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Unraveling IPO Underpricing: The Impact of Insider Ownership Evidence from Sweden

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Abstract

The thesis is a quantitative study examining the correlation between IPO underpricing and inside ownership and whether subgroups' significance has a greater effect on underpricing. The methodology of this study involved employing OLS regression analysis. Literature on IPO underpricing and ownership is primarily focused on the relationship between institutional investors. Furthermore, previous literature on IPOs and ownership have been conducted on the dilution of inside ownership post-introduction and retention rate concerning the firm's quality.

The contribution of the study is to the literature on IPO underpricing and asymmetric information due to inside ownership. In addition to previous literature, regarding underpricing of IPOs and the asymmetric information between inside and outside ownership. The results indicate that inside ownership increases underpricing of IPOs and that the subgroups CEO and Board of Directors significantly influence underpricing in the Swedish stock market. The study also investigated whether underpricing was affected by insider holding during uncertain periods such as the COVID-19 pandemic, but no evidence supporting this hypothesis was found.

Keywords: IPO, Underpricing, Inside ownership, ownership, agency problem

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Table of content

1	Introduction.....	1
1.1	Background	1
1.2	Problematization	3
1.3	Research question.....	4
1.4	Research purpose	4
1.5	Delimitation.....	4
2	Theoretical Framework.....	6
2.1	Capital structure.....	6
2.2	Agency Theory.....	7
2.3	Ownership	8
2.4	Initial Public Offering	9
2.4.1	Introduction IPO	9
2.4.2	The IPO processes and different ways of going public	9
2.4.3	Setting the issue price	10
2.4.4	IPO observations.....	10
2.4.5	Underpricing	11
2.4.6	Hot & cold markets.....	12
2.4.7	High IPO Costs	12
2.4.8	Long-term performance	12
2.5	Literature review of ownership during IPOs	13
2.6	Hypothesis development.....	13
3	METHODOLOGY.....	15
3.1	Scientific Method.....	15
3.1.1	Research Philosophy.....	15
3.1.2	Ontology	15
3.1.3	Epistemology	16
3.1.4	Research design	16
3.1.5	Research strategy	17
3.1.6	Research approach.....	17
3.1.7	Ethical research practices and methodological rigor.....	18
3.2	Practical method	19
3.2.1	Literature search	19
3.2.2	Data Collection.....	20
3.2.3	Sample Selection	20
3.2.4	Outlier definition	21
3.3	Modeling.....	21
3.3.1	Inference considerations & critique.....	21
3.3.2	Variable definition	23
4	Result & Analysis.....	27
4.1	Descriptive statistics.....	27
4.1.1	Model diagnostics.....	30
4.2	Main results.....	32

4.3	<i>Additional test</i>	34
4.4	<i>Concluding analysis</i>	35
5	Discussion	36
6	Conclusion	39
6.1	<i>Social and ethical considerations</i>	39
6.2	<i>Limitations</i>	39
6.3	<i>Further research</i>	40
7	References	41

List of Figures and Tables

Figure 1	Scatterplots of Underpricing and Inside Ownership	29
Table 1	Scientific method.....	18
Table 2	Primary & secondary sources.....	20
Table 3	Sample	21
Table 4	Summary of variable definitions	23
Table 5	Descriptive statistics.....	27
Table 6	Correlation matrix	31
Table 7	OLS regressions of Underpricing and Total Inside Ownership	32
Table 8	OLS regressions of Underpricing and Inside Ownership in subgroups	34

1 Introduction

The introduction chapter includes a general background for the thesis and problematization, research question & purpose, and delimitations. The chapter builds the foundation for the Theoretical Framework and Methodology used in the thesis.

1.1 Background

The COVID-19 pandemic had an unprecedented effect on the stock market, no other pandemic had made a significant shift in market volatility previously. Although the pandemic only had one-fourth of the mortality of the Spanish flu for example. This could be a consequence of the supply chain becoming more international over time. Furthermore, domestic agriculture and manufacturing are no longer financially sustainable to operate within the country to meet demand. Therefore, the supply chain shock of the pandemic increased the uncertainty in the global financial market. (Baker et al., 2020, pp.755–756)

The pandemic brought uncertainty to the Swedish financial market. Furthermore, the beginning of the pandemic seems to have been a catalyst for firms choosing to raise capital through IPOs (Initial public offerings), which 2021 increased dramatically according to Wass and Reha (2021) at S&P Market Intelligence. Underwriters were in high demand and had to increase operations in all Scandinavian countries to meet the demand of firms wanting to go public. The Swedish market increased the number of IPOs in 2021 by approximately 300% from 2020¹. This could indicate cycles/waves (also referred to as hot and cold issue markets) that an increase in introductions when the market conditions are optimal.

Hot markets became commonly known by the report by Casey (1972) at the Securities Exchange Commission (SEC) in 1972 presented findings of a high frequency of IPOs and evidence of abnormal initial returns in the USA. The hot issue market repeated its pattern in 1980 in the USA, described by Ritter (1984). The phenomena were later documented and studied by Rydqvist and Högholm (1995) about the wave of 1983 in IPOs in the Swedish stock market. The wave came after the start of the supply chain shock due to the war between Iran and Iraq (1979-1988). Indicating a relationship between increased underpricing and the theory of asymmetric information, (see e.g. Jensen and Meckling, 1976), as a possible explanation supporting the notion that firms went public and were willing to leave money on the table due to insider information or adverse selection, not acting in the best interest of the firm or shareholders. Rather the best in of owners' pre-introduction. This would indicate a weak form in the Efficient Market Hypothesis (EMH) introduced by Fama (1965).

In contrast to the IPO bubble at the end of 1999-2000 driven by technology and innovation in the technology sector and exuberance of investors and advisors, (see e.g. Maksimovic and Pichler, 2001; Bradley, Jordan and Ritter, 2008), the IPO increase in 2021 does not have the positive origin of exogenous shock as the year 1999.

¹ From descriptive statistics from the thesis

Furthermore, Boulton (2022, p.22) describes that a deterring factor of raising capital in times of economic policy uncertainty is that the firm behavior during periods of uncertainty also aggravates the informational asymmetry between the investor and the firm. The uncertainty also increases the cost of capital in addition to the deterring effect of uncertainty on raising capital.

This is in line with Zhang and Neupane (2024) results that for Sweden the relationship between underpricing and the COVID-19 pandemic was not significant. Indicating that it did not have the features of a hot market. The Swedish market also showed other contradicting features to the international market. According to Rubesam and Raimundo (2022, p.13), the crisis in Sweden showed signs of herding behavior in the financial market which was only detected in a few financial markets. The factors considered were the severity of the pandemic, government stringency in implementing preventative measures, and governmental economic support on herding behavior. The herding behavior would indicate that investors are confident in their analysis of the financial market movements, which would normally decrease with the uncertainty of a crisis. This confirms Barrafreem, Västfjäll and Tinghög (2020, pp. 4–5) results detecting optimism bias by individuals in the Swedish population for the individuals' financial future. However, not for the national and international economies. A study by Størdal et al. (2021, p.349) compared the Swedish and Norwegian financial markets and found that the Swedish policy with fewer restrictions was more beneficial for the financial market. However, the GDP of Norway increased due to domestic trade.

Initial Public offerings (IPOs) and the explanation for going public are widely debated in academic literature. Classical theories are rational (*homo economicus*) and are based on the efficiency in reducing the cost of capital (see e. g. Modigliani and Miller, 1958; 1963). The pecking order theory by Myers and Majluf (1984) confirms the rational-based literature. However, increasing capital by an IPO and the abnormal initial return the investor receives, the issuer is leaving money on the table (Loughran and Ritter, 2002). This would not be rational in the aspect of maximizing capital, therefore the option of going public is in congruence with Modigliani and Miller (1958) and Scott (1976). The persistence of underpricing as a phenomenon has been concluded not to be a mispricing of assets or the risk premia, but rather a compensation for underwriters and investors for the unknown intrinsic value at the introduction date. The underpricing of IPO's according to Ritter and Welch (2002, p.1816) is persistent. The percentage of underpricing is cyclical and does appear to increase with time. There is no single reason according to the authors that IPOs are underpriced. Furthermore, Loughran and Ritter (2004, p.436) conclude that one explanation for the underpricing phenomena is an indirect compensation for the underwriter. The issuer might not value as equal opportunity cost of indirect cost and direct costs such as fees and commission. However, the underpricing is money left on the table for the issuer. Therefore, the underpricing increases demand and stakeholder investment. This could increase the initial return and be a publicity stunt to increase awareness of the firm.

The study of Boulton (2022) shows that the underpricing in Sweden between 1998 to 2018 shows a mean of 10,49% underpricing of a sample of 178 observations. Both Boulton (2022) and Zhang and Neupane (2024) (16,2%) results support Ritter and Welch (2002) conclusion that underpricing is persistent and increases over time. Therefore, the increase in underpricing over time does not need to be directly correlated with the COVID-19 pandemic. It's a phenomenon that is persistently increasing with time.

Furthermore, the behavioral finance perspective for going public and diversification of ownership literature suggests it can be a strategic move to capture a wave of public perception of an industry or sector. When technology develops positive productivity shocks or influence from institutional investors, it increases market value to increase the threshold for competitive advantage to control the market. Maksimovic and Pichler, (2001, pp.484–485) discuss how timing affects if firms prefer public financing over private. The three criteria identified are the perception of the industry, technology development within the market segment, and the cost of research and development. This could create a barrier of entry for other firms within the sector and being the first pioneer in the market attracting outside investors to the company is a competitive advantage. One explanation could be a harvest strategy if insiders are ready to exit or reduce their holdings in the firm and the third is to facilitate a takeover. Additionally, Zingales (1995, p.444) concludes that the outside buyer sees the potential of increasing cash flows over time and the owner can gain by selling in a surplus without bargaining. This is value-maximizing for both owner and buyer, otherwise, the firm would continue to be privately owned. The fourth is a strategic move to disperse ownership of the firm. The underpricing can also be a strategy to incentivize specific outside investors, The studies done on the Swedish stock market indicate that the higher the offering price more foreign investors invest, while domestic institutional and private individuals prefer a low offering price on the IPO (Abrahamson and De Ridder, 2015, p.60; Abrahamson, 2024, p.10).

1.2 Problematization

From the perspective of previous academic literature, (see e.g. Ritter, 1984; Rydqvist and Högholm, 1995; Zingales, 1995; Easley and O'hara, 2004; Barrafreem, Västfjäll and Tinghög, 2020; Abrahamson, 2024), it could be argued that there is a pattern. An optimism bias by investors, increased liquidity by the government to stimulate financial markets, and asymmetric information between firms and investors. Creating an opportunity to increase the firm's capital and transfer the exposure of risk from inside owners to new shareholders.

Harjoto and Garen (2005, p.671,669) describe how inside ownership and an IPO dilute the inside ownership. The study examined IPOs between 1996 to 1997 globally, the average percentage for 1996, (1997), was 60,34%, (65,87%), and the post-IPO on average was 45,26%, (43,66%). The overall for the two years mean inside ownership was 42,42% and post IPO 36,88%. The CEO ownership mean was also diluted from 16,22% to 15,71% over the first year. The results indicate that the inside ownership decreases with an IPO.

In contrast, according to Harris and Raviv, (1991), adverse selection can also affect the organization when there is a disconnection between asymmetric information within the organization. Where the agent has more information than the principal, which the agent can use for self-interest. Therefore, the firms without inside ownership can be affected by agency problems. This supports the results of Chan et al. (2023) of managerial excessive risk-taking being linked to underpricing of IPOs. This could indicate that self-interest and personal characteristics of management affect IPO underpricing.

The discrepancy that the abnormal number of IPOs during 2021 not having the features of a hot wave when it comes to underpricing indicates that the firms chose to go public for other reasons. This could be a sign of asymmetric information between the principals and agents. The agency problem increases as there is less separation between decision management and control. As the preceding literature describes adverse selection has a decreasing effect on stock price and demand. The theory should apply to IPOs as inside ownership creates an

added information asymmetry towards outside investors. This would then mean that the higher the inside ownership at the IPO listing the greater the underpricing of the stock.

Furthermore, the literature description of inside ownership and underpricing of IPOs have not been examined. Inside ownership has not been widely researched and lack of conclusive evidence on the influence it has on the underpricing of IPOs. The few inside ownership studies found by (e.g., Su, 2004; Harjoto and Garen, 2005), indicate that inside ownership is diluted post-introduction and that high-quality firms have a higher retention rate of inside ownership post-introduction.

Based on this, the thesis examines the relationship between inside ownership and the underpricing of IPOs. To see if the underpricing is greater with high inside ownership, we will examine a sample of 164 IPOs listed on Nasdaq and First North between 2017 to 2021 to ensure the level of quality of financial reporting in the prospectus and disclosure of inside ownership indirect and direct ownership of the board of directors, CEO, and management. The modeling will build on Zhang and Neupane (2024) modeling with fundamentals to be able to observe firm-level characteristics and to control for COVID-19 pandemic effects on underpricing.

1.3 Research question

Is there an effect on underpricing of IPOs by inside ownership?

1.4 Research purpose

This thesis takes the perspective of examining IPOs and the effect of inside ownership on underpricing. The thesis also provides further understanding of inside ownership effects on underpricing. Additionally, the thesis will explore the inside ownership by dividing up the types of inside owners. The thesis will contribute to the literature on IPOs and the underpricing of IPOs in financial markets.

Previous ownership and IPO literature focus on institutional and retail investors' behavior and effects of offering price. Inside ownership and underpricing in academic literature have been linked to both underwriter quality and timing. However, the gap in the literature is how the underpricing is affected by inside ownership. Furthermore, the research on the different sub-categories of inside ownership is still limited in academic literature.

Our findings could be useful for investors, shareholders, venture capitalists, and credit institutions. To be able to use inside ownership as an indication of underpricing in relation to inside ownership. Furthermore, to strategically invest in IPOs on the Swedish market. The model could be used to continue to investigate inside ownership and the effect of underpricing.

1.5 Delimitation

The thesis is delimited to a study of the Swedish market. We acknowledge that the pandemic affected countries differently, and implementation of financial instruments and strategies by the government differs. As such the results cannot directly be generalized for other countries' financial markets without further investigations.

Data delimitations are the Swedish stock market, excluding IPOs introduced in another currency, firms not registered in Sweden with an organizational number, discontinued introductions, and IPOs introduced in other markets not registered by Swedish Tax Agency as new introductions. As such we only capture Swedish firms. Additionally, the scope of this thesis is delimited to the analysis of data from the period spanning 2017 to 2021, to inform the reader about a contemporary setting.

2 Theoretical Framework

The Theoretical Framework chapter delves into four key theoretical domains: Capital Structure, Agency Theory, Ownership, and IPO. From this theory, we conduct a comprehensive literature review focusing on ownership dynamics during Initial Public Offerings (IPOs). After our review, we wrap up by formulating hypotheses based on our findings.

2.1 Capital structure

The concept of corporate capital structure selection was originally introduced by Modigliani and Miller, (1958), who contended that the choice between debt and equity financing has no bearing on the firm's value or the cost and availability of capital, under the assumption of perfect and frictionless capital markets. However, Myers (2001 pp.81–82) recognizes the limitations of these assumptions in real-world scenarios, where factors like taxes, bankruptcy costs and agency costs introduce imperfections. Myers discusses three prominent theories that offer relevant insights into a company's decision-making regarding its debt-to-equity ratio, emphasizing that there is no general theory of the debt-to-equity choice. Theories about the optimal capital structure vary in how they prioritize or interpret previously named factors. Mayers (2001, p 96-97) also discusses that these theories are not intended to be universally applicable, as they are contingent upon previously named factors as well as a company's risk level.

Kraus and Litzenberger (1973, p.1918) introduced the Tradeoff theory, which operates within the framework of perfect and frictionless capital markets, positing that companies aim to strike a balance between the tax advantages of debt and the risks associated with excessive leverage. This theory suggests that companies tend to leverage moderately, particularly when tax considerations are favorable.

The Pecking Order theory, initially proposed by Myers and Majluf (1984, p.219), asserts that companies prioritize internal financing over external sources, preferring retained earnings to debt issuance or equity dilution, owing to information asymmetries. Consequently, the level of debt in a company's capital structure reflects its historical reliance on external financing, with the theory suggesting a preference for debt over equity issuance.

Furthermore, Jensen, Meckling and Holderness (1986, pp.323–329) discuss the Free Cash Flow theory. they suggest that an optimal level of debt can enhance a company's value, especially when it generates surplus cash flow beyond its investment needs. This perspective is particularly relevant for mature companies seeking to address agency costs stemming from excess cash reserves. Jensen's analysis implies a positive correlation between leverage and firm value, highlighting the importance of effectively managing a corporation's free cash flow.

Corporations' ownership structure has a significant impact on a firm's capital structure, affecting information asymmetry, control problems, and debt level (Harris and Raviv, 1991). When owners and management have different information about the company's operations, it can lead to opportunistic behavior from management. To mitigate this information asymmetry, a higher debt level can be used as a disciplining mechanism, forcing management to act more responsibly (Harris and Raviv, 1991, p.302). In firms with dispersed ownership,

management has more power and can more easily make decisions that benefit themselves at the expense of owners. Debt can be seen as a control mechanism that gives owners more influence over management decisions (Harris and Raviv, 1991, p.308). Lastly, firms' debt level depends on the ownership structure, whereas family firms tend to have a lower debt level due to the risk of losing control of the firm (Harris and Raviv, 1991, p.318). Institutional investors, on the other hand, may have a higher tolerance for risk and therefore prefer a higher debt level (Harris and Raviv, 1991, p.320).

2.2 Agency Theory

The theory of agency problem builds on the theory of transactional costs written by Coase (1937). Coase (1937, pp.390–391) concludes that by creating a firm there is a reduction of contract cost, however, does not eliminate the transaction cost between agents within the firm. In the theory of the firm, Jensen and Meckling (1976) introduce that separation of ownership and control creates a conflict of interest in the principle-agent relationship. The agency cost defined by Jensen and Meckling (1976, p.308) is the monitoring of expenditures by principals, the bonding expenditures by the agent, and the residual loss.

Fama and Jensen (1983, pp.321–322) claim that to be able to mitigate agency problems between principle and agent there needs to be a separation between decision management and decision control. To be able to limit the individual power of the agents, so that principles can monitor decision-making within the firm.

According to Shapiro (2005), the literature describes to main issues of the agency problem. The first is adverse selection, where agents act in their self-interest due to asymmetric information. When the principal doesn't have access to the information that the agents have, causing a power imbalance in the principal-agent relationship. The second is moral hazard, this agency problem illustrates the hidden actions of the agent. These hidden actions could be self-serving and shift the power dynamic between the agent and principal.

Adverse selection in information asymmetry reduces the price of a stock and the demand (Easley and O'hara, 2004, p.1578; Kelly and Ljungqvist, 2012, p.1408). As the heterogeneity of information between investors also increases asymmetric information affects for IPO affecting demand and stock price. Furthermore, Marshall (1976, p.889) describes the moral hazard dilemma as a risk-averse decision maker might cause diminishing returns by not investing. Only maximizing profits by the means of current assets. The risk-neutral decision maker is based on actions made to avoid the low-income state of the firm. The risky decision maker makes investments with little possibility of gaining on the investment. Consequently, the agent's risk appetite might not be in line with the principal. The agent makes hidden actions become a lost opportunity cost for the principal.

Noteworthy is the results by Noe and Rebello (1996, p.654) regarding financial policies. That there is a difference between principal-controlled and agent-controlled firms. That shareholders preference debt finance and agents are averse to it. To avoid mispricing, the shareholders could decrease their dependence on outside capital funding and for an (agent) management control can increase outside capital funding.

The agency problem increases in complexity when multiple agents and principals are introduced in the firm. As there is an inherent heterogeneity in individuals and then the added element of conflict of interest within the principal or agent group. In an IPO the conflict of interest described by Arthurs et al. (2008, pp.289–209) how inside and outside managers

might have different agendas. The inside manager influence to decrease the underpricing with a long-term perspective for the firm. To be able to gain capital as close to market value of the assets within the firm. However, this could be driven by an inside ownership and the desire to exit. On the other hand, the underwriter increases the underpricing to be able to profit of the short-term initial return.

2.3 Ownership

The composition of a firm's ownership structure may have a diverse mix of investors, primarily driven by financial objectives. Variations exist among investors due to differences in mainly regulatory environments and information-gathering capabilities. Investors are typically classified as insiders or outsiders, with disparities often observed between them (Connelly et al., 2010, pp.1563–1566). Insiders, defined as individuals or groups with direct control over a firm's management and decision-making encompass founders, board members, senior executives, and large shareholders due to their in-depth knowledge of the firm's operations and strategy. Equity owned by insiders helps to align management and shareholders' interests (Connelly et al., 2010, pp.1564–1566). Jensen and Meckling (1976, pp.351–354) propose that managers may prioritize longer-term horizons due to concerns about their careers and reputation. In contrast, incentives such as stock options, empire building, and management's risk aversion can contribute to a focus on shorter-term horizons. Outsiders, on the other hand, represent individuals or groups with no direct influence over management in other words minority shareholders. Outsiders' ownership of equity incentivizes them to oversee management actions, thereby keeping a vigilant eye on managers to ensure the company's best interests are upheld (Connelly et al., 2010, pp.1566–1569). Von Thadden (1995, pp.557–559) argues that outside investors, affected by information asymmetries wherein they lack comprehensive knowledge about a project's potential, contribute to short-term bias. Information asymmetries lead firms to prioritize short-term investments over potentially more lucrative long-term projects.

Ownership by insiders, such as management and board members, can have a significant impact on a firm's capital structure. Agency theory suggests that higher insider ownership leads to lower debt levels, as insiders have an incentive to act in their own best interests and avoid risky debt financing (Jensen and Meckling, 1976, p.323). Information asymmetry theory, on the other hand, suggests that higher insider ownership can lead to higher debt levels, as insiders have better information about the firm's prospects and can therefore use debt to extract more value for themselves (Myers and Majluf, 1984, p.192).

Several academic studies have explored the effects of ownership structure. Connelly et al. (2010, p.1561) argue that ownership itself acts as a form of corporate governance. This aligns with the findings of Kahn and Winton (1998, pp.121–122) who explore the link between ownership structure and shareholder interaction. They suggest that a concentrated ownership structure can lead to less speculation and potentially more efficient decision-making due to clearer lines of control. Further exploring the financial implications of ownership structure, Rajan, 1992 (pp.1392–1393) examines the choice between "informed debt" and "arm's-length debt" based on ownership. He demonstrates that insiders with significant ownership, who are more invested in the firm's long-term success, may prefer "informed debt" to maintain control. Outsiders, with a shorter-term focus on return on investment, may favor "arm's-length debt" to minimize risk. Lastly, Srivardhan (2009, p.11) emphasizes the role of the common but specific type of outsider institutional investors in corporate governance. He argues that institutional investors can play a positive role by actively monitoring management and

promoting good governance practices. Their involvement can help to mitigate some of the potential drawbacks of a more dispersed ownership structure.

2.4 Initial Public Offering

2.4.1 Introduction IPO

An Initial Public Offering (IPO), as defined by Brealey, Myers and Allen (2020, p.397) involves the introduction of a company's stock to the public market for the first time. A company can conduct a primary offering by issuing new shares or a secondary offering by selling already issued shares held by existing shareholders.

There are four main academic reasons for a firm to go public according to Anderson and Dyl, (2008, pp.405–406). The first is the cost of capital based on the literature (see e.g. Modigliani and Miller, 1963; Scott, 1976), that firms go public due to an aspiration to decrease the cost of capital. Due to asymmetric information, there may be an occurrence of mispricing of the stock. The pecking order theory introduced by Myers and Majluf (1984) reconfirms that there is a preference for the choice of type of financing for the firm. The second reason could be a harvest strategy if insiders are ready to exit or reduce their holdings in the firm, and the third is to facilitate a takeover. For the second and the third reason, Zingales (1995, p.444) concludes that the outside buyer sees the potential of increasing cash-flows over time and the owner can gain by selling in a surplus without bargaining. This is value-maximizing for both owner and buyer, otherwise, the firm would continue to be privately owned. The fourth is a strategic move to disperse ownership of the firm. Maksimovic and Pichler (2001, pp.484–485) discuss how timing affects if firms prefer public financing over private. The three subcategories of strategic dispersion of ownership identified are the perception of the industry, technology development within the market segment, and the cost of research and development. This could create a barrier of entry for other firms within the sector and being the first pioneer in the market to attract outside investors to the company is a competitive advantage.

Berk and DeMarzo (2023) argue in their textbook on corporate finance that the process of a company transitioning to a publicly traded entity confers two primary advantages: enhanced liquidity and improved access to capital. IPOs provide existing private investors the opportunity to diversify their holdings. Furthermore, IPOs provide public companies with access to future capital through subsequent offerings. However, they also argue, this transition to a public company also presents drawbacks. Diversification among investors leads to widespread ownership dispersion, diminishing shareholders' ability to effectively monitor management, known as the “agency problem”. Additionally, investors may devalue the stock price to compensate for the loss of control. Moreover, increased regulatory oversight from financial authorities, such as the Swedish Financial Supervisory Authority, introduces more standards for financial disclosure, heightened accountability, and stricter requirements for board members. While these standards aim to safeguard investors, compliance entails significant costs and time commitments for companies.

2.4.2 The IPO processes and different ways of going public

When a company decides to go public, it typically engages an investment bank, known as an underwriter, to oversee the IPO process and structure it accordingly. The underwriter's job is to promote the IPO, assist with required filings, and help determine the issue price. In the case of smaller IPOs, underwriters often opt for a best-effort basis, whereby they endeavor to sell

the stock at the optimal price without guaranteeing the complete sale. This arrangement may include an all-or-none clause, wherein either all shares are sold during the IPO, or the offering is terminated. Alternatively, a more common approach involves a firm commitment IPO, wherein the underwriter assures the sale of all shares at the predetermined offer price. Here, the underwriter purchases the entire stock issue at a discount and subsequently resells it at the offer price. Should the entire stock issue fail to sell, the underwriter bears the responsibility to sell the remaining shares at a lower price, incurring a financial loss. Auction IPOs is another way to go public where the market decides the stock price through bidding. Investors bid over a set time, and the highest bid that matches the number of offered shares sets the price. Winning bidders pay this price, no matter how much they bid. While auction IPOs haven't been widely used since the late 1990s, a hybrid version is becoming more popular. In it, investors bid like in an auction IPO, but the company can set the final price slightly lower and decide how shares are allocated (Berk and DeMarzo, 2023). Lastly, Berk and DeMarzo (2023) explain another alternative which a private company can initially raise public capital, which is through a special purpose acquisition company (SPACs) which have gained increasing popularity recently. SPACs are shell entities formed to raise capital through an IPO with the aim of acquiring or merging with an existing company. Despite their initial perception as a cost-effective and fast alternative to traditional IPOs, a recent study by Gahng, Ritter and Gahng, Ritter and Zhang (2023, p.35) indicates that SPACs are significantly more expensive than traditional IPOs. Additionally, SPACs don't provide investors with information about what they will invest in.

2.4.3 Setting the issue price

Before setting the offer price, underwriters work with the company, using two main methods: estimating future cash flows (DCF) and comparing with similar firms (comparable multiples method). They often combine these approaches and often rely on recent similar IPOs for guidance (Berk and DeMarzo, 2023).

Following the establishment of a price range, underwriters seek to gauge market sentiment regarding the valuation. This involves orchestrating a roadshow, during which the underwriter goes around to promote the company and explain the rationale behind the offer price to key institutional investors such as mutual funds and pension funds. Subsequently, these investors then express their interest by indicating the number of shares they may wish to purchase, although these commitments are non-binding. These investors rarely withdraw their interest due to their strong relationships with underwriters. Underwriters aggregate the total demand and adjust the price iteratively until the likelihood of the issue's failure diminishes, a process known as book building. This procedure furnishes an early indication of IPO demand, prompting withdrawal from the process if demand appears weak within the target price range (Lowry, Michaela and Volkova, 2017, pp.55–56)

Underwriters often utilize insights garnered during the book-building stage to intentionally underprice the IPO, mitigating their exposure to losses. Underwriters often use a risk management tool called a greenshoe provision, similar to an option, which allows them to issue additional stock after a successful issue, often accompanied by a short position to mitigate risk (Berk and DeMarzo, 2023).

2.4.4 IPO observations

The IPO phenomenon has four main areas that researchers have focused on: underpricing, cyclicity, high IPO costs, and long-term performance. The theoretical framework of this

study will center on the dependent variable underpricing along with cyclical, as they align closely with our research objectives. Investigating the connection between underpricing and insider holdings is particularly relevant given our focus. Additionally, cyclical holds significance as we examine a period of uncertainty marked by high IPO activity during COVID-19, transitioning from a previous cold period. As the cyclical may offer insights into the reasons behind the heated IPO market.

2.4.5 Underpricing

A well-known pattern associated with going public is the substantial initial returns on common stock on the IPO day. Underpricing in simple words means leaving money on the table for the issuer. This phenomenon is widespread across all markets, albeit with variations between countries. The underpricing of IPO according to Ritter and Welch (2002, p.1816) is persistent. The percentage of underpricing is cyclical and does appear to increase with time. The average initial returns of Swedish IPOs have remained consistently high over an extended period, although variations are evident across different time frames. Rydqvist and Högholm, (1995) study examined the average initial return for IPOs conducted between 1980 and 1984, finding a return of 34.1%. A more recent study encompassing a broader timeframe (1980-2015) reported a lower average first-day return of 25.9%. According to Berk and DeMarzo (2023) Underwriters benefit from underpricing by mitigating risk, while investors who purchase stock at the IPO price also profit from the first-day underpricing. However, pre-existing shareholders bear the costs of underpricing, as they sell their stock for less than its potential aftermarket value.

Multiple theories have been proposed to explain the underpricing of IPOs, offering different perspectives. Jamaani and Alidarous (2019) in their IPO theory review article discussed 13 different theoretical models that explain IPO underpricing based on information asymmetry, institutional explanations, ownership and control reasons, and behavioral explanations. However, in the end, they argue from a theoretical view that underpricing is ultimately explained by the existence of asymmetric information in the IPO market. Even if information asymmetries would be the main underpricing reason Berk and DeMarzo (2023) Argues that These explanations are often not mutually exclusive, and often the reasons are case/firm specific. Rock (1986) introduces one of these theories, the "winner's curse" hypothesis to address information asymmetry between investors in IPO markets. Institutional investors, better informed about IPO firm values, bid selectively for underpriced IPOs, while uninformed investors bid indiscriminately. Considerable empirical evidence, exemplified by studies such as those by Amihud, Hauser and Kirsh (2003) and Keloharju (1993), confirms the existence of the winner's curse in IPO markets. On the other hand, Loughran and Ritter (2002, p.437) include that one explanation for the underpricing phenomena is indirect compensation for the underwriter. The issuer might not value the equal opportunity cost of indirect costs and direct costs such as fees and commissions.

Further, Jamaani and Alidarous's (2019) favorite explanation for underpricing is the entrepreneurial wealth losses (EWL) theory, introduced by Ljungqvist and Habib (2001). Which is a combination of the "winner's course", "signaling model", "the ex-ante uncertainty" and "the certification hypothesis". Because the EWL model is the only one that addresses the problem of information asymmetry between the issuer and investor, it also considers the relationship between underwriter reputation and IPO underpricing. Ljungqvist and Habib (2001) argue that extensive promotion efforts can influence uninformed investors participation, reducing adverse selection and underpricing. The model posits two main

premises: IPO owners' concern about underpricing and their ability to influence it through promotion activities. The EWL model is backed with empirical evidence with their initial study, and later studies, like Ljungqvist and Wilhelm (2003), have further supported it.

2.4.6 Hot & cold markets

The volume of IPOs displays high cyclicalities, during economic upswings, the market experiences a surge in new issuances, whereas during downturns, the number of IPOs declines markedly. Hot and cold market issuing became widely known from the report by the Securities and Exchange Commission (SEC) in 1972 and was depicting an abnormal return on IPOs during a specific period. The report concluded that from 1958 to 1961 and 1968 to 1969 the hot issue consisted of the abnormal return of the IPO post introduction, frequency, and market performance. (Casey, 1972)

Further research by Ritter, 1984 (pp.2018–219) shows a relationship between high initial return and a high volume of offerings. Supporting the conclusions of Ibbotson and Jaffe (1975, p.1041) that the IPO market does not have a random walk pattern as the regular stock market. Helwege and Liang (2004, p.541) describe the incentive to introduce an IPO in a hot market as technology advances and positive productivity shocks. However, the literature describes it as an “window of opportunity” to exploit the exuberance of investors during a hot issue period. Their study shows that institutional ownership is larger than the venture capital investment in IPOs. Furthermore, the hot market has an increase of concentration within an industry sector but is not characterized as a cluster. The hot market has an overall increase of IPOs in all industry sectors.

The IPO wave in the Swedish stock market in 1983-1984 increased the amount of listed companies by 50% during the period documented by Rydqvist and Högholm (1995, p.288). The Iran-Iraq war period of 1979-1988 inflation and uncertainty of oil supply created uncertainty in the stock market. Similarly, the pandemic increased the uncertainty of the market, studies have shown that the underpricing during 2021 is higher than the previous year. Indicating that the uncertainty increases the underpricing of IPOs and the initial return (Mazumder and Saha, 2021, p.43; Zhang and Neupane, 2024, p.14). The underpricing increased by 17,6% compared to the years between 2015 and 2020. Noteworthy is that the initial return increased by 9,30% compared to the year 2020. Indicating that the pattern of increased risk premia and a higher underpricing due to market movements.

2.4.7 High IPO Costs

The high costs associated with conducting an IPO, where underwriters typically charge a fee of 7% of the issue price. When coupled with underpricing, the expenses of going public become substantial, especially when compared to alternative fundraising methods such as Seasoned Equity Offerings (SEOs), convertible bonds, and standard bonds, all of which incur lower costs (Chen and Ritter, 2000, p.1129).

2.4.8 Long-term performance

New public companies frequently demonstrate subpar long-term performance, as evidenced by a study conducted by Brav, Geczy and Gompers (2000, pp.246–247) which analyzed different long lengths of timespan following the IPO. However, a recent article by Ritter and Welch (2002, p.1823) reviewed past research and conducted their study, finding mixed results

depending on the periods analyzed. Nonetheless, they tend to support the idea that IPOs often underperform in the long run.

2.5 Literature review of ownership during IPOs

In the exploration of IPOs, firms' ownership structure plays a crucial role in shaping various aspects of the IPO process and outcomes. Several studies have shed light on different dimensions of this relationship. In Abrahamson's (2024) study on Swedish IPOs, it is revealed that firms can influence their ownership structure and level of shareholder monitoring by strategically setting the offer price for their IPOs. A lower offer price may attract more individual investors seeking high returns, resulting in a broader ownership base, while a higher offer price may attract institutional investors, leading to more concentrated ownership. This decision affects who invests in the IPO and how many shares they buy, shaping the firm's ownership composition and the intensity of shareholder monitoring. Additionally, Zingales's (1995, pp.444–445) study investigates the connection between insider ownership and the decision to go public. His study highlights the role of insider ownership in influencing firms' decisions regarding IPOs. A key finding from Zingales' research is that insider ownership influences firms' propensity to go public, with higher levels of insider ownership often leading to greater hesitancy in pursuing an IPO. Further, if maximizing the firm's value requires negotiating with potential buyers over the selling of the entire company, avoiding an IPO is preferred. Instead, the firm might opt to remain private and negotiate directly with potential buyers.

Pham, Kalev and Steen (2003, pp.943–944) explore how IPO underpricing influences post-listing ownership structure and liquidity. Their study shows that higher underpricing, which means selling shares at a lower price than their market value is linked to a broader shareholder base and better liquidity. The study highlights the role of ownership structure, suggesting that underpricing attracts small investors, leading to a more diverse ownership base. The findings suggest that firms can adjust underpricing levels to achieve desired ownership structures. Conversely, firms preferring concentrated ownership may opt for lower underpricing. Additionally, firms with higher agency costs are less likely to underprice shares. Previous research (Stoughton and Zechner (1998) and Brennan and Franks (1997) have found similar evidence, suggesting that IPO underpricing is used to influence post-IPO ownership structure, aiming to affect the level of monitoring or control exercised by the shareholders over the company after its IPO. Brennan and Franks (1997) and Booth and Chua (1996) suggest that underpricing serves as a tool to encourage investors to apply for more shares than they initially intended to purchase, facilitating managers in achieving a broader ownership base among investors after the company goes public. However, more contemporary studies such as Hill (2006, p.126) and Field and Sheehan (2002) find no evidence supporting this claim. Their analysis indicates that IPO underpricing does not significantly affect the proportion of block holdings in a firm's ownership structure, both initially and over the long term. Given these articles, the extent to which underpricing contributes to the expansion of the shareholder base remains a matter of uncertainty.

2.6 Hypothesis development

The hypothesis is developed from the perspective of the increase in IPOs from 54 in 2020 to 164 in 2021. Noteworthy is that previous literature, (Zhang and Neupane 2024), concludes that the difference in underpricing is not statistically significant during the COVID-19 pandemic in Sweden. This would indicate that the level of underpricing is persistent and not affected by economic policy uncertainty or illiquidity in the financial market. Supporting this

argument is the literature on the COVID-19 pandemic, (Barrafrem, Västfjäll and Tinghög, 2020; Rubesam and Raimundo, 2022), and the herd behavior and positive bias in the Swedish economy by investors. The literature models around underpricing being a strategy. Either to attract certain types of investors or current owners to exit the firm.

Furthermore, IPO and underpricing literature is still uncertain about the influence of inside ownership. Previous literature has focused on institutional blockholders with varying results.

Dilution of inside ownership and IPOs has been studied by Harjoto and Garen (2005) this would indicate either that the dilution is due to the increased number of stocks or a decrease in ownership. Chan et al. (2023) concluded that excessive risk-taking by managerial staff increased IPO underpricing. This led us to our hypothesis focuses on the inside ownership and their influence over the underpricing of stocks if they own the stock that is being offered:

$$H_1 = \textit{Underpricing is greater with greater inside ownership.}$$

Our additional testing stem from the results of both Harjoto and Garen (2005) and Chan et al. (2023), that CEO ownership decreases with an IPO, but furthermore, subgroups could affect the underpricing if they own the stock. As such we expect different subgroups of inside ownership (CEOs, managers, and the Board of Directors) to be associated with greater inside ownership. However, we do not formulate a separate hypothesis based on limited insights in previous research.

3 METHODOLOGY

The Methodology chapter includes three main sections of scientific method, literature & practical. The scientific method chapter includes the thesis research philosophy, ontology, epistemology, research design, research strategy and research approach. The Practical method chapter includes the literature search process, a description of the sources used for the data collecting, the sample selection process, the type of modeling used for the quantitative study and variable definition. In this chapter all stages of the construction of the sample and the inference methodology, considerations of statistical analysis and definition of variables.

3.1 Scientific Method

3.1.1 Research Philosophy

In the upcoming chapter, we will delve into the philosophical framework guiding our research approach, laying the groundwork for comprehending the theoretical and methodological decisions made in this study. This discussion underscores three key reasons identified by Saunders et al. (2019) for the significance of integrating philosophy into one's study, particularly concerning research methodology. Firstly, philosophy aids researchers in refining and specifying their research methods, facilitating the establishment of a clear research strategy. This involves defining the type and source of evidence, interpreting that evidence, and determining its contribution to answering the research question. Secondly, understanding research philosophy empowers researchers to assess various methodologies and methods, enabling them to avoid inappropriate use and unnecessary work by recognizing the limitations of specific approaches early in the process. Lastly, research philosophy fosters creativity and innovation in researchers' approaches by encouraging consideration of previously unexplored methods or adaptation of existing ones. According to Saunders et al. (2019) it is essential to acknowledge and confront the underlying assumptions made throughout the research process. These assumptions relate to our beliefs concerning human knowledge (epistemological) and the nature of reality encountered during our research (ontological). By carefully developing a coherent set of assumptions, we establish a credible research philosophy that serves as a guiding framework for our methodological choices, research strategy, and procedures for data collection and analysis. This ensures the overall coherence and integrity of our research project, and the next paragraphs will give more info about our approaches and why we picked them.

3.1.2 Ontology

Ontology, as described by Al-Saadi (2014), is all about understanding what exists and how things work in the world. It's like looking at the big picture of reality and what we can learn from it, especially about how people relate to each other in society. Al-Saadi talks about two main ways of thinking about reality: objectivism and constructionism. Objectivism sees reality as something that's out there, independent of what we think or feel. It's like saying there's a set truth that we can discover through observation. On the other hand, constructionism says that reality is shaped by how we see things and the meanings we give them. It's like saying reality is what we make of it through our beliefs and interactions. Al-

Saadi explains more about these ideas, saying that objectivism sees reality as fixed and predictable, while constructionism sees it as more fluid and influenced by individual perspectives. In simpler terms, ontology is about understanding what's real and how we see the world around us, whether we believe it's out there waiting to be discovered or something we create through our thoughts and actions.

In our study, we've opted for an objectivist approach for multiple reasons. Firstly, it suits the quantitative nature of our research, focusing on empirical evidence and direct observation. Objectivism's emphasis on the independent existence of reality aligns well with our goal of uncovering patterns in ontology through systematic analysis. By prioritizing objectivity, we ensure the credibility and reliability of our findings, vital in quantitative studies. Overall, the objectivist approach provides a solid foundation for our study, enabling rigorous research into the nature of existence and reality.

3.1.3 Epistemology

According to Al-Saadi (2014), epistemology is all about our core beliefs regarding knowledge and how we understand the world. It deals with questions like what knowledge is, how much we can know, and how we know what we know. It provides a lens through which we see and make sense of the world, deciding what's possible to understand and what isn't. Just like with ontology, epistemology can be split into two main viewpoints: positivism and interpretivism. Positivism leans towards objectivity and concrete evidence when seeking truth. It separates facts from personal values, aiming for unbiased investigations that lead to general conclusions. For instance, extreme positivism in research focuses on uncovering observable facts or patterns, using data to build credibility, and meaning. It also looks for cause-and-effect relationships in the data, leading to broad generalizations akin to scientific laws. Interpretivism, on the other hand, takes a more subjective approach, delving into the complexities of human experiences and contexts. It acknowledges that humans are different from physical phenomena and prioritizes understanding the depth of insights over finding universal laws. Unlike positivism, interpretivism values capturing the richness of individual perspectives rather than aiming for one-size-fits-all conclusions.

For our study, the approach used is positivism for several reasons. Firstly, it prioritizes objectivity and empirical evidence, ensuring that our findings are grounded in concrete data rather than subjective interpretations. Secondly, as quantitative researchers, our goal is to uncover patterns and relationships within the data, which is facilitated by the positivist framework through statistical analysis. Lastly, by separating facts from personal values, the positivist approach helps maintain the integrity and reliability of our research.

3.1.4 Research design

Saunders et al. (2019) classify research into three main types: exploratory, descriptive, and explanatory. Exploratory research aims to gain a better understanding of an area or problem. Descriptive research seeks to describe a specific situation or problem, while explanatory research endeavors to identify relationships between variables based on theoretical expectations (Malhotra and Grover, 1998). However, a research question may serve more than one purpose, allowing for a combination of any of these three types (Saunders, Lewis and Thornhill, 2009). Our research question, outlined in Chapter 1.3, address our key question:

- Is there an effect on underpricing of IPOs by Inside ownership?

The purpose of explanatory research is to analyze a situation or problem and elucidate the relationship between variables. This type of research is commonly paired with quantitative data collection methods (Saunders et al., 2019). Quantitative research involves explaining phenomena by gathering numerical data and analyzing them using mathematically based methods. In our study, we aim to address a question of explanatory nature using a quantitative research method. Specifically, we seek to uncover connections between underpricing and insider ownership. If that's the scenario, we aim to delve further to comprehend which particular type of insider ownership has an influence. Opting for a qualitative approach would have deprived us of the objectivity inherent and it would be challenging to draw statistical conclusions.

3.1.5 Research strategy

Different research strategies exist for addressing research questions. These include experiments, surveys, case studies, grounded theory, statistical methods, ethnography, archival research, and action research. While each strategy can serve various research purposes (exploratory, explanatory, or descriptive), some are more suited to inductive or deductive approaches (Saunders et al., 2019). An inductive approach starts with specific observations or data, looks for patterns, and then develops theories or hypotheses based on what is observed. On the other hand, a deductive approach begins with a general theory or hypothesis and then tests it with specific observations or data.

This study adopts a descriptive strategy, which is recommended for identifying trends, correlations, and patterns within large datasets (Saunders et al., 2019). This strategy choice aligns with our goal of using quantitative measures to systematically explore the relationships between variables by testing hypotheses derived from theory. Specifically, the study seeks to describe and investigate the connection between insider ownership and the underpricing of Swedish IPOs, utilizing mathematical and statistical analysis. The bivariate analysis method will be employed, as outlined by Coolidge (2021), involving scrutinizing the relationship between a dependent variable (underpricing) and independent variables (insider ownership, etc.). Further details on the statistical method employed can be found in Chapter 3.3.

3.1.6 Research approach.

Patton (2015) suggests that the choice of research approach is mainly practical. She explains that qualitative research delves deeply into phenomena with limited input, contrasting sharply with the data-intensive nature of quantitative research. However, opting for a quantitative approach offers distinct benefits. Firstly, it facilitates gathering data from a larger sample size, enhancing representation. Secondly, quantitative methods enable the identification of patterns and relationships through statistical analysis, enhancing reliability and validity. Additionally, findings can be replicated across various contexts, ensuring consistency and generalizability. Lastly, quantitative research provides a structured framework, reducing bias and subjectivity.

The quantitative method used in this study is based on previous studies on IPOs and underpricing (see e.g. Ritter, 1984; Rock, 1986; Ritter and Welch, 2002; Loughran and Ritter, 2004; Kelly and Ljungqvist, 2012; Zhang and Neupane, 2024). The regression will be an OLS regression with is modeled after Zhang and Neupane (2024) and Harjoto and Garen (2005).

The quantitative method in comparison to the qualitative method in this type of study, could be biased from the inside ownership perspective, with adverse selection, and asymmetric information. This is in line with Kahneman and Tversky (1979) findings that individuals have

an asymmetric relationship between loss and gain. The prospect theory is therefore diametrical to the expected utility theory, building on the same basis as classic theories (see e. g. Modigliani and Miller, 1963). Furthermore previous literature indicates, (Jensen and Meckling, 1976; Myers and Majluf, 1984; Arthurs et al., 2008), that the agency problem becomes more complex if there is multiple principals and agents and if there is less separation between ownership and control. Table 1 highlights our choices regarding the scientific method.

Table 1 Scientific method

Scientific Method	
Ontology	→ Objective
Epistemology	→ Positivism
Research Design	→ Explanatory
Research Strategy	→ Descriptive
Research Approach	→ Quantitative

3.1.7 Ethical research practices and methodological rigor

Ethical research practices prioritize integrity, fairness, and well-being for all involved. Researchers are tasked with upholding transparency and integrity, balancing interests like knowledge pursuit and privacy protection. Good research practice involves adherence to established frameworks, laws, and norms to ensure reliability, honesty, respect, and responsibility (Vetenskapsrådet, 2023).

Our thesis upholds these principles by meticulously following ethical guidelines. As a quantitative study, we employ structured methods to minimize ambiguities, enhance reliability, and facilitate assessment. Additionally, we source data from public sources, reducing the risk of causing harm or discomfort to individuals.

To minimize the risk of incorrect conclusions, [Saunders et al. \(2019\)](#) emphasizes the importance of ensuring both the reliability and validity of research. Reliability refers to the consistency of findings obtained through data collection and analysis processes. Our data, sourced from reputable databases such Refinitiv Eikon and the Swedish Tax agency “Skatteverket”, is regularly updated and reliable (see Table 2 for additional sources). Independent variables were gathered from the prospect of each IPO using a standardized procedure detailed in Chapter 3.2.2 *Data Collection*. This data was meticulously documented in Excel. Additionally, to ensure a high-quality sample, only prospects meeting rigorous criteria were included, as outlined in Chapter 3.2.3 *Sample Selection*. Validity pertains to whether findings accurately reflect the intended research focus and the extent to which they can be generalized. With a final sample of 165 IPOs, our research surpasses the necessary sample size for applying the Central Limit Theorem, ensuring both reliability and validity. This large sample size enhances the generalizability of our research findings.

3.2 Practical method

The Practical method chapter includes a description of the sources used for the data collecting, the sample selection process, the type of modeling used for the quantitative study and variable definition. In this chapter all stages of the construction of the sample and the inference methodology, considerations of statistical analysis and definition of variables. Lastly, how the literature search was conducted.

3.2.1 Literature search

According to Wisker (2022, pp.124–126) when digging into research, a literature search is like a treasure hunt. It's about systematically exploring all the relevant writings to get a clear picture of what's out there on a particular topic. Wisker suggests a smart approach called a "modified systematic literature review". This method helps cover all the important bases while focusing on what matters for our research question. It's like using a GPS to navigate through a sea of information, saving time and keeping us on track. Additionally, Timmins and McCabe (2005) acknowledge the critical importance of effective literature searching in a similar way as Wisker, emphasizing even further on the significance of a systematic and organized approach. One example of this is employing appropriate keywords to capture all relevant literature. These keywords should include synonyms and alternative terms, as well as partial words that are similar and relevant to the research question. Lastly, they highlight how important it is to narrow down your topic in the first stage of keyword development. This involves starting with one keyword related to your topic and then gradually adding more.

The aim of this literature search isn't solely about accumulating facts. It's about gaining insight into the current discourse within the field. Understanding what other researchers are discussing, the evidence they're employing, and how their ideas compare is crucial. By engaging with key theories, we can focus on what's most pertinent. Delving into the literature involves more than passive reading; it entails identifying patterns, themes, and recurring ideas. From this analysis, an informed foundation is established, enabling a substantive contribution to the field by leveraging existing scholarship (Wisker, 2022, pp.124–126).

In our study, we adhered to and followed a structured and systematic research approach previously described by Timmins and McCabe (2005) and Wisker, 2022 (pp.124–126). By starting with keywords identification and searching for everything relevant in the form of recent articles in mostly famous finance and economics journals. We proceeded by selectively reading materials pertinent to our study, examining the references cited in these articles to discern key theories and recent studies in our field. Certain journals also suggested renowned articles aligned with our research area, aiding us in the initial stages of our investigation. This enabled us to take notes on relevant articles, a practice endorsed by Timmins and McCabe (2005), facilitating the categorization of articles, and providing an overview of the current landscape related to our chosen topic, thereby pinpointing the research gap.

In our search for scholarly articles, we mainly relied on esteemed economic journals, Google Scholar, and the online repository "UmUB" provided by Umeå University for granted access. Moreover, physical copies of articles and books were obtained through the Umeå library. The pivotal role of the Umeå University library in facilitating access to resources from databases such as Google Scholar and reputable journals augmented the credibility of the sources utilized, as their accessibility underwent examination. Our selection criteria exclusively favored peer-reviewed articles, and particular emphasis was placed on works with significant citation counts to ensure the inclusion of high-quality research.

Main keywords we have used: IPO, insider ownership, ownership structure, capital structure, agency problem, underpricing, ownership, IPO process, hot & cold markets,

3.2.2 Data Collection

The data collection has predominantly done by primary sources, this is to ensure the quality of the information. All data that has been collected from secondary sources have been cross-referenced. This is to control that the data is correct.

The thesis data has been collected from different sources; the main source is Swedish Tax Agency (Skatteverket, 2024). This is to collect the registered date of the IPO, company origin, introduction price, and type of offering. This has been cross-referenced with the prospectus from the companies found at the Financial Supervisory Authority prospectus registry, company, or underwriter website (Finansinspektionen, 2024). Also cross-referenced from the EIKON database (Refinitiv, 2024). The firm-level characteristics have been collected from the IPO prospectus. The Underpricing has been collected from Affärsvärldens IPO guide (Affärsvärlden, 2024), this has been cross-referenced with Nasdaq and First North to control the validity of the data. Table 2 reports the different sources (Nasdaq, 2024a; 2024b).

Table 2 Primary & secondary sources

The table presents the different sources that have been used to collect data and cross-reference to control the data.

CF= Cross-Reference

X= Source Used

Year 2017-2021	IPO date	Prospectus	SIC code	Underpricing
Swedish Tax Agency	X			
Financial Supervisory Authority	CF	X		
Company Investor Relations		X		
Underwriter website		X		
Affärsvärlden				X
Stock Market				CF
EIKON	CF		X	

3.2.3 Sample Selection

The total amount of IPOs during the period 2017-2021 is 460 registered on all official stock markets, this includes Nasdaq, First North, NGM Growth Market, and Spotlight (formerly named Aktietorget). Due to the different quality and disclosure requirements in the prospectus NGM Growth Market, and Spotlight have been excluded companies registered in other countries, due to possible different law systems and taxation. All Prospectus that offers units with options included in the offering price is excluded, due to the premium bought and not exercised on the initial day of trade. Unsuitable data is data not found on the Financial Supervisory Authority's prospectus register, underwriter, or company website. The data could also be excluded due to unclear presentation of financial reports or in another currency than Swedish Krona. Table 3 presents the sample characteristics by year and restriction criteria.

Table 3 Sample

Year	2017–2021	2017	2018	2019	2020	2021	Sample (2017–2019)	Sample (2020–2021)
Swedish Tax Agency	460	123	71	48	54	164	242	218
List exclusion	145	47	31	17	14	36	95	50
Foreign registration	26	3	9	5	4	5	17	10
Unit exclusion	69	13	5	6	13	32	24	45
Unsuitable data	55	18	5	5	6	21	28	27
Total	165	42	21	15	17	70	78	86

3.2.4 Outlier definition

According to, Sullivan, Warkentin and Wallace (2021) in academic literature the outlier is not well defined in general, the x and y outliers are hard to define in academic literature in finance and on IPO the usage of winsorizing is used to minimize the effects of extreme values. In the winsorizing method used in this thesis an outlier is defined as the 1,25% in the top and bottom of the sample of all variables, this includes the y and x variables (see Table 5).

3.3 Modeling

The modeling of the thesis inference is built primarily Zhang and Neupane (2024) for fixed effects, firm-level characteristics, and the COVID-19 variable. The inside ownership and the subgroups are in percentage measurement modeled after Harjoto and Garen (2005) with modification.

The regression model that will be used is an Ordinary Least Square (OLS) regression. Sallis et al. (2021, p.176) describe the OLS regression as a method to measure the linear relationship between two variables, the dependent (Y) variable and the independent (X) variable. The explanatory value of the regression R squared. This value will describe how much the independent variables explain changes in the dependent variable. The significance of the regression models' independent variables is measured by the coefficients t-value. In this thesis the significance level of 10%, 5%, and 1%. The significance levels determine if the null hypothesis is not accepted or accepted.

3.3.1 Inference considerations & critique

In the thesis, to ensure the sample representativeness modifications for extreme value sensitivity of the OLS regression are considered. Since the definition of outliers in previous literature is vague, therefore the analysis of data will be conducted with three regressions. The three methods used are regular OLS regression, robust OLS regression, and OLS regression with winsorizing of 1,25% on both sides. The choice has been made to do three different OLS regression with different statistical methods to see if the results are affected by the extreme values and deviate from the initial OLS regression.

Due to the outlier dilemma described by Sullivan, Warkentin and Wallace (2021) in financial literature has been handled in three ways to ensure representativeness. This is regular OLS regression, a winsorizing method, and a robust regression to control for heteroscedasticity.

Sullivan, Warkentin and Wallace (2021) argue that the winsorizing method is a commonly used method of handling outliers in a sample in finance. The disadvantage of using this method is that it doesn't consider the representativeness of the extreme values. Although commonly used there is no theoretical support for this method. The method is one of the

simpler methods to exclude extreme values. Sullivan, Warkentin and Wallace (2021) also describe the method of trimming, where extreme values are excluded from the analysis. The winsorizing method is the compromise between excluding extreme values and keeping them in the OLS analysis. The conclusion is that as the sample is small a certain correction for both y and x outliers is needed to be representative of the population of 460 observations with a sample of only 164 observations.

The method used in this study for representativeness of the sample winsorizing of 1,25% on each side has been applied, with robust regression and no effect. Traditionally on larger samples 1% winsorizing has been applied to the total sample (Boone, Floros and Johnson, 2016; Sonu, 2022). However, due to the small sample, 2,5% is chosen for this thesis.

However, the robust regression option is more stable against outliers according to Cable and Holland (2000) that describe the robust OLS regressions are less sensitive to outliers. This is due to the change of weight that is assigned to the observations in the regression. In contrast to winsorizing the data, the robust method does not change the observations value in the percentile chosen (1,25%). It gives the observation a smaller weight and effect on the dependent variable. In the article Zhang and Neupane (2024) use this outlier criteria for all regressions.

The regression method used is an Ordinary Least square (OLS) regression, the OLS regression estimates a linear correlation between the dependent variable (Y) value and the independent variables (X).

To test the hypothesis, one regression model has been created (see below):

$H_1 = \text{Underpricing is greater with greater inside ownership.}$

$$UNDER = \alpha + \beta_1 COVID19_i + \beta_2 INSIDE + \beta_5 SIZE + \beta_6 MB + \beta_7 LEV + \beta_8 ATO + \beta_9 PROF + \beta_{10} IMARKET_i IND (FE) + e$$

If there is any significance of inside side ownership an additional test is conducted to determine if any subgroup has a greater influence than others.

Additional test

$$UNDER = \alpha + \beta_1 COVID19_i + \beta_2 CEO + \beta_3 BOARD + \beta_4 MGMT + \beta_5 SIZE + \beta_6 MB + \beta_7 LEV + \beta_8 ATO + \beta_9 PROF + \beta_{10} IMARKET_i IND (FE) + \varepsilon$$

Table 4 Summary of variable definitions

Variable	Data Analysis	Description
<i>Dependent variable</i>		
Underpricing	<i>UNDER</i>	Closing price first day minus offering price, divided by offering price
<i>Independent variables</i>		
<i>Inside ownership</i>		
Insiders	<i>INSIDE</i>	Total inside ownership divided by total amount of stock, (pre-IPO)
CEO	<i>CEO</i>	Total CEO ownership divided by total amount of stock, (pre-IPO)
Board members	<i>BOARD</i>	Total Board ownership divided by total amount of stock, (pre-IPO)
Management	<i>MGMT</i>	Total management ownership divided by total amount of stocks, (pre-IPO)
<i>Control Variables</i>		
<i>Firm-Level Characteristic</i>		
Asset turn over	<i>ATO</i>	Revenue divided by total assets at the time of listing
Log (Total Asset)	<i>SIZE</i>	The Logarithm of total assets at the time of listing
Leverage	<i>LEV</i>	The total liabilities divided by total assets at the time of listing
Market-to-Book	<i>MB</i>	Market value of total amount of stocks divided by the total book value of equity at time of listing
Profitability	<i>PROF</i>	Earnings (EBIT) divided by total assets at time of listing
<i>Dummy</i>		
COVID-19 pandemic	<i>COVID – 19_i</i>	1 st of January 2020 to 31 st of December 2021
Market	<i>MARKET_i</i>	Listed on Nasdaq or First North at time of listing
<i>Fixed effect</i>		
Industry	<i>IND</i>	Issuers Primary Standard Industry (SIC) code (First digit used)

3.3.2 Variable definition

The definition of variables follows Zhang and Neupane's (2024) construction and modeling of variables. The inside ownership is modeled after Harjoto and Garen (2005) as a percentage for inside ownership. The variables have been defined not only by the two main articles although also by previous literature on IPO underpricing. Since its central to be able to replicate the study. If no other comment on the variable definition, it's modeled from the two main sources for the definition. Some accommodation to sample size has altered the variables, this is noted in the definition. Table 4 provides a summary of variable definitions.

The underpricing is calculated with the Holding Period Return (HPR) this follows the procedure of the previously used method in IPO underpricing (Boulton, 2022; Chan et al., 2023; Zhang and Neupane, 2024). The method uses the closing price of the first day of trading minus the initial offering price of the stock in a prospectus divided by the initial offering price. This method is commonly used to calculate underpricing in academic literature, and this thesis follows suit by adopting it based on previous studies.

$$\text{Underpricing} = \frac{\text{Closing price} - \text{Initial offering price}}{\text{Initial offering price}}$$

The inside ownership is calculated based on ownership of the stock offered (b stock). Due to the ownership of preferences stock has a higher voting power and value. The underpricing of the type of stock being offered is not transferrable to other types of stock. This is in line with

previous ownership structure studies (Su, 2004; Hill, 2006; Elston and Yang, 2010). The percentage of stocks owned by inside owners are calculated in accordance with Harjoto and Garen, (2005) calculation of inside ownership, however, they do not disclose the type of stock or exclusion of stock.

$$\text{Inside ownership (INSIDE)} = \frac{\text{Total amount of stocks owned by management, board members \& CEO}}{\text{Total amount of stocks pre-IPO}}$$

$$\text{CEO, BOARD or MGMT ownership} = \frac{\text{Amount of stocks owned by management, board members or CEO}}{\text{Total amount of stocks pre - IPO}}$$

The model by (Zhang and Neupane, 2024) requires a control variable on firm-level characteristics, this is supported by previous literature, (Boulton, 2022; Zeng, Liu and Chan, 2024). To capture the unique features of companies, heterogeneity between the companies in the sample could be an industry feature of financial intermediaries and firm-level. A comparison could be a SPAC firm and an industrial production company. The assets of the company are not structured similarly. The industrial production company owns machines and raw materials. In contrast to the SPAC firms that are shell corporations for raising capital for companies. That doesn't necessarily have a substantial amount of material assets. Further support for firm-level characteristics by Dang, (Frank) Li and Yang (2018)

The data is collected directly from the prospectus, discrepancies might incur due to mostly large sample academic articles using secondary sources.

Firm-level Characteristics

Firm Size is our metric used to quantify the scale of a company's operations, measured by the natural logarithm of its total assets upon listing, to control for the size of the issuing firm. We adopt this widely used logarithmic transformation, following Zhang and Neupane (2024), to handle the large differences in numbers, simplifying data interpretation and analysis.

$$\text{Size} = \log(\text{Total assets}), \text{ at the time of listing}$$

Market-to-Book (MTB) ratio is determined by dividing the total market value of a company's outstanding stocks by the book value of its assets at the point of listing, to control for a firm's growth opportunities. This ratio provides insight into how the market perceives the value of a company relative to its accounting value. In essence, it reflects the premium (or discount) investors are willing to pay for each unit of book value.

$$\text{Market - to - Book value} = \frac{\text{Market value at Introduction date}}{\text{Book value of assets}} \text{ (at the time of listing)}$$

Asset turnover, derived by dividing a company's total revenue by its total assets at the time of listing, serves as a crucial measure. It allows us to assess how efficiently the company utilizes its assets to generate revenue, offering valuable insights into its operational efficiency. By analyzing this ratio, we gain a deeper understanding of the company's ability to generate income in relation to its asset base, providing valuable insights into its performance in optimizing asset utilization and maximizing revenue potential.

$$\text{Asset Turnover} = \frac{\text{Revenue}}{\text{Total assets}} \text{ (at the time of listing)}$$

Profitability, calculated by dividing Earnings before Interest and Taxes (EBIT) by Total assets at listing, assesses how effectively a company generates profits from its assets. This control variable offers valuable insights into a company's ability to generate profits relative to its assets.

$$\text{Profitability} = \frac{\text{Earnings (EBIT)}}{\text{Total assets}} \text{ (at the time of listing)}$$

Leverage, calculated by dividing Total debt by Total assets at listing, helps control the capital structure of the issuing firm. By integrating Leverage as a control variable, we can effectively account for the potential influence of debt levels on various outcomes under investigation, thereby enhancing the accuracy and reliability of our findings.

$$\text{Leverage} = \frac{\text{Total debt}}{\text{Total assets}} \text{ (at the time of listing)}$$

Fixed effect variables

COVID-19 is a dummy variable in the regression. The dummy variable is from January 2020, until the end of 2021 all other years are zero. This is following (Boulton, 2022; Zeng, Liu and Chan, 2024) as previous pandemic-related literature does not show any significance on the starting dates between January 2020 and March 2020. This is to control that the results from Zhang and Neupane (2024) of a non-significant effect on underpricing is the same for our sample since this was significant for the regression on the international sample of IPOs. This also confirms the results of Rubesam and Raimundo (2022) that Swedish investors' behavior was not affected by the COVID-19 pandemic.

Industry fixed effect is created with the four-digit Primary Standard Industrial Classification (SIC) code provided in the controlling for the Primary line of business of the issuer of the IPO. The information was collected from EIKON on the 29th of April 2024. This is in accordance with previous literature on IPOs in regression models, (Nielsson and Wójcik, 2016; Zhang and Neupane, 2024). Furthermore, the type of Industry Standard Industrial Classification varies, for this thesis the SIC is collected from DataStream/Eikon and the record for IPOs registered (Refinitiv, 2024). Modification for the small sample size is done by only using the first identifying number in the SIC number. This number describes the main feature of the industry.

Year fixed effect variable is based on Zhang and Neupane (2024) and supported by Dang, (Frank) Li and Yang (2018, p.22). The year fixed effect is created for the year that the firm goes public and not on the year that they publicize the announcement of their IPO. The years have been taken from a primary source, the Swedish Tax Agency registry of stock history of all companies in Swedish history from 1989. For the sample the years are regarding 2017 to

2021. The variable is used to control for endogeneity in the sample as is a common praxis in finance research. However, this variable needed to be excluded due to collinearity with the COVID-19 variable as they both measure time. This causes 2021 to be emitted from the regression and this affects the results.

4 Result & Analysis

The chapter Result & Analysis includes descriptive statistics and the OLS regressions. The descriptive statistics depict the independent and dependent variables mean, standard deviation, maximum, minimum and percentiles. A scatterplot figure is added to visually display any initial indication of correlation between underpricing and inside ownership. Lastly, the tables of the two regression models are presented and analyzed.

4.1 Descriptive statistics

Table 5 Descriptive statistics

The table display the mean, standard deviation, maximum, minimum and percentiles for the variables and the time of use. Total observations are 164 observations. The values int the table are unmanipulated by winsorizing 2,50%. Categorized in accordance with type of variable definition.

		Ownership variables					Firm-level Characteristics				
		UNDER	INSIDE	CEO	BOARD	MGMT	ATO	LEV	MB	SIZE	PROF
		%	%	%	%	%	Ratio	%	Ratio	Log	%
Observations		164	164	164	164	164	164	164	164	164	164
Mean		15,21	36,02	9,00	22,58	4,44	10,58	54,80	685,32	5,10	-14,11
Std. Deviation		33,03	30,23	15,11	24,66	9,05	123,73	32,56	7837,31	2,29	72,84
Minimum		-70,18	0,00	0,00	0,00	0,00	-0,019	0,00	-191,47	-3,69	-798,53
Maximum		175,56	100	100	100	65,21	1579,98	254,95	10000	11,92	62,85
Percentiles	1	-52,50	0,00	0,00	0,00	0,00	0,00	0,37	-55,81	-3,00	-279,67
	5	-21,54	0,60	0,00	0,00	0,00	0,00	6,00	1,14	1,84	-78,63
	10	-13,04	2,33	0,00	0,29	0,00	0,00	13,36	1,54	2,76	-34,45
	25	-1,08	10,07	0,21	1,97	0,00	0,04	31,92	4,15	3,66	-8,74
	50	8,96	28,72	1,98	13,21	0,69	0,32	56,15	7,74	4,75	0,55
	75	27,39	59,19	10,18	35,93	4,78	0,95	72,50	19,72	6,70	5,17
	90	50,00	81,82	26,56	64,30	12,76	1,66	89,70	59,94	7,97	12,43
	95	77,14	95,74	36,52	70,56	17,61	2,22	97,60	113,88	8,72	18,43
	99	161,29	100,00	80	98,79	53,61	39,70	151,90	9420	10,22	57,12

The descriptive statistics in Table 5 show the variables that are used in the regression model, the observations are in total 164 for all variables. The table included the median, mean, standard deviation, maximum and minimum, and percentiles 1%, 5%, 10%, 25%,50%, 75%,90%,95% and 100%. The ratios are presented below the variable to indicate what type of measurement is presented.

Table 5 for the underpricing is in line with Ritter and Welch (2002) results that underpricing is persistent and that it increases with time. The result of a mean of 15,21% of underpricing is

consistent with an increase since the result of 10,49% from the years 1998 to 2018. The discrepancy between the underpricing result of 15,21% and Zhang and Neupane (2024) result for the 2015 to 2021 mean of 16,2% could be because they included more years. Noteworthy is that the sample of Zhang and Neupane (2024), Ritter and Welch (2002), and this study of the Swedish IPO introductions are the same.

Furthermore, the results from previous studies are also done on larger international samples. The country-specific results and samples regarding Sweden are small and the period that the samples are used in is longer. This could create deviating results for the same period.

Inside ownership Harjoto and Garen (2005) show that on an international level, the inside ownership is on average 60,34% and 65,87% before an IPO, and the mean was 42,42% for the whole sample. The mean result of 36,02% is comparatively low on the Swedish stock market. This discrepancy could be explained either by a change in ownership structure over time or that the ownership has been calculated on the total amount of stocks. In this study, we have only calculated the amount of the offered stock in the IPO. As for the ownership by CEO the mean was 16,22% in the study by Harjoto and Garen (2005) is higher than the result of a mean of 9%. As the results of Management and Board are unparalleled with other studies the previous results would indicate that the Board of Directors (24,66%) and management (4,44%) ownership is lower than international levels of inside ownership.

The firm-level characteristic descriptive statistics indicate that the standard deviation for the Market-to-Book ratio and Asset Turnover has a wide range that would be considered a long tail. The standard deviation for the Market-to-Book ratio 7837,21, the percentiles of 95% (113,88) and 99% (9420) shows that the firms with low assets and high perceived markets value create a skewness in the sample in relation to normal distribution. As the maximum is 10000 and the minimum value of -191,47 shows a wide range in the sample. However this is due to the book value of companies in the IPO being negative or small, and some that have a high market value.

Furthermore, the same could be argued for the descriptive statistics for the Asset turnover, with a mean of 10,58 and a standard deviation of 123,73. The maximum of 1579,98 could be considered an extreme value as the 95th percentile value is 2,2 and the 99th percentile is 39,70.

Noteworthy are the results for the Profitability, with a negative mean of -14,11% and a standard deviation of 72,84%. This sample shows a skewness in a negative direction and a minimum value of -798,73 and the 1st percentile are -279,67. The results from this show that IPOs in the Swedish market have a low or negative profitability at the introduction date.

Furthermore, the leverage mean is 54% and one standard deviation is 32.56%. This means that 68% of the firms have a leverage between 21,44% and 86,56%. The maximum leverage is 254,95% and the minimum is 0%. The sample has a skewness towards the maximum value, The 99th percentile value is 151,90% in leverage.

Firm size is the logarithm of total assets to translate the conversion the mean is 5,10, which is approximately 164 million SEK. The standard deviation is 2,29 which is the equivalent of 9,9 million SEK. The sample within 68% is between the value of 154 million SEK to 173 million SEK. The maximum value is 11,92 with a value of 150 725,95 million SEK. The minimum is -3,69 and has total assets of 0,025 million SEK.

The results on the Firm-level characteristics show long tails in the 1st and 99th percentiles from minimum and maximum values. This could be an indication of extreme values in the sample since the 1st and 99th percentile represent 1,64 observations in the sample. The discrepancy between the two values is noteworthy.

Figure 1 Scatterplots of Underpricing and Inside Ownership

Preliminary indication of correlation between Underpricing and Ownership

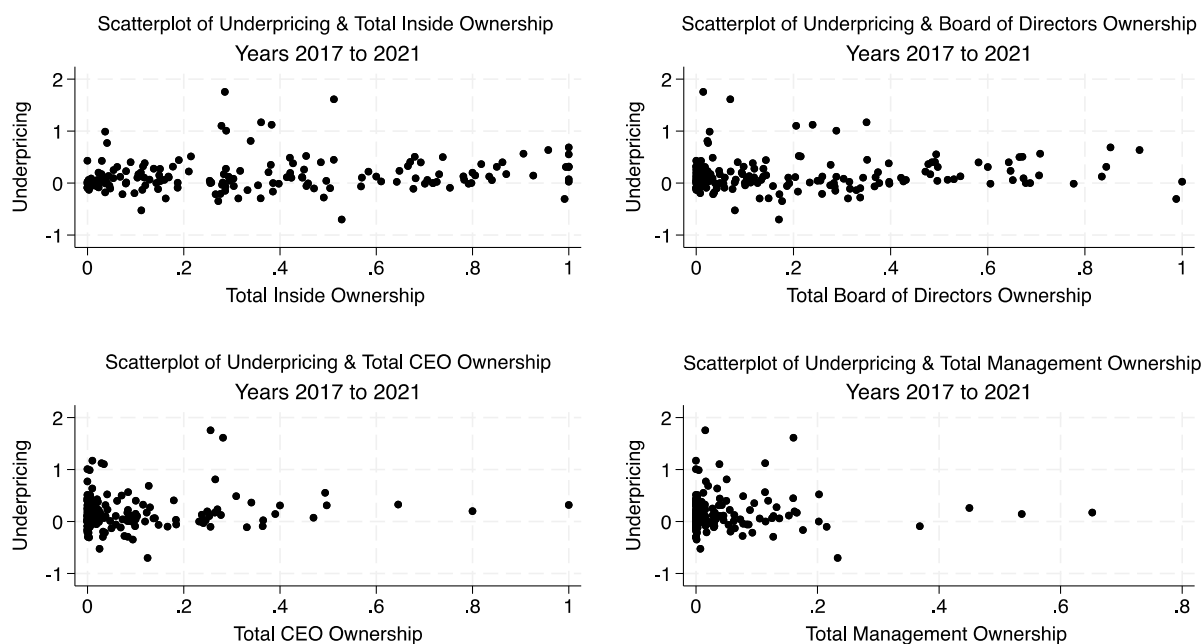


Figure 1 depicts the scatter plots of the relationship between underpricing and inside ownership in total and in subgroups. The initial scatter plot shows a preliminary instinctual visual picture of the linear relationship between the independent and the dependent variable. This creates a visual understanding of potential outliers and the main concentration of the sample. The scatterplots show a variance between 200% to -100% in underpricing. Most of the observations are one standard deviation (33,03%) from the mean of 15,21%, with a maximum of 175,56% and minimum of -70,18% for underpricing.

For the Scatterplot for Total Inside Ownership with a concentration of observations below 50% of ownership. The mean in the sample of Total Inside Ownership is 36,02%, and one standard deviation is 30,32%. This stipulates that 68% of the sample has a total ownership between 6,00% and 66,34%. There are approximately 3 observations that potentially could be outliers in relation to underpricing and could affect the result of the OLS regression.

From the scatterplot for total Board of Directors Ownership the concentration of observations is below 50% of ownership. The mean in the sample of total Board of Directors Ownership is 22,58% and one standard deviation is 24,66%. This stipulates that 68% of the sample has total ownership between 0% and 47,24%. Two observations could be considered outliers in relation to underpricing and could affect the OLS regression.

The Scatterplot for Total CEO Ownership The main concentration of observations is below 50% of ownership. The mean of the sample is 9% and one standard deviation is 15,11%. This shows that 68% of the sample owns 0% and 24,11%. Visually there is two that could be considered outliers in the relationship between CEO and underpricing.

The last scatterplot shows the Total management Ownership with a concentration of observations below 50% of ownership. The mean in the sample is 4,44% and a standard deviation of 9,05%. This group depicts that 68% of the sample has an ownership between 0,00% and 13,49% ownership. In relation to underpricing the three are one that could be considered the outlier and could affect the OLS regression.

The analysis from the descriptive statistics shows that the relationship between underpricing and ownership that all categories have a mean of ownership below 50%. Furthermore, the only group that owns more than 50% within one standard deviation is the Total Inside Ownership. The subgroup with the highest total ownership is the Board of Directors and the lowest ownership total is the Management category.

4.1.1 Model diagnostics

The study has conducted a multicollinearity test to exclude high correlation between independent variables. Stuart et al. (2007) describe two methods to examine the correlation of independent variables, the correlation matrix and variance inflation factor (VIF).

In the multicollinearity test with the variance inflation factor (VIF), according to Jacob and Varadharajan, 2023 (p.4369) the common rule of thumb is that a VIF result of 10 is an indication of a high multicollinearity. However, previous literature indicates, (O'Brien, 2007, p.684), that a lower number should be used equal to or higher than 4. The VIF test for the regression with a fixed effect for the total inside ownership regression of the independent control variables none exceed the value of 2,20. For the regression with the subgroups of inside ownership, the VIF test gives a 2,21 as a maximum value as a variance inflation factor for control variables.

To assess the correlation between independent variables, Argyrous (2011, p.272) indicates that the rule of thumb for assessing is that if the correlation is higher than or equal to 0,8, it's considered high multicollinearity. The correlations matrix in Table 6 does not indicate that there is any significant correlation above 0,8 between the independent variables. This strengthens the validity of the study.

Table 6 Correlation matrix

	UNDER	COVID-19	INSIDE	CEO	Board	MGMT	ATO
UNDER	1,000						
COVID-19	0,063	1,000					
INSIDE	0,136	-0,033	1,000				
CEO	0,133	0,061	0,541	1,000			
Board	0,081	-0,137	0,785	-0,006	1,000		
MGMT	0,012	0,162	0,30	0,153	-0,093	1,000	
ATO	-0,027	-0,080	0,073	0,083	0,053	-0,038	1,000
LEV	-0,084	-0,057	0,057	0,093	0,003	0,026	0,059
MARKET	-0,033	-0,002	-0,369	-0,117	-0,332	-0,132	-0,045
MB	-0,059	0,081	0,014	-0,045	0,053	-0,023	-0,006
PROF	-0,144	0,192	0,092	0,091	0,025	0,089	0,009
SIZE	0,013	0,184	-0,242	-0,021	-0,269	-0,041	-0,083

	LEV	MARKET	MB	PROF	SIZE
LEV	1,000				
MARKET	0,122	1,000			
MB	-0,121	0,124	1,000		
PROF	0,049	0,061	0,016	1,000	
SIZE	0,247	0,452	-0,329	0,192	1,000

For underpricing the correlation is positive for all inside variables ownership. For the firm-level characteristics, the relationship is inverse. Showing a negative correlation, except for size. This indicates that as underpricing increases the firm-level characteristics decrease. The correlation that is most negatively correlated is PROF (-0,144). The interpretation of this is that if the Return on Assets is low the underpricing of the stock increases.

The highest correlation noted is INSIDE and BOARD has a high correlation number of 0,785. However, this can be dismissed since they are not in the same regression. Furthermore, this pattern could be observed for all ownership variables in the matrix, as they measure the same value by different definitions. Noteworthy is the negative results between INSIDE and SIZE - 0,242, this is consistent overall for inside ownership. That the size of the firm decreases when inside ownership increases.

Noteworthy, for the firm-level characteristics the correlation between market and size is 0,452, this can be explained that Nasdaq and First North have different criteria for introduction. This would indicate that the size of the firm dictates the choice of market to introduce the stock. Furthermore, Market-to-book and size have a negative correlation of - 0,329. Indicating that when one increases the other decreases. This could suggest that the firms with a smaller ratio of market value and book value decrease as the firms become larger.

Furthermore, the COVID-19 variable has an increased correlation with a size of 0,452. This could indicate that the bigger firms have chosen to go public during the COVID-19 pandemic. The correlation matrix indicates that during the COVID-19 pandemic larger firms chose to go public and these firms had lower total inside ownership. However, the CEO and MGMT are positively correlated with the COVID-19 variable compared to the other inside ownership variables. Noteworthy, is the negative correlation between BOARD of -0,137. An indication that the Board of Directors owns less of the offered stock than in the pre-pandemic period.

4.2 Main results

The OLS regressions presented below display the independent variables, the coefficient is presented beside the name. Underneath, in the parentheses, the t-statistics are presented. The significance level is expressed with *, **, and *** for 1%, 5% and 10%. R squared represents the amount the regression explains the underpricing of the IPO. The method of dealing with outliers is presented below the name of the regression. This is either no method, robust regression, or winsorizing.

Table 7 OLS regressions of Underpricing and Total Inside Ownership

Outlier method Variable	<i>OLS regression</i>	<i>OLS regression</i>	<i>OLS regression</i>
	<i>None</i>	<i>Robust</i>	<i>Winsorized (2,5%)</i>
COVID-19	0,08 (1,37)	0,08 (1,36)	0,08 (1,45)
INSIDE	0,23** (2,40)	0,23** (2,71)	0,20** (2,24)
ATO	0,00 (-0,29)	0,00 (-1,44)	0,03** (2,21)
MB	0,00 (-1,45)	0,00** (-1,92)	0,00** (-2,49)
LEV	-0,11 (-1,34)	-0,11 (-1,19)	-0,03 (-0,38)
PROF	-0,08** (-2,02)	-0,08 (-1,56)	-0,07 (-1,10)
SIZE	-0,01 (-0,35)	-0,01 (-0,27)	-0,02 (-1,30)
Market (FE)	0,08 (1,05)	0,08 (1,26)	0,09 (1,39)
Constant	0,04 (0,11)	0,04 (0,27)	0,27 (0,80)
<i>Fixed Effects</i>			
IND (FE)	Yes	Yes	Yes
Observations	164	164	164
R ²	0,1269	0,1269	0,1544
T-value for t-statistics test the regressions are presented below estimated coefficients in parenthesis. Fixed effects are marked with (FE). The significance level of the t-statistics test is stated by the estimated coefficient with ***= 1%, ** = 5% and *= 10%			

The first regression shows that COVID-19 is not significant in the sample with a t-statistic of 1,37. The variable that is statistically significant of the firm-level characteristics is Profitability (PROF) and has a negative effect on underpricing. With a coefficient of -0,08

and a statistical significance of 5%. The INSIDE variable represents the Total Inside Ownership and is the amount of the total ownership of the b stock. This would indicate that going from zero to full Total inside ownership affects the Underpricing with 0,23 (23%). R squared for the regression is 0,1269 (12,69%), this means that the regression explains 12,69% of the changes in underpricing.

The Robust OLS regression shows that COVID-19 does not significantly affect underpricing. The firm-level characteristic that is statistically significant is Market-to-Book with a t-statistic of -1,92 and a significance level of 5%. The INSIDE variable (Inside ownership) is significant on a 5% level. R squared for the regression is 0,1269 (12,69%) the regressions' independent variables explain 12,69% of the change in underpricing.

OLS regression with winsorizing shows that COVID-19 does not affect does not affect underpricing. The firm-level characteristic variables that are statistically impacting the underpricing are Market-to-book and Asset turnover both on a 5% significance level (**). The coefficients are (ATO) 0,03 and (MB) 0,00, this indicates that the effect of the coefficient is smaller effect on the linear correlation although significant. The R square value for the regression is 0,1544, the regressions independent variables explain 15,44% of the change in underpricing.

The results are consistent with Zhang and Neupane (2024) that the COVID-19 variable is not significant for Sweden and for any of the regressions. Noteworthy is that the dummy variable for COVID-19 t-statistics increases with correction for heteroscedasticity. The firm-level characteristic does not differ between the robust regression and regular regression. Although the correction by the robustness decreases the t-statistics. For the winsorized regression the t-statistics increase, however not statistically significant to effect underpricing.

Furthermore, the result of INSIDE is significant on a 5% level for all three regressions. The coefficient for INSIDE (Inside Ownership) remains unchanged between the regular and robust regression. The t-statistics with robustness display an increased significance of 2,71 from 2,40 in the regular regression. In the winsorized, the t-statistics decrease the t-statistics to 2,24. R square increase with winsorized sample, this could be explained by the method not including the 1,25% of observational values. This increases the explanatory value.

The hypothesis examines if underpricing is greater with greater total inside ownership. The empirical finding is that the null hypothesis is rejected with a significance level of 5% for INSIDE for all regressions performed.

4.3 Additional test

Table 8 OLS regressions of Underpricing and Inside Ownership in subgroups

Outlier method	<i>OLS regression</i>	<i>OLS regression</i>	<i>OLS regression</i>
	<i>None</i>	<i>Robust</i>	<i>Winsorized</i> (2,5%)
Variable			
COVID-19	0,08 (1,32)	0,08 (1,37)	0,08 (1,40)
CEO	0,31* (1,68)	0,31* (1,71)	0,19 (1,16)
BOARD	0,21* (1,74)	0,21* (1,76)	0,19* (1,81)
MGMT	0,20 (0,67)	0,20 (0,97)	0,25 (0,91)
ATO	0,00 (-0,32)	0,00* (-1,71)	0,03** (2,18)
MB	0,00 (-1,37)	0,00* (-1,88)	0,00** (-2,48)
LEV	-0,12 (-1,36)	-0,12 (-1,19)	-0,03 (-0,37)
PROF	-0,08 (-1,36)	-0,08 (-1,55)	-0,07 (-1,09)
SIZE	-0,01 (-0,33)	-0,01 (-0,25)	-0,02 (-1,30)
Market (FE)	0,07 (0,97)	0,07 (1,18)	0,09 (1,39)
Constant	0,03 (0,08)	0,03 (0,20)	0,27 (0,80)
<i>Fixed Effects</i>			
IND (FE)	Yes	Yes	Yes
Observations	164	164	164
R ²	0,1284	0,1284	0,1546
T-Value for t-statistics test the regressions are presented below estimated coefficients in parenthesis. Fixed effects are marked with (FE). The significance level of the t-statistics test is stated by the estimated coefficient with ***= 1%, ** = 5% and * = 10%			

Initially, the OLS regression with only industry fixed effect and inside ownership subgroups COVID-19 is not statistically significant with a t-statistics 1,32. The firm-level characteristics are not significant in the regression. The independent variables of the subgroups that are statistically significant on a 10% level are CEO and BOARD. R squared for the regression with only the fixed effect of industry is 0,1284. This indicates that the independent variables explain 12,86% of underpricing.

For the Robust OLS regression, COVID-19 is not significant. The firm-level characteristics that are significant are Market-to-Book (MB) and Asset turnover (ATO) on a 10 % significance level. The independent variables inside ownership subgroups are CEO and BOARD ownership are statistically significant on a 10% level. The regression R squared is 0,1284 and explains 12,84% of underpricing with the independent variables.

OLS regression winsorizing (2,5%) shows that COVID-19 is not a significant coefficient with a t-statistic of 1,40. The firm-level characteristics are Asset turnover (ATO) and Market-to-

Book (MB) at a 5% level of significance. The independent subgroup variable with significance is BOARD with a significance level of 10%. R square for this regression is 0,1546 which means that the regression explains 15,46% of the independent variables explain variation in underpricing.

The regressions for inside ownership with subgroups show that COVID-19 is not statistically significant. However, for the firm-level characteristic variables, it differs depending on outlier considerations. In the regular regression, none of them had any significance. In the robust and winsorized OLS regression, Market-to-Book and Asset turnover have significance. As the outliers are winsorized the significance increases since the regression is not affected by outliers to the same extent as the weighted method (robust). The subgroup CEO and BOARD is significant on a 10% level for the first and second regression. In the winsorized regression, the significance decreases, as only BOARD is significant. This would indicate that as the firm-level characteristics increase the importance of subgroups of inside ownership decreases. Furthermore, for the R-squared results, the two first regressions have the same explanatory value. For the winsorized regression, the R square is higher, this would indicate that the explanatory value of the regression is affected by the values of 1,25% in the bottom and top of the sample.

The results from the additional test if underpricing is affected by the type of inside ownership. The empirical findings is that there is a difference between the subgroups. There is a significance level of 10% for the CEO and BOARD for the regular OLS regression and the robust OLS regression. As for the OLS regression with winsorizing the significant independent variable is BOARD with a 10% level of significance.

4.4 Concluding analysis

For the representativeness of the sample, the results indicate that the regression analysis and extreme value technique used do not affect the results significantly. Showing that the results are consistent with minor discrepancies, would indicate that the results are stable and representative of the population. However, the results do not apply to more complex offerings such as units or preference stocks. The units could include buy options for future stock splits or emissions. This could mean that the results do not apply to the value of the unit offerings. Likewise, if the offering is of the characteristics of preference stock, as these have a higher voting power than the regular stock.

Furthermore, the results indicate that if the ownership is of the stock type that is being offered it affects the underpricing. The Total inside ownership of stocks pre-introduction date indicates having a statistical significance on a 5% level and stronger significance than the subgroups individually. This could indicate a pooling effect of interest and effects the underpricing.

5 Discussion

In the Discussion chapter, we place our empirical analysis within the context of the hypotheses and theories previously explored. Here, we analyze findings in relation to theory, aiming to unveil insights and implications. In this chapter, we thoroughly explore the data, helping us understand the results better. By critically analyzing the findings, we aim to contribute to the discussion on the topic.

The thesis findings, which indicate that increased insider ownership leads to higher underpricing, contradict Harris and Raviv (1991). Their argument suggests that firms may increase debt levels to lower information asymmetries and thereby exert greater control over management decisions. This disconnection suggests that firms may be willing to accept higher levels of underpricing to lose control. Given the capital structure change in an IPO with reduced debt compared to equity. However, our findings align with Connelly's (2010) study, which suggests that going public broadens the ownership structure, giving rise to increased management control through public oversight. This implies that the rise in insider ownership identified in the thesis could stem from a desire to exert greater influence over the company's operations and strategic decisions. This is supported by the findings of Stoughton & Zhechner (1998) and Brennan and Franks (1997), who discovered evidence indicating that IPO underpricing is employed to shape the post-IPO ownership structure, with the intention of influencing the degree of monitoring or control exerted by shareholders over the company following its IPO.

These findings in relation to traditional financing theories, such as Mayer and Majluf's (1984) pecking order theory, suggest that companies may not always have the option of internal financing, especially during uncertain periods like COVID-19. Conversely, Kraus and Litzenberger's (1973) tradeoff theory proposes that companies may perceive higher risk levels when they are heavily indebted, prompting them to seek capital from the public market to maintain their desired capital structure. This theory would imply that the IPO decision was influenced by considerations of the firm's risk level considering its capital structure.

Habib and Lundqvist (2001) proposed the EWL theory to explain underpricing, suggesting that high demand for IPO shares typically leads to price increases. When connecting this to the findings that underpricing is larger with greater insider ownership, it suggests that insiders, owning a larger portion of the company before going public, might wield greater influence in setting the IPO price below its true value. While this strategy may attract more investors, it also means the company may not raise as much capital as it could have with a higher IPO price. Although this tactic may benefit insiders by enabling them to sell their shares at a premium in the future, it can adversely affect the company's ability to raise necessary capital during the IPO.

While our study identifies a negative correlation between underpricing and profitability, indicating that lower profitability tends to result in higher underpricing, the research conducted by Zhang & Neupane (2024) on international IPOs reveals a contrasting trend during the pandemic period. According to their findings, IPO firms with strong fundamentals, such as higher profitability and market-to-book ratios, exhibit increased underpricing compared to IPOs issued in non-COVID-19 periods. Our research also noted a positive

association between underpricing and higher market-to-book value. Likewise, we found a similar pattern with higher asset turnover. This disparity in profitability highlights the complex relationship between firms' fundamentals and underpricing, indicating that the impact of these factors may vary depending on the economic context.

However, this thesis did not find evidence to support differences in underpricing during uncertain periods such as COVID-19. Zhang and Neupane (2024) found similar results in Sweden during COVID-19. Nevertheless, their findings diverged internationally, where COVID-19 increased IPO underpricing due to heightened uncertainty, contrasting with stable periods. From an external viewpoint, the IPO period in Sweden in 2021 appears to be a "hot market", with 164 IPOs introduced. This figure is nearly equivalent to the total number of IPOs introduced in the previous three years combined, which stood at 173. However, despite these indicators, Zhang and Neupane's (2024) study disproves the Swedish "hot market", as there has not been a significant increase in underpricing.

In opposition to our results, the findings of previous studies, (Field and Sheehan, 2002; Hill, 2006) does not find any support for evidence of IPO underpricing being affected by blockholders or ownership structure. This would indicate that the institutional investors are acting rationally and do not underprice the IPO systematically to disperse ownership. Furthermore, Arthurs et al. (2008) argue that inside managers could potentially decrease the underpricing. As managers take the firm's long-term performance more into consideration.

In contrast, our results align with the evidence of Su (2004) and Harjoto and Garen (2005) that inside ownership is diluted post-IPO and that high-quality firms have a higher retention of inside ownership. That the total inside ownership affects the underpricing indicates asymmetric information and adverse behavior. Supporting the evidence of Chan et al., (2023) of excess risk-taking and increased underpricing by managerial self-serving interests.

For the results regarding the subgroups of inside ownership, the thesis shows that the higher the position of the stock owner the higher the influence on underpricing. Zingales (1995) supports the theory of underpricing being a strategy other than financial gain for the company. Pre-introduction date inside ownership and underpricing could indicate an exit, or other strategic underpricing by owners to capture market optimism.

On the other hand, this could be an indication that high inside ownership implies a higher power imbalance between inside owners and outside investors, causing a higher underpricing to compensate for the power imbalance. As Kelly and Ljungqvist (2012) indicate in their study that informational asymmetry increases the underpricing and the demand for the stock.

According to Harris and Raviv (1991), ownership structure affects informational asymmetry and control problems. The underpricing could be to increase demand for the stock and underpricing a tool to disperse ownership. To mitigate any agency problems of inside ownership. This would be in accordance with Arthurs et al. (2008) that the complexity of principal and agent is the relationship when the agent also is the principal. Heterogeneity in individuals' agenda and high inside ownership could create issues in control functions. Although a high concentration of inside ownership could have positive effects on time efficiency in decision-making processes and corporate governance.

However, the transactional cost according to Coase (1937) is only transferred inside the company. According to Fama and Jensen (1983) to mitigate the agency cost the needs to be a

separation between decision management and decision control to limit any individuals power as agents. The dilemma of the agent also being the principal could increase the agency's problem. The goal of the firm is to maximize profit for the shareholders rather than individuals' self-interest. An IPO could be a diversification to increase the separation of decision management and decision control to mitigate the agency problem.

The underpricing could also be due to high inside ownership linked to Shapiro (2005) as agents with ownership can take advantage of the informational asymmetry by adverse behavior unbeknownst to the outside owners. This could cause hesitance for outside investors and inside owners discount the price of the stock to increase demand. Noe and Rebello (1996) confirm that there is a difference between agent and principal-controlled firms in preference between different types of financing. Shareholders preference debt finance, meanwhile, agents are averse to it.

6 Conclusion

The conclusion chapter is the final remarks and findings from the thesis. This is to emphasize the findings. The chapter also includes suggestions on limitations of the study and further research based mainly on the study's limitations.

The concluding findings of the thesis are that underpricing is greater with a greater inside ownership. The study also concludes that subgroup of inside ownership has different significance in effect on underpricing of IPOs. This underpricing is mainly affected by the CEO and Board of Directors. Management does not have any statistically significant effect on underpricing as an individual group of owners of the offered stock.

The Thesis examines underpricing as a phenomenon correlated to inside ownership by informational asymmetry. As inside ownership increases the asymmetry increases between insiders and outsiders. The thesis provides evidence of the presence of increased underpricing with increased inside ownership of the stock being offered.

6.1 Social and ethical considerations

Who bears the consequences of various actions? One key aspect to consider is that insiders who own shares often underprice them during an IPO, potentially resulting in losses for these individuals. On the other hand, winners in this scenario include investors who purchase shares for less than their actual value, as well as investment banks that profit from the IPO, often through options obtained from the underpricing. These investors are typically institutional investors, who according to Field and Lowry (2009) benefit from better interpretation of public information, leading to higher returns. In contrast, individual investors often overlook or misinterpret public information, resulting in lower returns and bearing the brunt of IPO underperformance. Institutional investors often receive advantageous allocations of IPO shares, resulting in higher returns compared to retail investors (Boehmer, Boehmer and Fishe, 2006) Another aspect to consider is that long-term holders of IPOs often experience poor performance, as emphasized by (Brav, Geczy and Gompers, 2000).

Differences in access to investment opportunities contribute to socioeconomic inequalities, keeping retail investors from participating in the same rules. Where retail investors often pay more for the same opportunities, widening the wealth gap. Concentrated wealth reinforces systemic advantages, hindering economic mobility. Another inequality highlighted by Boehmer, Boehmer and Fishe, (2006) is access to inside information, which some institutional investors have to aid their investment decisions, unlike retail investors, further contributing to an uneven investment landscape.

6.2 Limitations

One limitation of the study pertains to the sample size, which is relatively small. In comparison to Zhang and Neupane's (2024) total observations of 6113. Expanding the number of observations could have facilitated a more comprehensive analysis and provided greater statistical power to detect significant relationships. Another potential limitation is the focus solely on B-shares while overlooking A-shares, options, and other financial instruments. This narrow scope may restrict the applicability of the findings and overlook important nuances present in different types of securities. Additionally, findings derived from OLS regression analysis may not necessarily generalize to all IPOs, or they may be specific to the particular period or market conditions in which the data was collected. Moreover, the focus

solely on Swedish IPOs may limit the generalizability of the findings to IPOs in other countries. Differences in regulatory frameworks, market structures, and investor behaviors across countries could significantly influence the dynamics of insider holdings and underpricing, thus warranting caution in extrapolating findings beyond the Swedish context. Furthermore, the study has encountered some reduction in the total original sample size due to the exclusion of some IPOs in the data-gathering process. This reduction could potentially affect the representativeness of the study's findings. Finally, the presence of endogeneity poses a potential challenge, whereby insider holdings may be influenced by other unobserved factors that also impact underpricing. This could introduce bias into the estimated relationship between insider holdings and underpricing.

6.3 Further research

Given the limitations of our study, there are several avenues for further research that could enhance the understanding of the relationship between insider ownership and underpricing in IPOs. Firstly, addressing the limitation related to sample size, future research could focus on expanding the dataset to include a larger number of observations. Additionally, our study only considered B-shares, overlooking A-shares, options, and other financial instruments held by insiders. To address this limitation, future research could explore the impact of all types of securities on underpricing, providing a more precise understanding of insider ownership. Moreover, findings derived from OLS regression analysis may not generalize to all IPOs or may be specific to a particular period or market conditions. Future research could investigate across longer or different periods. Furthermore, our study focused solely on Swedish IPOs, limiting the generalizability of the findings to IPOs in other countries. Future research could explore cross-country differences, to explore regional differences. Additionally, the reduction in the total original sample size due to the exclusion of some IPOs could affect the representativeness of the study's findings. Future research could address this limitation by including a more comprehensive sample of IPOs, ensuring that the findings are more representative of the broader population. Based on our findings indicating that insider ownership affects underpricing, future research could delve deeper into understanding the impact of individual groups, such as CEOs, board of directors, and management, on underpricing. Exploring how different groups within the company influence underpricing could provide valuable insights into the mechanisms driving this relationship. Furthermore, future research could investigate the role of options included in insider ownership when IPOs are introduced. Analyzing how buy- options stated in the prospectus impact underpricing could shed light on the incentives for insider ownership to increase or decrease the IPO price before and after.

Our study indicates that inside ownership affects the underpricing of IPOs. The study examines the ownership of a total amount for the CEO, Board of Directors, and Management. Examining the individual groups and their influence on the underpricing of an IPO. The results indicate that there is an impact by inside ownership.

Based on our findings, inside ownership affects underpricing. Further research could be done by including options that are included in the ownership when the IPO is introduced. In the prospectus, the buy options are stated and could indicate that if the offering price is low, it would be an incentive for inside ownership to increase. Other studies have shown that inside ownership is diluted post-introduction.

7 References

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