Levis, 2011). However, empirical evidence from the Nordics is scarce, despite the region's high IPO activity and high level of PE involvement (BVCA, 2014). According to BVCA (2014), the Nordic region is also known for providing a healthy, well-regulated, and transparent business environment, which presumably reduces issues of asymmetric information. Beatty and Ritter (1986) provide evidence suggesting that asymmetric information is negatively correlated with long-run performance, and Levis (2011) argues that the difference in long-run performance between PE-backed and non-backed IPOs is partly related to asymmetric information in the IPO processes. Thus, we find it interesting to see if we find similar results as previous literature when looking at a region where asymmetric information may not be as influential.

In addition to our focus on the Nordics, we intend to contribute to existing literature by solely focusing on main market IPOs. Existing literature on long-run IPO performance most often includes IPOs on both main and secondary exchanges, meaning that smaller and less mature IPOs are included in the sample. These smaller IPOs are associated with abnormally poor performance, and therefore have a significant negative effect on the overall sample performance (Brav et al., 2000). Thus, by focusing on larger and more mature main market IPOs, we examine long-run performance and differences in long-run performance from a slightly different angle, which we hope will add complementary insights to previous findings.

2 Literature Review

2.1 Long-Run Underperformance of IPOs

A predominant weight of academic literature provides evidence of long-run IPO underperformance. An IPO is subject to underperformance when the cumulative return of a comparable benchmark is greater than that of the IPO during a specific time period after flotation. Focusing on American IPOs, Ritter (1991) provides evidence of general underperformance over a period of three years after flotation, and Loughran and Ritter (1995) find similar evidence when looking at long-run performance over five years. While there is evidence of post-IPO underperformance, these results are somewhat controversial. Brav and Gompers (1997), for example, find no evidence of underperformance when matching IPOs with non-IPO portfolios based on book-to-market value and size. Moreover, Lyon et al. (1999) suggest that the observed aftermarket performance is highly dependent on the type of methodology, the choice of benchmarks, and the time period examined.

2.1.1 Overoptimistic Investors

Several theories intend to explain post-IPO underperformance, most of which are related to behavioral finance. Miller (1977) suggests that the most positive investors are the ones who are involved in the initial process of an IPO. Since these investors typically are enthusiastic and have high expectations, they buy into the IPO early on and drive up the stock price. In addition, Ritter (1991) shows that investors tend to overestimate their ability to find successful IPOs. Therefore, the initial stock price does not necessarily reflect the sentiment of the average investor, and, over time, the price converges back to its general market equilibrium (Ritter & Welch, 2002). The negative price convergence may also relate to the "fads theory", which states that overoptimistic investors grow increasingly pessimistic regarding their initial investments in the absence of estimated returns, and, over time, as investors re-evaluate their positions, stock prices decline (Aggarwal, 2000).

2.1.2 Market Cyclicality Theory

Another explanation for underperformance relates to market cyclicality and a concept called pseudo market timing. This concept states that companies are more inclined to go public in times of high market valuations or so-called hot issue periods (Schultz, 2003; Benninga et al., 2005). Loughran et al. (1994) provide evidence of this by showing that the number of IPOs correlates positively with general market trends. Moreover, both Cao (2011) and Schöber (2008) find that IPOs listed in hot issue periods experience worse aftermarket performance than IPOs listed in other periods, which mainly relates to initial overvaluations followed by cooling market conditions. Challenging the theory of pseudo market timing, however, Rydqvist and Högholm (1995) do not

find the timing of IPOs to be correlated with the business cycle when using a sample of family-owned companies in Sweden.

2.2 Long-Run Performance of Private Equity-Backed IPOs

2.2.1 Differences in Long-Run Performance

Long-run IPO performance seems to vary across IPOs with different ownership structures. Using a sample of American IPOs from 1972 to 1992, Brav and Gompers (1997) show that venture capital-backed (VC-backed) IPOs outperform non-backed IPOs after flotation. They attribute this outperformance to better management and governance structures in favor of the VC-backed IPOs. Similar studies have also been made on reverse leveraged buyouts (RLBOs). Using a sample of 526 American IPOs, Cao and Lerner (2009) show that RLBOs outperform other IPOs when controlling for size, book-to-market value, and industry fixed effects. They further note that the average RLBO is larger, more profitable, and listed by more prestigious underwriters. In contrast to Cao and Lerner (2009), Degeorge and Zeckhauser (1993) find no evidence of superior long-run performance of RLBOs, but they conclude that the average RLBO has better accounting performance before flotation compared to other IPOs. Muscarella and Vetsuypens (1990) show that the leverage ratio of an issuing company increases significantly during the PE ownership period and conclude that RLBOs experience superior aftermarket performance. While previous studies in the US suggest that there is a positive correlation between PE involvement and performance, evidence outside the US is yet somewhat limited.

Analyzing British IPO data, Levis (2011) provides evidence of general underperformance over a three-year time horizon when looking at IPOs from 1992 to 2005. Classifying the sample into three portfolios of VC-backed, PE-backed, and non-backed IPOs, he finds significant differences in long-run performance across the groups. While non-backed IPOs demonstrate severe and statistically significant underperformance, PE-backed IPOs outperform both non-backed and VC-backed IPOs. Furthermore, Levis shows that PE-backed IPOs outperform various benchmark indices, indicating that PE-backed IPOs defy the norm of long-run underperformance. He also shows that PE-backed IPOs, on average, are larger in terms of sales, assets, and market capitalization, and establishes a positive correlation between aftermarket performance and company size, leverage, asset turnover, and the proportion of the PE ownership directly after the IPO. Bergström et al. (2006) conduct a similar study when examining 1,522 IPOs in the UK and France from 1994 to 2004. They, too, find that PE-backed IPOs outperform non-backed IPOs, however, the PE-backed IPOs still underperform in the three-year aftermarket. Jelic et al. (2005), on the other hand, find no evidence of significant outperformance of PE-backed British management buyouts (MBOs) compared to non-backed MBOs. The role of PE backing is also examined by Katz (2009), who finds that PE-backed IPOs, on average, have higher earnings quality, engage less in earnings management, and are more conservative in their reporting, both before and after the IPO. Katz's study also provides evidence suggesting that IPOs that have PE firms as majority shareholders perform better in the aftermarket.

2.2.2 Private Equity Value Creation

Multiple researchers have tried to explain the observed success of the PE model. The most commonly listed sources of value drivers relate to operational efficiencies and leverage. The operational efficiencies primarily stem from closer monitoring (Kaplan, 1989) and management expertise (Jensen, 1986). Jensen (1986) also suggests that the positive correlation between leverage and performance relates to control functions arising when using debt financing. For example, these control functions may reduce agency costs. Hamada (1972) and Bhandari (1988), too, find positive correlations between leverage and stock price returns. Research on the correlation between debt

and stock returns is not unanimous, however. For example, leverage seems to be negatively correlated with future growth for companies that are financially distressed (Korteweg, 2010) or have low growth opportunities (Lang et al. 1996).

The effect of PE activities is also examined by Acharya et al. (2013), who find that both sales and operating margins of PE portfolio companies improve during the PE ownership period. They suggest that these operational improvements are derived from the experience and professional expertise that the partners of the PE firm possess. Holthausen and Larcker (1996), and Degeorge and Zeckhauser (1993) find that the financial performance of RLBOs at the time of flotation, on average, is significantly better than for their industry peers. In conclusion, PE-backed companies seem to outperform non-backed companies over a series of metrics, including both operational and long-run performance.

2.2.3 Initial Investor Sentiment

Previous literature demonstrates that post-IPO performance correlates with initial investor sentiment and overenthusiasm (Miller, 1977). Investor sentiment is commonly proxied using stock price returns on the first day of trading. Examining the relationship between short- and long-run performance, Purnanandam and Swaminathan (2004) find a negative correlation between first-day returns and post-IPO performance when looking at a sample of American IPOs. Levis (2011) demonstrates a similar relationship when looking at British IPO data. Levis also shows that PE-backed IPOs experience lower first-day returns than non-backed IPOs and argues that this is the combined result of more aggressive pricing and lower risk associated with PE-backed IPOs. Bergström et al. (2006) suggest that PE-backed IPOs experience lower first-day returns because they are generally associated with less information asymmetry between the selling side and the investors involved in the IPO. Higher information asymmetry is associated with greater ex-ante uncertainty and risk, for which investors require a discount and higher first-day returns to compensate.

2.3 Hypotheses

As noted, a large weight of empirical research identifies the long-run underperformance associated with IPOs. This underperformance is mainly explained by theories related to initial investor sentiment and market timing. Previous literature also suggests that PE backing is positively correlated with long-run performance, which is most commonly claimed to be related to either activities and strategies of the PE business model or company characteristics, or both. In line with the evidence and the underlying theories presented previously in this section, we form the following two hypotheses:

Hypothesis 1: Main market IPOs in the Nordics are subject to long-run underperformance.

Hypothesis 2: PE-backed IPOs listed on main markets in the Nordics experience better long-run performance than non-backed IPOs.

3 Data Collection

This study uses a sample of 130 IPOs listed on the main stock exchanges in Sweden, Norway Denmark, and Finland from October 2006 to December 2016. Secondary and tertiary exchanges are disregarded for two reasons: 1) they are less regulated and generally attract smaller and less mature companies which affects comparability, and 2) based on our initial dataset, PE firms in the Nordics almost exclusively turn to the main markets when executing IPO exits. The time period is

selected to yield the most recent data available. Since the employed index benchmarks only provide data from October 2006 onwards, we use that as our starting point. Benchmark returns data is retrieved from Nasdaq Nordic's (n.d.) website.

The original sample of 215 IPOs is collected from the SDC Platinum database. This data includes IPO characteristics such as offer price, first-day return, shares offered, total amount raised, exchange of listing, industry classification, and backing classification. First-day returns data is collected from SDC Platinum and complemented by Nasdaq Nordic's (n.d.) official website. Twenty IPOs are excluded for being investment trusts, secondary listings, stock exchange transfers, depositary receipts, or incorrectly included IPOs.[1] Sixteen observations are excluded for being duplicates. For the remaining 179 IPOs, stock price returns, accounting data, and market capitalization are collected from Thomson Reuters Eikon. Due to missing data on stock price returns, another 12 IPOs are excluded, and an additional 37 IPOs are excluded due to missing data on market capitalization. The final sample consists of 130 IPOs, of which 86 (66%) are identified as non-backed and 44 (34%) are identified as PE-backed.

PE-backing is a crucial part of this study. An IPO is classified as PE-backed if one or more PE sponsors have a controlling interest in the company at the time of the offer. Backing classifications were first retrieved from SDC Platinum, however, we noticed that several of the IPOs were incorrectly classified in the database. Therefore, we have classified all IPOs manually by examining their individual prospectuses. In cases where prospectuses are unavailable, we use data from PE firms' websites, Mergermarket, and the Private Equity and Venture Capital Associations of the Nordic countries to complete the classification. We found ten cases of incorrect classification by SDC Platinum, and in nine of these ten cases the classification was changed from non-backed to PE-backed.

Accounting data, market capitalization, and total amount raised are adjusted for inflation based on the consumer price indices of the respective countries. The prices are indexed based on price levels as of December 2019. Data on the historical consumer price indices is retrieved from Inflation.eu (n.d.).

4 Methodology

Post-IPO performance is commonly divided into two time periods: 1) the first day of trading, related to first-day returns, and 2) the subsequent aftermarket period, related to long-run performance.

4.1 Measuring Long-Run Performance

Following Levis (2011), we measure post-IPO long-run performance in terms of buy-and-hold abnormal returns (BHARs). Compared to other measurement methods, the BHAR method is known to more accurately capture the experience of investors (Schöber, 2008). BHAR is computed based on the closing price on the first day of trading. By starting from the first-day closing price rather than the offer price, we incorporate the sentiments of all investors who are interested in buying shares from the start, not just those selected investors who are allocated shares at offer price.

BHAR is calculated by compounding monthly stock price returns for each specified event time period in addition to the first partial month of trading, which is the same as the cumulative total return over the whole event time period. Monthly and cumulative returns data is obtained from Thomson Reuters Eikon and the returns account for both stock price changes and dividends,

[1] Incorrectly included IPOs are IPOs that have not been listed on one of the main exchanges used in this study.

mimicking the gross returns obtained by investors. The equal- and value-weighted BHARs are computed as follows:

$$(1)\quad BHAR_i^T = \prod_{t=1}^{T}(1 + r_{i,t}) - \prod_{t=1}^{T}(1 + r_{b,t})$$

$$(2)\quad BHAR_p^{EW} = \frac{1}{N_p}\sum_{\mathrm{i=1}}^{\mathrm{N_p}}(BHAR_i^T)$$

$$(3)\quad W_{i,p} = \frac{MC_{i,p}}{\sum_{\mathrm{i=1}}^{\mathrm{N_p}}(MC_{i,p})}$$

$$(4)\quad BHAR_p^{VW} = \sum_{i=1}^{N_p}(W_{i,p} * BHAR_i^T)$$

where $BHAR_i^T$ is the buy-and-hold abnormal return of IPO *i* over event time period *T*, and $r_{i,t}$ and $r_{b,t}$ are the raw returns of IPO *i* and benchmark *b* for event month *t*. $\mathrm{BHAR_p^{EW}}$ is the equal-weighted buy-and-hold abnormal return of portfolio *p* over event time period T, and N_p is the number of IPOs in each portfolio *p*. $W_{i,p}$ is the value weight of IPO *i* in portfolio *p*, and $MC_{i,p}$ is the inflation-adjusted market capitalization of IPO *i* in portfolio *p* on the first day of trading. $BHAR_p^{VW}$ is the value-weighted buy-and-hold abnormal return of portfolio *p* over event time period *T*. For each event time period *T*, we also retrieve the median BHAR of each IPO and portfolio.

We use both equal- and value-weighted returns when computing abnormal returns since comparing the two indicates how larger IPOs perform relative to smaller IPOs. To examine the performance development throughout the 36-month period, we also compute and test BHARs after 12 and 24 months.

To avoid survivorship bias, we include IPOs that are delisted within 36 months after flotation. In the case of delisting, the IPO BHAR equals the cumulative return up until the month of delisting. In line with Levis (2011), the abnormal return for each IPO is computed from the closing price on the first day of trading until the earlier of the delisting date and the three event time periods.

4.2 Performance Benchmarks

Two different benchmarks are employed to compute BHARs: 1) a Nordic equity index, OMX Nordic Eur GI (OMXNGI), and 2) a Nordic size-adjusted benchmark (SIZE) based on individual market capitalization on the first day of trading.[2] OMXNGI is a value-weighted all-share index adjusted for dividends. It includes all stocks from Nasdaq's main exchanges in the Nordics, namely

[2] One of three size-adjusted index benchmarks is assigned to each IPO based on individual market capitalization on the first day of trading, unadjusted for inflation. IPOs with a market capitalization over €1 billion are benchmarked against the OMX Nordic Large Cap index. IPOs with a market capitalization between €150 million and €1 billion are benchmarked against the OMX Nordic Mid Cap index. IPOs with a market capitalization below €150 million are benchmarked against the OMX Nordic Small Cap index.

Table 1

Number of IPOs, Total Amount Raised, and Average Market Capitalization by Listing Year

Year	Number of IPOs			Total Amount Raised (€m)			Average Market Capitalization (€m)		
	ALL	NB	PE	ALL	NB	PE	ALL	NB	PE
2006 [3]	5	5	-	670	670	-	333	333	-
2007	17	13	4	1,526	777	749	290	204	569
2010	11	7	4	5,065	2,657	2,407	1,260	1,016	1,687
2011	7	6	1	841	774	67	204	217	125
2012	3	3	-	411	411	-	231	231	-
2013	12	10	2	1,584	862	722	407	344	724
2014	25	16	9	4,797	2,444	2,352	450	377	580
2015	31	15	16	6,365	2,264	4,100	479	330	619
2016	19	11	8	5,928	4,116	1,812	1,282	1,784	593
Total	**130**	**86**	**44**	**27,187**	**14,976**	**12,210**	**600**	**552**	**692**

Note. The full IPO sample consists of 130 IPOs (ALL), of which 86 are non-backed (NB) and 44 are private equity-backed (PE). All IPOs are listed on either OMX Stockholm, OMX Helsinki, OMX Copenhagen or Oslo Børs from October 2006 to December 2016. Total amount raised is defined as the total number of shares offered to the market multiplied by the offer price. Market capitalization is the total number of shares outstanding multiplied by the closing price, on the first day of trading. Total amount raised and market capitalization are adjusted for inflation based on the consumer price indices in the respective countries.

Stockholm, Copenhagen, Helsinki, and Reykjavik. The size-adjusted benchmark indices are derived directly from OMXNGI based on market capitalization; the Large Cap index only includes companies with a market capitalization over €1 billion, the Mid Cap index includes companies with a market capitalization between €150 million and €1 billion, and the Small Cap index includes companies with a market capitalization below €150 million Nasdaq Nordic (2018). As noted by Fama and French (1993), smaller (larger) companies are associated with higher (lower) risk and higher (lower) expected returns. Our use of a size-adjusted benchmark aims to mitigate these differences in size-related risk and expected return profiles.

4.3 The Event Time Measurement Approach

Academic literature mainly employs two approaches when measuring abnormal returns: calendar time and event time. While the calendar time approach is used to detect variations across specific time periods, it cannot be used to capture performance differences across IPOs floated at different times (Schultz, 2003). The event time approach, on the other hand, allows us to compare IPO performances irrespective of calendar dates. For example, this means that the performance of an IPO listed in 2006 can be compared to the performance of an IPO listed in 2015. Due to the specific focus of our research questions we focus on the event time approach.

[3] Only IPOs listed in October, November, or December are included for 2006.

5 Descriptive Statistics

In this section we provide descriptive statistics of our sample and demonstrate differences in characteristics between the PE-backed and the non-backed IPO portfolios.

5.1 IPO Distribution

Table 1 presents the annual distribution of all IPOs in the sample and displays the number of listings, total amount raised, and average market capitalization. Values are given for the whole sample (ALL), the non-backed IPO portfolio (NB), and the PE-backed IPO portfolio (PE) respectively. Out of the 130 IPOs included in our sample, 86 (66%) are non-backed and 44 (34%) are PE-backed.

In the hot issue period leading up to the financial crisis we observe 5 listings in the final three months of 2006, and 17 listings in 2007. In the following years, IPO activity slows drastically following the financial crisis. Notably, the sample does not contain a single IPO in the years of 2008 and 2009. Towards the end of the study's time horizon, from 2013 and onwards, the number of IPOs per year increases significantly. The last three years, 2014 to 2016, contain half of all listings, and 75% of the PE-backed IPOs. In 2015 especially, the number of PE-backed IPOs surged. The increase in IPO activity is consistent with the rapid growth of the Nordic IPO market and the growth of the Nordic PE industry over the last decade (Argentum, 2018; Nasdaq Nordic, 2017; Segerström, 2018).

We find similar trends when looking at total amount raised. Collectively, the IPOs in our sample raised €27.2 billion over the whole study period. On average, PE-backed IPOs raised more capital than non-backed IPOs. Representing only 34% of all IPOs, the PE-backed IPOs raised 45% of the total amount raised. In 2010, a surge in total amount raised is visible in both portfolios, which is the result of two specific IPOs raising €3.1 billion in total. The final three years, 2014 through 2016, account for over 60% of the total amount raised for the whole sample expected considering the surge in IPO activity in more recent years.

Compared to Levis' (2011) study on British IPOs from 1992 to 2005, the IPOs in this study are significantly larger in terms of average market capitalization. This is not surprising since Levis, in addition to main market IPOs, includes IPOs listed on a secondary market associated with smaller and less mature companies. The PE-backed IPOs in our sample are, on average, larger across all years but two. Out of the 17 IPOs with a market capitalization over €1 billion, nine are PE-backed, and out of the 65 IPOs with a market capitalization between €150 million and €1 billion, 26 are PE-backed. A comprehensive distribution of IPOs based on size can be found in Appendix A. Comparing market capitalization across years, we observe an increasing trend, indicating that companies listed in more recent years are larger compared to companies listed a decade ago. This trend partly stems from the fact that most PE-backed IPOs, which are larger in size, are listed at the end of the study period.

Due to the relatively small number of IPOs in each IPO portfolio per year, both total amount raised and market capitalization are susceptible to the significant influence of individual IPOs. In 2016 for example, Dong Energy A/S (non-backed) was listed with a market capitalization of €14.8 billion. Without it, the average market capitalization of the non-backed IPOs that year would be €477 million, rather than the presented €1.8 billion.

Presented in **Table 2**, there are major differences in IPO activity across countries, both in terms of number of IPOs and total amount raised. Accounting for nearly 48% of all IPOs, Sweden is the most active country. Sweden has also listed most of all PE-backed IPOs, both in absolute and relative terms, accounting for 66% of all Nordic PE-backed IPOs, and almost half of the Swedish IPOs are PE-backed. Expectedly, we find a similar trend when looking at total amount raised. Of the €27.2 billion raised in total, Sweden accounts for 42%. Denmark has raised the most

Table 2

Number of IPOs and Total Amount Raised by Stock Exchange

Exchange	Number of IPOs			Total Amount Raised (€m)		
	ALL	NB	PE	ALL	NB	PE
Stockholm	62	33	29	11,278	4,104	7,174
	(47.7)	(38.4)	(65.9)	(41.5)	(27.4)	(58.8)
Oslo	34	28	6	7,497	5,874	1,623
	(26.2)	(32.6)	(13.6)	(27.6)	(39.2)	(13.3)
Copenhagen	20	16	4	6,657	3,734	2,923
	(15.4)	(18.6)	(9.1)	(24.5)	(24.9)	(23.9)
Helsinki	14	9	5	1,755	1,264	490
	(10.8)	(10.5)	(11.4)	(6.5)	(8.4)	(4.0)
Total	**130**	**86**	**44**	**27,187**	**14,976**	**12,210**
	(100)	**(100)**	**(100)**	**(100)**	**(100)**	**(100)**

Note. The full IPO sample consists of 130 IPOs (ALL), of which 86 are non-backed (NB) and 44 are private equity-backed (PE). The table reports the number of IPOs and the total amount raised by stock exchange for each IPO portfolio. Total amount raised is the total number of shares offered to the market multiplied by the offer price. Total amount raised is adjusted for inflation based on the consumer price indices in the respective countries. Percentages are reported in parentheses.

capital per IPO, amounting to €333 million on average. This is true even when excluding the largest IPO, Dong Energy A/S, which raised €2.4 billion.

5.2 Market Capitalization and Financials

Table 3 presents a summary of different IPO characteristics such as market capitalization and operating performance data. Mean and median values are reported for the whole sample (ALL), and the non-backed and PE-backed IPO portfolios respectively. PE-backed IPOs are larger in terms of market capitalization, sales, and number of employees. Median sales of the PE-backed IPOs is €438.2 million, which is nearly five times as high as the median of €91.8 million reported for the non-backed IPOs. On average, the PE-backed IPOs are 25% larger in terms of market capitalization and 57% larger in terms of sales. The significant differences between the mean and median values of both sales and market capitalization for the non-backed IPO portfolio indicate that a few non-backed IPOs are significantly larger than the rest. These differences in means and medians are smaller for the PE-backed IPOs, indicating that they are more clustered around relatively larger values. Also related to size, the average number of employees is more than twice as high for the PE-backed IPOs, and the median difference is almost six-fold.

Looking at both medians and means, the PE-backed IPOs have a higher asset turnover, indicating that they more operationally efficient. PE-backed IPOs are also almost twice as highly leveraged when looking at the medians. Both mean and median operating margins (EBITDA to sales) are higher for non-backed IPOs, suggesting that the non-backed IPOs generally are more profitable.

Table 3
Market Capitalization and Financials

		ALL	NB	PE
Market Capitalization (€m)	Mean	599.5	552.0	692.4
	Median	271.8	208.3	438.2
	No. Obs.	130	86	44
Sales (€m)	Mean	614.7	498.9	781.5
	Median	201.8	91.8	438.2
	No. Obs.	105	62	43
EBITDA (€m)	Mean	88.2	107.0	61.9
	Median	32.2	22.7	49.3
	No. Obs.	103	60	43
EBITDA Margin, %	Mean	16.3	17.7	14.5
(EBITDA to Sales)	Median	14.0	15.7	11.7
	No. Obs.	98	56	42
Asset Turnover, %	Mean	98.7	89.1	112.6
(Sales to Total Assets)	Median	82.8	71.0	96.6
	No. Obs.	105	62	43
Total Debt to Total Assets, %	Mean	35.4	28.8	46.7
	Median	33.8	24.0	47.1
	No. Obs.	117	74	43
Number of Employees	Mean	2,017	1,200	3,264
	Median	653	232	1,367
	No. Obs.	96	58	38

Note. The full IPO sample consists of 130 IPOs (ALL), of which 86 are non-backed (NB) and 44 are private equity-backed (PE). The table reports the mean and median values for each IPO portfolio. Due to differences in data availability, the number of observations varies across the presented metrics. Market capitalization is the total number of shares outstanding multiplied by the closing price on the first day of trading. Sales, EBITDA, total debt, total assets and number of employees are presented as of the end of the last fiscal year before the IPO. Market capitalization, sales, and EBITDA are adjusted for inflation based on the consumer price indices in the respective countries.

5.3 First-Day Returns

Table 4 presents the average and median first-day returns for the sample as a whole and the two IPO portfolios respectively. Two-tailed t-tests are employed to establish if the average first-day returns differ from zero. We find that both the equal- and value-weighted first-day returns for each IPO portfolio are positive and different from zero at the 1% significance level. The results are consistent with previous literature (Ibbotson, 1975; Jenkinson & Ljungqvist, 2001; Ritter & Welch, 2002).

The results also show that the equal-weighted (EW) first-day returns are very similar for the two portfolios, registered at 9.2% for PE-backed and 10.0% for non-backed IPOs. Bergström et al. (2006) demonstrate somewhat similar results by showing that the equal-weighted first-day returns for PE-backed IPOs in the UK and France, on average, are lower than for non-backed IPOs. Looking at the value-weighted and the median first-day returns, however, we see a different picture. The value-weighted first-day return is considerably higher for the PE-backed IPO portfolio than for the non-backed IPO portfolio, registered at 10.2% and 5.5% respectively. Similarly, the

Table 4

First-Day Percentage Returns

		ALL	NB	PE
First-Day Returns (EW), %	Mean	9.72***	9.99***	9.22***
(t-statistic)		(6.55)	(5.05)	(4.35)
First-Day Returns (VW), %	Mean	7.77***	5.47***	10.23**
(t-statistic)		(3.45)	(3.65)	(2.35)
First-Day Returns, %	Median	5.43	4.37	6.52
	No. Obs.	89	58	31

Note. * Significant at the 0.10 level. **Significant at the 0.05 level. ***Significant at the 0.01 level.
The full IPO sample consists of 130 IPOs (ALL), of which 86 are non-backed (NB) and 44 are private equity-backed (PE). The table reports equal- (EW) and value-weighted (VW) first-day returns, as well as median first-day returns. Only those IPOs with available first-day returns data are included. [4] First-day return is defined as the price change from the offer price to the unadjusted closing price of the first day of trading. The value weights of the IPOs are based on their inflation-adjusted market capitalization on the first day of trading. The null hypothesis that the mean first-day returns are equal to zero is tested using a two-tailed t-test, and t-statistics are reported in parentheses.

median first-day return is higher for the PE-backed IPO portfolio. These results contrast those of Levis (2011), who demonstrates that PE-backed IPOs experience significantly lower first-day returns than non-backed IPOs.

Overall, we do not find evidence suggesting that PE-backed IPOs experience lower first-day returns, as suggested by existing literature. Rather, we observe the opposite trend. This divergence from previous literature may be related to the high degree of transparency that permeates the Nordic markets. Furthermore, compared to previous studies, we study a more recent time period associated with better information accessibility. Consequently, differences in asymmetric information may not be as prominent.

6 Results

6.1 Long-Run Performance

In this section we examine the long-run performance to see if the IPOs in our sample experience long-run *under*performance (*Hypothesis 1)*. First, we use a parametric t-test to establish whether the mean BHARs are different from zero. Then, to add robustness, we use the non-parametric Wilcoxon signed-rank test to establish whether the median BHARs are different from zero.

Table 5a and **Table 5b** report 12-, 24-, and 36-month BHARs calculated against both the all-share index benchmark (OMXNGI), and the size-adjusted benchmark (SIZE). A more comprehensive description of the benchmarks is found in Section 4.2.

6.1.1 Equal- and Value-Weighted Buy-and-Hold Abnormal Returns

Table 5a reports equal- and value-weighted BHARs reported for the full sample (Panel A), the non-backed IPO portfolio (Panel B), and the PE-backed IPO portfolio (Panel C). The null hypotheses, that the mean BHARs are equal to zero, are tested using a two-sided t-test and the corresponding p-values are reported in the parentheses.

[4] While 41 IPOs are excluded due to lack of data, the concentration of non-backed (65%) and PE-backed (35%) IPOs remains approximately the same as for the full sample.

Table 5a

Equal- and Value-Weighted Buy-and-Hold Abnormal Returns

Months After IPO	Equal-Weighted BHARs, %		Value-Weighted BHARs, %	
	OMXNGI	SIZE	OMXNGI	SIZE
Panel A. All IPOs (No. Obs.=130)				
12	3.70	-0.70	6.23	2.70
	(0.37)	(0.85)	(0.43)	(0.73)
24	8.30	-0.80	13.55	6.71
	(0.22)	(0.90)	(0.13)	(0.45)
36	3.70	-8.60	16.90	9.30
	(0.61)	(0.25)	(0.11)	(0.38)
Panel B. NB IPOs (No. Obs.=86)				
12	3.80	1.10	23.15**	20.76**
	(0.52)	(0.86)	(0.02)	(0.03)
24	3.30	-4.20	29.76**	23.25*
	(0.69)	(0.61)	(0.02)	(0.06)
36	-6.30	-18.30**	29.32	20.86
	(0.48)	(0.05)	(0.11)	(0.27)
Panel C. PE-Backed IPOs (No. Obs.=44)				
12	3.60	-4.30	-11.88	-16.64
	(0.45)	(0.35)	(0.35)	(0.19)
24	18.20	5.70	-3.81	-11.00
	(0.13)	(0.62)	(0.77)	(0.40)
36	23.30*	10.60	3.61	-3.09
	(0.07)	(0.41)	(0.70)	(0.75)

Note. * Significant at the 0.10 level. **Significant at the 0.05 level. ***Significant at the 0.01 level.
The table presents equal- and value-weighted BHARs for each portfolio, computed against two benchmarks and for three event time periods. BHARs are presented as percentages. The value-weights of the IPOs in each portfolio are based on their inflation-adjusted market capitalization on the first day of trading. The null hypotheses that the average BHARs are equal to zero are tested using a two-sided t-test, and corresponding p-values are reported in parentheses. BHARs are presented as percentages. The full IPO sample consists of 130 IPOs (ALL), of which 86 are non-backed (NB) and 44 are private equity-backed (PE). Buy-and-hold abnormal returns (BHARs) are computed for each IPO by subtracting the cumulative total return of a selected benchmark from the cumulative total return of the IPO. Each IPO's total return is computed based on the closing price on the first day of trading and BHARs are computed for 12, 24, and 36 months. For IPOs that are delisted before 36 months after flotation, BHARs are computed until the delisting date. Two different benchmarks are used to compute BHARs: 1) a Nordic dividend-adjusted all-share index, OMX Nordic Eur GI (OMXNGI), and 2) one of three Nordic size- and dividend-adjusted indices (SIZE), based on each IPO's market capitalization on the first day of trading. [5]

[5] One of three size-adjusted index benchmarks is assigned to each IPO based on individual market capitalization on the first day of trading, unadjusted for inflation. IPOs with a market capitalization over €1 billion are benchmarked against the OMX Nordic Large Cap index. IPOs with a market capitalization between €150 million and €1 billion are benchmarked against the OMX Nordic Mid Cap index. IPOs with a market capitalization below €150 million are benchmarked against the OMX Nordic Small Cap index.

For all combinations of time periods and weighting methods, all portfolios perform better against OMXNGI than against the size-adjusted benchmark. Presented in Panel A, the equal-weighted BHARs for the whole sample are positive for all three time periods against OMXNGI, although, these results lack statistical significance. Against the size-adjusted benchmark, on the other hand, the BHARs are negative, yet also statistically insignificant. These results do not support previous evidence of general underperformance (Levis, 1993, 2011; Loughran & Ritter, 1995; Ritter, 1991). However, the results are consistent with Brav and Gompers (1997), who find no evidence of underperformance when using a size-adjusted equal-weighted BHARs for the whole sample, which indicates that larger IPOs experience better performance over all three time periods for both benchmarks.

Separately, the non-backed and the PE-backed portfolio BHARs show clearer performance trends. Looking at the 36-month mark, we find that the non-backed IPOs (Panel B), on average, underperform the size-adjusted benchmark at the 5% significance level. We also observe that the PE-backed IPOs (Panel C), on average, outperform OMXNGI at the 10% significance level.

The differences in equal- and value-weighted BHARs in Panel B indicate that the larger non-backed IPOs in our sample perform better than the smaller non-backed IPOs. Looking at Panel C, we find the opposite indication for the PE-backed IPOs. The significant differences in equal- and value-weighted BHARs for the non-backed IPOs relate to the positive performance observed for a few abnormally large IPOs, which jointly have a drastic effect on the value-weighted BHARs. For example, the six largest non-backed IPOs, in terms of inflation-adjusted market capitalization, account for over a third of the weight of the non-backed IPO portfolio, and their average BHAR exceeds 60% against both indices. Therefore, the equal-weighted BHARs arguably provide a fairer picture of how each IPO portfolio performs.

6.1.2 Median Buy-and-Hold Abnormal Returns

To add robustness to the results in **Table 5a**, we perform a complementary non-parametric test on the median BHARs in **Table 5b**. Panel D presents the results for the whole sample, Panel E for the non-backed IPO portfolio, and Panel F for the PE-backed IPO portfolio. The null hypotheses that the median BHARs are equal to zero are tested using a non-parametric Wilcoxon signed-rank test.

Consistent with **Table 5a**, we observe that all IPO portfolios perform worse when using the size-adjusted benchmark. For the whole sample (Panel D), we observe underperformance against the size-adjusted benchmark over the 36-month period at the 10% significance level. Using OMXNGI, the median BHAR is slightly negative, yet not statistically significant. Using the size-adjusted benchmark, we observe that non-backed IPOs underperform in the 36-month aftermarket at the 5% significance level. This result aligns with the negative and statistically significant equal-weighted BHAR observed for non-backed IPOs in **Table 5a** (Panel B).

Presented in Panel F, the 36-month median BHARs for the PE-backed portfolio are positive against both benchmarks, however, not statistically significant. These positive trends provide an indication of post-IPO overperformance of PE-backed IPOs.

Based on the results and corresponding statistical tests, we do not observe a clear trend of post-IPO underperformance for the whole sample. Instead, our results vary depending on the measurement method employed. *Hypothesis 1* is only supported at a statistically significant level for the median BHAR against the size-adjusted benchmark. Otherwise, the BHARs for the whole sample are either negative but not statistically significant, or positive. Therefore, we conclude that we do not have enough evidence to support the hypothesis that Nordic IPOs experience long-run underperformance. We do conclude, however, that the non-backed IPOs, in terms of both equal-weighted and median BHARs, underperform against both benchmarks. The underperformance, in terms of both equal-weighted and median BHARs, is statistically significant against the size-adjusted benchmark.

Table 5b

Median Buy-and-Hold Abnormal Returns

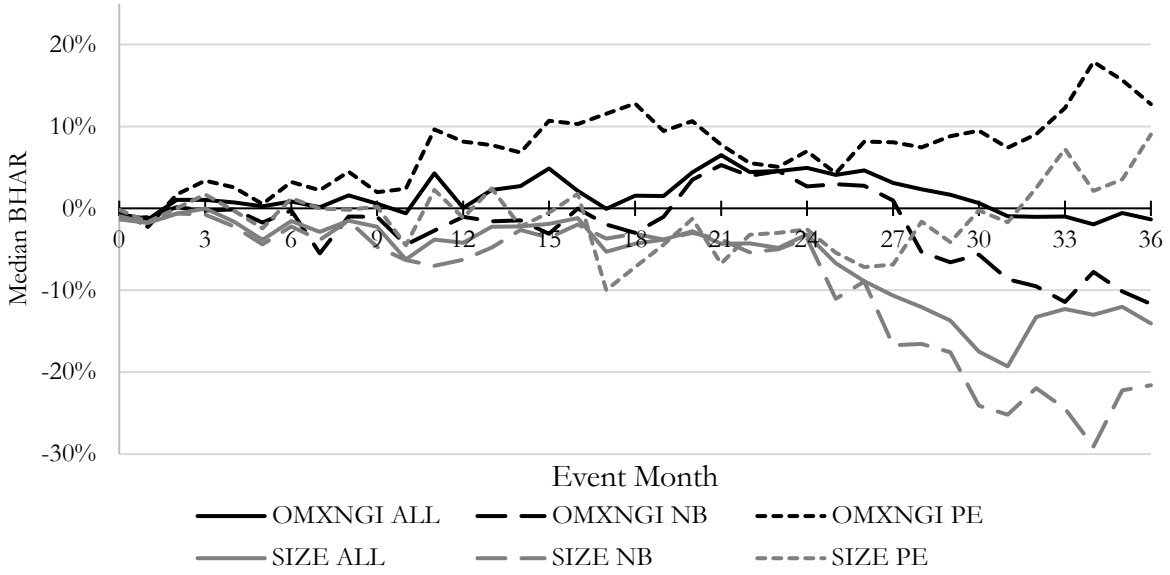
Months After IPO		Median BHARs, % OMXNGI	Median BHARs, % SIZE
		Panel D. All IPOs (No. Obs.=130)	
12	Median, %	0.05	-4.20
	(p-value)	(0.67)	(0.42)
24	Median, %	4.95	-3.19
	(p-value)	(0.49)	(0.37)
36	Median, %	-1.36	-14.04*
	(p-value)	(0.80)	(0.10)
		Panel E. NB IPOs (No. Obs.=86)	
12	Median, %	-1.03	-6.29
	(p-value)	(0.98)	(0.55)
24	Median, %	2.68	-3.66
	(p-value)	(0.94)	(0.40)
36	Median, %	-11.67	-21.59**
	(p-value)	(0.22)	(0.02)
		Panel F. PE-Backed IPOs (No. Obs.=44)	
12	Median, %	8.15	-1.14
	(p-value)	(0.32)	(0.56)
24	Median, %	6.98	-2.54
	(p-value)	(0.32)	(0.62)
36	Median, %	12.73	9.01
	(p-value)	(0.13)	(0.67)

Note. *Significant at the 0.10 level. **Significant at the 0.05 level. ***Significant at the 0.01 level.
The table presents the median BHARs for each portfolio, computed against two benchmarks and for three event time periods. The null hypotheses that the median BHARs are equal to zero are tested using the Wilcoxon signed-rank test. BHARs are reported as percentages, and p-values are reported in parentheses. The full IPO sample consists of 130 IPOs (ALL), of which 86 are non-backed (NB) and 44 are private equity-backed (PE). Buy-and-hold abnormal returns (BHARs) are computed for each IPO by subtracting the cumulative total return of a selected benchmark from the cumulative total return of the IPO. Each IPO's total return is computed based on the closing price on the first day of trading and BHARs are computed for 12, 24, and 36 months. For IPOs that are delisted before 36 months after flotation, BHARs are computed until the delisting date. Two different benchmarks are used to compute BHARs: 1) a Nordic dividend-adjusted all-share index, OMX Nordic Eur GI (OMXNGI), and 2) one of three Nordic size- and dividend-adjusted indices (SIZE), based on each IPO's market capitalization on the first day of trading. [6]

[6] One of three size-adjusted index benchmarks is assigned to each IPO based on individual market capitalization on the first day of trading, unadjusted for inflation. IPOs with a market capitalization over €1 billion are benchmarked against the OMX Nordic Large Cap index. IPOs with a market capitalization between €150 million and €1 billion are benchmarked against the OMX Nordic Mid Cap index. IPOs with a market capitalization below €150 million are benchmarked against the OMX Nordic Small Cap index.

Figure 1

Median Buy-and-Hold Abnormal Returns Against OMXNGI and SIZE



Note. The figure presents the development of median BHARs for each portfolio, computed against both benchmarks over the 36-month period. The full IPO sample consists of 130 IPOs (ALL), of which 86 are non-backed (NB) and 44 are private equity-backed (PE). Buy-and-hold abnormal returns (BHARs) are computed for each IPO by subtracting the cumulative total return of a selected benchmark from the cumulative total return of the IPO. Two different benchmarks are used to compute BHARs: 1) a Nordic dividend-adjusted all-share index, OMX Nordic Eur GI (OMXNGI), and 2) one of three Nordic size- and dividend-adjusted indices (SIZE), based on each IPO's market capitalization on the first day of trading.

While we find no conclusive evidence of general underperformance, we observe differences in performance between the PE-backed and the non-backed IPO portfolios. **Figure 1** demonstrates how these differences emerge over time by showing the median BHAR development for the whole sample, and the two IPO portfolios respectively. The figure shows that the 36-month median BHARs are higher for the PE-backed IPO portfolio against both benchmarks. Moreover, we see that the portfolio BHARs are rather clustered during the first 24 months before they diverge in the last 12 months. The 36-month median BHARs for the PE-backed portfolio are positive against both benchmarks, while the median BHARs for the non-backed portfolio are negative. We reach the same conclusions looking at mean BHAR developments presented in Appendix B.

6.2 Differences in Long-Run Performance

In this section we examine the differences in long-run performance between PE-backed and non-backed IPOs, addressing the first part of our research question and *Hypothesis 2*, that the PE-backed IPOs outperform the non-backed IPOs. First, we perform a parametric two-sided t-test to examine the differences in means between the PE-backed and the non-backed portfolios. Then, to add robustness, we perform a non-parametric Mann-Whitney U-test to examine the differences in medians.

Table 6

Differences in Buy-and-Hold Abnormal Returns Between Non-Backed and Private Equity-Backed IPOs [7]

Months After IPO		OMXNGI	SIZE
	Panel A. Differences in Equal-Weighted BHARs		
12	Difference in Percentage Points	0.20	5.30
	(p-value)	(0.99)	(0.54)
24	Difference in Percentage Points	-15.00	-9.90
	(p-value)	(0.29)	(0.48)
36	Difference in Percentage Points	-29.50*	-28.90*
	(p-value)	(0.06)	(0.07)
	Panel B. Differences in Median BHARs		
12	Median, NB (%)	-1.03	-6.29
	Median, PE (%)	8.15	-1.14
	(p-value)	(0.51)	(0.98)
24	Median, NB (%)	2.68	-3.66
	Median, PE (%)	6.98	-2.54
	(p-value)	(0.48)	(0.78)
36	Median, NB (%)	-11.67	-21.59
	Median, PE (%)	12.73	9.01
	(p-value)	(0.05)*	(0.06)*

Note. *Significant at the 0.10 level. **Significant at the 0.05 level. ***Significant at the 0.01 level.
Panel A presents the differences in equal-weighted BHARs between the non-backed and the PE-backed IPO portfolios, computed against both benchmarks and for three event time periods. The null hypotheses that the differences in the means are equal to zero are tested using the two-sided t-test. Panel B reports the median BHARs for each portfolio. The null hypotheses that the differences in median BHARs are equal to zero are tested using the Mann-Whitney U-test. BHARs are presented as percentages, and p-values are reported in parentheses. The full IPO sample consists of 130 IPOs (ALL), of which 86 are non-backed (NB) and 44 are private equity-backed (PE). Buy-and-hold abnormal returns (BHARs) are computed for each IPO by subtracting the cumulative total return of a selected benchmark from the cumulative total return of the IPO. Each IPO's total return is computed against the closing price on the first day of trading and BHARs are computed for 12, 24, and 36 months. For IPOs that are delisted before 36 months after flotation, BHARs are computed until the delisting date. Two different benchmarks are used to compute BHARs: 1) a Nordic dividend-adjusted all-share index, OMX Nordic Eur GI (OMXNGI), and 2) one of three Nordic size- and dividend-adjusted indices (SIZE), based on each IPO's market capitalization on the first day of trading. [8]

Table 6 reports the mean and median BHAR differences between the non-backed and PE-backed IPOs over the three time periods. A negative difference implies that the mean or median portfolio BHAR is higher for the PE-backed IPO portfolio. Presented in Panel A, the results show that PE-backed IPOs, on average, outperform non-backed IPOs at the 10% significance level over the 36-month period. Against both benchmarks, the differences in average BHARs are nearly 30 percentage points. Adding robustness to these results, Panel B, too, shows that the 36-month BHARs for the PE-backed IPO portfolio are higher than for the non-backed IPO portfolio at the 10% significance level. Once again, this is true using both benchmarks. The results demonstrate

[7] The BHAR difference is defined as the mean (median) BHAR of the non-backed portfolio minus the mean (median) BHAR of the PE-backed portfolio.

[8] One of three size-adjusted index benchmarks is assigned to each IPO based on individual market capitalization on the first day of trading, unadjusted for inflation. IPOs with a market capitalization over €1 billion are benchmarked against the OMX Nordic Large Cap index. IPOs with a market capitalization between €150 million and €1 billion are benchmarked against the OMX Nordic Mid Cap index. IPOs with a market capitalization below €150 million are benchmarked against the OMX Nordic Small Cap index.

that PE-backed IPOs experience superior long-run performance in the 36-month aftermarket, which is consistent with previous evidence (Bergström et al., 2006; Cao & Lerner, 2009; Levis, 2011). Presented in Appendix C, the superior performance of the PE-backed IPOs also holds consistent for each respective year.

Looking at the results from the 12- and 24-month periods in **Table 6**, the PE-backed IPOs perform better than the non-backed IPOs in all cases except for the 12-month equal-weighted BHARs. However, these results are not statistically significant.

Based on the statistically significant and robust 36-month BHAR differences in favor of PE-backed IPOs, we find conclusive evidence in support of *Hypothesis 2*. Thus, we conclude that the PE-backed IPOs in our sample experience superior long-run performance compared to the non-backed IPOs.

7 IPO Characteristics and Long-Run Performance

While the previous section provides evidence suggesting that PE-backed IPOs outperform non-backed IPOs over the 36-month period post flotation, this section investigates the correlation between selected IPO characteristics and long-run performance. Thus, this section addresses our second research question. The section is divided into two parts; first, we examine differences in operational characteristics between PE-backed and non-backed IPOs over time. Then, we use a cross-sectional regression to find what IPO characteristics are associated with long-run performance.

7.1 Operational IPO Characteristics

Table 7 presents the annual development of asset turnover (Panel A), EBITDA margin (Panel B), and leverage (Panel C). The values are reported as of the fiscal year before the IPO year (t-1), and the following three fiscal years. Thus, t+1 corresponds to the fiscal year of the IPO. A two-sided t-test is employed to establish if there are statistically significant differences in operational metrics between the PE-backed and the non-backed IPO portfolios. For robustness, a Mann-Whitney U-test is used to determine whether the portfolio medians are statistically different from each other.

7.1.1 Asset Turnover

As presented in Panel A, we observe higher asset turnover for the PE-backed IPOs across all years, and with statistical significance for the last three years. These results remain robust for both mean and median values. The results also show that both mean and median differences increase over time, indicating that the PE-backed IPOs continue to outperform the non-backed IPOs after flotation. Isolating the PE-backed IPOs, we observe that both mean and median asset turnovers are higher after the PE ownership period. As suggested by Brav and Gompers (1997), the observed superior and consistent operating performance of the PE-backed IPOs may be related to improved management structures implemented by the PE firms during the PE ownership period. The non-backed IPOs, on the other hand, experience a deterioration in asset turnover, starting from the fiscal year before flotation (t-1), suggesting that they grow less efficient after flotation.

Table 7

Operating Performance Development

		t - 1	t + 1	t + 2	t + 3
Panel A. Asset Turnover (Sales to Assets), %					
NB	Mean	90.10	76.80	76.50	74.80
	Median	72.40	58.70	55.90	66.80
	No. Obs.	61	61	61	61
PE	Mean	112.60	117.90	123.70	123.40
	Median	96.60	99.00	107.60	99.50
	No. Obs.	43	43	43	43
T-Test	(p-value)	(0.31)	(0.06)*	(0.04)**	(0.03)**
M-W U	(p-value)	(0.35)	(0.01)***	(0.00)***	(0.00)***
Panel B. EBITDA Margin, %					
NB	Mean	18.0	15.4	17.7	4.7
	Median	15.7	15.0	14.5	15.6
	No. Obs.	55	55	55	55
PE	Mean	14.9	15.0	14.6	12.6
	Median	11.9	12.0	11.4	11.0
	No. Obs.	41	41	41	41
T-Test	(p-value)	(0.61)	(0.95)	(0.62)	(0.57)
M-W U	(p-value)	(0.09)*	(0.25)	(0.11)	(0.13)
Panel C. Leverage (Total Debt to Total Assets), %					
NB	Mean	28.6	24.6	25.4	28.6
	Median	23.9	22.9	22.3	24.6
	No. Obs.	73	73	73	73
PE	Mean	46.7	31.2	28.6	29.7
	Median	47.1	29.1	27.9	28.4
	No. Obs.	43	43	43	43
T-Test	(p-value)	(0.00)***	(0.09)*	(0.40)	(0.80)
M-W U	(p-value)	(0.00)***	(0.03)**	(0.19)	(0.37)

Note. *Significant at the 0.10 level. **Significant at the 0.05 level. ***Significant at the 0.01 level.
The full IPO sample consists of 130 IPOs (ALL), of which 86 are non-backed (NB) and 44 are private equity-backed (PE). The table reports mean and median asset turnover, operating margin, and leverage for the non-backed and the PE-backed IPO portfolios. The values are reported as of the end of the fiscal year before the IPO year (t – 1), followed by the three subsequent fiscal years. The performance ratios are calculated including only those IPOs for which the financials are available for all four years. The null hypotheses that the portfolio medians are different from each other are tested using the Mann-Whitney U-test. P-values are reported in parentheses.

7.1.2 EBITDA Margin

Across all years, the median EBITDA margin is lower for the PE-backed IPOs than for the non-backed IPOs. However, these results are only statistically significant for the year before the fiscal year of the IPOs. We also observe that the median values remain at similar levels across all years for both IPO portfolios. While the median values suggest that the EBITDA margins remain rather constant over time, the mean values paint a different picture. Looking at the mean values of the non-backed IPOs, we see a drastic decrease in EBITDA margin over time. The increasing difference between the mean and median EBITDA margins of the non-backed portfolio suggests that a fraction of the non-backed IPOs experience a drastic decrease in profitability over time,

while the median IPO perform similarly across all years. The mean and median EBITDA margins of the PE-backed IPOs decrease slightly over time.

7.1.3 Leverage

As shown in Panel C, the PE-backed IPOs have higher leverage ratios than the non-backed IPOs during the first two years. These differences are statistically significant and robust for both mean and median values. We also observe that the leverage ratios of the PE-backed IPOs drop drastically after flotation. This is reasonable considering that debt financing is an essential part of the PE business model (Muscarella & Vetsuypens, 1990), and, therefore, leverage is likely to decrease after the PE ownership period. As a result of the decreasing leverage levels of the PE-backed IPOs, the differences in leverage converge over time and are no longer statistically significant for the last two fiscal years.

7.1.4 Investor Reactions

In terms of asset turnover, the PE-backed IPOs are more consistent over time compared to the non-backed IPOs. Furthermore, PE-backed IPOs manage to drastically reduce their debt levels right after flotation. Considering that PE-backed IPOs outperform non-backed IPOs in terms of abnormal stock returns (shown in **Table 6**), investors seem to be positively surprised by PE-backed IPOs' ability to remain operationally consistent in the aftermarket, while simultaneously reducing debt levels.

7.2 Cross-Sectional Regression of Long-Run Performance

Demonstrated in **Table 6**, PE-backed IPOs outperform non-backed IPOs in the 36-month aftermarket. As shown in **Table 3** and **Table 7**, we also find that PE-backed IPOs are larger, more leveraged, and have higher asset turnover than non-backed IPOs. In this sub-section we show the correlation between IPO characteristics and long-run performance. As suggested by Levis (2011), we also factor in the potential correlation between initial investor sentiment and long-run performance. Also suggested by Levis, we use first-day return and price-to-book value based on the first day of trading as proxies for initial investor sentiment.

Table 8 presents five cross-sectional regressions related to the joint IPO portfolio (both backing types), as well as the non-backed and the PE-backed portfolios respectively. Following Brav and Gompers (1997) and Levis (2011), the performance metric and dependent variable used is the natural logarithm of the equal-weighted buy-and-hold wealth relative. The wealth relative for each IPO is computed as follows:

$$(5) \quad WR_{i,T} = \frac{R_{i,T}}{R_{b,T}},$$

where $WR_{i,T}$ is the wealth relative for IPO *i*, $R_{i,T}$ is the cumulative return for IPO *i* over time period *T*, and $R_{b,T}$ is the cumulative return for benchmark *b* over time period *T*. In the cross-sectional regressions, *T* equals 36 months, and *b* is the size-adjusted benchmark.

The independent variables are chosen based on the independent variables used by Levis (2011) and based on the observed differences in IPO characteristics between the PE-backed and the non-backed IPOs in our sample. The independent variables are presented in **Table 8**. Price-to-book value is based on the closing price on the first day of trading and the book value of equity of the most recent fiscal period before the IPO. Market capitalization is derived using the closing price on the first day of trading multiplied by the number of shares outstanding. Leverage and asset turnover are based on financial data from the fiscal year of the IPO (t+1). Since some of the

Table 8

Multivariate Cross-Sectional Regressions of the 36-Month Long-Run Performance[9]

	ALL (1)	ALL (2)	ALL (3)	NB (4)	PE (5)
First-Day Return	-0.165	-0.356	-0.529	0.260	-0.452
	(-0.23)	(-0.59)	(-0.78)	(0.26)	(-1.19)
Ln of Price-to-Book Value	0.026	0.059	0.091	0.108	0.117
	(0.28)	(0.74)	(1.00)	(0.94)	(1.27)
Hot Issue Period Dummy	0.182	0.315	0.303	-0.085	0.415**
	(0.73)	(1.45)	(1.24)	(-0.27)	(2.55)
Log of Market Cap		0.758***	0.803***	0.879***	0.137
		(4.71)	(3.63)	(3.09)	(0.72)
Leverage			0.514	0.935*	-0.889*
			(1.03)	(1.72)	(-1.84)
Asset Turnover			0.206	0.372**	-0.349**
			(1.67)	(2.14)	(-2.86)
PE Backing Dummy	0.449***	0.267**	0.169		
	(3.20)	(2.09)	(1.04)		
Intercept	-0.399**	-6.748***	-7.456***	-8.313***	-0.529
	(-2.51)	(-4.76)	(-4.00)	(-3.49)	(-0.31)
Adj. R^2	0.033	0.272	0.299	0.367	0.549
No. Obs.	66	66	56	35	21

Note. *Significant at the 0.10 level. **Significant at the 0.05 level. ***Significant at the 0.01 level.
The dependent variable is the natural logarithm of the 36-month wealth relative calculated using the size-adjusted benchmark. The independent variables are first-day return, the natural logarithm of price-to-book value at the time of flotation, [10] a dummy for the hot issue period (October 2006-2007), the logarithm of the inflation-adjusted market capitalization on the first day of trading, leverage, [11] asset turnover, [12] and a PE backing dummy. Robust t-statistics are reported in parentheses.

independent variables are endogenous to the PE backing dummy, the regression coefficients provide no evidence of causality. Therefore, their magnitudes may not be interpreted. Rather, the regression analysis relies on the signs of the coefficients and their respective significance levels.

In **Table 8**, Columns (1), (2), and (3) report the regression results for the joint portfolio (including both non-backed and PE-backed IPOs), while Columns (4) and (5) report the regression results for the non-backed and the PE-backed IPO portfolios respectively.

7.2.1 Private Equity Backing

In Columns (1) and (2) we observe that the PE backing dummy is positive and statistically significant at the 1% and the 5% significance levels respectively. These results are in line with our previously established conclusion that PE-backed IPOs experience better long-run performance than non-backed IPOs. Evident in Column (2), the PE backing dummy loses some of its

[9] The regression does not include all IPOs in the sample. However, the relative representation of PE-backed IPOs is almost identical to that of the full sample, accounting for 32% of the IPOs in Columns (1) and (2). Thus, the risk of systematical differences compared to the full sample composition is less severe.

[10] Price-to-book value is computed by multiplying the closing price on the first day of trading by the number of shares outstanding at the time, divided by the book value of equity for the last fiscal period before flotation.

[11] Leverage is calculated by dividing total debt by total assets reported for the fiscal year of the IPO.

[12] Asset turnover is calculated by dividing net sales by total assets reported for the fiscal year of the IPO.

explanatory power when controlling for market capitalization, indicating that there is a correlation between size and the PE backing dummy. We confirm the existence of a positive correlation between market capitalization and the PE backing dummy in Appendix D. This positive correlation suggests that size is a part of the equation for why PE-backed IPOs, which are observed to be larger, outperform non-backed IPOs. Adding robustness to our results, we show that the PE backing dummy remains statistically significant when controlling for industry and country fixed effects, see Appendix E.

7.2.2 Leverage and Asset Turnover

Observed in Column (3), the PE backing dummy is no longer statistically significant when controlling for leverage and asset turnover, indicating the presence of their expected multicollinear relationship. We confirm that the PE backing dummy is positively correlated with both leverage and asset turnover in Appendix D**.** These results indicate that both leverage and asset turnover are important IPO characteristics that are positively related to the observed superior long-run performance of PE-backed IPOs. The positive correlations between long-run performance and both leverage and asset turnover are also evident for the non-backed IPO portfolio in Column (4), indicating that non-backed IPOs with higher leverage and asset turnover outperform non-backed IPOs with lower leverage and asset turnover. The observed positive relationship between leverage and long-run performance is consistent with the findings of Jensen (1989), Acharya et al. (2013) and Levis (2011), as well as the generally accepted idea that high debt utilization is one of the PE model's main value drivers.

Presented in Column (5), the coefficients for both leverage and asset turnover are negative and statistically significant for the PE-backed IPOs. This indicates that PE-backed IPOs, which are already more leveraged and have a higher asset turnover than the average IPO, perform worse in the aftermarket if the leverage and asset turnover ratios are too high right after of flotation. Due to the few observations, however, we are careful about making any general inferences based on the results in Column (5).

7.2.3 Market Capitalization

The logarithm of market capitalization is positively correlated with long-run IPO performance at the 1% significance level when looking both at the joint portfolio in Columns (2) and (3), and the non-backed portfolio in Column (4). The positive and statistically significant correlation between market capitalization and long-run performance indicates that the IPOs in our sample benefit in the aftermarket from being larger at the time of flotation. This is consistent with the observed differences between equal- and value-weighted BHARs presented in **Table 5a**. The results are also in line with previous findings by Brav and Gompers (1997), who conclude that smaller non-backed IPOs perform worse than larger and PE-backed IPOs. Brav et al. (2000) also find that underperformance is mostly fueled by smaller firms. Goergen et al. (2007) find a similar correlation and attribute the superior performance of larger IPOs to differences in managerial strategies and financial performance before the IPO.

Looking at the PE-backed IPO portfolio in Column (5), the positive coefficient for market capitalization is not statistically significant. As shown in **Table 3**, PE-backed IPOs are larger than non-backed IPOs and also more clustered in terms of size. These observations indicate that market capitalization is less positively correlated with the long-run performance of IPOs that have already reached a certain size threshold. However, the small sample of PE-backed IPOs is prone to the influence of a few individual IPOs, and, therefore, we refrain from making any general inferences.

7.2.4 First-Day Return and Price-to-Book Value

Columns (1), (2), (3), and (5) all show signs of a negative relationship between first-day returns and long-run performance, although without statistical significance. Consequently, we do not find enough evidence to confirm the negative correlation between first-day returns and long-run performance demonstrated by Bergström et al. (2006) and Levis (2011). The coefficients for the natural logarithm of price-to-book value, too, are not statistically significant. With these results as background, we cannot confirm that our proxies for initial investor sentiment are correlated with long-run performance.

7.2.5 Hot Issue Period

Looking at the hot issue period dummy, we find no statistically significant correlation with the dependent variable, except for the positive coefficient observed in Column (5). Worth noting, however, is that only four PE-backed IPOs were listed during the defined hot issue period, and that the results, therefore, reflect a few individual companies' performances rather than a general trend. [13]

8 Conclusion, Limitations, and Further Research

8.1 Conclusion

Using a sample of 130 main market IPOs in the Nordics from October 2006 to December 2016, we examine differences in characteristics and long-run performance between PE-backed and non-backed IPOs. Furthermore, we investigate the relationship between several selected IPO characteristics and long-run performance. We measure long-run performance as the buy-and-hold abnormal return over a 36-month period after flotation.

First, we establish that PE-backed IPOs, on average, are larger in terms of sales, assets and market capitalization compared to non-backed IPOs. We also show that PE-backed IPOs, on average, are more leveraged and have higher asset turnover compared to non-backed IPOs in the fiscal year of flotation.

Second, we find no conclusive evidence of long-run underperformance of the IPOs in our sample. Instead, our results vary significantly depending on the combination of benchmark and weighting method employed. These results differ from previous evidence from the US and the UK, showing clear trends of long-run IPO underperformance (Levis, 2011; Loughran & Ritter, 1995; Ritter, 1991). One possible explanation for not finding significant general long-run underperformance could be tied to the findings of Brav et al. (2000), who provide evidence suggesting that general underperformance mainly is a result of abnormally poor performance of smaller and less mature IPOs. A predominant weight of previous literature analyzes the performance of IPOs on both main and secondary exchanges, meaning that they include the smaller and less mature IPOs mentioned. As we only include IPOs from the main exchanges in the Nordics, essentially excluding all typically smaller and less mature IPOs, our sample is less susceptible to the negative influence of smaller IPOs. This could explain why we do not find conclusive evidence of IPO underperformance.

Third, while we find no conclusive evidence for long-run underperformance, our empirical results show significant performance differences between PE-backed and non-backed IPOs. More specifically, we confirm that PE-backed IPOs, on average and in terms of medians, outperform

[13] Three of the four PE-backed IPOs listed in 2006 or 2007 experience a BHAR of over 20%, and only one experience a negative BHAR.

non-backed IPOs over the 36-month period after flotation. These results remain robust, as we complement the results from the parametric t-test with supporting evidence from the non-parametric Mann-Whitney U-test.

Finally, using five cross-sectional regressions, we conclude that IPOs benefit in the aftermarket from being larger, more leveraged, and from having higher asset turnover in the fiscal year of flotation. Comparing IPO characteristics, we also demonstrate the that PE-backed IPOs have higher values for all these measures. This indicates that size and the high levels of both leverage and asset turnover are important factors as to why PE-backed IPOs outperform non-backed IPOs. The positive correlation between leverage and long-run performance supports the general idea that high debt utilization is one of the main drivers of the PE business model (Acharya et al., 2013; Jensen, 1989). Due to the limited scope of this study, we cannot confirm whether the differences in size, leverage, and asset turnover of PE-backed IPOs stem from operational strategies employed during the PE ownership period, or if the PE firms prefer acquiring targets that already have these characteristics. However, considering the PE model's typical use of high debt levels to finance rapid growth, we have reason to believe that companies grow larger and become more leveraged during the PE ownership period.

Another potential explanation for why PE-backed IPOs outperform non-backed IPOs relates to the argument that the BHAR measurement does not capture differences in risk and expected returns associated with differences in leverage. In accordance with conventional asset pricing models, more leverage is associated with greater risks and subsequently greater expected returns. Therefore, the higher BHARs of PE-backed IPOs may just reflect the higher leverage ratios that characterize these IPOs.

8.2 Limitations

The fact that our sample is rather small has several implications. For example, we cannot accurately confirm any unfavorable distributional properties, like skewness, typically associated with long-run abnormal returns data (Lyon et al., 1999). Therefore, we rely on non-parametric tests to account for potential distributional deficiencies and add robustness to our findings. Furthermore, the sample size limits our ability to effectively control for country and industry fixed effects, since the number of observations in each of the industry subgroups is low. Another limitation of this study relates to how long-run performance is measured. Suggested by Lyon et al. (1999), empirical results on long-run performance are highly dependent on the methodology, time period, and benchmark used. Thus, using different methodologies and benchmarks to analyze IPO performance in the Nordics would complement, and potentially contrast, the findings of this study. Finally, our sample risks suffering from survivorship bias due to the expected lower data availability of delisted companies. Since delisted companies typically underperform in the aftermarket, our performance results may, therefore, be slightly inflated.

8.3 Further Research

In this study, we provide evidence suggesting that the superior long-run performance of PE-backed IPOs is associated with the fact that these IPOs are larger, more leveraged, and have higher asset turnover compared to non-backed IPOs. However, we do not address the underlying drivers that give rise to these characteristics. Investigating the operations and strategies associated with the PE model, and their effect on size and operational performance, would add further depth into this research area. Another area to examine further is the positive relationship between size and long-run IPO performance, and, more specifically, how this relates to potential synergies arising from the buy-and-build strategy employed by PE firms.

References

Acharya, V. V., Gottschalg, O. F., Hahn, M., & Kehoe, C. (2013). Corporate governance and value creation: Evidence from private equity. *The Review of Financial Studies, 26*(2), 368-402. Retrieved from http://www.jstor.org/stable/23356858

Aggarwal, R. (2000). Stabilization activities by underwriters after initial public offerings. *Journal of Finance, 55*(3), 1075-1103. doi:10.1111/0022-1082.00241

Argentum. (2018). *The state of Nordic private equity 2018* [White Paper]. Retrieved from https://argentum.no/wp-content/uploads/sites/73/2019/06/Argentum_The-state-of-Nordic-private-equity-2018_digital.pdf

Beatty, R. P., & Ritter, J. R. (1986). Investment banking, reputation, and the underpricing of initial public offerings. *Journal of Financial Economics, 15*(1), 213-232. doi:10.1016/0304-405X(86)90055-3

Benninga, S., Helmantel, M., & Sarig, O. (2005). The timing of initial public offerings. *Journal of Financial Economics, 75*(1), 115-132. doi:https://doi.org/10.1016/j.jfineco.2003.04.002

Bergström, C., Nilsson, D., & Wahlberg, M. (2006). Underpricing and long-run performance patterns of European private-equity-backed and non-private-equity-backed IPOs. *The Journal of Private Equity, 9*(4), 16-47. Retrieved from http://www.jstor.org/stable/43503484

Bhandari, L. C. (1988). Debt/equity ratio and expected common stock returns: Empirical evidence. *Journal of Finance, 43*(2), 507-528. doi:10.1111/j.1540-6261.1988.tb03952.x

Brav, A., Geczy, C., & Gompers, P. A. (2000). Is the abnormal return following equity issuances anomalous? *Journal of Financial Economics, 56*(2), 209-249. doi:https://doi.org/10.1016/S0304-405X(00)00040-4

Brav, A., & Gompers, P. A. (1997). Myth or reality? the long-run underperformance of initial public offerings: Evidence from venture and nonventure capital-backed companies. *The Journal of Finance, 52*(5), 1791-1821. doi:10.1111/j.1540-6261.1997.tb02742.x

BVCA. (2014). *Guide to private equity & venture capital in the Nordics* [White Paper]. Retrieved from https://www.bvca.co.uk/Portals/0/library/documents/BVCA%20Guide%20to%20PE%20&%20VC%20in%20the%20Nordics.pdf

Cao, J. X. (2011). IPO timing, buyout sponsors' exit strategies, and firm performance of RLBOs. *Journal of Financial and Quantitative Analysis, 46*(4), 1001-1024. doi:10.1017/S0022109011000160

Cao, J., & Lerner, J. (2009). The performance of reverse leveraged buyouts. *Journal of Financial Economics, 91*(2), 139-157. doi:https://doi.org/10.1016/j.jfineco.2008.03.002

Degeorge, F., & Zeckhauser, R. (1993). The reverse LBO decision and firm performance: Theory and evidence. *Journal of Finance, 48*(4), 1323-1348. doi:10.1111/j.1540-6261.1993.tb04756.x

Fama, E. F., & French, K. R. (1993). Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics, 33*(1), 3-56. doi:10.1016/0304-405X(93)90023-5

Goergen, M., Khurshed, A., & Mudambi, R. (2007). The long-run performance of UK IPOs: Can it be predicted? *Managerial Finance, 33*(6), 401-419. doi:http://dx.doi.org/10.1108/03074350710748759

Hamada, R. S. (1972). The effect of the firm's capital structure on the systematic risk of common stocks. *Journal of Finance, 27*(2), 435-452. doi:10.1111/j.1540-6261.1972.tb00971.x

Holthausen, R. W., & Larcker, D. F. (1996). The financial performance of reverse leveraged buyouts. *Journal of Financial Economics, 43*(3), 293-332. doi:https://doi.org/10.1016/0304-405X(96)00884-7

Ibbotson, R. G. (1975). Price performance of common stock new issues. *Journal of Financial Economics, 2*(3), 235-272. doi:https://doi.org/10.1016/0304-405X(75)90015-X

Inflation.eu. (n.d.). *Historic inflation – CPI inflation year pages*. Retrieved April 9, 2020 from https://www.inflation.eu/inflation-rates/historic-cpi-inflation.aspx

Jaskiewicz, P., González, V. M., Menéndez, S., & Schiereck, D. (2005). Long-run IPO performance analysis of German and Spanish family-owned businesses. *Family Business Review, 18*(3), 179-202. Retrieved from https://search.proquest.com/docview/211082516?accountid=39039

Jelic, R., Saadouni, B., & Wright, M. (2005). Performance of private to public MBOs: The role of venture capital. *Journal of Business Finance & Accounting, 32*(3), 643-682. doi:10.1111/j.0306-686X.2005.00608.x

Jenkinson, T., & Ljungqvist, A. (2001). *Going public: The theory and evidence on how firms raise equity finance* (2nd ed.). Oxford: Oxford University Press.

Jensen, M. C. (1986). Agency costs of free cash flow, corporate finance, and takeovers. *The American Economic Review, 76*(2), 323-329. Retrieved from http://www.jstor.org/stable/1818789

Jensen, M. C. (1989). "Active investors, LBOs, and the privatization of bankruptcy*". *Journal of Applied Corporate Finance, 2*(1), 35-44. doi:10.1111/j.1745-6622.1989.tb00551.x

Kaplan, S. (1989). The effects of management buyouts on operating performance and value. *Journal of Financial Economics, 24*(2), 217-254. doi:https://doi-org.ez.hhs.se/10.1016/0304-405X(89)90047-0

Katz, S. P. (2009). Earnings quality and ownership structure: The role of private equity sponsors (2007 American accounting association competitive manuscript award winner). *The Accounting Review, 84*(3), 623-658. doi:10.2308/accr.2009.84.3.623

Korteweg, A. (2010). The net benefits to leverage. *Journal of Finance, 65*(6), 2137-2170. doi:10.1111/j.1540-6261.2010.01612.x

Le, A., & Robson, V. (2018, Oct 10,). Nordic private equity fights to be heard. *Private Equity International,* Retrieved

from https://global.factiva.com/redir/default.aspx?P=sa&an=PRION00020181010eeaa00001&cat=a&ep=ASE

Lang, L., Ofek, E., & Stulz, R. (1996). Leverage, investment, and firm growth. *Journal of Financial Economics, 40*(1), 3-29. doi:10.1016/0304-405X(95)00842-3

Levis, M. (1993). The long-run performance of initial public offerings: The UK experience 1980-1988. *Financial Management, 22*(1), 28-41. doi:10.2307/3665963

Levis, M. (2011). The performance of private equity-backed IPOs. *Financial Management, 40*(1), 253-277. doi:10.1111/j.1755-053X.2010.01141.x

Loughran, T., & Ritter, J. R. (1995). The new issues puzzle. *The Journal of Finance, 50*(1), 23-51. doi:10.1111/j.1540-6261.1995.tb05166.x

Loughran, T., Ritter, J. R., & Rydqvist, K. (1994). Initial public offerings: International insights. *Pacific-Basin Finance Journal, 2*(2-3), 165-199. doi:10.1016/0927-538X(94)90016-7

Lyon, J. D., Barber, B. M., & Tsai, C. (1999). Improved methods for tests of long-run abnormal stock returns. *The Journal of Finance, 54*(1), 165-201. doi:10.1111/0022-1082.00101

Miller, E. M. (1977). Risk, uncertainty, and divergence of opinion. *Journal of Finance, 32*(4), 1151-1168. doi:10.1111/j.1540-6261.1977.tb03317.x

Muscarella, C. J., & Vetsuypens, M. R. (1990). Efficiency and organizational structure: A study of reverse LBOs. *Journal of Finance, 45*(5), 1389-1413. doi:10.1111/j.1540-6261.1990.tb03720.x

Nasdaq. (2018, March). *Rules for the construction and maintenance of the NASDAQ OMX all-share, benchmark and sector indexes* [Fact Sheet]. Retrieved from https://indexes.nasdaqomx.com/docs/Methodology_NORDIC.pdf

Nasdaq Nordic. (2017, December 29). *Record year for listings on Nasdaq's Nordic markets* [Press Release]. Retrieved from https://www.nasdaq.com/about/press-center/record-year-listings-nasdaqs-nordic-markets

Nasdaq Nordic. (n.d.). *Indexes*. Retrieved April 9, 2020 from http://www.nasdaqomxnordic.com/indexes

Purnanandam, A. K., & Swaminathan, B. (2004). Are IPOs really underpriced? *The Review of Financial Studies, 17*(3), 811-848. doi:10.1093/rfs/hhg055

Ritter, J. R. (1991). The long-run performance of initial public offerings. *The Journal of Finance, 46*(1), 3-27. doi:10.1111/j.1540-6261.1991.tb03743.x

Ritter, J. R., & Welch, I. (2002). A review of IPO activity, pricing, and allocations. *Journal of Finance, 57*(4), 1795-1828. doi:10.1111/1540-6261.00478

Rydqvist, K., & Högholm, K. (1995). Going public in the 1980s: Evidence from Sweden. *European Financial Management, 1*(3), 287-315. doi:10.1111/j.1468-036X.1995.tb00021.x

Schöber, T. (2008). *Buyout-backed initial public offerings* [Unpublished doctoral dissertation]. University of St. Gallen.

Schultz, P. (2003). Pseudo market timing and the Long-Run underperformance of IPOs. *Journal of Finance, 58*(2), 483-517. doi:10.1111/1540-6261.00535

Segerström, S. (2018, August 21). *Sweden's IPO boom*. FactSet. Retrieved from https://insight.factset.com/swedens-ipo-boom

Spliid, R. (2013). Is Nordic private equity different? *The Journal of Private Equity, 16*(2), 38-57. doi:10.3905/jpe.2013.16.2.038

Appendix A

Table 9
Number of IPOs by Size Segment

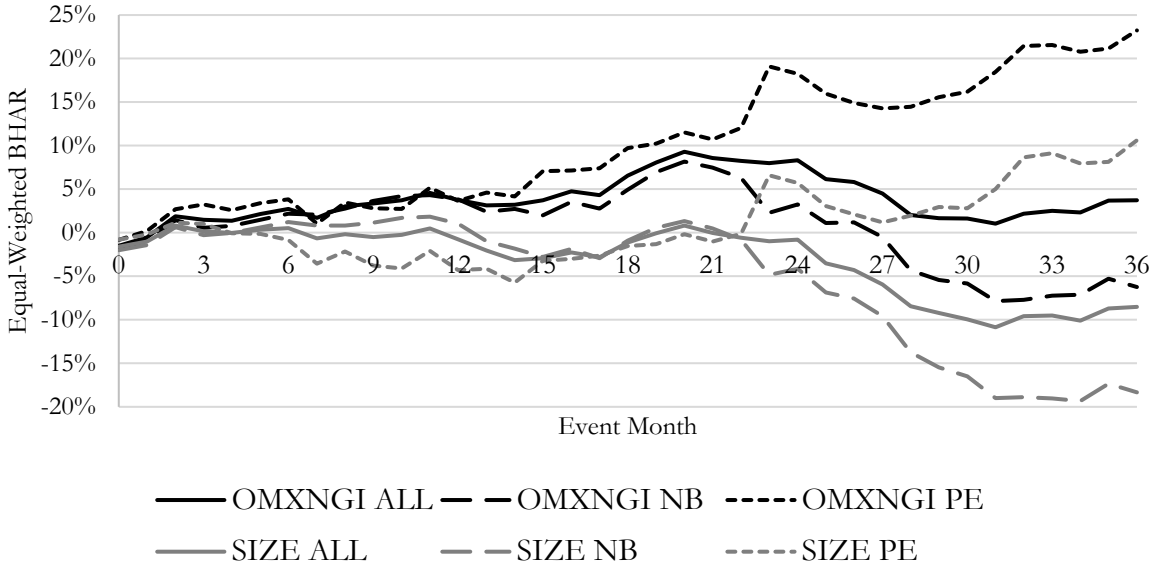
	Large Cap	Mid Cap	Small Cap	No. Obs.
Panel A. Based on Market Capitalization				
Non-Backed	8	39	39	86
PE-Backed	9	26	9	44
No. Obs.	17	65	48	130
Panel B. Based on Inflation-Adjusted Market Capitalization				
Non-Backed	8	41	37	86
PE-Backed	9	27	8	44
No. Obs.	17	68	45	**130**

Note. The full sample consists of 130 IPOs (ALL), of which 86 are non-backed (NB) and 44 PE-backed (PE). The table presents the distribution of IPOs based on market capitalization. The IPOs are divided into three different groups: Large Cap, Mid Cap and Small Cap. Panel A shows the IPO distribution based the unadjusted market capitalization, and Panel B shows the IPO distribution based on the inflation-adjusted market capitalization. IPOs with a market capitalization over €1 billion are benchmarked against OMX Nordic Large Cap Eur GI. IPOs with a market capitalization between €150 million and €1 billion are benchmarked against OMX Nordic Mid Cap Eur GI. IPOs with a market capitalization below €150 million are benchmarked against OMX Nordic Small Cap Eur GI.

Appendix B

Figure 2

Equal-Weighted Buy-and-Hold Abnormal Returns Against OMXNGI and SIZE



Note. The figure presents the development of the equal-weighted BHARs for each portfolio, computed against both benchmarks over the 36-month period. The full IPO sample consists of 130 IPOs (ALL), of which 86 are non-backed (NB) and 44 are private equity-backed (PE). Buy-and-hold abnormal returns (BHARs) are computed for each IPO by subtracting the cumulative total return of a selected benchmark from the cumulative total return of the IPO. Each IPO's total return is computed based on the closing price on the first day of trading. For IPOs that are delisted before 36 months after flotation, BHARs are computed until the delisting date. Two different benchmarks are used to compute BHARs: 1) a Nordic dividend-adjusted all-share index, OMX Nordic Eur GI (OMXNGI), and 2) one of three Nordic size- and dividend-adjusted indices (SIZE), based on each IPO's market capitalization on the first day of trading.

Appendix C

Table 10

Equal-Weighted 36-Month BHAR against the Size-Adjusted Benchmark (SIZE) by Cohort Year

Listing Year		ALL	NB	PE
2006	Mean	5.94	5.94	-
	Median	-13.62	-13.62	-
2007	Mean	-1.83	-9.84	24.23
	Median	0.26	-2.64	48.87
2010	Mean	-22.91	-32.12	-6.81
	Median	-51.06	-61.42	-31.81
2011	Mean	4.99	-7.15	77.79
	Median	31.61	6.21	77.79
2012	Mean	71.76	71.76	-
	Median	37.38	37.38	-
2013	Mean	-55.26	-60.68	-28.17
	Median	-81.03	-86.45	-28.17
2014	Mean	-28.86	-39.93	-9.18
	Median	-10.69	-17.79	10.53
2015	Mean	-1.94	-19.73	14.74
	Median	-3.59	-22.06	15.14
2016	Mean	17.81	10.52	27.83
	Median	-12.77	-12.77	-10.01

Note. The table reports equal-weighted and median buy-and-hold abnormal returns (BHARs) for each IPO portfolio. The BHARs are computed using the size-adjusted benchmark.

Appendix D

Table 11

Correlation Matrix for the PE Backing Dummy, Asset Turnover, and Leverage

	PE Backing Dummy	Leverage	Asset Turnover	Log of Market Capitalization
PE Backing Dummy	1			
Leverage	0.166	1		
Asset Turnover	0.215	-0.129	1	
Log of Market Capitalization	0.289	0.335	0.094	1

Note. The table shows the correlation between the independent variables PE backing dummy, leverage, and asset turnover. Leverage and asset turnover are calculated by dividing net sales by total assets reported for the fiscal year of the IPO.

Appendix E

Table 12

Multivariate Cross-Sectional Regressions of the 36-Month Long-Run Performance, Controlling for Country and Industry Fixed Effects

	ALL (1)	ALL (2)	ALL (3)	NB (4)	PE (5)
First-Day Return	-0.081	-0.260	-0.280	1.151	-1.047
	(-0.10)	(-0.40)	(-0.34)	(1.03)	(-1.82)
Ln of Price-to-Book Value	0.066	0.098	0.132	0.111	0.231
	(0.66)	(1.16)	(1.32)	(0.77)	(0.73)
Hot Issue Period Dummy	0.175	0.350	0.279	-0.226	0.559*
	(0.63)	(1.53)	(0.98)	(-0.63)	(2.18)
Log of Market Capitalization		0.806***	0.844***	0.782*	0.546
		(4.95)	(3.48)	(2.02)	(0.84)
Leverage			0.386	1.160	-1.025
			(0.64)	(1.71)	(-0.56)
Asset Turnover			0.210	0.304	-0.201
			(1.54)	(1.32)	(-1.05)
PE Backing Dummy	0.545**	0.342*	0.235		
	(2.50)	(1.71)	(1.08)		
Intercept	0.365	-6.072***	-6.806***	-6.800**	-4.523
	(0.82)	(-4.39)	(-3.34)	(-2.14)	(-0.78)
Adj. R^2	-0.031	0.290	0.284	0.355	0.299
No. Obs.	66	66	56	35	21
Controlling for Country Fixed Effects	Yes	Yes	Yes	Yes	Yes
Controlling for Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes

Note. * Significant at the 0.10 level. **Significant at the 0.05 level. ***Significant at the 0.01 level.
*Significant at the 0.10 level. **Significant at the 0.05 level. ***Significant at the 0.01 level.
The dependent variable is the natural logarithm of the 36-month wealth relative calculated using the size-adjusted benchmark. The independent variables are first-day return, the natural logarithm of price-to-book value at the time of flotation, [14] a dummy for the hot issue period (October 2006-2007), the logarithm of the inflation-adjusted market capitalization on the first day of trading, leverage, [15] asset turnover, [16] and a PE backing dummy. Robust t-statistics are reported in parentheses. All regressions control for industry and country fixed effects. Robust t-statistics are reported in the parentheses.

[14] Price-to-book value is computed by multiplying the closing price on the first day of trading by the number of shares outstanding at the time, divided by the book value of equity for the last fiscal period before flotation.

[15] Leverage is calculated by dividing total debt by total assets as reported for the fiscal year of the IPO.

[16] Asset turnover is calculated by dividing net sales by total assets as reported for the fiscal year of the IPO.