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Ownership retention effect on IPO underpricing

Empirical evidence from Nordic IPOs during 2012-2019

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Abstract:

The purpose of this study is to examine how the ownership retained by the existing shareholders influences the underpricing of an initial public offering ("IPO") in the Nordic countries. The study examines the association between ownership retention and IPO underpricing and whether the association is different for different levels of retained ownership. In IPO, a company issues its shares to public investors by issuing new shares, selling existing shares of the current shareholders, or both. This means that existing shareholders will lose a certain proportion of the company's ownership to the new investors. Ownership retention refers to the company's ownership retained by pre-IPO shareholders during the IPO.

When a company decides to go public, existing shareholders usually possess some information that is not available to potential investors. This condition is referred to as information asymmetry, which can lead to increased uncertainty among potential investors, complicating the IPO process in terms of IPO valuation and pricing. As information asymmetry can cause problems for potential investors, they try to interpret signals from existing shareholders' decisions and actions on valuing the potential IPO investment. Existing academic literature suggests that ownership retained by the existing shareholders can be used as a signal to indicate the company's value.

The final data sample consists of 241 IPOs issued in the time period of 2012 to 2019 in the Nordic markets. The relationship between ownership retention and underpricing is first studied with OLS regressions and then different quantiles are studied with quantile regression. Control variables are also included in the estimation model, including different offer-, market- and firm-specific characteristics.

As the existing literature on the IPO-retention relationship has provided mixed results, this study aims to provide more insight into the topic. Nordic IPO markets have been still a minority area of study and therefore this study also aims to provide a baseline for future research on the Nordic IPO markets.

The results show that ownership retention has a positive relationship with IPO underpricing. However, the relationship is negative in lower levels of ownership retention and changes to positive the higher ownership retention goes. The result of this study is not unanimously in line with the previous academic literature, however, the existing studies on the topic have provided mixed results. Moreover, as all the results are not statistically significant, this study cannot fully confirm the relationship between ownership retention and underpricing.

Key words: ownership, IPO, underpricing, retention, signaling

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Tiivistelmä:

Tutkimuksen tarkoituksena on tarkastella, miten nykyisten osakkeenomistajien säilyttämä omistus vaikuttaa listautumisannin alihinnoitteluun Pohjoismaissa. Tutkimus tarkastelee, onko omistuksen säilyttämisellä ja listautumisannin alihinnoittelun välillä yhteyttä sekä sitä, onko yhteys erilainen eri omistuksen säilyttämisen tasoilla. Listautumisannissa yritys laskee liikkeelle osakkeitaan uusille sijoittajille joko laskemalla uusia osakkeita, myymällä olemassa olevia osakkeita nykyisten osakkeenomistajien toimesta tai molempia. Tämä tarkoittaa, että nykyiset osakkeenomistajat menettävät tietyn osuuden yrityksen omistuksesta uusille sijoittajille.

Kun yritys päättää listautua pörssiin, nykyisillä osakkeenomistajilla on yleensä tietoa, joka ei ole saatavilla uusille potentiaalisille sijoittajille. Tätä tilannetta kutsutaan informaatioepäsymmetriaksi, mikä voi lisätä epävarmuutta potentiaalisten sijoittajien keskuudessa ja vaikeuttaa listautumisantia sen arvonmäärityksen ja hinnoittelun osalta. Koska informaatioepäsymmetria voi aiheuttaa ongelmia potentiaalisille sijoittajille, he pyrkivät tulkitsemaan signaaleja nykyisten osakkeenomistajien päätöksistä ja toimista arvioidakseen potentiaalisen sijoituksen arvoa. Olemassa oleva akateeminen kirjallisuus viittaa siihen, että nykyisten osakkeenomistajien säilyttämä omistus voi toimia signaalina yrityksen arvosta.

Lopullinen aineisto koostuu 241 listautumisannista Pohjoismaiden markkinoilta vuosilta 2012–2019. Omistuksen säilyttämisen ja alihinnoittelun välistä suhdetta tutkitaan ensin OLS-regressiolla ja sitten eri kvanttileilla kvantiiliregression avulla. Regressiomalliin sisältyy myös ohjaavia muuttujia, mukaan lukien erilaisia listautumisanti-, markkina- ja yrityskohtaisia tekijöitä.

Koska olemassa oleva kirjallisuus alihinnoittelun ja omistuksen säilyttämisen välisestä suhteesta on tuottanut ristiriitaisia tuloksia, tämä tutkimus pyrkii antamaan lisää näkökulmaa aiheeseen. Pohjoismaiden listautumisannit ovat edelleen vähemmistöalue tutkimuksessa, ja siksi tämä tutkimus pyrkii myös tarjoamaan perustan tulevalle tutkimukselle Pohjoismaiden listautumisannista.

Tulokset osoittavat, että omistuksen säilyttämisellä on positiivinen suhde listautumisannin alihinnoitteluun. Edellä mainittu suhde on kuitenkin negatiivinen alhaisemmillä omistuksen säilyttämisen tasoilla ja muuttuu positiiviseksi, mitä korkeampi omistuksen säilyttäminen on. Tämän tutkimuksen tulokset eivät ole yksimielisesti linjassa aiemman akateemisen kirjallisuuden kanssa, mutta aiemmat tutkimukset aiheesta ovat tuottaneet ristiriitaisia tuloksia. Lisäksi, koska kaikki tutkimustulokset eivät ole tilastollisesti merkittäviä, tämä tutkimus ei voi täysin vahvistaa suhdetta omistuksen säilyttämisen ja alihinnoittelun välillä.

Avainsanat: omistus, listautumisanti, alihinnoittelu, säilyttäminen, signaalointi

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1 Introduction

An initial public offering (“IPO”) is one of the most important decisions companies make during the company’s lifetime. IPO refers to the process of a private company offering its shares to the public for the first time, and it is in many cases the largest equity issue a company makes (Zingales, 1995). One of the main reasons for a company to go public is to raise equity capital but still, numerous previous studies have shown that IPOs tend to be underpriced, meaning the first-day closing price is higher than the initial share price of the IPO. Investor optimism can be one reason for the higher first-day initial returns, for which a good example was the irrational behavior of the investors during the dot-com bubble in the early 21st century, leading to an eight times higher underpricing for the IPOs compared to the average underpricing from previous years (Ljungqvist and Wilhelm, 2003). Nevertheless, a company can also deliberately not maximize its equity gains and undervalue the initial share price of the IPO, which is referred to as money left on a table.

One example of underpricing was eBay’s IPO in 1998, which was 163% underpriced based on the first-day closing price, leaving approximately 103 million dollars money left on the table by eBay (Dolvin and Jordan, 2008). Another more recent example of the underpricing phenomenon was IPOs for Airbnb and DoorDash in 2020 where first-day initial returns were 86% and 113% respectively (Kim, 2020). Even though these are just some extreme examples, underpricing is a well-known phenomenon in the existing IPO literature.

Underpricing of IPOs is a well-researched subject as the pricing of the IPO is influenced by several different factors. One of these factors is ownership retention, which refers to the percentage of shares existing shareholders retain in the IPO. The ownership retention determinant for IPO underpricing will be the main subject of study in this thesis.

Ownership management is one example of a corporate governance tool in a company. In the context of an IPO, decisions regarding ownership retention and concentration

during the IPO process are used in planning the future ownership structure of the company, but it can also give signals to potential public investors about how existing shareholders value the company as they usually have some internal information that is not available for public investors (Bruton et al. 2009). Moreover, the decisions regarding ownership retention can impact the aftermarket liquidity and post-IPO operational performance. (Booth and Chia, 1996; Jain and Kini, 1994)

Previous studies have shown mixed results on the relationship between ownership retention and IPO underpricing. Therefore, the purpose of this study is to obtain a better understanding of the ownership retention's effect on IPO valuation and underpricing. Nordic markets have not been that extensively researched market area for this topic since Nordic IPO markets are relatively small on a global scale. Therefore, this study provides insights into how the underpricing phenomenon is applied in the Nordic IPO markets, offering a baseline for future research.

1.1 Purpose of the study

The purpose of this study is to examine how the ownership retained by the existing shareholders influences the underpricing of an initial public offering. Furthermore, the study examines the association between ownership retention and IPO underpricing and whether the association is different for different levels of retained ownership. The study is conducted using Nordic IPOs between the years 2012 and 2019 to assess how the existing theoretical framework on the IPO-ownership retention relationship can be applied within the Nordic IPO markets.

1.2 Hypotheses

Ibbotson (1975) was among the first pioneering studies that captured the IPO underpricing phenomenon, meaning that the initial share price of an issued IPO has been lower

than the share price after the first trading day. A study by Leland and Pyle (1977) introduced the information asymmetry phenomenon, a condition where existing shareholders have inside information on the company, that is not available for the new investors. To reduce the information asymmetry, potential investors try to interpret signs from different decisions and actions from the existing shareholders. The signaling model by Leland and Pyle (1977) argues that ownership retention can be considered as an effective signal of the company's value for external investors. Based on the signaling model, ownership retention can be seen as existing shareholders' belief in the company's future performance, meaning that higher ownership retention indicates to stronger belief in the company's good future performance. Studies by Fan (2007) and Mohd Rashid and Abdul-Rahim (2012) also support the signaling model. Based on these theoretical models, the first hypothesis is formed as below.

H1: Ownership retention has an influence on IPO underpricing in the Nordic markets

Jensen and Meckling (1976) argue that low levels of retained ownership in IPO would lead to possible separation of ownership and corporate control, indicating inferior post-IPO operational performance through increased agency costs. On the opposite side, high levels of retained ownership may result in entrenchment from the major shareholders, where they would prioritize their own interests at the expense of minor shareholders (Fama and Jensen, 1983). Robinson et al. (2004) applied both of these theories as their study suggested that ownership retention and IPO underpricing should be seen as a curvilinear hump-shaped model, where the positive effect of the ownership starts to decrease in low and high levels of retained ownership. Based on these observations, the second hypothesis of this study is formed as below.

H2: Ownership retention and IPO underpricing relationship is non-linear, effecting differently in different quantiles of retained ownership

1.3 Structure of the study

This study consists of seven main chapters, covering both the theoretical framework and the empirical parts of this study. The first chapter is the introduction, briefly presenting the underpricing phenomenon on initial public offerings and how ownership retention of the pre-IPO shareholders influences the possible underpricing. Moreover, the purpose of the study and research hypotheses are introduced. The second chapter explains the concept of an initial public offering and how the IPO process works. Additionally, the concept of IPO underpricing is introduced as well as some existing theories on why IPOs are underpriced. Also, previous studies on the IPO's aftermarket performance are covered in the second chapter. The third chapter focuses on ownership retention, what implications it can have for the company's ownership structure, operating performance, and how it can affect IPO underpricing and aftermarket liquidity. Also, the impact of certain institutional characteristics on ownership retention is presented in this chapter. The fourth chapter introduces some of the existing academic literature on the relationship between ownership retention and IPO underpricing.

The empirical part of this study starts in the fifth chapter. This chapter explains the data used in this study, the chosen variables used for the analysis, and the used regression models. The sixth chapter provides the results of the study on the relationship between ownership retention and underpricing. The seventh chapter summarizes the study, as well as provides conclusions and ideas for future research.

2 Initial Public Offerings

This chapter provides a general understanding of an initial public offering (“IPO”) and how the IPO process works. Moreover, IPO underpricing as well as the theories regarding IPO underpricing, excluding the more extensively studied IPO-ownership retention theories, are introduced. Lastly, existing studies on the IPO aftermarket performance are discussed.

2.1 Initial public offering

An initial public offering is usually the largest equity issue a company makes during its lifetime (Zingales, 1995). Espinasse (2014) explains that IPO refers to the process of a private company offering its shares to the public for the first time. IPOs can consist of new shares issued to the market to raise new capital for the company or existing shares sold by existing shareholders to generate liquidity in the share market. Usually, IPOs consist of both new shares issued and existing shares sold, however selling existing shares can be seen to some extent as suspicious activity from the investors, especially in a case where the existing shareholder does not retain any equity after the IPO.

According to Welch and Ritter (2002), one of the main reasons why companies decide to go public is to raise equity capital for the company and to create a public market where pre-IPO shareholders can liquidate their ownership at a later point in time. An additional benefit of going public is to gain prestige by having more exposure which might attract consumers and new qualified employees (Payne et al., 2023). Moreover, IPOs are in many cases exit strategies for existing shareholders just as entrepreneurs or venture capitalists to make a profit on their current shareholdings (Zingales, 1995).

2.2 IPO process

According to Espinasse (2014), depending on the experience of the issuer's management on the capital markets and the availability of the company's financial information, the overall IPO process varies between 6 to 9 months. Usually, the IPO timetable is dictated by the availability of the company's financial information as an IPO requires a more extensive amount of financial information to be filed with the regulators compared to the requirements of a private company. Especially if the company has recently undergone large changes in business such as company acquisitions, providing the financial information to regulators might demand a higher workload as it might be necessary to recompute historical accounts of the acquired company. Overall, the IPO process can be divided into two parts; a preparation phase which includes due diligence and documentation, and subsequently a marketing phase for the investors.

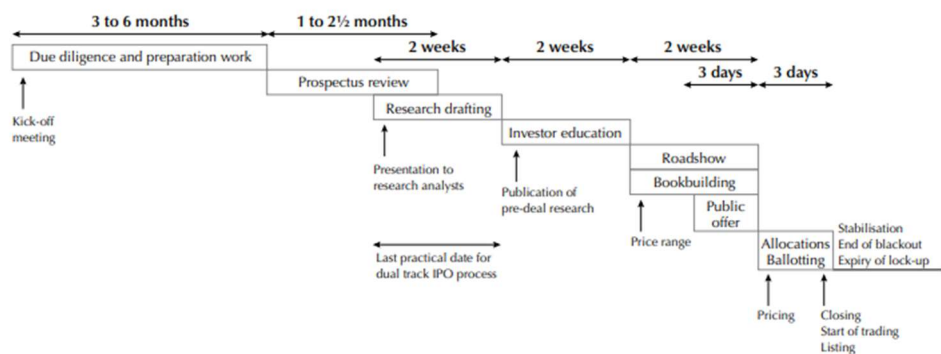
Espinasse (2014) describes that the IPO process starts with due diligence conducted by different external advisors. Due diligence includes compiling the financial information and drafting and negotiating the prospectus. One of the external advisors is called underwriters which consist of a team from an investment bank, that will help to draft the prospectus and overall manage the IPO process. When this phase has reached a relatively advanced stage, a draft prospectus can be sent to regulators or to the stock exchange for a review depending on the market. The review process usually lasts between 4 to 6 weeks in the EU and in addition to the prospectus, documents such as financial statements, application forms, and other corporate documents need to be provided.

Espinasse (2014) continues that when regulators have given the green light for the IPO process to go forward, the marketing phase starts. The marketing phase of an IPO is relatively short, around four weeks in total, from which two weeks are used for actual order-taking from investors. During the marketing phase, there are numerous presentations on the upcoming IPO for potential investors which is called a roadshow. Typically, the price range of the IPO is decided when the roadshow starts but nowadays in Europe, there is a recent trend where the roadshow starts without the decided price range. The

price range is then later determined based on the feedback gathered from the roadshow presentations. The initial share price is determined during the book building phase, where the underwriter takes bids from the institutional investors on how much they would be willing to pay for the IPO. This helps underwriters to find the market equilibrium between supply and demand for the share price. However, according to the partial adjustment phenomenon presented by Hanley (1993), pre-market demand is only partially adjusted to the IPO share price, and it does not necessarily reflect the company's intrinsic value. After the IPO price has been determined, orders for the IPO are gathered from both institutional and public investors, and offered shares are then allocated between these two investor groups (Espinasse, 2014).

Espinasse (2014) concludes the IPO process as after the IPO has launched the last phase consists of IPO aftermarket activities. There can be high fluctuation in the share price after the IPO and the share price is usually stabilized by one of the leading banks within a month from the launch. In addition, retained shares by the pre-IPO shareholders will have a lock-up period that usually lasts from 6 to 12 months. During this time retained shares are not allowed to be sold on the market to ensure investors that no further large blocks of shares will come to the market which would decrease the share price.

Graph 1. IPO process and timetable (Espinasse, 2014).



2.3 IPO underpricing

Even though one of the main reasons for an IPO is for the company to raise equity capital, numerous studies have proved that companies tend not to maximize their gained equity during the IPO. This is referred to as “money left in the table” as an average IPO leaves 9.1 million dollars on the table which is calculated as the first-day price gain multiplied by the number of shares sold (Loughran and Ritter, 2002). This is more commonly referred to as IPO underpricing; if the closing price of the first day of trading is greater than the initial share price, the IPO is considered underpriced. As Barry (1898) and Certo et al. (2001) explain, underpricing indicates both wealth creation for the first-day investors who acquire the share at the initial issue price and the unretained wealth of the pre-IPO shareholders who have sold their equity at a price below the valuation of the public investors.

Ibbotson (1975) conducted one of the first pioneering studies where underpricing of IPOs was recognized among the IPOs between 1960 to 1972. Later, Loughran and Ritter (1995) examined the same underpricing phenomenon by analyzing IPOs between 1970 and 1990, indicating that IPO underpricing is consistent over time. Understanding the different particles of IPO underpricing is a complex puzzle, but some of the mainly recognized determinants of IPO valuation and underpricing are introduced in the following chapters.

Loughran and Ritter (2002) argue that IPO underpricing is greater in the setting where initial share prices have been higher than originally anticipated. This is based on the Prospect theory explaining that if the initial share price is revised up from the original estimation, existing shareholders will realize they are wealthier than previously thought. Therefore, they have less incentive to bargain on the reduction of underpricing. If the initial share price is revised down, initial shareholders will have the opposite effect and will be willing to bargain more aggressively on the reduction of underpricing.

Ibbotson and Jaffe (1975) conducted one of the first studies to capture the phenomenon of hot and cold issue markets. Hot issue market refers to a period when new IPOs have significantly higher initial returns and when the number of new IPOs is higher than on average and vice versa on a cold issue market. Investors have a possibility to gain abnormal returns if they are able to recognize when a hot issue market is ongoing.

The phenomenon of the hot issue market was later identified by Ritter (1984) showing that during the 15 months starting from January 1980, initial returns from the new initial offers were 48,4% compared to the average of 16,3% initial returns from the remaining period between 1977 and 1982. Abnormal initial returns from the initial offerings were mainly from the companies operating in the natural resources industry.

Loughran and Ritter (2002) provide an equilibrium theory for the hot issue markets. Due to the partial adjustment phenomenon presented by Hanley (1993), initial offer prices only adjust partially on the public information, first-day returns can be predicted based on lagged market returns. Thus, hot and cold issue periods can exist as long as the book building phase is used in the IPO listing process.

One extensively studied example of the hot issue market was the dot-com bubble occurring in the late 1990s and early 2000s. According to Schultz and Zaman (2001), U.S. IPOs for Internet companies from January 1999 to March 2000 were 91% underpriced on average even though most of the companies had minor revenues, just 28 out of the 321 companies were profitable in the last quarter before IPO and many of the companies had been in business only for a few months. This underlines the irrational over-optimism among investors during the dot-com bubble.

2.4 IPO aftermarket performance

The aftermarket performance of IPOs has been extensively studied in addition to the underpricing phenomenon.

Ritter (1991) examined the long-term performance of the IPOs by studying a sample of 1526 IPOs that were listed between the years 1975 and 1984 in the U.S. market. Results indicated that the issuing companies underperformed 17% on average compared to the non-issuing companies of a comparable sample during a 3-year holding period after the IPO. Moreover, results showed that underperformance was even higher during the period of high listings, especially with young firms. This supports the Window of opportunity theory arguing that issuers have managed to time their issues during a period of over-optimism among the investors increasing the value of the company, thus taking advantage of the window of opportunity. Baker and Wurgler (2000) further provided insights into this theory arguing that market sentiment and investor behavior in terms of over-optimism influences significantly to the decision of companies to issue new equity to the public market. More equity is issued during periods of high market valuations and positive investor sentiment.

Subsequently, similar results were discovered by Loughran and Ritter (1995) with a more extensive sample period. They studied companies that issued shares between 1970 and 1990 whether through an IPO or a seasoned equity offering ("SEO"). The study shows significant underperformance compared to the non-issuing firms during a 5-year holding period. The average annual return for IPOs was 5% and 7% for SEOs. Based on the realized returns, investors should have invested 44% more in the issuers compared to the non-issuers to accumulate the same amount of wealth during the 5-year holding period.

3 Ownership retention

IPO can be considered as one of the major events in a company's lifecycle. According to Dalziel et al. (2001), decisions made during the IPO process can have far-reaching consequences in terms of the company's health and growth. Factors that have been considered to have a significant impact on the company's future after the IPO are ownership structure, changes in the ownership due to the IPO, and exit strategies of the pre-IPO shareholders.

According to Bruton et al. (2010), ownership retention refers to the shares retained by a pre-IPO shareholder during the IPO instead of liquidating the ownership by selling the shares. In the context of IPO, the issuing company's ownership structure and governance are seen as a relevant concern to new investors. The relationship between ownership retention and IPO underpricing is a widely researched topic and provides several theories as to why pre-IPO shareholders choose to retain their ownership and how it affects the IPO valuation.

This chapter further introduces existing theories regarding why ownership retention is used as one of the determinants in IPO underpricing, how ownership retention can be used as a corporate governance tool, and how ownership retention affects IPO underpricing and post-IPO operating performance. Also, the impact of the legal framework is described in this chapter.

3.1 Information asymmetry

Leland and Pyle (1977) are one of the first ones to examine the information asymmetry in the financial market, a condition where existing shareholders have inside information on the company, which is not available to the new investors. Rock (1986) and Ibbotson & Ritter (1995) argue that information asymmetry during the IPO process increases uncertainty which affects investor decisions, IPO offer prices and complicates the valuation

of the IPO as information asymmetry can cause problems with adverse selection and moral hazard. Initial shareholders might perpetrate adverse selection as there might be some information that the company is reluctant to distribute to the public as it might have some negative effects on the company's future performance. This might include competitors starting bidding for the same financial resources which could reduce the company's future profits (Shane and Cable, 2002). Moreover, information asymmetry can lead to a moral hazard issue among the initial shareholders and managers if disclosing some of the company information might benefit them personally (Sanders and Boivie, 2004).

Rock (1986) provides results on the information asymmetry in the context of an IPO, arguing that information asymmetry leads to the underpricing of an IPO. The IPO market consists of informed insiders who possess detailed insider information on the issuing company and uninformed investors who do not have access to the same information, creating an information asymmetry between these two investor groups. Based on the Winner's curse theory uninformed investors tend to bid on the overpriced IPOs and informed investors on the underpriced IPOs. Even though an IPO could have been priced according to its intrinsic value, the share price would still be reduced as compensation for the uninformed investors willing to take the risk that they don't possess the same level of information as the informed investors.

One way of reducing the information asymmetry is by information disclosure. Beatty and Ritter (1986) studied the relationship between IPO prospectus information disclosure and the degree of IPO underpricing arguing that higher information disclosure on the IPO prospectus will reduce the IPO underpricing. A more recent study by Payne et al. (2023) further examines the issue of the information disclosure on the IPO prospectus and shows that information asymmetry between initial shareholders and new investors can be decreased by longer IPO process time. Longer IPO process time provides more time for the information disclosure and its distribution; hence underpricing is reduced as the role of ownership is more clarified. Furthermore, the relationship between

ownership retention and IPO process time can be partially mitigated by older companies going through the IPO process as more historical information is available (Payne et al., 2023).

3.2 Signaling theory

According to Downes and Heinkel (1982), potential investors value an IPO as an investment based on the observable characteristics available such as financial information including evidence from past performance, industry where the company operates, and other metrics. However, some characteristics are difficult to observe but are still valuable information when valuing an investment such as the quality of the management and the possibility for a company to develop valuable new products. As this type of information asymmetry exists among shareholders and outsider investors, information transfer to the public investors is needed as outsider investors try to interpret and look for signals in shareholders' decisions and actions.

Leland and Pyle (1977) provide a signaling model, which shows that ownership retention can be considered as an effective signal of the company's value for external investors. Ownership retention can be seen as costly for the shareholders because retaining ownership shareholders forgoes diversification of personal portfolios. Since shareholders have better knowledge of the company's future cash flows compared to potential investors, retaining ownership signals shareholders' trust in the company's future cash flows. Subsequent empirical research by Downes and Heinkel (1982) provides similar results by using the signaling model provided by Leland and Pyle (1977) to confirm that entrepreneurial ownership retention increases the valuation of the company. Feltham et al. (1991) further extend the empirical research by confirming the signaling model but also finding further evidence that high-quality auditors can reduce the need for ownership retention in order to fully communicate undisclosed information between shareholders and potential investors.

In the context of IPO, Fan (2007) uses the signaling model to argue that ownership retention of pre-IPO shareholders acts as a positive signal of the firm's value for public investors. Aggarwal et al. (2009) further argue that the positive relationship can also be explained from a moral hazard perspective; directors who own the company's shares also have managerial incentives to work harder to generate higher cash flows. New investors anticipate this and therefore companies with higher retained ownership are valued more than low-ownership companies.

Furthermore, Fan (2007) enhances the signaling model by adding earnings management as another positive signal for the external investors for a positive firm's value. Ownership retention should be favored over earnings management in a case when there is more certainty on the company's future cash flows and vice versa. Habib and Ljungqvist (2001) also provide more reasoning for the underlying phenomenon by arguing that pre-IPO shareholders who sell only a small portion of their shares are less concerned about the underpricing of the shares they are selling as their wealth loss would be considered marginal compared to shareholders selling a larger portion of their shares. In contrast, shareholders who are willing to sell a larger portion of their shares have a greater incentive to reduce the IPO underpricing for them to maximize their profits. In contrast, a study by Mohd Rashid and Abdul-Rahim (2012) shows that a reduction in original shareholders' ownership has a negative signal to investors reflecting their lack of confidence in their firms' future prospects.

As discussed, ownership retention can be considered as one of the governance signals for reflecting the value of the company. However, Payne et al. (2023) highlight that investors tend to interpret these signals based on their previous experiences and beliefs on how different ownership structures might affect the company's performance. As previously stated, initial shareholders retaining their shares indicates to the new investors a positive view of the company's future performance and could be willing to work hard to generate higher cash flows. In contrast, new investors could assume that higher ownership retention could lead shareholders to perpetrate moral hazard and place personal

benefits such as control and personal reputation above the economic benefits of the company (Brennan and Franks, 1997). Therefore, the relationship between ownership retention and IPO underpricing could be considered as a curvilinear hump-shaped model, where too high ownership can be seen as a risk for management entrenchment (Robinson et al., 2004).

3.3 Ownership structure

Although ownership retention can be seen as a method for the pre-IPO shareholders to signal the value of the company to public investors, ownership retention can be used as a governance tool in the IPO. Brennan and Franks (1997) argue that directors tend to retain a larger number of shares during the IPO compared to non-directors in order to keep control of the company. Under the theory of Brennan and Franks (1997), a diffuse share ownership structure post-IPO is preferred, since this limits the influence of block shareholders, thus protecting directors from the threat of hostile takeover. Retaining the ownership and underpricing the IPO is used to ensure the oversubscription of the shares in the IPO which rationalizes the share allocation to smaller shareholders groups and thus reduces the block size of the new shareholders. As new shareholder blocks are dispersed, there are fewer incentives to monitor the current management of the company, which is called the Reduced monitoring hypothesis. Findings by Chemmanur and Fulghieri (1999) indicate similar relationships as they found that control retention of the pre-IPO shareholders will have a positive relationship with the degree of IPO underpricing. Higher underpricing will create more dispersed ownership, thus reducing the incentive for individual shareholders to engage in the costly monitoring of the company. Pagana and Roell (1998) also confirm in their study how IPO can be used to gain more equity with lesser monitoring. Going public includes additional costs like the cost of listing but will generate more dispersed ownership, thus avoiding excessive monitoring from the shareholders. In contrast, selling shares as a private company is more cost-efficient but managers need to tolerate more excessive monitoring from large external shareholders. Therefore, shareholders need to decide on a trade-off between the cost of providing a

liquid aftermarket and excessive monitoring. Pagana and Roell (1998) argue that the decision on whether to go public or sell the shares private is largely dependent on the amount of equity that needs to be raised.

The theory for the urge for pre-IPO shareholders to maintain control of the company after the IPO is also supported by Alavi et al. (2008) as their empirical research indicates that pre-IPO ownership affects the number of shares offered in the IPO in a way that it reflects the managers' interests on retaining control in the company. Research shows that ownership retention is higher among managerial shareholders and lower among non-managerial shareholders as they want to maintain control. Boulton et al. (2010) argued that underpricing is the cost for pre-IPO shareholders to maintain control in the company after the IPO. They studied IPOs across 29 countries and found that underpricing is even higher in countries whose legal systems are designed to empower outside investors. Therefore, outsiders monitoring incentives needs to be reduced by creating excess demand for the shares which will create a more dispersed ownership structure.

3.4 Multiple agency theory

According to Fama (1980), an agency problem refers to the conflict of interest between an agent (manager) and a principal (shareholder) as an agent needs to act on behalf of its principal. Especially when an agent has control over the principal's invested assets, agency problems can be seen as a major problem as agency problems can lead to behaviors such as managerial self-interest, shirking responsibilities, or pursuing objectives not aligned with shareholders' interests. The adverse action that an agent does to the principal due to a conflict of interest can be referred to as an agency cost. In an IPO setting, multiple agency theory is relevant as it examines the conflict of interest between several different agents and principals. Multiple agency theory examines many-to-many relationships instead of a one-to-one relationship. Arthurs et al. (2008) demonstrate the multiple agency theory by arguing that in the context of an IPO, an underwriter who acts as an agent for both issuer and institutional investors will more likely favor the

institutional investors at the expense of the issuer. Considering the underwrites' relationships in the IPO network, it has a greater incentive to act on behalf of its institutional investors by lowering the share price and increasing underpricing as an encouragement for the institutional investors to engage in future IPOs provided by the underwriter (Pollock et al., 2004).

Arthurs et al. (2008) and Bruton et al. (2010) argue that ownership retention can be considered as a way to reduce agency costs. Higher ownership retention has shown higher levels of ownership involvement in the company which would lead to a reduction in agency costs as fewer entities or individuals own. Furthermore, Chemmanur and Fulghieri (1999) suggest that even though control retention among pre-IPO shareholders might increase underpricing, it can also reduce agency costs as pre-IPO shareholders' interests are aligned with the new shareholders.

3.5 Ownership classes

In addition to the studies examining the relationship between ownership retention and IPO underpricing, the ownership retention of different ownership classes and the relationship with IPO underpricing have been previously studied. Different ownership classes can include the issuing company's CEO, other company management, and private equity investors.

Among different ownership classes, private equity ("PE") investors including venture capitals ("VC") are probably the most researched ownership class. Aggarwal et al. (2009) studied how ownership retention affects IPO underpricing among different ownership classes by examining 1655 IPOs between the years 1986-1990 and 1997-2001. Results show that on average VC pre-IPO ownership has almost tripled on average from 7,8% in 1986 to 21,7% in 2001. Moreover, results indicate that among different ownership classes, ownership retention of VCs has the highest positive impact on the IPO valuation and underpricing. Katz (2009) and Levis (2011) provide similar results suggesting that PE-

backed IPOs tend to perform better than non-PE-backed IPOs. As IPOs are usually considered as an exit strategy for PE investors, retained ownership gives a strong signal to investors about pre-IPO owners' faith in the company when information asymmetry is present.

Duan and Niu (2019) studied the IPO underpricing phenomenon in founder-CEO and founder-family controlled companies in the U.S. market. Their empirical research shows that founder-controlled companies' IPOs are on average 10% more underpriced compared to non-founder companies. Duan and Niu argue that founder-CEOs usually consider their companies as their life's achievement and therefore are more eager to push the IPO process through and bargain less with the underwriter on the IPO price. Research also indicates that the partial adjustment phenomenon first presented by Hanley (1993) can be explained through the prospect theory presented by Loughran and Ritter (2002).

Nevertheless, there are also contradictory studies on the relationship between VC ownership retention and IPO underpricing. Bruton et al. (2009) and Arthurs et al. (2008) highlight the effect on multiple agency theory meaning that since PE investors have a greater agency role to their institutional investors and therefore post-IPO monitoring may not be their main focus. Furthermore, PE investors want to maintain their reputation among underwriters, hence they need to signal that they are not walking away from bad investments. Based on these observations Bruton et al. (2009) argue that PE retained ownership might have a negative influence on the IPO performance.

3.6 Aftermarket liquidity

Ownership retention also affects the IPO aftermarket liquidity. Zheng et al. (2005) argue that if the ownership retention of the IPO is high, this will decrease the liquidity of the shares after the IPO since fewer shares are floating in the market. Therefore, a company can deliberately underprice the IPO to increase its demand and thus improve the aftermarket liquidity. According to Booth and Chua (1996), higher ownership retention will

create an oversubscription of sales which will increase the demand for trades and thus improve the IPO aftermarket liquidity. Furthermore, a study by Li et al. (2005) confirms the same phenomenon, suggesting that high retention rates attract more trades and improve IPO aftermarket liquidity. Higher underpricing will attract more small investors which will increase the aftermarket liquidity (Pham et al., 2003).

According to Bruton et al. (2009), most IPOs include a lock-up period meaning that pre-IPO shareholders are not allowed to sell their shares after the IPO which usually lasts from 6 to 12 months. Due to the lock-up period retained ownership of the pre-IPO shareholders can be seen as illiquid and presenting the cost of the retained ownership. Therefore, retained ownership can be seen as a positive sign for investors as pre-IPO shareholders are willing to bear the cost involved in their retained shares. If after the lock-up period, pre-IPO shareholders are willing to sell their shares, they would benefit from a more liquid aftermarket as the trading costs would be less (e.g. bid-ask spread). Therefore, pre-IPO shareholders may want to underprice the IPO in order to have a more liquid aftermarket at the time when the lock-up period ends (Zheng et al., 2005).

3.7 Post-IPO operating performance

Previous studies have shown ownership structure been shown to have an impact on the company's operating performance. The alignment-of-interest hypothesis first introduced by Jensen and Meckling (1976) suggests that the separation of ownership and corporate control due to the IPO results in an increase in agency costs. Therefore, retained ownership can have a positive impact on the company's operating performance.

However, Fama and Jensen (1983) provide a contradicting Entrenchment effect hypothesis arguing that a combination of ownership and corporate control results in these types of shareholders acting in a way that prioritizes their own interests at the expense of minor shareholders.

Kim et al. (2005) explain that an IPO can lead to a drastic change in the company's ownership structure it would lead to a separation of ownership and corporate control which would then increase agency conflicts. Therefore, share retention by the existing shareholders can reduce agency costs and thus improve the operating performance of the company.

Even though much of the existing research such as Jain and Kini (1994), Kim et al. (2005), and Wang (2004) indicates that IPOs tend to underperform in the following years after going public, performance can be better when the ownership retention is higher.

Jain and Kini (1994) studied U.S. IPOs between the years 1976 and 1988 and found that even though there was a significant decrease in post-IPO operating performance, there was a positive relationship between ownership retention and operating post-IPO performance, which can be explained by both agency theory and signaling theory. According to the agency theory, higher ownership retention by the pre-IPO shareholders increases the alignment of incentives on the company's operating performance, thus reducing agency costs. In addition, according to the signaling theory high ownership retention indicates a strong belief in the company's future cash flows for the outside investors. Therefore, both theories predict better post-IPO performance when ownership retention is high.

Similarly, Bruton et al. (2009) found out in their empirical research that the operating performance, using adjusted Return on Assets ("ROA") as a measurement, of the IPO company was positively related to ownership retention. However, Kim et al. (2005) did not find any significant relationship between ownership retention and post-IPO company performance when studying IPOs in an emerging market.

3.8 Legal framework

Previous studies have shown that institutional characteristics, such as the legal framework used in the country, can further influence the ownership retention's effect on IPO underpricing. Sheela (2019) studied how different institutional characteristics influence different signaling effects, such as ownership retention, which are used to mitigate information asymmetry. There are two different main legal frameworks that a country can apply, common law and civil law from which the latter one is the legal framework used in all the Nordic countries. According to Sheela (2019), countries where civil law is applied have a more significant influence between ownership retention and IPO underpricing. This can be seen especially in IPOs that have high degrees of retained ownership. This is because the civil law framework provides less legal protection for the investors and provides managers and large stakeholders more opportunities to transfer profits from the company at the expense of minority shareholders. Therefore, investors may require higher returns on their investment as compensation for the risk taken due to the weaker legal protection.

Similar results were found by Bruton et al. (2009) as they studied how retained ownership affects IPO underpricing in a common law country, presented by the UK, and in a civil law country which was presented by France. Results showed that ownership retention had a positive relationship with IPO underpricing in France with the civil law framework whereas in the UK the relationship was negative. Bruton et al. (2009) conclusions are in line with Sheela (2019), civil law countries offer less legal protection for minority shareholders, and therefore ownership retention should be a more important governance mechanism compared to common law countries.

4 Previous evidence from the relationship between ownership retention and IPO underpricing

This chapter provides examples of the existing literature where the relationship between ownership retention and IPO underpricing has been studied.

An empirical study by McBain and Krause (1989) examined the relationship between IPO underpricing and insider equity retention, where equity ownership structure was the determinant for the pricing of the IPOs. Their results showed that IPOs with higher equity retention rates were more underpriced due to the lower requirements for the rates of return.

Ljungqvist and Habib (2001) studied U.S. IPOs between the years 1991 and 1995 and discovered a positive relationship between ownership retention and IPO underpricing. The relationship is explained through the cost of monitoring; pre-IPO shareholders have fewer incentives to monitor underwriters to reduce IPO underpricing since the cost of monitoring becomes more expensive if fewer shares are sold. Subsequent research by Ljungqvist and Wilhelm (2003) studied the same relationship during the dot-com bubble in 1999 and 2000. Results showed that even though ownership retention decreased during the dot-com bubble, from 63,9% in 1996 to 51,8% in 2000, underpricing was greater when pre-IPO shareholders were selling fewer shares. Ljungqvist and Habib also show that "directed share programs", which allow shareholders family members, friends, company employees, and sometimes venture capitals to purchase shares at the IPO price, increased from 24,7% from 1996 to 92,6% in 2000. This could provide a rational explanation of why ownership retention decreased during the dot-com bubble and provided an additional incentive to underprice the IPOs even more.

However, there are also studies with contradicting results on the relationship between ownership retention and IPO underpricing. Field and Sheehan (2004) studied U.S. IPOs in the years 1988 to 1992 and results showed that there is not any relationship between

ownership retention and IPO underpricing. Similar results were found in the empirical research by Hill (2007) which studies IPOs between 1991 and 1998 and argues that ownership retention and dispersed post-IPO ownership structure do not play a significant role as a determinant for IPO underpricing. Teti and Montefusco (2022) studied Italian IPOs between 2000 and 2015 and found that ownership retention and IPO underpricing have an inverse relationship. Bruton et al. (2009) studied IPOs in France and UK in the years 1996 to 2002. Results showed that ownership retention had a positive relationship with IPO underpricing in France with the civil law framework as in common law country UK, the relationship was negative.

Table 1. Summary of previous studies on ownership retention relationship with IPO underpricing. The last column presents how the aforementioned relationship is concluded in the study.

Authors(s)	Market	Time period	IPO-retention relationship
McBain and Krause (1989)	US	1978-1985	Positive
Ljungqvist and Habib (2001)	US	1991-1995	Positive
Ljungqvist and Wilhelm (2003)	US	1996-2000	Positive
Field and Sheehan (2004)	US	1988-1992	No relationship
Hill (2007)	UK	1991-1998	No relationship
Bruton et al. (2009)	UK	1996-2002	Negative
	France	1996-2002	Positive
Teti and Montefusco (2022)	Italy	2000-2015	Negative

As seen from Table 1, previous studies have shown contradicting conclusions on the IPO-retention relationship. Due to the mixed results from previous studies further research is needed to better understand the relationship between ownership retention and IPO underpricing.

5 Data and methodology

In this chapter, the data and methodology for testing the proposed hypotheses are introduced. This chapter consists of three subchapters. The first chapter describes the data collection process, how the data is formed, and what the data consists of. The second chapter introduces the research methodology by describing the different variables used and the last chapter introduces the regression models used in this study.

5.1 Data description

The data for the IPOs, the share prices, and firm-specific characteristics were collected from the Thomson Reuters Eikon database. Some of the IPO and firm-specific characteristics were missing from the Thomson Reuters Eikon database and the missing data was collected manually from the web in respective companies' websites, prospectuses, and financial statements. The final data sample consists of 241 IPOs listed in the Nordic countries between 2012 and 2019. From the original data sample, some of the IPOs had to be excluded due to missing information regarding share prices, and IPOs or because the required information on the IPO was not found on the web. From the Nordic countries, Iceland was fully excluded, but this did not affect the sample significantly. There might be some errors in the final sample since part of the material was collected manually from the web, but the information was cross-checked from different sources available.

The time period of the IPOs in this study is between the years 2012 and 2019. Table 2 indicates the number of IPOs issued during the aforementioned time period by country and year. The table shows that Sweden has been by far the most active country on IPO issuances. The rest of the Nordic countries have fairly similar numbers, with Denmark being the least active IPO country from the data sample. The volume of the IPO markets was still low during the years 2012 and 2013, as the recession was still affecting the economic situation in the whole Eurozone and the European debt crisis was ongoing. However, as the economy started to recover from the financial crisis in 2008, followed by the

recession, a big increase in IPO listings can be seen in the Nordic markets, especially in Sweden. In 2018 and 2019, IPO volumes started to decrease from the previous years which can be mostly explained by the lower number of IPOs in Sweden as in other Nordic countries the numbers stayed fairly stable. Based on the IPO volumes can be argued that especially Sweden's IPO market has started to mature from 2014 onwards.

Table 2. IPO volumes distributed by country and year.

Year	Denmark	Finland	Norway	Sweden	Total
2012	1	1	2	2	6
2013	3	3	5	1	12
2014	4	4	9	11	28
2015	2	10	4	26	44
2016	4	4	2	26	37
2017	4	9	8	44	65
2018	8	8	3	13	32
2019	3	3	5	9	20
Total	29	42	38	132	241

Table 3 describes the volume of the IPOs distributed by different industries in the 2012-2019 time period. The table shows that high technology and healthcare industries have been the most active ones with IPOs, followed by industrial and consumer products and services.

Table 3. IPO volumes distributed by industry.

Industry	IPO volume
Consumer Products and Services	26
Consumer Staples	6
Energy and Power	14
Financials	16
Healthcare	49
High Technology	58
Industrials	27
Materials	6
Media and Entertainment	5
Real Estate	14
Retail	13
Telecommunications	7
Total	241

Table 4 provides descriptive statistics of the IPO data sample by providing median figures for the issue and IPO companies' financial information.

Table 4. Descriptive statistics of the IPO sample.

Variable	Median	Unit
Issue proceeds	36,9	Meur
Shares offered	8,4	M shares
Market value	86,3	Meur
Total assets	39,8	Meur
Total debt	20,0	Meur
Total revenue	24,4	Meur
Leverage	18,3	%
ROA	0,4	%
EBITDA%	1,6	%

5.2 Ownership retention

Ownership retention refers to the percentage of shares pre-IPO shareholders have after the IPO. An IPO can consist of new shares offered to the public, existing shares sold by the existing shareholders, or both. Offering new shares in the IPO also decreases pre-IPO shareholders' share ownership through the dilution effect as the total number of shares increases through the issuance of new shares. In addition to the shares issued at the IPO date, IPOs also include an overallotment option. Espinasse (2014) describes that an overallotment option allows underwriters to issue additional shares that the issuing company plans to sell in the IPO. An overallotment option is exercised when the demand for the shares is high, and the shares are trading above the offering price. The overallotment option needs to be exercised within 30 days from the IPO and it is used to stabilize the share price. Since the overallotment option is exercised after the company has listed public, it was excluded from the dataset as first-day returns are examined in this research. However, in our data sample, the majority of the IPOs were oversubscribed, and the overallotment was exercised. This is aligned with the theory initially provided by Brennan

and Franks (1997), that the issuing company wants to create an oversubscription for the shares offered in the IPO in order to create a more dispersed ownership.

IPO data from Thomson Reuters Eikon did not provide the exact figures for ownership retention percentages of the IPOs. However, the data sample included share issuance information on the IPOs from which ownership retention was able to be calculated. Ownership retention was calculated following the same method as Downes and Heinkel (1982), Feltham et al. (1991), and Fan (2007) by the number of shares held by the existing shareholders before the IPO adjusted by the shares existing shareholders sold in the IPO which was then divided by the number of total shares in the company after the IPO and possible issuance of new shares. This will give us the following formula:

$$\text{Ownership retention (\%)} = \frac{(N_{\text{before}} - N_{\text{secondary}})}{N_{\text{after}}} \quad (1)$$

N_{before} = Total amount of shares in the company prior to the IPO

$N_{\text{secondary}}$ = Amount of existing shares sold by the shareholders

N_{after} = Amount of shares in the company after the IPO

However, for some IPOs, some of the share issuance information was missing from the data sample. Therefore, the missing information was collected manually from the companies' IPO prospectuses, press releases regarding the IPO, and annual reports. In some of the cases, the direct percentage of shares offered in the IPO from the total amount of the company's shares was described, from which ownership retention of the pre-IPO shareholders was easy to calculate.

(2)

$\text{retention (\%)} = \text{current ownership (100\%)} - \% \text{ of shares offered in the IPO}$

Table 5 shows the average percentage of ownership retention at the IPO across the years 2012-2019. The table shows that excluding the stronger decrease in ownership retention during 2014, there have not been significant discrepancies in the average ownership retention rates, averaging 64,41% from the whole time period. Also, when comparing the ownership retention percentages across Nordic countries, there were not any significant differences, and the average rates can be approximately applied in all respective countries.

Table 5. Annual levels of ownership retention percentage.

Year	Ownership retention	IPO volume
2012	63,22 %	6
2013	63,58 %	12
2014	59,89 %	28
2015	63,60 %	42
2016	66,47 %	36
2017	65,43 %	65
2018	63,74 %	32
2019	67,27 %	20
Average	64,41%	241

5.3 Variables

This study focuses on examining the relationship between IPO underpricing and ownership retention. Underpricing is determined based on the initial returns from the first day of trading where the impact of ownership retention is examined. All the methods follow existing academic literature on corporate governance, underpricing, and IPOs, and thus usage of these methods can be empirically justified. In this section of the study, different variables used in this study are explained in more detail.

5.3.1 Underpricing

Underpricing presents the initial return of an IPO after the first day of trading. In other words, underpricing indicates the percentage of how much the share price has increased or decreased during the first day of trading. The underpricing phenomenon is a well-researched topic in academic literature and the measurement of underpricing follows a standardized methodology. In this study, we follow Arthurs et al. (2008). Certo et al. (2001) and Filatotchev and Bishop (2002) by calculating the underpricing by subtracting the IPO offer price from the first-day closing price and then dividing it with the IPO offer price. The aforementioned formula is presented as follows:

$$\text{Initial return (\%)} = \frac{(P_{\text{first day closing price}} - P_{\text{offer price}})}{P_{\text{offer price}}} \quad (3)$$

In the regression model examining the relationship between IPO underpricing and ownership retention, the measurement of underpricing is used as the dependent variable following the same methodology as Arthurs et al. (2008). Certo et al. (2001) and Filatotchev and Bishop (2002) have done.

Table 6 indicates the average annual levels of underpricing over the examined 8-year time frame. During the years 2012 and 2013 average underpricing was negative, when the number of IPOs was also low. This aligns with the hot and cold market theory first introduced by Ibbotson and Jaffe (1975) indicating that lower initial returns are associated with lower volumes of IPOs. After the number of IPO issuances started to increase in 2014 as shown in Table 2, also the first-day initial returns started to increase. On average, the highest first-day initial returns were reached in 2018, with a 14,29% initial return percentage, while 8,63% being the average from the whole time period. From the statistics, it can be argued that both the level of IPO underpricing and the IPO issuance

volumes follow the general economic situation as Loughran and Ritter (2004) found in their study.

Table 6. Annual levels of underpricing by average.

Year	Underpricing
2012	-4,38 %
2013	-1,83 %
2014	10,47 %
2015	7,19 %
2016	5,53 %
2017	10,31 %
2018	14,92 %
2019	9,31 %
Average	8,63 %

5.3.2 Ownership retention

Ownership retention presents the percentage from the number of total shares held by the pre-IPO shareholders after the IPO and the stabilization period. In other words, this indicates the percentage of shares pre-IPO shareholders own after the shares issued in the IPO are allocated to new investors. The method of measuring ownership retention is described in the previous chapter where data collection, formulation, and descriptive statistics were introduced. As ownership retention's impact on IPO underpricing is examined in this study, ownership retention is used as an independent variable in the regression models.

5.3.3 Control variables

As the underpricing of an IPO is determined by several factors, several different control variables are used in the regression model to further explain the impact of different determinants on the degree of underpricing.

Company age variable presents the company's age in years, and it is calculated from the year when the company was established to the year when the IPO was issued. In the calculation, partly years were calculated as full years, following Bruton et al (2009). According to Ritter (1984; 1991), younger companies are seen as riskier as their historical information is not as extensive as in the older companies. Therefore, the informational asymmetry can be bigger in the younger companies, thus IPO can be more underpriced. Also, according to research by Loughran and Ritter (2004), young companies usually experience higher degrees of underpricing compared to older companies. When observing the post-IPO performance Kim et al. (2005) argue that older companies tend to perform better after the IPO compared to younger companies.

Company size variable presents the size of the company which is calculated as a logarithm of the company's capitalization at the IPO offer price in euros following Bruton et al. (2009). According to Ritter (1984; 1991), smaller companies are considered riskier. Moreover, Deb (2013) argues that larger companies might hire more reputed underwriters and also have better post-IPO performance. According to Mikkelsen et al. (2007), larger and older companies tend to have more similar operating performance as the industry average compared to smaller and younger companies where the performance is lower.

Technology variable is a dummy variable presenting if an IPO company works in a technology industry. The dummy variable is presented as 1 if the company works in a technology industry and 0 if not. Dolvin and Jordan (2008) argue that technology companies have higher underpricing on average compared to companies working in other industries. Also, according to Lowry and Murphy (2007), riskier companies have greater initial

returns. Therefore, companies working in the technology industry may have greater underpricing.

IPO size variable presents the size of the IPO issue calculated by multiplying the number of shares offered in the IPO with the issue price. Suresha et al. (2023), found in their study that there is a strong relationship between the issue size and IPO underpricing, as moderate or large issue IPOs tend to be more underpriced compared to smaller issue IPOs. As bigger IPOs can attract larger and different types of investor groups, the subscription rate of the IPO would be higher which can lead to higher underpricing.

Market condition is a dummy variable presenting if the IPO has been launched during a hot or cold issue market. According to Ibbotson and Jaffe (1975) and Ritter (1984) Hot issue market refers to a period when new IPOs have significantly higher initial returns and when the number of new IPOs is higher than on average and vice versa on a cold issue market. The different market cycles are calculated by the average initial returns and volume of the new IPOs issued. Time periods that are above the average are considered as hot market, presented by dummy variable 1, and periods with below average are considered as cold market, presented by dummy variable 0.

5.4 Regression models

Following Zheng et al. (2005) to test the first hypothesis of this study a multivariate OLS regression model is used to analyze the relationship between ownership retention and IPO underpricing with underpricing being the dependent variable and ownership retention in addition to the set of control variables will be independent variables. The multivariate OLS regression model is applied for four different data sets based on the types of shares offered in the IPO, which are introduced in more detail in the next chapter. The regression model will be as follows:

$$IR_i = \beta_0 + \beta_1 \text{Ownership} + \beta_2 \text{Company age} + \beta_3 \text{Company size} + \beta_4 \text{IPO size} + \beta_5 \text{Market condition} + \beta_6 \text{Technology} + \varepsilon \quad (4)$$

where:

IR = Initial return presenting the percentage of the IPO underpricing

Ownership = Percentage of shares retained by the pre – IPO shareholders

Company age = Company's age at the time of the IPO

Company size = Logarithm of the company's market capitalization after IPO

IPO size = Proceeds from IPO

Market condition = Hot or cold market dummy variable

Technology = Technology company dummy variable

Following Robinson et al. (2004) the relationship between ownership retention and IPO underpricing is examined through different quantiles of the data, using the quantile regression model. The quantile regression model, first introduced by Koenker and Bassett (1978), allows to analyze the data from different quantiles to see if the impact of the variable changes in different quantiles of the data if the relationship between the independent and dependent variable is not expected to be linear. By being also less sensitive to the outliers in the data, quantile regression provides a more comprehensive analysis compared to the standard OLS regression. In this study, quantiles 0,2, 0,4, 0,6, and 0,8 are examined (t_1, t_2, t_3, t_4), which will give us the following formula:

$$IR_{ti} = \beta_0 + \beta_{1ti} \text{Ownership} + \beta_{2ti} \text{Company age} + \beta_{3ti} \text{Company size} + \beta_{4ti} \text{Market condition} + \beta_{5ti} \text{Technology} + \varepsilon \quad (5)$$

6 Results

The results of the empirical study are represented in this chapter. First, the relationship between IPO underpricing and ownership retention is represented with multivariate OLS regression analysis. Secondly, the same multivariate model is run through quantile regression analysis to analyze if there is a non-linear relationship between IPO underpricing and ownership retention. In addition, the symmetric quantiles test is performed on the quantile regression to test the robustness of the analysis results.

6.1 Underpricing and ownership retention

As previously mentioned, an IPO can include three different kinds of share issuances, primary shares which are new shares issued by the company, secondary shares which are existing shares sold by existing shareholders or an IPO can include a mix of both primary and secondary shares. To thoroughly test the relationship between ownership retention and IPO underpricing, four different multivariate OLS regressions are used to examine how different types of share issuances influence underpricing. The first regression includes the whole data sample, the second regression includes IPOs that only issued primary shares, the third regression includes IPOs that only issued secondary shares and the fourth regression includes IPOs that issued both primary and secondary shares.

The descriptive statistics on ownership retention and underpricing for different types of share issuances can be seen in Table 7. Statistics show that IPOs including just primary shares, or a mix of primary and secondary shares are the most common types of share issuances in the Nordics IPO markets, and only approximately 18% of IPOs included only secondary shares. However, secondary share IPOs have the lowest level of ownership retention but still the highest level of underpricing on average. This is in contradiction with the assumption of ownership retention's positive relationship with underpricing but can also indicate that the type of share issuance has a different effect on underpricing.

Table 7. Descriptive statistics by the type of shares issued in the IPO. Ownership retention is indicated with the letter α and UNP indicates underpricing.

Measure	Primary & Se-			
	All	Primary	Secondary	condary
Mean α	64,4 %	72,9 %	55,5 %	59,8 %
Median α	66,4 %	73,0 %	60,0 %	63,0 %
Std. Dev α	0,17	0,13	0,17	0,16
Mean UNP	8,6 %	7,9 %	14 %	7,0 %
Median UNP	2,7 %	0,0 %	6,0 %	3,0 %
Std. Dev. UNP	0,28	0,37	0,28	0,15
Min UNP	-86 %	-86 %	-16 %	-19 %
Max UNP	213 %	213 %	182 %	76 %
Observations	241	98	43	100

Results for the four different multivariate OLS regression models are presented in Table 8. Regressions 1 and 2 show that the coefficient for ownership retention is positive on underpricing, although not being statistically significant. However, regressions 3 and 4 also indicate a positive relationship between ownership retention and underpricing, while being statistically significant with 1% and 5% significance levels respectively. In addition, the ownership coefficient in regression 3 is significantly higher compared to other regression models. Therefore, we can argue that the positive relationship between ownership retention and underpricing in IPOs included in regression 4, is mainly driven by the secondary shares sold by the existing shareholders.

This is in line with the information asymmetry and signaling model relationship first presented by Leland and Pyle (1977). As information asymmetry exists between the new investors and existing shareholders, new investors try to interpret any signals from existing shareholders' actions and decisions on valuing the company. The signaling model suggests that ownership retention by the existing shareholders shows a positive signal

on the company value which is supported by the results from the OLS regression analysis. The results also show that ownership retention seems to have more influence on the shareholders' wealth loss point of view rather than existing shareholders' loss of ownership in the company. Even though existing shareholders lose a certain proportion of the ownership in the company in the primary shares, due to the dilution effect, this type of ownership loss does not seem to have a significant effect on the IPO underpricing. On the other hand, in secondary shares the effect is significant as ownership retention by not selling the existing shares can be seen as costly as shareholders then forgo diversification of their personal portfolio (Leland and Pyle, 1977). Overall, the positive relationship between ownership retention and IPO underpricing is in line with findings from Ljungqvist and Habib (2001) and Ljungqvist and Wilhelm (2003) who also documented the positive relationship between the underpricing and ownership retention.

The first hypothesis of this study argues that ownership retention of the pre-IPO shareholders affects underpricing. H1 can be accepted with certain conditions. Even though the regression analysis shows a positive relationship between ownership retention and underpricing in all regression models, only regressions 3 and 4 were statistically significant. Therefore, ownership retention influences underpricing only in IPOs where existing shareholders' shares are included in the share issuance. The positive relationship is consistent with the signaling model presented by Leland and Pyle (1977) which argues that ownership retention gives a positive signal to new investors as pre-IPO shareholders might have more insider information on the company's future cash flows and thus retaining ownership signals their trust in the company's future performance. Therefore, retained ownership increases the IPO underpricing.

When examining the control variables, we can see that the market condition dummy variable also has a positive relationship with underpricing with a 1% significance level in regression 1 and a 10% significance level in regression 2. This finding supports the hot and cold issue market phenomenon first captured by Ibbotson and Jaffe (1975) which

argues that underpricing is higher during the hot issue periods. The same phenomenon can therefore be seen also in the Nordic IPO markets.

When examining the other control variables, surprisingly a company's size has a negative relationship with underpricing, being statistically significant in regression 3. This contradicts with results by Bruton et al. (2009) and Ritter (1981; 1984) who all argue that larger companies tend to have higher first-day initial returns compared to smaller companies. The inverse relationship between technology variable and underpricing also contradicts with findings by Dolvin and Jordan (2008) that indicated technology-industry companies having higher underpricing compared to other industries. However, coefficients for the technology variable are statistically insignificant. Moreover, age and issue size variables seem to have no relationship with statistically insignificant coefficients.

Table 8. Multivariate OLS regression analysis of the IPO underpricing, where the underpricing percentage is the dependent variable. * refers to statistical significance at the 10% level, ** at the 5% level, *** at the 1% level. T-statistics are given in parentheses.

Variable	Regression 1	Regression 2	Regression 3	Regression 4
Intercept	0,232 (0,78)	1,029 (1,50)	2,310* (1,92)	-0,062 (-0,20)
Ownership	0,163 (1,43)	0,166 (0,50)	0,827*** (2,80)	0,235** (2,37)
Company age	0,000 (-0,11)	-0,003 (-1,04)	0,000 (0,74)	0,000 (-0,81)
IPO size	0,000 (0,43)	0,000 (0,76)	0,000 (0,69)	0,000 (0,14)
Market condition	0,105*** (2,81)	0,147* (1,87)	0,070 (0,75)	0,034 (1,05)
Company size	-0,014 (-1,05)	-0,063 (-1,53)	-0,138** (-2,13)	-0,001 (-0,07)
Technology	-0,014 (-0,32)	-0,060 (1,50)	-0,096 (-0,77)	0,036 (0,95)
Adjusted R^2	0,02	0,02	0,14	0,02
N	241	98	43	100

6.2 Ownership retention non-linear relationship

Even though the OLS regression indicates that ownership retention has a positive relationship with underpricing, the relationship between these two variables might be more complex as Robinson et al. (2004) suggest that ownership retention should be seen as a curvilinear hump-shaped relationship with the IPO underpricing. Therefore, a quantile regression analysis is conducted to see if there are differences in different quantiles of ownership retention.

Table 9 shows the results of the quantile regression analysis. Results show that in ownership retention's lower quantiles, the coefficient is actually negative, indicating it would decrease the underpricing. This could be explained by the alignment-of-interest hypothesis by Jensen and Meckling (1976) which argues that a decrease in the pre-IPO shareholders ownership can lead to the separation of the ownership and control in the company, which would increase the agency costs. Higher agency costs can lead to less efficient management of the company, leading to lower operating performance and thus showing as a negative sign for external investors, resulting in lower first-day initial returns. However, the results from the two lower quantiles of this analysis are statistically insignificant.

Moreover, in other quantiles, the ownership retention coefficients turn positive and increase as the quantiles go higher, being statistically significant in 0,6 and 0,8 quantiles with 5% and 1% significance levels. This would be in line with Leland and Pyle (1977) signaling model but would not support the entrenchment effect theory by Fama and Jensen (1983). According to the entrenchment effect hypothesis theory, a combination of ownership and corporate control can result in these types of shareholders acting in a way that would prioritize their own interests at the expense of minor shareholders. Therefore, an extremely high percentage of ownership retention could be considered to have a negative effect on underpricing as Robinson et al. (2004) discovered in their curvilinear hump-shaped relationship between ownership retention and underpricing.

However, the legal framework used in the Nordics can explain why the underpricing continues to increase on higher levels of retained ownership even though the risk of entrenchment effect can still be a valid concern. As mentioned in the earlier chapter of this study, Nordic countries apply a civil law framework which according to Sheela (2019) provides less legal protection for the investors and provides managers and large stakeholders more opportunities to transfer profits from the company at the expense of minority shareholders. Since there is less legal protection in a possible case of

entrenchment from the major shareholders, investors may require higher returns as compensation for the risk taken. Data used in the Robinson et al. (2004) study was from the U.S., which is a common law country, offering better legal protection. Therefore, the need for higher returns on higher retained ownership levels might not be needed and the entrenchment effect can have an inverse effect on the IPO underpricing.

When examining control variables, we can see that market condition continues to have a positive impact on the underpricing level, being statistically significant on the 0,6 and 0,8 quantiles. In contradiction with the OLS regression analysis, company size has a positive relationship with the IPO underpricing and turns into a negative relationship at the 0,8 quantile. However, only 0,2 results are statistically significant for this variable. The technology variable also has contradicting results with the OLS regression analysis as the coefficients are only negative in the 0,2 quantile although none of the results for this variable are statistically significant. For company age and IPO size, there seems to be no impact on the IPO underpricing with the *Company age* variable in 0,6 and 0,8 quantiles being statistically significant.

Table 9. Multivariate quantiles regression analysis observed from 0,2, 0,4, 0,6, and 0,8 quantiles of the ownership retention, where the underpricing percentage is the dependent variable. * refers to statistical significance at the 10% level, ** at the 5% level, *** at the 1% level. T-statistics are given in parentheses.

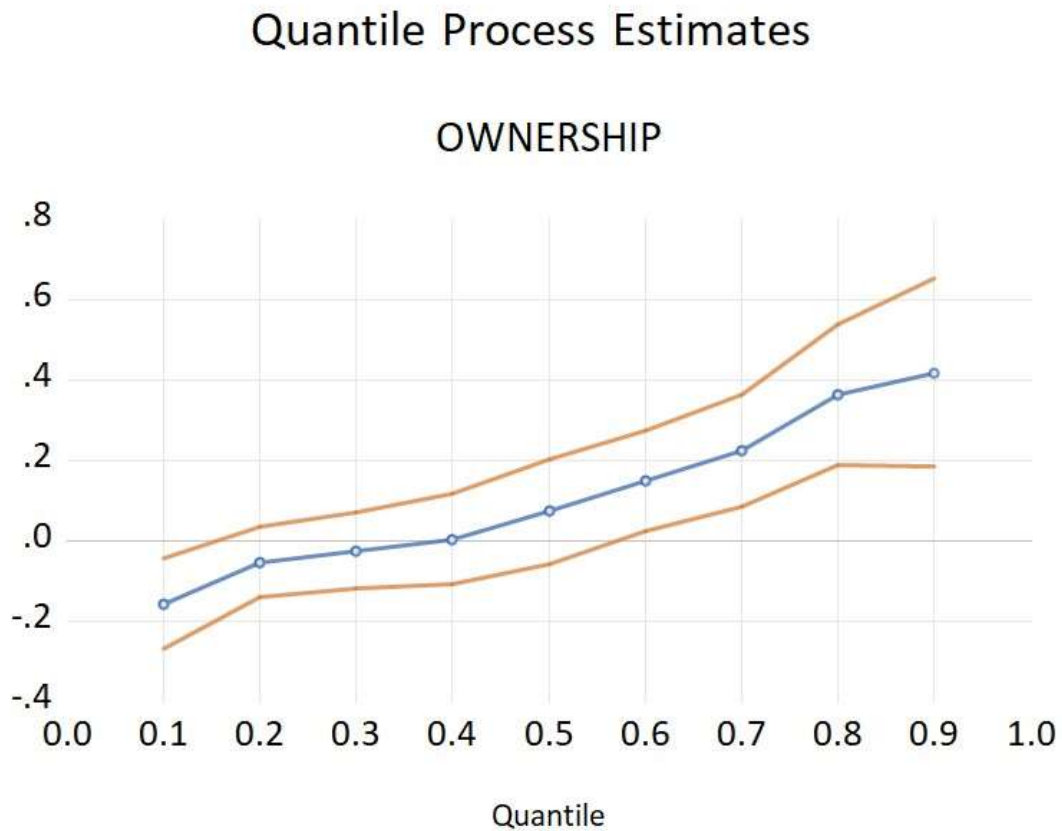
	Quantile 1	Quantile 2	Quantile 3	Quantile 4
Variable	(0,2)	(0,4)	(0,6)	(0,8)
Intercept	-0,479** (-2,4)	-0,240 (-1,27)	-0,317 (-1,43)	0,468 (0,83)
Ownership	-0,54 (-1,22)	0,002 (0,50)	0,147** (2,30)	0,363*** (4,07)
Company age	0,000 (-1,04)	0,000 (-0,23)	0,000** (1,96)	0,000 (1,45)
IPO size	0,000 (-0,96)	0,000 (-0,40)	0,000 (-0,66)	0,000 (0,27)
Market condition	0,016 (0,94)	0,018 (0,92)	0,056* (2,32)	0,089** (2,02)
Company size	0,025** (2,41)	0,012 (1,21)	0,013 (1,10)	-0,030 (-0,96)
Technology	-0,014 (0,51)	0,036 (1,16)	0,035 (0,81)	0,051 (0,80)

Graph 2 illustrates the ownership retention coefficients in different quantiles. From the graph, we can see that ownership effect on IPO underpricing starts as a negative, and then starts to have a more positive impact when larger amounts of ownership are retained. Based on the graph, ownership retention effect turns into positive when approximately 40% of ownership is retained during the IPO. This would indicate that there is a non-linear relationship between ownership retention and underpricing although the curvilinear relationship described by Robinson et al. (2004) cannot be confirmed.

The second hypothesis of this study is that even though ownership retention affects IPO underpricing, the relationship is not linear. Based on the quantile regression analysis, H2 can be accepted as the relationship is non-linear. However, the complete non-linearity

of the relationship cannot be confirmed as the quantile regression results are statistically significant only in 0,6 and 0,8 quantiles with 5% and 1% significance levels.

Graph 2. Quantile process estimates for ownership retention.



6.3 Robustness test

To further test the results of the quantile regression analysis and the non-linearity of ownership retention, the symmetric quantiles test is used. The Symmetric quantiles test, first introduced by Newey and Powell (1987), is performed to test the conditional symmetry of the variables' different quantiles. Conditional symmetry would imply that the average value of two sets of coefficients for symmetric quantiles around the median will equal the value of the coefficients at the median. This would give the following formula.

$$\frac{\beta(\tau) + \beta(1-\tau)}{2} = \beta(1/2) \quad (6)$$

As the regression of the quantile regression analysis showed inverse relationships between the lowest and highest percentiles of ownership retention, these two quantiles' asymmetry will be further tested. This would be applied in the symmetric quantile test formula as demonstrated below.

$$\frac{\beta(0,2) + \beta(0,8)}{2} = \beta(0,5) \quad (7)$$

Table 10 shows the Wald test, which assesses the significance of the coefficients of our regression model. Results show that the coefficients are statistically significant with a 1% confidence level.

Table 10. Wald test results for the quantile regression analysis. * refers to statistical significance at the 10% level, ** at the 5% level, *** at the 1% level.

Wald test	
Chi-sq. statistics	19,109***

Table 11 shows the results of the symmetric quantiles test. Results show that the coefficients for the between the 0,2 and 0,8 quantiles are asymmetric. However, the results are statistically significant only with the 15% significance level, therefore not being statistically significant. The asymmetry between the tails of distribution for ownership retention further provides insights into the nonlinear relationship between the variable and the IPO underpricing even though the test cannot statistically confirm the relationship.

Table 11. Symmetric quantiles test between 0,2 and 0,8 quantiles. * refers to statistical significance at the 15% level, ** at the 10% level, *** at the 5% level, and **** at the 1% level.

Variables	Quantiles
	0.2, 0.8
Intercept	0,776
Ownership	0,166
Company age	0,000
IPO size	0,000
Market condition	0,045
Company size	-0,042
Technology	-0,040

Overall, the empirical part of this study provides statistically significant evidence of the relationship between ownership retention and IPO underpricing. Firstly, there is a positive relationship between ownership retention and IPO underpricing, indicating that higher ownership retention would lead to higher first-day initial returns of the IPO. Secondly, the relationship is more effective in the event of existing shareholders selling their shares as a part of the IPO. Thirdly, the conducted quantile regression analysis shows that the relationship between ownership retention and underpricing is nonlinear as low levels of ownership retention can lead to overpricing of the IPO. However, the full non-linearity of the relationship cannot be confirmed as the results of all the quantiles are not statistically significant. The symmetric quantiles test supports the nonlinear relationship, indicating the asymmetry between the quantiles. However, the ownership retention quantiles asymmetry is only significant at a 15% significance level.

7 Conclusion

This study examines how the underpricing of an initial public offering (“IPO”) is impacted by the retained ownership of the pre-IPO shareholders. As previous studies have provided mixed results on the relationship between underpricing and ownership retention, the purpose of this study is to provide further clarity on the aforementioned relationship by examining the Nordic IPO markets where there have not been that many studies on this topic. Furthermore, existing studies provide theories and results on the nonlinearity of the relationship between underpricing and ownership retention. This is also considered in the study to see how ownership impacts underpricing in different levels of retained ownership.

The study is conducted with the final data sample of 241 IPOs from the time period between years 2012 and 2019 including Nordic countries Sweden, Finland, Norway, and Denmark. In order to test the relationship between IPO underpricing and ownership retention, two following methods have been used in this study. OLS regression analysis is conducted to test the relationship between the aforementioned variables with four different regression models, divided by the types of shares issued in the IPO. To test the nonlinearity of this relationship, quantile regression analysis is performed with an additional symmetric quantiles test to further validate the test results.

As Leland and Pyle (1977) explain when a company decides to go public, existing shareholders usually possess some information that is not available to potential investors. This condition is referred to as information asymmetry, which can lead to increased uncertainty among potential investors, complicating the IPO process in terms of IPO valuation and pricing. As information asymmetry can cause problems with adverse selection and moral hazard among the existing shareholders, potential investors try to interpret signals from existing shareholders’ decisions and actions on valuing the potential IPO investment.

Existing literature provides several theories on how retained ownership by the pre-IPO shareholders can affect the IPO valuation and therefore underpricing, and how it can be used as a corporate governance tool. The signaling model by Leland and Pyle (1977) provides evidence that ownership retention has a positive effect on IPO underpricing as retained ownership from the existing shareholders signals their belief in the company's future performance. Moreover, previous studies argue how ownership retention can lead to reduced agency costs, improved aftermarket liquidity, and better post-IPO operational performance. Therefore, the first hypothesis of this study argues that ownership retention affects IPO underpricing. The OLS regression analysis conducted in this study shows that ownership retention has a positive impact on underpricing, which is in line with previous studies such as Ljungqvist and Habib (2001) and Ljungqvist and Wilhelm (2003). However, the positive coefficient is statistically significant when the IPO includes shares sold by the existing shareholders. Hence, the H1 hypothesis can be accepted conditionally, only for the IPOs including secondary shares.

However, the relationship between ownership retention and underpricing is not so simple that it can solely be assessed with a standard linear regression. Low levels of retained ownership can lead to the separation of ownership and company control, which would then result in increasing agency costs. On the other hand, high levels of retained ownership can lead to the entrenchment of the major shareholders, as they might act in a way that would prioritize their own interests at the expense of minor shareholders. Robinson et al. (2004) point out these two phenomena as their empirical research shows that ownership retention's relationship with IPO underpricing should be a curvilinear hump-shaped figure, decreasing from both sides of the distribution tail.

Therefore, the second hypothesis of this study argues that the ownership retention effect on IPO underpricing is nonlinear. The quantile regression analysis conducted in this study shows that in lower levels of ownership, retention has a negative effect on underpricing. When ownership retention starts to increase so does the underpricing, reaching a neutral point around 40% of retained ownership and steadily increasing from there.

This result supports the alignment-of-interest theory with the increasing agency costs on the lower levels of retained ownership, but the entrenchment effect on the higher levels of retained ownership cannot be observed from the results. However, the civil law framework used in the Nordic countries might explain the reason why the entrenchment effect is not reflected in the underpricing. Civil law provides less legal protection for investors and provides managers and large stakeholders more opportunities to transfer profits from the company at the expense of minority shareholders. Since there is less legal protection in the possible case of entrenchment of the major shareholders, investors may require higher returns as compensation for the risk taken. Therefore, in civil law countries, IPOs might be more underpriced to compensate for the possible risk of entrenchment. Common law countries provide better legal protection in case of a possible entrenchment, therefore there is not a similar need for compensation by increasing the underpricing, and instead, the entrenchment effect could be more visible and negatively impact the underpricing on the high levels of retained ownership.

Overall, the results of this study indicate that there is a relationship between ownership retention and underpricing. However, the influence of ownership retention depends on the degree of retained ownership, being negative when the retained ownership is under 40% and starting to affect positively on the underpricing from 40% onwards. The results of this study support the majority of the existing theories related to the IPO-retention relationship as well as some other IPO-related theories such as the hot and cold issue market phenomenon. Moreover, the study provides insights into how the IPO-retention theories can be applied to the Nordic IPO market, which is still a relatively less studied IPO market even though the Nordic IPO market has started to mature during the last few years.

Nevertheless, the results of this study should be interpreted with caution. The data is retrieved from the Thomson Reuters Eikon database where some of the IPO and firm-specific characteristics data were missing from. The missing data was collected manually from the web in respective companies' websites, prospectuses, and financial statements

and even though the data was cross-checked from different available sources, the chance of faulty information still exists. In addition, not all of the examined ownership retention quantiles were statistically significant and therefore the full confirmation of the nonlinear relationship between ownership retention and underpricing cannot be concluded. The data sample of 241 IPOs was relatively small compared to other IPO-related studies, although for the relatively small Nordic IPO market, the sample size was fairly extensive.

The study still leaves a lot of possibilities for extending this base study for further research. As covered in the theoretical section, different ownership classes such as CEOs, other company's management, and private equity investors such as venture capitals and business angels might have different incentives for retaining ownership. Previous studies suggest that external investors might interpret the decisions and actions of different ownership classes differently, therefore it would be interesting to see how this would apply to the ownership retention within the Nordic IPO markets. Another possible idea to extend the study would be comparing the Nordic IPO market with some similar IPO market where the common law framework is applied. Previous studies e.g. by Bruton et al. (2009) show that ownership retention can have a different influence on IPO underpricing based on the legal framework applied in the country. Therefore, it would be interesting to see to what extent the results of this study can be explained through the civil law framework applied in the Nordic countries.

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Appendices

Appendix 1. The sample

Issue date	Issuer	Issue date	Issuer
11.6.2012	Selvaag Bolig ASA	28.12.2016	Unified Messaging Systems ASA
21.6.2012	FDT System Holding AB	10.2.2017	IRLAB Therapeutics AB
9.10.2012	Siili Solutions Oyj	22.2.2017	Oncopeptides AB
18.10.2012	Borregaard ASA	16.3.2017	Biovica International AB
5.11.2012	Veloxis Pharmaceuticals A/S	22.3.2017	Next Games Oy
30.11.2012	Recyctec Holding AB	23.3.2017	MIPS AB
18.3.2013	Asetek A/S	24.3.2017	Fondia Oy
19.3.2013	EAM Solar ASA	31.3.2017	Ambea AB
29.4.2013	Multiclient Geophysical ASA	3.4.2017	Isofol Medical AB
27.6.2013	Ocean Yield AS	6.4.2017	Actic Group AB
28.6.2013	Matas A/S.	6.4.2017	BerGenBio ASA
26.9.2013	Odfjell Drilling AS	6.4.2017	SSM Holding AB
4.10.2013	Orava Asuinkiinteistorahasto Oyj	7.4.2017	FM Mattsson Mora Group AB
21.11.2013	Restamax Oyj	9.5.2017	Integrum AB
28.11.2013	Platzer Fastigheter AB	11.5.2017	Kamux Oyj
4.12.2013	Napatech A/S	11.5.2017	Instalco Intressenter AB
4.12.2013	LINK Mobility Group ASA	18.5.2017	TerraNet Holding AB
9.12.2013	Sanitec Oy	19.5.2017	Munters Group AB
20.2.2014	Bufab AB	23.5.2017	Medicover AB
12.3.2014	ISS A/S	24.5.2017	Saferoad Holding ASA

Issue date	Issuer	Issue date	Issuer
18.3.2014	Saniona AB	26.5.2017	Nitro Games Oyj
19.3.2014	Hemfosa Fastigheter AB	30.5.2017	TC Connect AB
26.3.2014	OW Bunker A/S	31.5.2017	Boozt AB
27.3.2014	Vardia Insurance Group ASA	8.6.2017	Silmaasema Oyj
2.4.2014	Recipharm AB	12.6.2017	SpareBank 1 Ostlandet
4.4.2014	Verkkokauppa.com Oyj	15.6.2017	Green Mobility A/S
7.4.2014	Scanship Holding ASA	19.6.2017	Sedana Medical AB
30.5.2014	Herantis Pharma Oyj	20.6.2017	Bonesupport Holding AB
11.6.2014	Besqab AB	21.6.2017	EVRY ASA
11.6.2014	cXense AS	21.6.2017	Conferize A/S
18.6.2014	Zalaris ASA	22.6.2017	Omnicar Holding AB
18.6.2014	Bactiguard Holding AB	14.7.2017	Seamless Distribution Systems AB
24.6.2014	Havyard Group AS	13.9.2017	Inhalation Sciences Sweden AB
26.6.2014	Scandi Standard AB	14.9.2017	SenzaGen AB
2.7.2014	Serendex Pharmaceuticals A/S	26.9.2017	Bublar Group AB
25.9.2014	Inwido AB	27.9.2017	Infront ASA
1.10.2014	Scatec Solar ASA	28.9.2017	Rovio Entertainment Oy
3.10.2014	XXL ASA	5.10.2017	Balco Group AB
9.10.2014	Granges AB	5.10.2017	Bibbinstruments AB
16.10.2014	Entra ASA	9.10.2017	Webstep ASA
3.11.2014	Nexstim Oyj	9.10.2017	Handicare Group AB
20.11.2014	Lifco AB	10.10.2017	Terveystalo Oy
25.11.2014	Thule Group AB	11.10.2017	Global Gaming 555 AB

Issue date	Issuer	Issue date	Issuer
2.12.2014	NP3 Fastigheter AB	11.10.2017	Climeon AB (publ)
4.12.2014	Nixu Oyj	12.10.2017	BioArctic AB
12.12.2014	RenoNorden AS	13.10.2017	Seafire AB
4.2.2015	Ferratum Oyj	25.10.2017	Self Storage Group ASA
5.2.2015	Eltel AB	27.10.2017	2cureX AB
10.2.2015	The Lexington Co AB	6.11.2017	Crayon Group Holding ASA
12.2.2015	Dustin Group AB	6.11.2017	Touchtech AB
5.3.2015	NNIT A/S	13.11.2017	Gofore Oyj
11.3.2015	Savo-Solar Oy	15.11.2017	Orphazyme A/S
13.3.2015	Detection Technology Oy	16.11.2017	Colabitoil Sweden AB
19.3.2015	Evolution Gaming Group AB	21.11.2017	IRRAS AB
24.3.2015	Hoist Finance AB	23.11.2017	TCM Group A/S
26.3.2015	Asiakastieto Group OYJ	24.11.2017	Acconeer AB
26.3.2015	Troax Group AB	30.11.2017	DevPort AB
22.4.2015	Tobii AB	5.12.2017	Tempest Security AB
20.5.2015	Robit Oyj	5.12.2017	InfraCom Group AB
21.5.2015	Multiconsult AS	6.12.2017	24SevenOffice Scandinavia AB
27.5.2015	SciBase Holding AB	7.12.2017	Efecte Oyj
2.6.2015	Inission AB	8.12.2017	Hitech & Development Wireless Sweden Holding AB
4.6.2015	Pihlajalinna Oy	8.12.2017	Mag Interactive AB
4.6.2015	Magnolia Bostad AB	11.12.2017	Lyko Group AB
9.6.2015	Collector AB	15.12.2017	Orgo Tech AB
10.6.2015	Pegroco Invest AB	21.12.2017	CGit Holding AB

Issue date	Issuer	Issue date	Issuer
16.6.2015	Alimak Group AB	19.1.2018	NPInvestor.com A/S
16.6.2015	Nordax Group AB	1.2.2018	Admicom Oyj
16.6.2015	Coor Service Management Holding AB	5.3.2018	Zutec Holding Ab
16.6.2015	Hugo Games A/S	20.3.2018	Fjordkraft Holding ASA
17.6.2015	Nobina AB	21.3.2018	Harvia Oyj
18.6.2015	Pandox AB	22.3.2018	Elkem ASA
19.6.2015	Europris ASA	22.3.2018	Green Landscaping Holding AB
25.6.2015	FIT Biotech Oy	22.3.2018	Altia Oyj
26.6.2015	A Group Of Retail Assets Sweden AB	26.3.2018	Iconovo AB
29.6.2015	Capio AB	27.3.2018	Bygghemma Group First AB
7.10.2015	CLX Communications AB	29.3.2018	Fluicell AB
15.10.2015	Bravida Holding AB	16.4.2018	Enersense International Oy
29.10.2015	Kid ASA	23.4.2018	Happy Helper A/S
30.10.2015	Skandiabanken ASA	17.5.2018	Ovzon AB
13.11.2015	Maxkompetens Sverige AB	7.6.2018	NetCo Group A/S
23.11.2015	Evli Pankki Oyj	8.6.2018	Better Collective A/S
27.11.2015	Attendo AB	14.6.2018	Kojamo Oyj
1.12.2015	Scandic Hotels Group AB	18.6.2018	VMP Oyj
2.12.2015	Camurus AB	19.6.2018	Projektengagemang Sweden AB
3.12.2015	Stillfront Group AB	20.6.2018	ViroGates A/S
10.12.2019	Consti Yhtiot Oy	28.6.2018	Calliditas Therapeutics AB

Issue date	Issuer	Issue date	Issuer
10.2.2016	Scandinavian Tobacco Group A/S	31.7.2018	Risk Intelligence A/S
15.3.2016	Garo AB	6.9.2018	Metacon AB
16.3.2016	LeoVegas AB	27.9.2018	poLight AS
18.3.2016	Suomen Hoivatilat Oyj	4.10.2018	Fellow Finance Oyj
21.3.2016	Humana AB	12.10.2018	StenoCare A/S
25.4.2016	Nepa AB	21.11.2018	Scape Technologies A/S
25.4.2016	Lehto Group Oyj	29.11.2018	Oma Saastopankki Oy
28.4.2016	Resurs Holding AB	4.12.2018	Jetpak Top Holding AB
29.4.2016	Tokmanni Group Oyj	6.12.2018	Lime Technologies AB
11.5.2016	Wilson Therapeutics AB	6.12.2018	Lime Technologies AB
24.5.2016	Paradox Interactive AB	13.12.2018	Industrial Solar Holding Europe AB
1.6.2016	GomSpace Group AB	5.3.2019	Ascelia Pharma AB
9.6.2016	Nordic Waterproofing Holding A/S	11.4.2019	Karnov Group AB
9.6.2016	DONG Energy A/S	6.5.2019	Konsolidator A/S
10.6.2016	B3IT Management AB	22.5.2019	Danish Aerospace Company A/S
13.6.2016	TF Bank AB	29.5.2019	Ultimovacs ASA
14.6.2016	AcadeMedia AB	5.6.2019	John Mattson Fastighetsforetagen AB
21.6.2016	Lauritz.com Group A/S	14.6.2019	Mentice AB
21.6.2016	Maha Energy AB	14.6.2019	OKEA ASA
22.6.2016	Expres2ion Biotech Holding AB	18.6.2019	Norbit ASA
23.9.2016	Nets A/S	24.9.2019	EQT AB

Issue date	Issuer	Issue date	Issuer
27.9.2016	InDex Pharmaceuticals Holding AB	15.10.2019	Relais Group Oy
28.9.2016	Internationella Engelska Skolan i Sverige Holdings II AB	16.10.2019	Norske Skog ASA
28.10.2016	Ahlsell AB	23.10.2019	SATS ASA
28.10.2016	Tobin Properties AB	19.11.2019	Fodelia Oyj
4.11.2016	Heeros Oyj	28.11.2019	K-Fast Holding AB
18.11.2016	THQ Nordic AB	29.11.2019	Astralis Group A/S
22.11.2016	SERNEKE Group AB	4.12.2019	Optomed Oyj
22.11.2016	Alligator Bioscience AB	9.12.2019	24Storage AB
29.11.2016	Arcus ASA	10.12.2019	Kollect On Demand Holding AB
29.11.2016	DNA Oyj	12.12.2019	Qleanair Holding AB
29.11.2016	Smart Eye AB	15.10.2019	Relais Group Oy
7.12.2016	Acarix AB	16.10.2019	Norske Skog ASA
7.12.2016	SeaTwirl AB	23.10.2019	SATS ASA
8.12.2016	Edgeware AB	19.11.2019	Fodelia Oyj
8.12.2016	Aino Health AB		