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Push the leverage?

A study on the effect of interest bearing debt with regard to IPO underpricing

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Abstract

This study looks closer at the relationship between interest bearing debt and underpricing in initial public offerings (“IPOs”) in Sweden, Norway and Denmark. The sample comprises 318 IPOs on each country’s main list as well as Nasdaq First North between 2013 and 2022. We analyse the dataset through univariate and multivariate regression analyses to determine the relationship between leverage, defined as interest bearing debt over market value of equity, and IPO underpricing. The results imply a negative relationship between the two, with higher leverage being associated with less underpricing. Looking at the full sample the correlation is not statistically significant. When excluding outliers from the sample the negative correlation between leverage and underpricing is statistically significant at a 10 per cent significance level. Dividing the sample into Swedish and non-Swedish IPOs shows a statistically significant relation at a 10 per cent significance level for Norwegian and Danish IPOs but not for Swedish, leading to the conclusion that the results are uncertain but pointing towards a limited relationship between leverage and underpricing.

Keywords: Initial public offering, underpricing, leverage, interest-bearing debt

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1. Introduction

1.1. Background

A firm going public is arguably one of the biggest events in its corporate journey. Being listed on a publicly traded stock exchange means new investors entering the company, stricter financial regulation and being subject to public scrutiny on a grander scale. Furthermore, transitioning from private to public allows the firm to raise capital in order to grow and enables existing shareholders to realise capital gains from their previous investments. An IPO is a high stake event, which is one of the reasons they have been widely studied in economic and financial literature.

There are diverging interests during an IPO event. If the price is set too high the IPO risks being undersubscribed, and if the price is too low it will be oversubscribed leaving money on the table. Investors will of course want a positive first day return on their investment, and on one hand the firm will want this too in order to make their new shareholders happy, as evident by some financial newspapers raising a red flag for IPOs with a negative first day price development. On the other hand this means that the shares have been underpriced and that the selling shareholders miss out on gains that could have been made and capital that could have been raised, meaning there is money left on the table. Excessive IPO underpricing, defined as the substantial divergence of a firm's offering price to its fair value, is therefore something the owners of the company want to avoid, which raises the question how this market anomaly can be limited.

Over the years, much research has been conducted on the phenomena of IPO underpricing and why it occurs. Studies in the US have looked at companies' capital structure and how it affects the performance of the stock when it becomes listed. Their findings were that firms with private lending relationships prior to an IPO are less underpriced than their peers, and argues that this is because of the signalling value that leverage entails (James & Wier, 1990; Ljungqvist & Habib, 2001). Little research has been conducted in the Nordic market which is why our study will examine if similar correlations can be drawn here.

The Nordic IPO market in general and the Swedish in particular has been hot during recent years. Sweden has the most listed companies out of all countries in the EU, and 2021 was the busiest year for Swedish initial public offerings in over two decades (Daly, 2021). The Nordics are a powerhouse when it comes to start-ups with companies like Klarna, Wolt,

Kahoot! and Voi to name a few. With many of them rumoured going public in the near future, we believe it is of great interest to study how capital structure affects IPO underpricing and if there is an optimal capital structure to avoid leaving money on the table. Of course, there are trade-offs when it comes to leverage as it increases the company's financial risk profile, exemplified by US investor Warren Buffet once saying "My partner Charlie says there is only three ways a smart person can go broke: liquor, ladies and leverage" (Kim, 2018). With this in mind, and the somewhat contradictory relationship between debt financing and equity pricing, a closer dissection and analysis of the Nordic market sheds light on this very connection. The purpose of this study is to examine if leverage affects the underpricing in IPOs, and therefore our research question is:

Does a firm's leverage ratio affect its underpricing when the firm becomes listed in an initial public offering on the Swedish, Norwegian or Danish market?

1.2. Contribution

To the best of our knowledge no previous studies have been made on the topic of leverage and IPO underpricing in the Nordic market. Through our study we therefore hope to fill this information gap. Our study contributes in two ways to the existing literature: firstly, it is conducted in a new market, the Nordics, which has not been studied yet. Secondly, it is conducted in another time period. Earlier studies examined IPOs during the 80s, 90s and early 2000s (Jaemin, Pukthuanthong, & Walker, 2008; James & Wier, 1990; Ljungqvist & Habib, 2001), while our study is conducted on IPOs during the period 2013-2022. With our study we hope to provide managers contemplating going public with insight on how the company's capital structure will affect the pricing of the IPO.

1.3. Scope

Our study is conducted on IPOs in the Nordic market. Our data is gathered from Stockholm Stock Exchange, Oslo Stock Exchange, and Copenhagen Stock Exchange. We have also included IPOs on Nasdaq First North, a marketplace for small and medium sized growth companies in Sweden, Denmark, Iceland and Finland. We have chosen to exclude IPOs in the Icelandic market because of its relative illiquidity and lower IPO activity compared to the other Nordic markets. Finland has also been excluded due to a language barrier when verifying and completing the database figures; as financial reports and prospectus in some

cases are only published in Finnish. Our study is conducted over a ten year period starting in 2013 and ending in 2022.

1.4. Disposition

The remainder of our thesis is organised as follows. Section 2 is a literature review presenting theories and previous research conducted on the topic of IPOs and leverage, which provide the basis for our hypothesis. In section 3 we present our methodology and data, as well as our statistical methodology of choice. In section 4 we present the empirical results from our model. In section 5 we analyse and discuss our findings. In section 6 we present our conclusions. Lastly, in section 7 we discuss the limitations of our study as well as give directions for future research.

2. Literature review

In the following section we present a theoretical background on IPOs, underpricing and leverage which our study is built on. We also provide an overview of existing literature and research conducted on the topic of our study.

2.1. IPOs and IPO underpricing

2.1.1. Advantages and disadvantages of going public

An initial public offering (“IPO”), is when a company transitions from private to public, i.e., the first time a company’s shares are offered to the general public. This is a way to raise capital that the firms can use to grow in addition to diversifying the investor base and allowing previous owners an opportunity to partly exit their investment. Being listed on a public market is advantageous since it leads to greater liquidity and gives firms access to much larger amounts of capital, both through the initial public offering as well as in eventual subsequent offerings. Typically public firms are able to raise substantially more capital than what would have been possible solely through private equity funding (DeMarzo & Berk, 2019, ch. 14-15).

Furthermore, public firms face less obstacles in future capital issues, whether debt or equity, which add to the list of reasons firms choose to seek a listing. That being said, there are disadvantages of going public as well. As new shareholders enter the company, the equity holders of the firm become dispersed resulting in loss of control. Furthermore, as a public company there are strict standards and regulations that must be followed. The standards, such

as thorough financial disclosure and accountability principles, have been designed to protect investors, and compliance with these standards can be time-consuming and costly for the companies (DeMarzo & Berk, 2019, ch. 14-15).

2.1.2. Underwriters managing risk

When an underwriter, such as an investment bank, commits to taking a company public they take on risk. Since the banking firm buys the shares from the company and then sells them to the general public, they expose themselves to the risk of having to sell the shares at a lower price than what they paid the company for the shares, thereby taking a loss. However, the vast majority of IPOs are in fact underpriced. For instance during the period 1990-1998 only 9% of IPOs in the US experienced a decline in share price on the first day of trading. And during 1960-1982 in the US, the ca. 5,000 companies that went public were on average trading at a price 18.8% above the offering price shortly after public trading began (Beatty & Ritter, 1986). This indicates that the initial offering price is in general set lower than what investors are willing to pay. It appears that underwriters use the information they gather during their book building process to underprice IPOs intentionally to protect themselves against loss exposure. This phenomena can provide some explanation why IPO underpricing occurs (Beatty & Ritter, 1986; DeMarzo & Berk, 2019, ch. 14-15; Loughran & Ritter, 2002).

2.1.3. Winner's curse and information cascade

IPO underpricing can also be explained by the Winner's curse by Rock (1986) and information cascade theory. The winner's curse in short is when uninformed investors end up paying above the intrinsic value of a stock, with the reason behind this being lack of information, while informed investors will only participate in IPOs they know are underpriced. According to Rock, some underpricing is needed for uninformed investors to keep wanting to participate in offerings despite the adverse selection problem. The cascade theory means that people tend to make decisions solely based on other people's decisions and occurs when external information overrides one's own knowledge on a matter, regardless of its correctness. This results in no new information being added as people blindly follow others' decisions assuming and believing that all of the people before cannot be wrong. Combining the two, this explains why the price of a stock can diverge from its fundamental value (Bikhchandani, Hirshleifer, & Welch, 1998; Hirshleifer & Teoh, 2003; Rock, 1986).

2.1.4. Information asymmetry and valuation uncertainty

Studies on the topic of underpricing have found that if a company is difficult to value it results in IPO underpricing. Two models by Beatty and Ritter (1986) and Baron (1982) explain this phenomenon. The former is an extension of Rock's theory and says that the relationship between informed investors (investors who have incurred information acquisition costs prior to the IPO) and uninformed investors results in underpricing. This is because uninformed investors will only continue to participate in IPOs if there on average is underpricing, and as the ex-ante uncertainty (the difficulty of valuing an issue) increases the winner's curse dilemma intensifies. Their model finds empirical evidence that "the greater is the ex-ante uncertainty about the value of an issue, the greater is the expected underpricing" (Beatty & Ritter, 1986). Baron's model instead looks at the information asymmetry between the investment banking firm and the issuing company, where the former is informed and the latter is uninformed. The underwriter generally has superior information of the capital market, whereas the issuer does not have the same knowledge. Because of the information asymmetry between them, the issuing company cannot monitor the investment banking firm and its distribution efforts. The ex-ante uncertainty enables investment banking firms to underprice the new issues, since the issuer must compensate the bankers for their superior information (Baron, 1982).

2.2. Leverage and leverage profiles

2.2.1. Theories on leverage

Through leverage a firm can increase the potential gains of an investment since leverage allows greater investment quantum at a generally lower cost of capital. However, leverage also increases the magnitude of potential losses. Since the Modigliani and Miller theorems, modern theories on capital structure have evolved and can be said to fall into two categories: pecking order theory and trade-off theory. The former is the pecking order presented by Myers and Majluf (1984). According to them there is a hierarchy when firms raise funds, which is, internal financing in the form of cash is preferred to external financing. And if external funds are obtained, firms prefer debt over equity due to information asymmetry. The latter is the trade-off theory, which says that a firm will determine its optimal capital structure by balancing the costs of financial distress with the benefits (such as signalling value and tax advantages) of debt financing. By trading off the benefits with its costs, a firm can determine what capital structure results in the lowest weighted average cost of capital (Ross, 1977).

2.2.2. Industry differences - Financial vs. operational risk

Debt levels vary largely across industries. Companies in growth industries like high technology or biotechnology carry little debt compared to firms within real estate, utilities, automotive and telecommunication, which can be highly levered. The leverage ratios are typical for their respective industries and can be concluded as the more operational risk a business has, i.e. the more uncertain cash flows, the less financial risk the firm will be willing (or allowed) to take on. This is because banks and other lenders look for debtors who will be able to repay their debt with certainty. Furthermore, the amount of debt a firm has or should have can be linked to what results in a tax-optimal capital structure. Since interest payments are tax deductible, from a tax saving perspective, interest should equal EBIT. If there are negative earnings, there is no tax shield to benefit from, but if interest exceeds EBIT the firm will be paying excess interest. Predicting future EBIT precisely is difficult. But if the uncertainty of cash flows is high, the risk of interest exceeding EBIT is higher, which is another reason why firms in industries characterised by high operational risk tend to have lower levels of leverage (DeMarzo & Berk, 2019, ch. 14-15).

2.2.3. The leverage effect on capital structure

There is a well-established relationship between return on a stock and its volatility, which is that when stock prices fall volatility increases. One explanation for this is that when the market value of a firm's equity changes it affects its capital structure. When the stock price falls and the market value of equity decreases the firm becomes more levered, which increases volatility since a higher leverage ratio increases company risk (Figlewski & Wang, 2000). According to what Figelski and Wang call “the leverage effect” the companies that are most volatile and therefore should experience the largest increase in first day returns are the firms with higher leverage. The relationship between leverage and volatility contradicts what can be said about the signalling value of leverage and how it should reduce underpricing, which is why we in our study examine this further.

2.3. Previous studies on the topic of IPOs and leverage

2.3.1. Signalling

Signalling is a way for a party, in this case a firm, to disclose its private information to the uninformed, or less informed, counterparty. James and Wier (1990) find in their article that firms with private lending relationships prior to an IPO are less underpriced than their peers. They argue that this is because of the signalling value that leverage entails, i.e. having a

proven access to the debt market reduces the information asymmetry regarding a firm's financial performance and outlook. The study looks at American public offerings in the early eighties, more specifically between the years 1980 and 1983. They reference an article by Slovin and Young (1990) who find the same results (that banking relations act as a signal and reduce the expected initial first day return) hold for listings during 1980-1984 in the US. However, Slovin and Young do not explain why not all firms then incur debt prior to an IPO. James and Wiers's model on the other hand looks at how a borrowing relationship before the stock is publicly listed reduces IPO underpricing, but also why some companies still choose to issue shares without having an established borrowing relationship. The results of their model are consistent with their predictions that debt contracts prior to an IPO reduces underpricing. However, they do state that "we cannot rule out the possibility that the existence of a borrowing relationship is related to some other unobserved characteristic of the firm and that it is this characteristic that actually affects underpricing" (James & Wier, 1990).

They also argue that growth firms are more likely to have lower debt levels because of the nature of their assets. Growth firms mostly have intangible assets, and banks typically prefer tangible assets over intangible assets for loan collateral. Furthermore, the authors claim that if investors view the growth firms' market values as highly uncertain when going public, there will be severe IPO underpricing, which is similar to what Beatty and Ritter (1986) say about valuation uncertainty and its effect on underpricing.

We find several strengths with James and Wier's study. We believe their model is exhaustive and looks at several relevant factors. Another strength is that they explain why some firms still choose not to establish credit relationships beforehand, with the reason being that a bank debt rejection would affect the IPO negatively and that debt is costly. Moreover, they included a part where they looked at industry classification and if it affected underpricing, albeit they found that industry had no implication on the first day returns. A weakness we find with their study is that their data is from a rather short period of time, that being 1980-1983. We have instead chosen a longer time period to capture the market in a broader range of different states (James & Wier, 1990; Slovin & Young, 1990).

2.3.2. Insider selling and promotional activities

Staying in the US, Habib and Ljungqvist (2001) conducted a study on underpricing and wealth losses on IPOs on Nasdaq between 1991 and 1995. They developed a model to

examine if insider selling and promotional activities affects underpricing. They argue that insider selling can explain why some IPOs are more underpriced than others, stating that “Owners who sell very few shares suffer only marginally from underpricing. Conversely, the more shares they sell, the greater is their incentive to decrease underpricing. As a consequence, we expect that the degree of equilibrium underpricing depends on the extent of insider selling” (Ljungqvist & Habib, 2001). Furthermore, they discuss actions that can reduce underpricing, that being choice of underwriter and its reputation, auditor and promotional activities. They state that “For promotion costs to affect underpricing presumes that promoting an issue can be an alternative to underpricing the issue” (Ljungqvist & Habib, 2001). Through their model they find empirical evidence that both insider selling and promotional activities reduce IPO underpricing.

Habib and Ljungqvist come to the same conclusion regarding lender relationships, leverage, and IPO underpricing as James and Wier (1990). The authors find that the same correlation holds true for IPOs on Nasdaq between 1991 and 1995, stating that “the presence and extent of prior credit relationships (leverage) significantly reduce underpricing as in James and Wier (1990)” (Ljungqvist & Habib, 2001). This study is beneficial as the authors provide insights on underpricing and how it can be reduced through certain actions. Furthermore, since they find that the same relation between leverage and underpricing holds for their data, even referencing James and Wier in their article, we believe this strengthens both studies. A potential weakness is that they did not make any industry comparisons, which is something we have included in our study.

2.3.3. Leverage and IPO underpricing in high- vs. low-tech IPOs

Jaemin, Pukthuanthong and Walker (2008) have conducted a study on IPOs between 1996-2002 examining how leverage affects underpricing in IPOs in high- versus low-tech firms. They reference both articles by James and Wier (1990) and Habib and Ljungqvist (2001) stating that debt holds a signalling value that can reduce underpricing, but they acknowledge that optimal debt and equity levels can widely vary between firms and their industry. Through their study they find that for low-tech firms debt lowers underpricing. For high-tech firms however leverage has the opposite effect, resulting in greater underpricing. They argue that this is because debt financing is less attractive for high tech firms, stating that because of their often uncertain cash flows the risk of bankruptcy is increased, the costs of financial distress are higher due to them generally carrying significant intangible rather than

tangible assets and that with negative earnings in their early years, they have little to gain from the tax shield that debt provides. Their findings are that depending on the firm's underlying characteristics, and therefore different optimal capital structure, the leverage's signalling value affects IPO underpricing differently (lower underpricing for low-tech firms and greater underpricing for high-tech firms). We believe this study is beneficial since it takes optimal capital structure and firms' underlying characteristics into consideration, which has a tendency of being overlooked in the literature on IPOs (Jaemin, Pukthuanthong, & Walker, 2008).

2.4. Summary and hypothesis development

The literature highlights that debt issuance prior to the public offering signals financial strength. Which is partly because high quality firms have better access to debt, and partly because the due diligence and covenants debt incurrence entails assures robust financial performance. Furthermore the debt contracts give managers less space to act freely as they have to adhere to the terms of the contracts. All-in-all, this reduces the information asymmetry and uncertainty which in turn reduces the IPO underpricing (James & Wier, 1990; Ljungqvist & Habib, 2001). Still, there is some ambiguity regarding leverage and how it affects underpricing since as Figlewski and Wang (2000) state leverage increases volatility.

Worth mentioning is that the study by James and Wier (1990) looks at the existence of a private lending contract prior to the IPO whereas our study examines the leverage ratio and if it affects underpricing. Based on the theoretical frameworks and previous research presented we arrive at our hypothesis that is:

H1: A higher leverage ratio is negatively correlated with underpricing in initial public offerings

3. Methodology and data

3.1. Metric used for analysing

To study the relationship between IPO underpricing and leverage we used the relationship between the offering price and the first day closing price, calculated as:

$$IPO\ underpricing = \frac{Price\ at\ first\ close}{Offering\ price} - 1$$

This is representative of the underpricing. The offering price is set by the underwriting syndicate and represents their assessment of the fair value of the company in question, typically with a haircut to generate positive post-IPO momentum and get around the winner's curse. For the leverage component we looked at the latest reported interest-bearing debt to market value of equity ratio ("leverage ratio" or "leverage") at the time of the IPO, i.e., at the offering price, calculated as:

$$Leverage\ ratio = \frac{Interest\ bearing\ liabilities}{Equity\ (market\ value)}$$

We chose to study interest-bearing debt to market value of equity in our study as it is a balance sheet based measurement thus present in all studied firms, as well as being applicable to companies with negative earnings unlike common covenant ratios such as debt to EBITDA or net debt to EBITDA. Using interest-bearing debt instead of net debt or total debt means looking specifically at the total quantum of obligations to financial debtholders, and is thus a measurement of loan-to-value and further represents a lending relationship between the company and lender.

3.2. Multivariate regression model

To further test the relationship between IPO underpricing and leverage we use a multivariate regression model estimated as:

$$Underpricing_i = \beta_0 + \beta_1 IBD_i + \beta_2 BS_i + \beta_3 CON_i + \beta_4 BANK_i + \beta_5 MED_i + \beta_6 RE_i + \beta_7 TMT_i$$

Table 1: Independent variable overview

Variable	Description	Expected sign of coefficient
IBD/E = Interest-bearing debt / Market value of Equity	Leverage ratio retrieved from Factset Database	-
BS = Business Services	Firms with Factset industry classification: Advertising/Marketing Services, Agricultural Commodities/Milling, Miscellaneous Commercial Services, Other Transportation, Trucking, Wholesale distributors	-
CON = Consumer	Firms with Factset industry classification: Apparel/Footwear, Beverages: Alcoholic, Catalog/Specialty Distribution, Department Stores, Food Retail, Food: Meat/Fish/Dairy, Home Furnishings, Hotels/Resorts/Cruise lines, Internet Retail, Movies/Entertainment, Other Consumer Services, Recreational Products, Specialty Stores, Tobacco	-
BANK = Financial Institutions	Firms with Factset industry classification: Finance/Rental/Leasing, Financial Conglomerates, Investment Managers, Major Banks, Regional Banks, Savings Banks	-
MED = MedTech, Pharmaceuticals, BioTech	Firms with Factset industry classification: Biotechnology, Hospital/Nursing Management, Medical Specialties, Medical/Nursing Services, Pharmaceuticals: Generic, Pharmaceuticals: Major, Services to the Health Industry	+
RE = Real estate	Firms with Factset industry classification: Real Estate Development	-
TMT = Technology, Media, Telecom	Firms with Factset industry classification: Cable/Satellite TV, Casinos/Gaming, Computer Peripherals, Electrical Products, Electronic Components, Electronic Equipment/Instruments, Electronic Production Equipment, Electronics Distributors, Electronics/Appliances, Information Technology Services, Internet Software/Services, Media Conglomerates, Packaged Software, Semiconductors, Specialty Telecommunications, Telecommunications Equipment, Wireless Telecommunications	+

The group of firms denoted as Industrials or IND in the tables below, i.e., firms with Factset industry classification: Aerospace & Defense, Alternative Power Generation, Aluminium, Building Products, Chemicals: Major Diversified, Construction Materials, Containers/Packaging, Contract Drilling, Electric Utilities, Engineering & Construction, Environmental Services, Forest Products, Homebuilding, Industrial Machinery, Marine Shipping, Metal Fabrication, Miscellaneous Manufacturing, Motor Vehicles, Oil & Gas Production, Oilfield Services/Equipment, Pulp & Paper, Textiles, Trucks/Construction/Farm Machinery, have the widest spread in operations and are therefore not included as a separate variable in the model. For the avoidance of doubt, the constant in the multivariate regression model thus represents the Industrials segment.

As explained in section 2.2.2. different industries have different optimal capital structures depending on the operational risk inherent to their specific vertical. Thus, the ideal amount of debt is not only dependent on the specific firm but also the industry it operates in. The median for all firms' level of debt was about 23% of firm value in the US in 2015 (DeMarzo & Berk, 2019, ch. 14-15). Furthermore, previous studies on leverage and IPO underpricing by Jaemin, Pukthuanthong and Walker (2008) find significant differences between high- and low-tech firms with regard to their underpricing with respect to leverage. To take the industry-specific gearing considerations into account we divided the sample into six distinct groups and included these as variables in our regression model.

Business Services (BS)

Firms in the Business Services segment are diverse due to the various industries they serve. However, addressing other businesses rather than consumers the operational risk is lower as revenue predictability is higher and demand less cyclical. They have therefore somewhat higher debt levels compared to other firms. There is a large spread between firms and their operations in this group, but overall we believe these firms will experience lower underpricing compared to firms with lower leverage ratios. We therefore predict the coefficient to be negative.

Consumer (CON):

Consumer-oriented firms have relatively predictable revenues. The firms in this group produce and sell cyclical and non-cyclical goods, which impacts both the risk of their operations and thus their respective bankability. Overall we believe these firms are

characterised by less valuation uncertainty and will thereby showcase lower underpricing. We therefore predict the coefficient to be negative.

Financial Institutions (BANK)

These firms have large balance sheets with low operational risk. Due to the nature of their business the debt load on their balance sheet is organically large, and while macroeconomic trends, such as central bank reference rates and the housing market will affect cash flows, banks and financial institutions are generally stable. We therefore believe they will show little underpricing, which is why we predict the coefficient to be negative.

Industrials (IND)

The constant in the multivariate regression model represents the industrial segment. Industrials cover a large set of sub sectors why drawing a general conclusion regarding their valuation uncertainty and risk profile is overly simplifying. As the industrial sector is represented by the constant in the model we make no hypothesis regarding its sign but assume that the constant will be positive as to indicate underpricing within the segment.

MedTech, Pharmaceutical, BioTech (MED)

These firms bear the stamp of valuation uncertainty and can often have negative earnings in early stages but are expected to reach profitability in the future. They often have significant intangible assets such as patents and R&D. Because of high ex-ante uncertainty they have little to no debt. Due to the higher risk profile of these firms, we believe they will experience greater underpricing which is why we predict their coefficient to be positive.

Real Estate (RE)

Real estate firms are generally uncomplicated to value with little ex-ante uncertainty. Their assets can easily be used as collateral which allow them to use leverage to a great extent. We therefore believe they will experience low underpricing, hence the coefficient is predicted to be negative.

Technology, Media, Telecom (TMT)

Firms within the tech industry are often difficult to value with high ex-ante uncertainty. A significant number of these are growth firms with uncertain future cash flows and limited

debt access to debt. As a result we believe they will experience greater underpricing, and we therefore predict their coefficient to be positive.

3.3. Data

3.3.1. Data collection

The data used in this study is IPOs performed in Sweden, Norway, and Denmark between the 21st February of 2013 and the 21st February of 2022, i.e., the last ten years. Only offerings on Nasdaq Stockholm, Oslo Stock Exchange, and Nasdaq Copenhagen, with the inclusion of Nasdaq First North Market, have been included in the sample. Although fitting the above criteria, Special Purpose Acquisition Companies (“SPACs”) have been excluded due to them neither having operations nor financial history prior to the listing event thus not contributing to the subject studied in this paper. Furthermore, IPOs of preference shares and so called D-shares have been excluded due to the debt-like characteristics of such securities. IPOs where the Factset database did not retrieve or find any data regarding the interest-bearing debt to equity ratio have been excluded from the sample to ensure conformity in the measure across all observations.

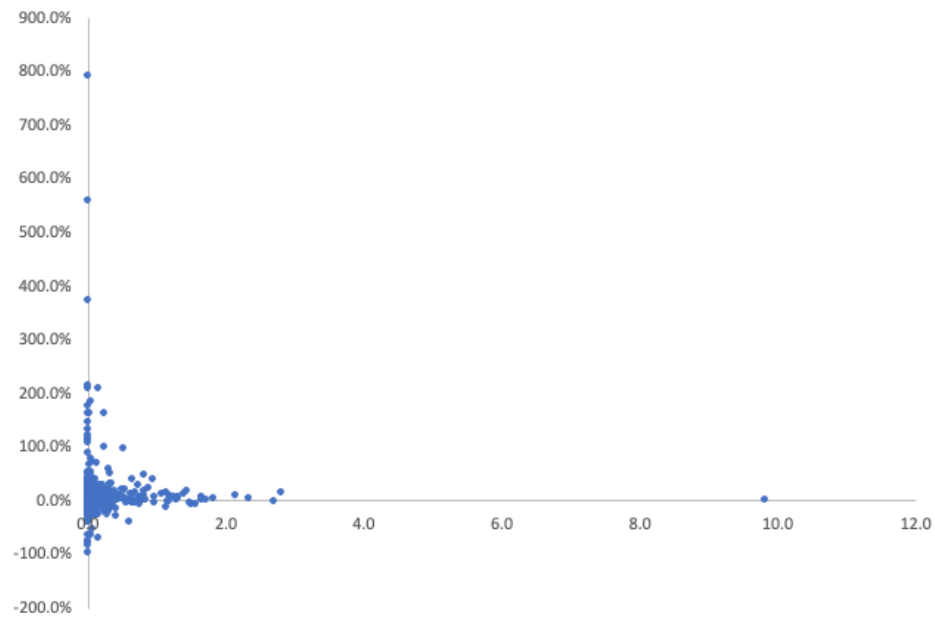
The time period in question, 2013 to 2022 has been characterised by stable growth and, with the exception of the Covid-induced downturn in March of 2020, an active equities market without major external uncertainties. The beneficial market environment reduces pricing unpredictability which in turn limits the effect of exogenous factors with regard to first day price development.

3.3.2. Databases

The primary source of data is the Factset Database, containing data regarding share price development, full financial information, and industry classifications. The Factset Database was made available to us by an employer. In some cases no information regarding first day price development was present in the database; for those companies we calculated the price change based on listing price in the offering prospectus or corresponding press release and first day closing price from the FinBas database. To ensure accuracy all leverage ratios were manually checked against the offering prospectus published in conjunction with each IPO. Where differences were found the manually collected data from the prospectuses was used.

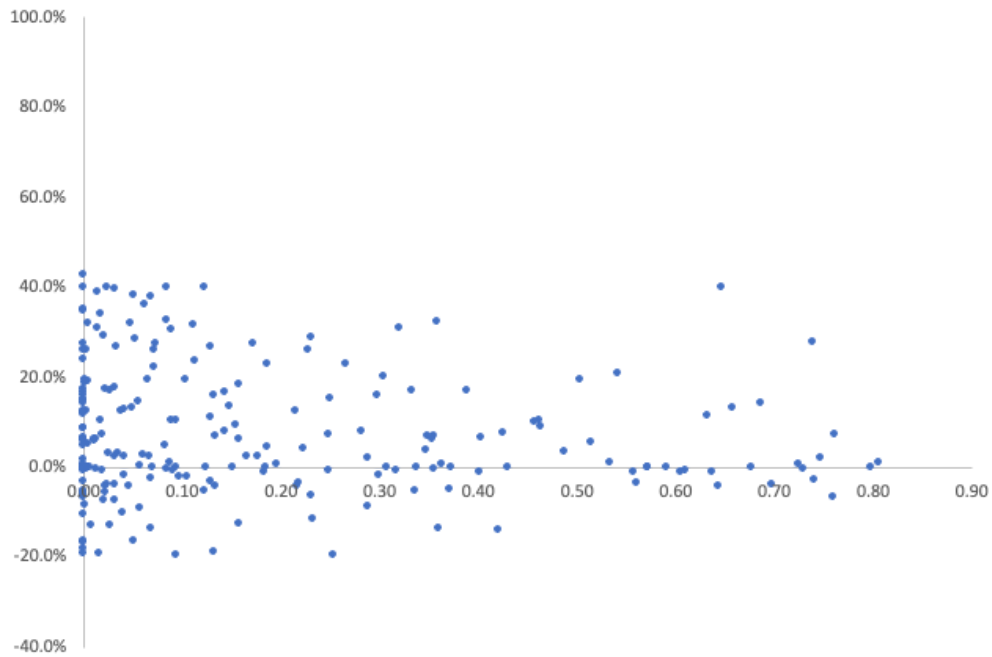
3.3.3. Descriptive statistics

Figure 1: Sample overview, all observations (n=318)



X-axis: Leverage ratio; Y-axis: IPO underpricing

Figure 2: Sample overview, outliers excluded (n=223)



X-axis: Leverage ratio; Y-axis: IPO underpricing

Table 1: Descriptive statistics of sample, exchange and industry

Exchange	BS	CON	BANK	IND	MED	RE	TMT	Total
First North Denmark		1		3	1		15	20
First North Sweden	7	7		8	20	7	32	81
NASDAQ OMX Stockholm	16	20	13	33	23	8	35	148
OMX Nordic Copenhagen	4	4	1	7	1		9	26
Oslo Børs	6	6	2	16	1	1	11	43
Grand Total	33	38	16	67	46	16	102	318

The distribution of IPOs with regard to exchange and industry shows TMT, or technology, media and telecom, being the most active sector in total, and on all exchanges except for Oslo Børs. The sample is weighted towards the Swedish market, with Swedish listings making up 72% of the total number of studied listings. With this in mind we performed separate analyses with Swedish listings being excluded (“Subsample 1”) and only Swedish listings (“Subsample 2”), in order to ensure that the results are representative of Sweden, Norway, and Denmark rather than Sweden only. Due to the low number of firms per industry in Norway and Denmark we do this analysis on a univariate level, i.e., without industry control variables.

Table 2: Descriptive statistics of sample, exchange and year distribution

Exchange	'13	'14	'15	'16	'17	'18	'19	'20	'21	'22	Total
First North Denmark					1	7	1	5	6		20
First North Sweden	1	2	3	5	20	11	9	13	17		81
NASDAQ OMX Stockholm	3	18	28	24	18	5	3	9	40		148
OMX Nordic Copenhagen	1	2	1	2	1	1		7	11		26
Oslo Børs	6	8	4	1	4	2	3	6	8	1	43
Grand Total	11	30	36	32	44	26	16	40	82	1	318

Table 2 shows the cyclical nature of the market for IPOs, highlighting the hot and cold market environments. 2021 is the most active year with 82 IPOs, almost double that of the next most active year, 2017, with its 44 IPOs.

Table 3: Descriptive statistics of sample, leverage by industry

IBD/E	BS	CON	BANK	IND	MED	RE	TMT	Total
<0.5x	20	30	11	50	44	2	99	256
0.5x-1.0x	8	7	1	12	2	7	1	38
1.0x-1.5x	3	0	1	4	0	4	1	13
>1.5x	2	1	3	1	0	3	1	11
Grand Total	33	38	16	67	46	16	102	318

Mean: 0.31x Std: 0.70x Min: 0.00x Max: 9.83x

Table 3 shows the interest-bearing debt to market value of equity ratio across the industries studied. The findings are in line with what DeMarzo and Berk (2019) state regarding the leverage profiles as they relate to financial and operational risk (DeMarzo & Berk, 2019, ch. 14-15). This is most evident in the sector we have denoted MedTech, which includes pharmaceutical companies as well as med- and biotech firms, and tech firms, denoted TMT, as these firms generally have inherently higher risk in their operations prior to their commercial phase. The opposite can be seen in real estate firms, where the operational risk is low and assets are plenty, which enables higher levels of leverage. The mean leverage ratio in the sample is 0.31x the market value of equity.

Table 4: Descriptive statistics of sample, underpricing by industry (%)

Under-pricing	Average	Median	Min.	Max.	1st quartile	3rd quartile
BS	9.1%	-0.6%	-64.7%	175.6%	-8.2%	14.1%
CON	6.8%	7.1%	-84.1%	108.9%	-3.7%	20.2%
BANK	8.1%	4.6%	-70.5%	96.5%	-5.0%	25.0%
IND	14.9%	2.3%	-63.6%	208.7%	-1.3%	18.9%
MED	36.9%	-0.2%	-96.5%	790.6%	-17.0%	18.4%
RE	7.0%	5.1%	-2.0%	40.2%	0.0%	11.3%
TMT	19.5%	7.7%	-77.8%	213.8%	-0.8%	26.9%

Full sample	17.3%	4.4%	-96.5%	790.6%	-3.5%	19.3%
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Table 4 displays descriptive statistics of IPO underpricing by industry. The average IPO is 17.3% underpriced, with all studied industry groups being underpriced on average. The median underpricing is 4.4%, significantly lower than the average, especially compared with IPOs in the Business Services and MedTech sectors, where the median IPO is overpriced, i.e., the offering price being higher than the closing price on the first day of trading. The two industries with the highest underpricing on average are MedTech and TMT, which also have the largest spread between minimum and maximum pricing. This is in line with studies such as Beatty & Ritter (1986), James and Wier (1990) and Jaemin, Pukthuanthong and Walker (2008) which find that these firms are generally less mature compared to their peers and thereby have more inherent ex-ante uncertainty in their valuations.

Table 5: Test of multicollinearity

	IBD/E	BS	TMT	MED	CON	BANK	RE
IBD/E	1.000						
BS	0.087	1.000					
TMT	-0.199	-0.234	1.000				
MED	-0.146	-0.140	-0.283	1.000			
CON	-0.006	-0.125	-0.253	-0.151	1.000		
BANK	0.255	-0.078	-0.158	-0.095	-0.085	1.000	
RE	0.226	-0.078	-0.158	-0.095	-0.085	-0.053	1.000

Table 5 shows the cross-correlation between the independent variables in the multivariate regression model. The analysis was done to ensure that no variables were highly correlated which in turn would have meant that adjustments to the multivariate regression model had to be made. No multicollinearity between the variables can be implied, and as such, the model defined in section 3.2 can be used as stated.

3.4. Empirical strategy

We started our empirical analysis by conducting a univariate regression on the full dataset, doing this to investigate if there was a direct correlation between the variables. Our full, multivariate regression model contains additional variables which we added successively to observe if and how coefficients and significance levels change, both in terms of their sign and value. As evident in table 1 and 2 our dataset is largely made up of IPOs on the Swedish stock exchanges, and due to this, we divided our sample into two subsamples to ensure that the results were not skewed by the geographic distribution of the data points.

Additionally, we ran the same models excluding outliers, removing the observations that had the highest and lowest underpricing as well as the highest leverage. We thus excluded the top and bottom 10% in terms of underpricing and the top 10% in terms of leverage ratio. This was done in order to see how the most extreme values affected our model.

To further understand any relation between leverage and IPO underpricing we also conducted a non-parametric test in the form of a Mann-Whitney U Test on the sample, doing so by dividing our sample into two groups, one with a leverage ratio of 0.25x or greater and one with a leverage ratio of less than 0.25x. Our reasoning behind supplementing our regression model with this analysis is to ensure that there is no potential correlation not noticeable in the regression model was left out of our results.

4. Results

In the following section we present the results of our regression analysis on IPO underpricing as it relates to the leverage ratio (interest-bearing debt / market value of equity) as well as industry groups as selected control variables.

4.1. Results from regression analysis

4.1.1. Univariate regression

Table 6: Univariate regression of IPO underpricing, full sample

Variable	Underpricing
IBD/E	-6.856 (-1.219)
Constant	19.379*** (4.520)
Observations	318

T-statistics in parentheses below coefficient.

***p<0.01, **p<0.05, *p<0.1

Table 7: Univariate regression of IPO underpricing, outliers excluded

Variable	Underpricing
IBD/E	-7.192* (-1.651)
Constant	8.857*** (7.151)
Observations	223

T-statistics in parentheses below coefficient.

***p<0.01, **p<0.05, *p<0.1

Table 6 and 7 show the results of the univariate regression of IPO underpricing in relation to interest-bearing debt over market value of equity. When looking at the full sample, the model does not imply any statistically significant correlation between the dependent and independent variable, but points to a relation where higher leverage is related to lower underpricing as evident by the negative coefficient for the IBD variable. Further it is evident that the underpricing itself is a statistically significant phenomenon.

Excluding outliers, the result shifts and shows a statistically significant correlation between underpricing and leverage at a 10% significance level. By the negative sign of the coefficient this correlation is negative, i.e., higher leverage is implied to reduce underpricing in IPOs.

4.1.2. Multivariate regression

Table 8: Multivariate regression of IPO underpricing, full sample

Variable	Underpricing
IBD/E	-3.956 (-0.642)
BS	-5.286 (-0.355)
CON	-8.313 (-0.585)
BANK	-3.959 (-0.198)
MED	20.843 (1.541)
RE	-5.376 (-0.271)
TMT	3.647 (0.328)
Constant	16.306* (1.846)
Observations	318

T-statistics in parentheses below coefficient.

***p<0.01, **p<0.05, *p<0.1

Table 9: Multivariate regression of IPO underpricing, excluding outliers

Variable	Underpricing
IBD/E	-7.218 (-1.447)
BS	-5.221 (-1.346)
CON	3.740 (1.164)
BANK	5.092 (0.988)
MED	-3.953 (-1.166)
RE	-2.925 (-0.507)
TMT	1.224 (0.328)
Constant	8.788*** (3.583)
Observations	223

T-statistics in parentheses below coefficient.

***p<0.01, **p<0.05, *p<0.1

Table 8 and 9 show the result of the multivariate regression model of IPO underpricing for the entire sample population and with outliers excluded respectively. The results show no statistically significant correlations between the dependent and independent variables but are nevertheless interesting due to what they show about valuation uncertainty and underpricing in each respective industry. The coefficient for each of the industry control variables show the underpricing in that industry relative to the industrials sector which is represented by the constant variable. The regression model shows the highest underpricing in the MedTech and Tech industries, sectors characterised by high growth assumptions, while less complex and more asset heavy industries including financial institutions, real estate as well consumer firms are less underpriced.

In table 7, the univariate regression model highlights a statistically significant correlation at a 10% significance level between leverage and underpricing for the sample with outliers excluded. Comparing those results to table 9 the implication remains, increased leverage is correlated to less underpricing, but the relationship is, when adding the industry control variables, not statistically significant.

4.1.3. Robustness analysis

Table 10: Univariate regression, subsample 1

Variable	Underpricing
IBD/E	-6.365 (-1.206)
Constant	23.440*** (3.808)
Observations	89

T-statistics in parentheses below coefficient.

***p<0.01, **p<0.05, *p<0.1

Table 11: Univariate regression, subsample 1 - outliers excluded

Variable	Underpricing
IBD/E	-10.999* (-1.684)
Constant	6.988*** (3.227)
Observations	64

T-statistics in parentheses below coefficient.

***p<0.01, **p<0.05, *p<0.1

Table 12: Univariate regression, subsample 2

Variable	Underpricing
IBD/E	-9.052 (-0.825)
Constant	18.321*** (3.161)
Observations	229

T-statistics in parentheses below coefficient.

***p<0.01, **p<0.05, *p<0.1

Table 13: Univariate regression, subsample 2 - outliers excluded

Variable	Underpricing
IBD	-3.522 (-0.623)
Constant	9.329*** (6.223)
Observations	159

T-statistics in parentheses below coefficient.

***p<0.01, **p<0.05, *p<0.1

Table 10, 11, 12 and 13 show the results of the univariate regression model on IPO underpricing in Subsample 1 (Norwegian and Danish firms), and Subsample 2 (Swedish firms) with outliers included and excluded respectively. For the full sample, the models imply no statistically significant correlation between leverage and underpricing. Thus, the results of the models for the entire sample, presented in table 6 and 8, are representative for all three studied countries. Notable is that studied non-Swedish IPOs are more underpriced than their Swedish peers, as evident by a lower constant variable, statistically significant at a 1% significance level in both subsamples. Further the effect of leverage is implied to be higher in Sweden compared to Norway and Denmark, as seen in the larger IBD-coefficient.

Taking a closer look at the respective subsamples with outliers excluded shifts the results. In table 11 and 13 the results shift, showing less underpricing and a higher leverage coefficient for non Swedish IPOs compared to Swedish. Furthermore, the univariate regression model for the full sample with outliers excluded showed a statistically significant relation between underpricing and leverage at a 10% significance level. When divided into subsamples, this statistically significant relationship holds for the Norwegian and Danish IPOs but not for the Swedish.

4.2. Nonparametric analysis

4.2.1. Mann-Whitney U Test

In addition to the regression models we also conducted a nonparametric test of the sample, dividing it into firms with a leverage ratio of 0.25x or higher and firms with a leverage ratio of under 0.25x. Although the test showed a lower mean rank, i.e., less underpricing for the group of firms with a leverage of 0.25x or greater the result was not statistically significant. The same result was observable excluding outliers from the sample.

5. Discussion

Our results point towards a negative, but not statistically significant relation between IPO underpricing and leverage in initial public offerings on the Swedish, Danish and Norwegian stock market between 2013 and 2022. In short, when looking at the full sample, firms with higher leverage were less underpriced compared to lower levered firms, but not at a statistically significant level. The underpricing itself is statistically significant at a 1% significance level. Removing outliers from the sample changes our result, and shows negative correlation between leverage and underpricing, statistically significant at a 10% significance level.

As the Swedish market makes up 72% of the sample we performed a robustness check by dividing the sample into Swedish and non-Swedish IPOs and applying our univariate regression model on the two subsamples. Performing the same univariate regression analysis on the full sample showed no statistically significant correlation between IPO underpricing and leverage could be implied. In both subsamples the underpricing was statistically significant at a 1% confidence level. Notable was that Swedish IPOs were less underpriced than their Norwegian and Danish peers, as showcased by a lower constant coefficient. Furthermore, the effect of leverage was implied to be higher in Sweden as evident by a higher leverage coefficient in the model.

Removing outliers from the subsamples shows that the statistically significant relationship between leverage and underpricing, when looking at the full sample with outliers removed, only holds for IPOs in Norway and Denmark, with Swedish IPOs showing the same negative correlation but at a statistically insignificant level. Additionally, when excluding outliers, Norwegian and Danish IPOs are less underpriced with leverage impacting the price more than what is the case for Swedish IPOs.

When adding control variables for industry the underpricing, represented by the constant in the model, is statistically significant at a 10% significance level for the full sample and at a 1% significance level when outliers are excluded. None of the independent variables, including the leverage ratio, show statistical significance, but the size and sign of their respective coefficients do nevertheless provide an insight into pricing of IPOs. As hypothesised in table 1, firms with less complex operations and a lower growth profile, e.g., firms in the Financial Institutions, Real Estate and Consumer industries are less underpriced

than their peers. The opposite is true for firms in the MedTech and Tech sector, with a possible explanation behind this being that the valuation of these firms is reliant on expected future cash flows, often with a high growth profile assumed. As these factors are uncertain the perceived risk is higher and the valuation is thereby more ambiguous and dependent on the assumptions, thereby increasing the risk of the IPO being further underpriced, as discussed in Beatty & Ritter (1986), James and Wier (1990) and Jaemin, Pukthuanthong and Walker (2008). When excluding outliers from the sample in the multivariate regression model the negative correlation between the leverage ratio and the underpricing is not statistically significant, diverging from the univariate regression model of the same sample. This implies that while leverage may play a role in explaining the underpricing in IPOs in Sweden, Denmark and Norway, other factors, such as sector or industry, have a greater explanatory value.

In economic terms, there are a few implications following this result. In the univariate regression model, the coefficient for interest-bearing debt over market value of equity was -6.856, meaning that increasing the debt load by 100% of the equity value would reduce underpricing by 6.856%. As such, the economic benefit that would be realised by leveraging up to reduce underpricing is limited. An unlevered firm with an equity value of SEK 1bn would by incurring 20% of that value in debt, *ceteris paribus*, reduce its underpricing by 1.4% thereby potentially realising an additional SEK 14m in the IPO. However, costs associated with this debt, such as the interest rate, the arrangement fees, as well as the operational restrictions that would likely arise from covenants would in all likelihood eat into that figure to the extent that debt incurrence for the sake of reducing IPO underpricing would be an unwise thing to do.

The findings in our study are somewhat contradictory to previous, American, studies on the effect of leverage on IPO underpricing by James and Wier (1990) and Ljungqvist and Habib (2001). Although James and Wier looked at private lending relationships as a binary metric and we chose to look at the respective leverage ratio of each firm, we hypothesised that our findings would be in line with previous studies. There are a multitude of factors that could explain this divergence in results. One is that the leverage ratio, unlike the private lending relationship, is dependent on the operations of the firm. Asset-heavy firms, such as real estate companies and banks have due to the nature of their business the ability to incur high debt loads which will give them higher leverage ratios compared to growth companies with low

cash flows and light balance sheets. This means that the ability for a firm to issue or incur debt is of greater weight in our study compared to previous papers on the topic. This point is highlighted by the fact that when the industry control variables in our regression model for the sample excluding outliers, leverage goes from statistically significant at a 10% significance level to statistically insignificant.

One fundamental point of consideration is what the cause of underpricing is. Rock's (1986) theory is that the winner's curse resulting from the information asymmetry between informed and uninformed investors lead to IPOs being priced below their fair value to ensure positive, or at least non-negative, price development for all investors across a larger number of offerings. Otherwise uninformed investors would not want to participate in IPOs. Looking solely at the information asymmetry aspect we believe that debt is a signalling factor, i.e., that it discloses private information regarding a firm's financial robustness to the public, as discussed in the article by James and Wier (1990).

There is a divergence between the European and American market which partly can explain the differences in results between the two continents and thereby between our study and previous research. American firms are more likely to use bonds while European firms are more reliant on private debt financing (Duffy et al., 2022). Key differences between the two debt forms are different financial covenants, with bonds generally being incurrence based i.e., placing no or few financial restrictions on the company other than incurrence of additional debt, while private debt generally is more restrictive in its covenants. As private debt is more common in Europe than the US, it could be argued that the signalling effect of debt is not as prevalent in the European market. Whereas in the US where financing through bonds is more prevalent, having a private debt contract could provide a higher signalling value since it is more uncommon.

Another explanatory factor is the time difference between previous studies and our. The Preqin Database, which contains information regarding private debt funds, shows that assets under management for Europe focused lenders have increased by 9,700% since the year 2000. The implication of this is that debt is more easily accessible today compared to 20 years ago. Because of this, it can be argued that the signalling effect is less than it previously has been as more firms can incur debt from lenders which have a higher risk appetite compared to banks who historically have had a monopoly on the private debt market.

6. Conclusion

The research question for this study was to investigate the effect of leverage, in this case defined as interest bearing debt, on IPO underpricing in Sweden, Norway and Denmark. As the geographic scope is limited, and as previously discussed, there are significant differences between the capital markets in the studied countries, the learnings of this paper are limited with regard to other countries. Historical research on the subject is limited and what has been studied is centred around the US in the 80s, 90s and early 2000s. Our study does thereby shed a light on the effects of debt in IPOs in one of the most active equity markets in the world, up until now unstudied in the context of what we are looking at, which provides ample relevance concerning the topic in question.

In our study we looked at 318 IPOs in Sweden, Norway and Finland between 2013 and 2022. To gain a further understanding of the subject we also performed our analysis on a sample which excluded the outliers with regard to both underpricing and leverage, comprising 223 IPOs. No matter which sample or subsample we looked at the underpricing was in and of itself always statistically significant, and while this was expected, it underlines a very real phenomenon.

The answer to the question of the effect of leverage on IPO underpricing is inconclusive. When looking at the univariate regression of the full sample a negative correlation between the two is implied, with higher leverage being associated with less underpricing, but the correlation is not statistically significant. Adding industry control variables provides further colour on the effects of the characteristics of each respective industry, with growth firms implied to be more underpriced while less complex and more stable firms with larger balance sheets are implied to be less underpriced. However, the differences between the industry groups is not statistically significant. Dividing the full sample into Swedish and non-Swedish IPOs show the same implied negative correlation between leverage and underpricing, with the result not being statistically significant in either subsample.

Excluding outliers from the sample results in a somewhat different result. Looking only at underpricing and leverage, the negative correlation between the two is statistically significant at a 10% significance level. However, looking at the subsamples of Swedish and non-Swedish IPOs the correlation is not statistically significant for Swedish IPOs but remains so for the Norwegian and Danish. Further, when adding industry control variables to the full

sample with outliers excluded, the same negative correlation between leverage and underpricing is still observed but once again at a level which is not statistically significant.

In conclusion, the results of this study are to a large extent contrary to our hypothesis that a higher leverage ratio is negatively correlated with underpricing in initial public offerings. Although all regression models on the sample and subsamples implied a negative correlation between leverage and underpricing, the statistical significance is varying. When excluding outliers the correlation is significant in the univariate regression, but in terms of geography the significance only holds for Norwegian and Danish IPOs. Further, when adding industry control variables to the regression of the sample with outliers excluded the correlation is not statistically significant, suggesting that part of the effect of leverage on underpricing is explained by the leverage profiles of different industries. Ultimately, leverage seems to have a signalling effect which reduces uncertainty and thereby underpricing, but the effect is small.

Finally, the economic implication of the observed relation is that while incurring additional debt is implied to lead to decreased underpricing which will generate greater proceeds in the IPO, such savings will be largely undone by the costs and fees which follow, unless it results in a more optimal capital structure. Furthermore, the reduced operational flexibility is hard to put a price on, but since the potential gains are small both managers and owners would likely prefer and deem increased flexibility more profitable in the long run.

7. Limitations and directions for future research

This study is limited in terms of that no qualitative data regarding the debt has been extracted or looked at. Outside our scope from the outset, who the lender is and what type of debt the firm in question has incurred can be assumed to have an effect on how the leverage is perceived by the market. There is a great difference in the signal that an investment grade bond or bank financing compared to a high-yield unitranche loan sends, and because of this it can be hypothesised that different financings equal in leverage ratio will affect uncertainty and thereby underpricing in an IPO differently.

Although we had a sizable dataset comprising IPOs in Sweden, Denmark and Norway between 2013 and 2022, it limited the number of industry control variables that could be added which in turn reduces the accuracy and explanatory value of those included. Further, the limited geographic scope reduces the ability to extrapolate conclusions from this study to other markets and countries. Looking at a broader geographic scope would increase the sample size and enable more general conclusions while at the same time highlighting differences between countries.

A common usage of proceeds in an IPO is to delever the firm, i.e., repaying some or all of the existing debt. Because of this the firm that investors choose to invest in has a different capital structure and thereby financial risk profile compared to what it had prior to the IPO. Pre-IPO leverage has the advantage of being a sign of due diligence performed by another party as well as that management has restrictions limiting their flexibility. However, as this is not the structure that an IPO investor buys into it is possible that the historical capital structure is of less importance than the future capital structure. Including post-IPO leverage could thereby shed a further light on the relationship between debt and IPO underpricing.

Lastly, the limited previous research on the topic, especially in Europe and the Nordic region, limits the conclusions that can be drawn from this study in relation to and on the back of previous research.

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