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Ownership Concentration and IPO Underpricing on the Stockholm Stock Exchange

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Abstract

The purpose of this paper is to examine if ownership concentration prior to an initial public offering (IPO) can explain first-day returns. This relationship is explored by studying new issues offered to the public in Sweden between January 1, 2000 and December 31, 2017. Using a data sample consisting of 96 firms listed on the Stockholm Stock Exchange, we compute first-day returns and find an average underpricing level of 9.1% for the sample period. To test if ownership concentration prior to the IPO can explain underpricing we use three different independent ownership concentration variables. The ownership concentration variables are based on the percentage of voting rights held by the single largest shareholder or the three largest shareholders prior to the IPO. We test if firms with a majority shareholder prior to the IPO experience different underpricing levels than firms without a pre-IPO majority shareholder. We find no statistical evidence that the average underpricing is different between the two groups of firms. We also test how a higher level of ownership concentration affects underpricing, and find a negative relationship between pre-IPO ownership concentration and underpricing for all three ownership concentration variables. However, the results are not statistically significant.

Keywords: Initial Public Offerings, Underpricing, Ownership Concentration, Large Shareholders, Information Asymmetry

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1. Introduction

The initial public offering (IPO) is the process in which a privately held company is transformed into a public company. The IPO is often one of the most important stages during a company's lifetime. The reasons for going public are many. Going public is a way to raise new equity capital, to monetize the investments of private shareholders, to enable trading of the shares or to change the ownership structure in the company (Ritter and Welch, 2002). The IPO process usually involves an underwriter, which typically takes the form of an investment bank, who works closely with the issuing firm to determine the initial offering price of the securities. There is a global phenomenon of a discrepancy between the offer price and the first day closing price. This difference is usually a positive first-day return, also widely known as IPO underpricing. Ritter and Welch (2002) found positive average first-day returns of 18.8% between 1980 and 2001 in the United States. When underpricing an issue, the previous owners "leave money on the table" by selling their shares at a lower price than the true market value of the shares (Ritter and Welch 2002). The main focus in previous finance literature has therefore been on understanding why new issues are underpriced.

Over the years, many explanations of IPO underpricing have been provided. These explanations can be divided into four main categories: institutional explanations, behavioral reasons, ownership and control explanations and information asymmetry (Ljungqvist, 2007). The first category, institutional explanations, implies that firms and underwriters underprice the offer to reduce their legal liability or the probability of being sued for misrepresentation (Tinic, 1988). Behavioral reasons state that issuers underprice intentionally since they believe they will recoup the costs on the shares they retain or on future seasoned offerings (Loughran and Ritter, 2002). The third category involves ownership and control reasons, which presents an explanation where initial owners underprice to be able to reduce the block size of new shareholders (Brennan and Franks, 1997). The final explanation of IPO underpricing is based on information asymmetry between parties involved in the IPO transaction, where underpricing is required because parties are not equally informed about the true value of the firm (Rock, 1986).

Focusing on information asymmetry, previous research has been investigating how large pre-IPO owners can signal the quality of the firm and reduce the ex-ante uncertainty. Through close monitoring and control of the firm these large shareholders have a reputation of being an owner that increases firm value. This will reduce underpricing by

setting an offer price closer to the true market value. Empirical evidence on large pre-IPO owners and underpricing has been provided by Mogilevsky and Murgulov (2012) who found that private equity-backed IPOs experience less underpricing than venture capital-backed or non-sponsored IPOs. In addition to this, Bruton, Chahine and Filatotchev (2009) found evidence that IPOs of family businesses were less underpriced than IPOs of non-family businesses. Also, Filatotchev, Chahine and Bruton (2006) found evidence that the founders' ownership level can reduce underpricing.

Other studies connected to signaling in the IPO covers how corporate control affects underpricing. Chen and Strange (2004) argue that if there are large shareholders with a lot of control rights, there is a potential problem of private benefits of control. Private benefits of control imply that large shareholders get an economic gain at the expense of small shareholders. Large shareholders signal the potential issue of private benefits of control. The presence of large shareholders therefore makes it less attractive for smaller shareholders to purchase shares in the offer. This would imply that firms with dominant shareholders are valued lower, resulting in a lower first-day closing price. Chen and Strange (2004) found a significant negative relationship between underpricing and ownership concentration.

Studying previous findings on IPO underpricing we expect a high pre-IPO ownership concentration to result in lower underpricing than for companies with a dispersed ownership structure. We base this prediction on two main arguments. The first argument is that certain types of large pre-IPO shareholders can signal firm quality and hence increase the offer price. The second argument is that firms with large shareholders are valued lower, since the private benefits of corporate control is allocated to the large shareholder, making it less attractive for small shareholder to purchase shares in the offer. The previous literature covering the relationship between pre-IPO ownership concentration and underpricing in Sweden is scarce. We are hence determined to delve deeper and understand the relationship more. The purpose of this paper is therefore to investigate whether or not a large control stake, held by the largest, or a few of the largest shareholders, prior to the IPO affects underpricing in Swedish public listings. We modify the regression models used in previous literature to investigate this relationship further. This modification is vital for our paper to contribute to existing finance literature. Our aim for this paper is to provide a new angle on large shareholders and their influence on IPO underpricing on the Swedish market.

In order to investigate if ownership concentration prior to the IPO affects underpricing levels we use a data set consisting of 96 successful IPOs made on the Stockholm Stock Exchange between January 1, 2000 and December 31, 2017. The Stockholm Stock

Exchange is chosen exclusively. The reason for this delimitation is that we are concerned that issues made on other Swedish lists are not comparable due to regulatory differences. Sweden is used to test if the results on the Swedish market deviate from similar studies made on the U.S. market, Asian markets and wider European markets. The time period 2000-2017 is chosen to include periods of both booms and bursts on the Swedish market. Furthermore, this study only includes companies that go public for the first time. As a result of this, list changes, secondary listings, equity carve outs or spin-offs are excluded from the data sample.

Starting with IPO data collected from SDC Platinum and stock price data collected from Datastream we calculate first-day returns. Our findings indicate that Swedish IPOs experience an average positive first-day return of 9.1%, with the results significant at a 1% level. Using data on ownership structures prior to the IPO, collected from the listing prospectus, we also test if firms with a majority shareholder prior to the IPO experience different underpricing levels than firms without a pre-IPO majority shareholder. We find no statistical significance that a pre-IPO majority shareholder reduces underpricing more than for firms without a majority shareholder. We also run several regressions with the observed underpricing as the dependent variable and three different pre-IPO ownership concentration variables. The ownership concentration variables are based on the voting right stake held by the single largest shareholder or the three largest shareholders prior to the IPO. We also add control variables to the regression including IPO- and firm characteristics. The regressions display a negative relationship between pre-IPO ownership concentration and underpricing, but the results are not significant at a 10% significance level.

2. Previous Literature and Hypothesis Development

In this section, we first cover theoretical explanations and empirical evidence on IPO underpricing. Thereafter, we develop our hypotheses based on previous research.

2.1 Theoretical Explanations of IPO Underpricing and Empirical Evidence

The phenomenon of IPO underpricing has throughout the years been documented by a large amount of researchers. Ritter and Welch (2002) found that the average first-day return for IPOs in the U.S. between 1980 and 2001 was 18.8%. They further found that about 70% of the IPOs ended at a closing price above the offer price, and that 16% had a first-day return of exactly zero. Furthermore, Loughran and Ritter (2004) found underpricing levels of 7% in the

1980s, of 65% during the internet bubble in 1999-2000 and 12% during 2001-2003 for the U.S. market. In addition to observations being made in the U.S., the European market has also shown evidence of IPO underpricing. Ljungqvist (1997) examined German IPOs during 1970-1993 and found an average underpricing level of 9.2%. Cassia et al. (2004) presents an underpricing level of 21.9% on the Italian Stock Exchange between 1985 and 2001. Additionally, Thorsell and Isaksson (2014) found average underpricing levels of 15% in Sweden between 1996 and 2006. Another study on the Swedish market presents average initial returns of 7.7% between 1996 and 2011 (Abrahamson and De Ridder, 2015). Looking at the Asian market, Chen and Strange (2004) found an average underpricing of 130% in China between 1995 and 1999.

Over the years, many explanations of underpricing have been offered and the wider explanations can be divided into four main categories. These are: institutional explanations, behavioral reasons, ownership and control explanations and information asymmetry (Ljungqvist, 2007).

2.1.1 Theories Based on Institutional Explanations

Institutional explanations of underpricing argue that underwriters and issuers underprice the offer to reduce their legal liability and the likelihood of being sued for misrepresentation. The underpricing will protect the issuer and the underwriter from being sued since the future share price is less likely to drop below an underpriced offer price (Tinic, 1988). However, this theory has been disputed in previous literature covering the subject, as it has been shown that countries that does not have the same litigative tendencies as the U.S. experience similar levels of IPO underpricing (Keloharju, 1993).

2.1.2 Behavioral Reasons

Underpricing theories based on behavioral reasons suggest that the issuer intentionally underprice the offer. The issuer is not upset by the intentional underpricing, since the loss is offset by the gain they will achieve on the shares they retain. By giving investors a positive first-day return, the performance in the secondary market increases and future equity issues could be placed at the higher market price, which will compensate for the IPO underpricing (Loughran and Ritter, 2002; Ibbotson, 1975).

Furthermore, a too high offer price in an IPO might also lead to a negative informational cascade. This means that investors demand shares only when other investors

demand shares. If the offer price is set too high, investors will abstain because others do so. The possibility of cascades gives power to early investors who can demand more underpricing in return for committing to the IPO (Welch, 1992).

2.1.3 Ownership and Control Explanations

Theories connected to ownership and control suggests that underpricing is used as a corporate control mechanism. By underpricing the issue, the initial owners increase demand for the shares, making it possible for them to strategically allocate shares with parties that are less likely to call for their dismissal (Jensen and Meckling, 1976). Brennan and Franks (1997) found empirical evidence that underpricing is used to ensure oversubscription in the issue and for initial owners to remain in control post the IPO. They suggest that the initial owners underprice the issue to reduce the size of new shareholdings.

2.1.4 Theories Based on Information Asymmetry

2.1.4.1 Information Asymmetry Between Investors

According to Rock (1986), if all investors in the market were equally informed, all IPOs would be underpriced because the informed investors would only buy shares with a price below the true market value. In reality, all IPOs are not underpriced and Rock (1986) therefore argues that there are two types of investors, the informed and the uninformed investors.

The uninformed investor fears a winner's curse when purchasing shares in an IPO. This means that the uninformed investor fear that they have received full allocation of shares because they were willing to pay the highest price. The uniformed investor would receive a full allocation only when the IPO is overpriced and a partial allocation when it is underpriced. The uninformed investors are aware of the problem that they are likely to end up receiving shares in unattractive IPOs and they will therefore not participate in the IPO. The demand from informed investors is usually not sufficient for a successful IPO and hence the issuer needs the uninformed investors to participate as well. To get the uninformed investor to participate, the issuing firm therefore has to underprice the offer (Rock 1986). According to this theory, IPOs are underpriced so that an uninformed investor, on average, breaks even

when investing in IPOs (Ritter and Welch, 2002). Keloharju (1993) confirms the presence of the winner's curse on the Finnish market.

In the IPO process, the underwriter obtains information from informed investors to set an offer price range, called the book building process. After the book building process, the underwriter goes on a "road show" to create more demand and to get an understanding of the interest in the IPO. Basic supply and demand theories imply that more demand will lead to a higher offer price, but in an IPO the investor knows that showing a high interest will result in a higher price. The investor therefore requires something in return for showing their interest (Ritter and Welch, 2002). To make the informed investors willing to reveal information about their interest, they must in return, either receive more allocations or underpricing. Cornelli and Goldreich (2001) found that investment bankers award a higher number of shares to investors who reveal more information in their bids.

Conelly, Limpaphauon and Siraprapasiri (2004) argue that large shareholders are more informed than small investors. They found that a higher post-IPO ownership concentration results in more underpricing. This means that large investors have the ability to find more underpriced offers, and are hence more informed. The authors study the relationship between post-IPO ownership concentration and underpricing in Thailand between 1989 and 1993. However, Venkatesh and Neupane (2005) studied the same relation in Thailand, but during the years 2000 and 2004. They instead found post-IPO ownership concentration to negatively affect underpricing, with the expectation of the opposite relation.

2.1.4.2 Information Asymmetry Between the Issuer and Investors

According to Akerlof (1970) investors fear a so-called "lemons problem" when purchasing shares in an IPO. Due to information asymmetry, the investor cannot judge if the shares are of good or bad quality (a lemon). To compensate for the uncertainty about the quality of the shares, the investor requires an average price of the shares. This creates an incentive for lower-than-average quality issuers to sell their shares since the average market price is most likely higher than the price they would receive without information asymmetry. At the same time, this implies that higher quality issuers are forced to sell their shares at a lower price than the true value of the shares. This deters higher quality issuers from selling their shares. For this reason, signaling quality in an IPO is of great importance (Ritter and Welch, 2002).

The presence of certain large shareholders has proven to signal firm quality in the issue and hence reduce underpricing. A common type of large shareholder is private

equity firms. A private equity firm is a financial investor that invests in existing companies and typically buys 100% ownership of the companies they invest in (Nigudkar, 2018). Mogilevsky and Murgulov (2012) studied underpricing differences in the U.S. between private equity-backed, venture capital-backed and non-sponsored IPOs between 2000 and 2009, and found that private equity-backed IPOs were on average, less underpriced. The authors argue that the private equity firm is a lucrative and continuing client for the investment bank and therefore the investment bank reduces the costly underpricing. In line with this, Ferretti and Meles (2011) argue that companies backed with a private equity investor faces less ex-ante uncertainty and are therefore expected to have lower underpricing. The authors found evidence on the Milan Stock Exchange that issues backed by a private equity syndicates experience lower first-day returns.

Another type of financial investor is venture capital firms. Venture capital firms usually invest in companies with a high growth potential and often buy 50% or less of the equity in the companies they invest in (Nigudkar, 2018). Barry et al. (1990) studied venture capital-backed IPOs between 1978 and 1987 in the U.S. and found that venture capital firms provide close monitoring services, take concentrated equity positions and retain a large portion of the shares after the IPO. The authors found a relationship between the quality of the monitoring and the level of underpricing. They provide evidence that initial returns decrease when the quality of the monitoring is high. In line with this, Belghitar and Dixon (2012) confirmed the prevailing belief that venture capital firms reduce uncertainty in the IPO and found that venture capital-backed IPOs were less underpriced than non-venture capital-backed IPOs on the U.K. market.

Other types of large pre-IPO owners are families or founders. Daugherty and Jithendranathan (2012) found that American family businesses experienced less underpricing than non-family businesses. Bruton, Chahine and Filatotchev (2009) found evidence that the founder's retained ownership limits the problems with IPO underpricing. They argue that the founder's retention of shares signals the quality of the company.

Furthermore, large shareholders can also signal the potential problem of private benefits of control. Private benefits of control mean that large shareholders benefit at the expense of small shareholders. Examples of private benefits of control include the misuse of corporate resources, pursuing pet project or entering into conflicts-of-interest transactions. Chen and Strange (2004) argue that the presence of large shareholders makes it less attractive for small shareholders to purchase shares in the offer, because the private benefits of control are allocated to the large shareholder. This would imply that firms with dominant

shareholders are valued lower, which would result in a lower initial return. Chen and Strange (2004) confirmed this theory on the Chinese market and found a significant negative relationship between underpricing and the portion of shares held by the largest pre-IPO shareholder between 1995 and 1999. On the contrary, Claessens et al. (2002) found that firm value increases with large shareholders in East Asian countries, because of a positive incentive effect. Large shareholders have an incentive to monitor the firm more closely and work actively with corporate governance. Smaller shareholders would then value these IPOs higher since they can reduce their monitoring costs when purchasing shares in firms with large shareholders.

2.2 Hypothesis Development

The previous literature covering IPO underpricing reach the conclusion that IPOs are, on average, underpriced. In line with these findings, we define the following alternative hypothesis:

Hypothesis 1: Swedish IPOs exhibit a positive first-day return

Sweden is used to test if the results on the Swedish market deviate from comparable studies made on the U.S. market, Asian markets and wider European markets. We believe that the Swedish market will present lower underpricing levels than other countries due to high regulation on the Swedish market. Also, the Swedish capital market is smaller when being compared to the U.S. market, European markets and Asian markets. We believe larger capital markets to have more speculative issues that increase the average underpricing.

Concluding previous research, we believe the expected relationship between pre-IPO ownership concentration and IPO underpricing to be negative in Sweden. We base this prediction on two main arguments. The first reason for our predictions is that previous studies have found a negative relationship between large pre-IPO shareholders and underpricing. These studies argue that certain types of large pre-IPO owners can act as a certification of firm quality, which reduces the uncertainty in the offer, and hence increases the offer price. The reason for why the large shareholders can signal quality and increase the offer price is because that they through close monitoring and control of the firm have a reputation of being an owner that increases firm value. In addition, certain types of large shareholders also have a close relationship with the underwriters, who will reduce the costly

underpricing. The second argument for our predictions is based on research made on corporate control and IPO underpricing. These studies argue that for larger shareholders with a lot of control rights, there is a higher private benefit of control. Large shareholders signal the potential issue of private benefits of control. The presence of a large shareholder therefore makes it less attractive for small shareholders to purchase shares in the offer. This would imply that companies with dominant shareholders are valued lower by the market (Chen and Strange, 2004). This will in turn result in a reduced closing price, contributing to a lower underpricing level.

We also find existing theories predicting the opposite as well. For instance, ownership and control theories suggests that large shareholders underprice to remain in control. By underpricing the issue, the initial shareholders create a high demand for the shares to be able to strategically allocate shares to smaller shareholders. Additionally, a large shareholder has a higher incentive to monitor the firm, which means that small shareholders can reduce their monitoring costs by purchasing shares in IPOs with large owners. This makes firms with large shareholders more attractive and hence valued higher, which increases the initial return. Therefore, we first want to investigate how a pre-IPO majority shareholder affects underpricing and we hence state the following alternative hypothesis:

Hypothesis 2: Swedish firms with a pre-IPO owner holding more than 50% of the voting rights exhibit different underpricing levels than firms with a dispersed ownership structure prior to the IPO

Finally, we are also interested in understanding whether or not the level of ownership concentration reduces IPO underpricing, regardless if the firm has a pre-IPO majority shareholder or not. We therefore define the final alternative hypothesis:

Hypothesis 3: A higher level of pre-IPO ownership concentration leads to lower underpricing levels within Swedish firms

3. Data

This section provides a description of the data collection process and the data sources used for IPO data, underpricing data and the regression variables.

3.1 IPO Data

In order to test our hypotheses, we need data on the issues made on the Stockholm Stock Exchange between January 1, 2000 and December 31, 2017. The primary data set is collected from Thomson Reuters Security Data Company (SDC) Global New Issues Database (provided by the Swedish House of Finance). The collected listings are checked with data from Bloomberg and Nasdaq's website, which also provide data on the IPOs during the sample period. The initial number of issues during the sample period is 221.

From the gathered sample, all firms that changed lists or made a secondary listing are excluded. The reason for this is to focus on firms that go public for the first time. We also believe that the first-day return will be heavily influenced by the stock performance on the previous stock exchange. The number of firms that made a secondary listing is 16 and the number of firms that changed list is 69. Additionally, equity carve-outs and spin-offs are also excluded from the sample since these issues often do not have an offer price. The number of equity carve-outs and spin-offs are 16 during the period. Firms with missing data are also excluded from the sample and amounts to 24 issues. The final number of issues in the data set is 96.

Table 1
Sample Selection Criteria

The table displays the selection criteria for the data set and the number of firms excluded at each criterion. Data on listings are collected from SDC Platinum and checked with Bloomberg and Nasdaq's website. For the third criterion, the listing prospectus, Datastream and the Swedish Tax agency is used to collect the necessary data. The listing prospectuses are provided by the Swedish Financial Supervisory Authority.

Criteria	**Firms**	**Excluded**
1. Listed on the Stockholm Stock Exchange 2000-2017	221	
2. Pure IPOs (No list change, secondary listing, carve out or spin-off)	120	-101
3. Complete data	96	-24
Final sample	**96**	

3.2 Underpricing Data

To calculate the initial return, we need the offer price and the first-day closing price in the aftermarket. The offer price is collected from SDC platinum and is compared with published prices on the Swedish Tax Agency's website. The first-day closing price is collected from Thomson Reuters Datastream and Nasdaq's website. The first-day closing price is the unadjusted price, which means that it is not adjusted for any stock splits etc. The unadjusted price is used to ensure that the closing price corresponds to the offer price.

3.3 Regression Variables

To understand how ownership concentration prior to the IPO affects underpricing in Swedish IPOs we need data on ownership structures prior to the IPO. This is collected manually from the listing prospectus, which provides details on the largest shareholders and their holdings. The listing prospectus is provided by the Swedish Financial Supervisory Authority. In the regression models, we use six different control variables. We control for the age of the firm, which is defined as the difference between the foundation date and the listing date in years. Data on foundation date is collected from the listing prospectus and the company's website, whereas the IPO date is collected from the Swedish Tax Agency's website. The regression also includes total market capitalization at the time of the IPO, which is collected from Datastream. Furthermore, we control for total proceeds raised in the offer, pre-IPO profitability (ROA) and the retention rate of all pre-IPO shareholders. Data for these control variables are also collected from the listing prospectus. Table 2 below displays the volume distribution of IPOs per year. Companies with a majority shareholder prior to the IPO amounts to 53, which corresponds to approximately 55% of the final sample.

Table 2
Number of IPOs Per Year

The table displays the volume distribution of IPOs per year on the Stockholm Stock Exchange between January 1, 2000 and December 31, 2017, and the distribution divided into two groups based on the ownership concentration prior to the IPO. The first group includes firms with a pre-IPO owner holding more than 50% of the voting rights (OC > 50%) and the second group includes all other firms (OC 0-50%). The data is collected from SDC Platinum and the companies' listing prospectuses. The listing prospectuses are provided by the Swedish Financial Supervisory Authority.

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
OC > 50 %	3	1	1	0	0	3	2	2	0	0	2	0	0	0	7	14	9	9	53
OC 0-50 %	4	3	2	0	3	2	6	0	0	0	1	4	0	1	5	4	3	5	43
Total	**7**	**4**	**3**	**0**	**3**	**5**	**8**	**2**	**0**	**0**	**3**	**4**	**0**	**1**	**12**	**18**	**12**	**14**	**96**

4. Methodology

In this section we first present the empirical strategy used on underpricing, based on previous literature. We also describe the dependent variable, the key independent variables and the control variables used in the regression models. We further present the statistical tests to be performed and lastly, we test our econometric model.

4.1 Empirical Strategy

In order to test our hypotheses, we use an Ordinary Least Square (OLS) regression with the observed underpricing as the dependent variable. Underpricing is defined as the percentage change between the offer price and first-day closing price. To properly account for the effects of ownership concentration in public listings, it is necessary to control for certain variables. A total of nine independent variables are used in the regression, whereof three variables are key independent variables to test our hypotheses, and six variables are considered control variables.

4.1.1 Dependent Variable

When examining underpricing it is important to use the same stock price quote as previous papers so that the results are comparable. We use the first-day closing price in line with Loughran and Ritter (2004), Mogilevsky and Murgulov (2012) and Marcato, Milcheva and Zheng (2018). The first-day closing price is used since later day closing prices could be influenced by new market information that is difficult to control for. Lastly, the first-day closing price is not adjusted to better correspond to the offer price. According to Beatty and Ritter (1986), market movements are very small compared to average initial returns. The authors argue that it is therefore reasonable to use the unadjusted first-day closing price when calculating the initial return. The first-day return is hence calculated as follows:

$$UP_i = \frac{P_{i,t}^{C} - P_{i,t}^{O}}{P_{i,t}^{O}}$$

Where $P_{i,t}^{C}$ is the first-day closing price in the aftermarket for firm *i* and time *t*, and $P_{i,t}^{O}$ is the offer price for firm *i* at time *t*.

4.1.2 Key Independent Variables

Pre-IPO Majority Shareholder - "OC_MAJORITY"

To test the hypothesis that firms with a pre-IPO majority shareholder, experience different underpricing levels than firms without a pre-IPO majority shareholder, a dummy variable is used. The variable takes on a value of one if the largest pre-IPO shareholder holds more than 50% of the voting rights in the firm prior to the IPO. We expect underpricing to be lower for firms with a majority shareholder prior to the IPO since it is assumed to reduce the information asymmetry between parties involved in the IPO transaction. We also assume a pre-IPO majority shareholder to signal potential issues with private benefits of control, which makes smaller investors abstain the offer. This will in turn lower the first-day closing price. We hence expect a negative coefficient for this variable.

Voting Rights Held by the Largest Pre-IPO Shareholder - "OC_PERCENT"

This is the second ownership concentration variable that is used to test our hypotheses. The variable is defined as the percentage of voting rights held by the largest pre-IPO shareholder. In line with previous hypotheses we believe a higher ownership concentration to result in lower underpricing. This is a common way to measure ownership concentration and is for instance used by Thomsen and Pedersen (2000) and Chen and Strange (2004).

Voting Rights Held by the Three Largest Shareholders - "OC_HERFINDAHL"

The third ownership concentration variable is calculated using the Herfindahl index. The Herfindahl index is calculated by squaring the percentage of voting rights held by the three largest shareholders and then summing the squares. In previous research, the combined share held by a number of the largest owners is used as a way to measure ownership concentration, as in the work by Demsetz and Villalonga (2001). The Herfindahl index has also been used by Goergen and Renneboog (2001) who sums the square of the three largest shareholders of each category of owner type. In this study we use a modified version of the definition used by Goergen and Renneboog (2001), by only summing the squares of the three largest pre-IPO shareholders. The reason for this modification is that our study is not investigating how different types of owners influence the level of underpricing. In line with the above expectations, we believe that the variable will have a negative coefficient.

4.1.3 Control Variables

The Size of the Firm - "LN_MCAP"

Beatty and Ritter (1986) found that a reduced level of information asymmetry lowers the level of underpricing. As a proxy for ex-ante uncertainty we use the size of the firm, measured as total market capitalization in SEK at the time of the IPO. We hypothesize that larger firms experience less underpricing because they have more information available to the public prior to the IPO than smaller firms. This reduces the information asymmetry for larger firms between parties involved in the transaction. The natural logarithm of total market capitalization is used to reduce the influence of extreme observations.

The Size of the Offering - "LN_PROCEEDS"

This variable is the amount of proceeds raised in the IPO in SEK, and is defined as primary and secondary offerings times the offer price. The natural logarithm is used to reduce the influence by extreme observation. The variable has been used as a control variable in previous research, for instance by Mogilevsky and Murgulov (2012). Furthermore, Beatty and Ritter (1986) found a significant relationship between proceeds raised in an offering and initial returns, and argue that smaller offerings are more speculative and therefore have higher initial returns. Additionally, Carter and Manaster (1990) provide evidence of a negative relationship between offer size and IPO underpricing. In line with their findings we expect larger offerings to show lower underpricing, and hence a negative relationship between the variable and underpricing.

Percentage of Shares Retained by Total Pre-IPO Shareholders - "RETAINED"

This variable is the percentage of ownership retained by the total pre-IPO shareholders in the offer. Brealey, Leland and Pyle (1977) argue that owners retain shares to demonstrate to the market that the shares are of good quality and that they are reluctant to release a portion of future cash flows to outside investors. This leads to a higher closing price, which increases underpricing. At the same time, Habib and Ljungqvist (2001) argue that the initial owners want to maximize the return on their investment, and hence selling more shares in the IPO would incentivize them to put in more effort to get a higher offer price. The higher offer price would then in turn result in lower underpricing. We expect to find similar results and hence predict a positive coefficient for the variable.

The Age of the Firm - "LN_AGE"

This variable is defined as the number of years from the foundation date to the time of the listing on the Stockholm Stock Exchange. The natural logarithm of (1 + the age of the firm in years) is used, since there are large absolute differences in the sample. Using natural logarithms reduces the influence of observations with extreme values. Mogilevsky and Murgulov (2012) and Ritter (1984) used the variable age for control purposes in their studies as it is believed that older firms have more information available to investors than newer firms. This implies that older firms reduce the information asymmetry in the offer. This hypothesis has been confirmed in a study by Muscarella and Vetsuypens (1989), which shows that the older the firm, the lower is the initial return. Additionally, Megginson and Weiss (1991) used the variable to control for the degree of information asymmetry and found a significant negative relationship between the age of the firm and the level of underpricing. We therefore expect to see a negative coefficient for the variable.

Pre-IPO Profitability - "ROA"

Return on total assets is defined as the last fiscal year's Earnings Before Interest and Tax (EBIT), divided by total assets in the firm. This variable is a measure of pre-IPO firm performance. Return on assets has been used in multiple previous papers, for instance in the work by Mogilevsky and Murgulov (2012). We expect higher pre-IPO performance to result in less underpricing as a result of reduced information asymmetry. The reason for reduced information asymmetry is that a higher pre-IPO performance signals a high quality of the firm. The coefficient is therefore expected to be negative.

The Level of IPO Activity During the Year - "IPO_ACTIVITY"

Ritter (1984) describe years with a lot of IPO activity as "hot issue markets" characterized by a lot of firms going public and increased underpricing due to high valuations. When more firms are going public, the average quality of the issues may decrease, increasing the "lemons problem". Since this would increase underpricing during years with a high amount of IPOs, we expect the coefficient to be positive. To control for this effect, a dummy variable is included in the regression that takes on a value of one if the number of IPOs that year is above the 75th percentile for our sample, and zero if the number of IPOs is below the 75th percentile. This method was suggested by Schöber (2008). Using this method, the years with high IPO activity (above the 75th percentile) are 2016 and 2017. The rest of the years are considered to be low/medium IPO-activity years.

4.1.4 The OLS Regression

Combining the variables described above, three different linear OLS regressions are used for each ownership concentration variable. The regression models test if the coefficients are statistically different from zero. For our hypotheses this implies that the three ownership concentration variables will test if ownership concentration, prior to the IPO, can explain the level of underpricing, and if the relationship is negative or positive. The OLS regression will hence test hypothesis (2) and (3), where we expect the coefficients to be negative, for all three key independent variables. We hence estimate the following OLS regressions:

$$UP_i = \beta_0 + \beta_1(OC\_MAJORITY_i) + \beta_2(LN\_MCAP_i) + \beta_3(LN\_PROCEEDS_i) + \beta_4(RETAINED_i) + \beta_5(LN\_AGE_i) + \beta_6(ROA_i) + \beta_7(IPO\_ACTIVITY_i) + \varepsilon_i$$

$$UP_i = \beta_0 + \beta_1(OC\_PERCENT_i) + \beta_2(LN\_MCAP_i) + \beta_3(LN\_PROCEEDS_i) + \beta_4(RETAINED_i) + \beta_5(LN\_AGE_i) + \beta_6(ROA_i) + \beta_7(IPO\_ACTIVITY_i) + \varepsilon_i$$

$$UP_i = \beta_0 + \beta_1(OC\_HERFINDAHL_i) + \beta_2(LN\_MCAP_i) + \beta_3(LN\_PROCEEDS_i) + \beta_4(RETAINED_i) + \beta_5(LN\_AGE_i) + \beta_6(ROA_i) + \beta_7(IPO\_ACTIVITY_i) + \varepsilon_i$$

Where UP_i is the percentage change between the offer price and first-day closing price. $OC\_MAJORITY_i$ is a dummy variable that takes on the value of one if the firm has a majority pre-IPO shareholder and $OC\_PERCENT_i$ is the percentage of voting rights held by the largest pre-IPO shareholder. $OC\_HERFINDAHL_i$ sums the squares of the percentage of voting rights held by the three largest shareholders prior to the IPO. LN_MCAP_i is the natural logarithm of the market capitalization in SEK at the end of the first day going public and $LN\_PROCEEDS_i$ is the natural logarithm of the amount of capital raised in the IPO denominated in SEK. $RETAINED_i$ is the percentage of ownership held by the pre-IPO shareholders after the issue and LN_AGE_i is the natural logarithm of (1 + the age of the firm in years). ROA_i is the return on total assets and is defined as the last fiscal year's Earnings Before Interest and Tax (EBIT), divided by total assets in the firm. $IPO\_ACTIVITY_i$ is a dummy variable that takes on the value of one if the number of IPOs during the observation's year is above the 75th percentile of our sample, and zero otherwise.

4.2 Statistical Tests

To test our hypotheses, we employ several different statistical tests. Hypothesis (1) is tested using a two-sided t-test, which tests if the average return in the total sample is significantly different from zero. In this test the null hypothesis is that the average return is zero. To test hypothesis (2), we use Welch's two-sample t-test, which tests if there is a difference in mean between the two subgroups, defined by the variable "OC_MAJORITY". The reason for using the Welch's t-test and not a regular two sample t-test is that it is considered to be the most reliable test, indifferent of whether the variances are equal or not (Minitab, 2017). In the difference in mean test the null hypothesis is that there is no difference in mean between the two subgroups. We further include the variable "OC_MAJORITY" in a regression to test the variable when including control variables. Furthermore, hypothesis (3) is tested using regressions. In the regression, the variables are tested using a two-sided t-test by running robust linear regressions that provides coefficients, statistical significance and robust standard errors. We run the regressions with changing composition of control variables to test the robustness of the results. The null hypothesis in the regression is that the coefficients are zero.

4.3 Testing the Econometric Model

Before conducting the OLS regressions we test our econometric model by investigating the impact of market returns on the level of underpricing, examining multicollinearity between the independent variables and the presence of outliers. We also investigate the underlying OLS assumption homoscedasticity.

4.3.1 Inclusion of Market Returns

Since the chosen time period includes both market booms and bursts, the market return could have an impact on the first-day returns. Although Beatty and Ritter (1986) argue that it is not necessary to adjust for market movements, we still want to get an overview of how underpricing would be affected when adjusting for market returns. We thus calculate the benchmark adjusted return for descriptive purposes. The benchmark used to adjust the initial return is the Stockholm all share index (OMXSPI), which includes all shares on the Stockholm Stock Exchange. The benchmark adjusted returns are calculated as follows:

$$UPadj_i = UP_i - R_{m,t}$$

Where UP_i is the percentage change between offer price and first-day closing price for firm *i*, and $R_{m,t}$ is the market return of the corresponding day of the IPO at time *t*.

As can be seen in Appendix 2, the market return on the IPO dates in our sample is, on average -0.2% which results in a higher average benchmark adjusted underpricing than unadjusted underpricing. However, the difference between the average unadjusted underpricing and benchmark adjusted underpricing is only 0.1% and it could therefore be seen as sufficient to use the unadjusted underpricing in the following statistical tests. Comparing our observed market return to previous studies, Ritter and Welch (2002) found the average daily market returns to be 0.05% in the U.S. during the period 1980 to 2001. Their average differs from our period's market return of -0.2%, but we deem the difference to be small enough to be considered insignificant.

4.3.1 Multicollinearity

The presence of multicollinearity is an issue when running multiple regressions since it increases standard errors. A high multicollinearity does not violate any of the OLS assumptions, but it can imply that some of the independent variables have to be dropped to reduce multicollinearity. It is regarded as more robust to have low correlation between the independent variables (Wooldridge, 2013).

Multicollinearity is first tested for by examining the pairwise correlations between variables used in the regression (Pearson's Correlation). A pairwise correlation exceeding |0.8| or many pairwise correlations exceeding |0.5| could be an indication of multicollinearity (Edlund, 1997). Appendix 3 shows that no independent variables have a pairwise correlation higher or lower than 0.8 and that there are not multiple correlations higher or lower than 0.5. Since the three ownership concentration variables are included in separate regressions, their correlation will not affect the results. Appendix 3 displays the highest correlation of 0.77 between the independent variables "LN_MCAP" and "LN_PROCEEDS". Therefore, there is no indication of multicollinearity.

In addition to this, we further evaluate multicollinearity using variance inflation factors (VIF). VIF measures how much the variation in a coefficient is increased due to multicollinearity. A VIF-value above 10 is often regarded as high multicollinearity (Wooldridge, 2013). Appendix 4 displays three different VIF-tests, since we use three pre-

IPO ownership concentration variables. All variables in the three VIF-tests display VIF-values below three, implying that we can assume that no multicollinearity exists between the independent variables. We can hence disregard any issues resulting from multicollinearity in the OLS regressions.

4.3.2 Outliers

Outliers can greatly influence the OLS regression and it is therefore important to identify them, especially in small samples. An outlier can be a result of a data error or when sampling data from a small population if one or several members of the population are very different from the rest (Wooldridge, 2013). Using the interquartile range and by observing scatter plots of the different variables we found a number of outliers in the sample (scatterplots can be found in Appendix 5). We therefore present an additional approach where the first-day return, "UP", as well as the variable return on assets, "ROA", are winsorized. The reasons for only winsorizing these variables are that dummy variables cannot be winsorized, ownership variables can only have a value between 0 and 1 and we use the natural logarithm for the rest of the regression variables. By winsorizing the variables on a 95% cut-off, values below the 2.5th percentile and above the 97.5th percentile are replaced. Instead of completely excluding outliers, we consider this method to be more appropriate. After winsorizing the two variables, the following regressions are estimated:

$$UP\_w_i = \beta_0 + \beta_1(OC\_MAJORITY_i) + \beta_2(LN\_MCAP_i) + \beta_3(LN\_PROCEEDS_i) + \beta_4(RETAINED_i) + \beta_5(LN\_AGE_i) + \beta_6(ROA\_w_i) + \beta_7(IPO\_ACTIVITY_i) + \varepsilon_i$$

$$UP\_w_i = \beta_0 + \beta_1(OC\_PERCENT_i) + \beta_2(LN\_MCAP_i) + \beta_3(LN\_PROCEEDS_i) + \beta_4(RETAINED_i) + \beta_5(LN\_AGE_i) + \beta_6(ROA\_w_i) + \beta_7(IPO\_ACTIVITY_i) + \varepsilon_i$$

$$UP\_w_i = \beta_0 + \beta_1(OC\_HERFINDAHL_i) + \beta_2(LN\_MCAP_i) + \beta_3(LN\_PROCEEDS_i) + \beta_4(RETAINED_i) + \beta_5(LN\_AGE_i) + \beta_6(ROA\_w_i) + \beta_7(IPO\_ACTIVITY_i) + \varepsilon_i$$

Where UP_w_i is the winsorized (95%) percentage change between the offer price and the first-day closing price. $OC\_MAJORITY_i$ is a dummy variable that takes on the value of one if the firm has a majority pre-IPO shareholder and $OC\_PERCENT_i$ is the percentage of ownership held by the largest pre-IPO shareholder. $OC\_HERFINDAHL_i$ sums the squares of

the percentage of voting rights held by the three largest shareholders prior to the IPO. LN_MCAP_i is the natural logarithm of the market capitalization in SEK at the end of the first day going public and $LN\_PROCEEDS_i$ is the natural logarithm of the amount of capital raised from the IPO denominated in SEK. $RETAINED_i$ is the percentage of ownership held by the pre-IPO shareholders after the issue. LN_AGE_i is the natural logarithm of (1 + the age of the firm in years) and ROA_w_i is the winsorized (95%) return on total assets and is defined as the last fiscal year's Earnings Before Interest and Tax (EBIT), divided by total assets in the firm. $IPO\_ACTIVITY_i$ is a dummy variable that takes on the value of one if the number of IPOs during the observation's year is above the 75th percentile of our sample, and zero otherwise.

4.3.3 Homoscedasticity

Homoscedasticity is an underlying OLS assumption and implies that the unobserved error term has constant variance. To test if the assumption of homoscedasticity holds, we test for the presence of heteroscedasticity in our regression using the Breusch-Pagan test (Breusch and Pagan, 1979). Increasing the sample size cannot solve this problem and heteroscedasticity is common in cross-sectional data (Wooldridge, 2009).

In Appendix 6 we test of homoscedasticity in our sample by stating the null hypothesis that the error term is homoscedastic. Appendix 6 shows that the null hypothesis can be rejected at a 1% significance level in all three regressions. This implies that the error term in each regression is in fact not constant. To overcome the issue of heteroscedasticity we run robust linear regressions.

5. Empirical Results and Analysis

In this section we present the results from testing our hypotheses and analyze our main findings.

5.1 Underpricing Results

Table 3
Underpricing Descriptive Statistics for the Total Sample and Divided by Subgroups
The table shows underpricing descriptive statistics for the total sample and by subgroups. The subgroups are based on the level of ownership concentration prior to the IPO held by the single largest shareholder. The subgroup OC > 50% includes all firms with a single pre-IPO owner holding more than 50% of the voting rights and the subgroup OC 0-50% includes all other firms. The table displays both conventional underpricing and winsorized underpricing. We winsorize underpricing on a 95% cut-off. The significant levels are based on a two-sided t-test, which tests if the mean return is significantly different from zero. The t-test can be found in Appendix 7. The data is collected from Datastream and the Swedish Tax Agency.

Descriptive	**Underpricing**			**Underpricing (win)**		
statistics	**OC 0-50 %**	**OC > 50 %**	**Total**	**OC 0-50 %**	**OC > 50 %**	**Total**
Maximum	95.7%	47.5%	95.7%	40.0%	40.0%	40.0%
Minimum	-22.9%	-11.6%	-22.9%	-16.1%	-11.6%	-16.1%
Median	2.8%	7.7%	6.1%	2.8%	7.7%	6.1%
Mean	7.3%**	10.5%***	9.1%***	6.2%**	10.3%***	8.5%***
Standard deviation	0.200	0.123	0.162	0.151	0.119	0.135

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

Table 3 shows that for the total sample, including both conventional and winsorized underpricing, the mean initial returns are positive and statistically significant from zero. The results are significant at a 1% level. The average underpricing is 9.1% and the average winsorized underpricing is 8.5% for the total sample. We can therefore reject null hypothesis 1, that Swedish firms are not underpriced. This implies that Swedish issues are, on average, underpriced. When comparing these results to previous studies, it seems like the level of underpricing has been decreasing. Ritter and Welch (2002) found average underpricing levels of 18.8% in the U.S. between 1980 and 2001. Looking at the European market, Cassia et al. (2004) found underpricing levels of 21.87% in Italy between 1985 and 2001. Additionally, Ljungqvist (1997) examined German IPOs during 1970-1993 and found an average underpricing of 9.2%. Furthermore, Thorsell and Isaksson (2014) found average underpricing levels of 15% in Sweden between 1996 and 2006. A more recent study on the Swedish market presents average initial returns of 7.68% between 1996 and 2011, which is more in line with our findings (Abrahamson and De Ridder, 2015). Comparing our findings with the Asian markets, Chen and Strange (2004) found an average underpricing of 130% in China between 1995 and 1999.

The reason for this decrease might be a result of reduced information asymmetry on the wider capital markets due to better transparency between issuers, investors and

underwriters. One can also argue that following a financial crisis, the market generally becomes more regulated which also has an impact on the information availability. The differences in underpricing levels between the countries could also be a result of the fact that the studies use different time periods and that underpricing levels are cyclical.

It could also be argued that the Swedish market in general experiences less underpricing, since our findings are lower than those of Ritter and Welch (2002), Cassia et al. (2004) and Chen and Strange (2004), but more in line with previous findings on the Swedish market. Higher underpricing might indicate that the American, European and Asian markets have a higher portion of speculative issues than Sweden, since Beatty and Ritter (1986) argue that higher initial returns might be a result of smaller and more speculative issues. The reason for why Sweden has less speculative issues might be that the Swedish market is smaller. However, the German market seems to experience similar first-day returns as Sweden, although the sample periods are not overlapping. This might indicate that the German and the Swedish markets have similar characteristics.

Looking at differences between the subgroups (based on the variable "OC_MAJORITY"), we find that the average underpricing levels for firms with a single pre-IPO shareholder holding more than 50% of the voting rights experience higher underpricing than firms with a diluted ownership structure prior to the IPO. The conventional underpricing levels for firms with a pre-IPO majority shareholder is on average, 10.5% but only 7.3% for the other subgroup. These results show different means for the two subgroups, which would imply that we are correct in hypothesis (2). However, we expected that the difference would go in the opposite direction, with full pre-IPO control resulting in less underpricing.

Since large shareholders have shown to serve as a certification for high quality in previous research we assumed that high ownership concentration prior to the IPO would imply similar results as Mogilevsky and Murgulov (2012), who found that private equity-backed IPOs experience lower levels of underpricing, and Bruton, Chahine and Filatotchev (2009), who found that family firms experience less underpricing. We also assumed large shareholders to signal a potential issue of private benefits of control to small shareholders, making them reluctant to buy shares in the offer, which would reduce the IPO underpricing. The results from table 3 do not support our expectations and we believe a reason for this to be that large pre-IPO shareholders underprice the issue to remain in control. The initial shareholders use underpricing to be able to strategically allocate shares to reduce the size of new shareholdings (Brennan and Franks, 1997).

To further test hypothesis (2) we use Welch's two-sample t-test to test if there is a difference in mean between the two subgroups, defined by the variable "OC_MAJORITY". The Welch t-test do not show significance for neither conventional- nor winsorized underpricing. The results from the tests can be found in Appendix 8. We can therefore not reject the null hypothesis that there is no difference in mean between the two subgroups. Our results so far imply that there is no significant difference in average underpricing between firms with a pre-IPO majority shareholder and firms with a diluted ownership structure. One explanation for our findings might be that there are multiple types of owners in our sample and firms with different characteristics, that might affect underpricing differently. Since we have not yet included any sort of control variables in our analysis, it is difficult to isolate the effect of ownership concentration within our sample. This could explain our lack of statistical significance within the Welch's t-test, as well as the results that firms with a pre-IPO majority shareholder, on average, experiences more underpricing than those with a dispersed ownership structure.

To conclude this subsection, our findings suggests that Swedish issues are, on average, underpriced and that the observed underpricing levels have declined over time when comparing our results with earlier studies. One could also argue that Sweden experiences lower underpricing levels than other capital markets. Our findings are therefore in line with hypothesis (1). Furthermore, we can also state that our results do not suggest that firms with a pre-IPO owner with full control experience significantly different underpricing levels from firms with a diluted pre-IPO ownership structure. Hence, null hypothesis (2) cannot yet be rejected.

5.2 Main Regression Results

To test hypothesis (3), we run three different linear OLS regressions for each of the three ownership concentration variables. The OLS regression is run with a changing composition of control variables to test the robustness of the results. The dependent variable, underpricing, is also winsorized to mitigate outliers and increase robustness. This results in a total number of 15 regressions. Regression model (1) includes the dependent underpricing variable and the independent ownership concentration variable in each panel. Regression model (2) adds firm and IPO characteristics in each panel. Regression model (3) only includes the ownership concentration variable and the variable "IPO_ACTIVITY". These regressions are run to see

how the results will change with different variables included in the regression. Lastly, regression models (4) and (5) include all variables where regression model (5) swaps the unwinsorized variables for the winsorized variables, "ROA_w" and "UP_w".

Table 4
Main Regression Results - Explanatory Factors of Underpricing

The table reports the output from regressions on underpricing and eight independent variables. Underpricing and return on assets is also winsorized (_w). We winsorize the 2.5 th and 97.5 th percentile of the sample (resulting in the 1st and 2nd observation changing value to the 3rd and the 95th and 96th changing value to the 94th). Panel A contains the independent variable "OC_MAJORITY", which is a dummy variable that takes the value one if the largest shareholder prior to the IPO holds more than 50% of the voting rights, and zero otherwise. "LN_MCAP" is the natural logarithm of the market capitalization in SEK at the end of the first day going public. "LN_PROCEEDS" is the natural logarithm of the amount of capital raised from the IPO denominated in SEK. "RETAINED" is the percentage of ownership held by the total pre-IPO shareholders after the issue. "LN_AGE" is the natural logarithm of (1 + the age of the firm in years), defined as the number of years between foundation date and the listing date on the Stockholm Stock Exchange. "ROA", return on total assets is defined as the last fiscal year's Earnings Before Interest and Tax (EBIT), divided by total assets in the firm. "IPO_ACTIVITY" is a dummy variable that takes the value one if the number of IPOs during the observation's year is above the 75th percentile of our sample, and zero otherwise. The regressions in the other panels contain the same independent variables as Panel A but swaps "OC_MAJORITY" for "OC_PERCENT" in Panel B and "OC_HERFINDAL" in Panel C. "OC_PERCENT" is the percentage of voting rights held by the largest shareholder prior to the IPO. "OC_HERFINDAHL" is calculated using the Herfindahl index, which sums the squares of the percentage of voting rights held by the three largest shareholders prior to the IPO. The significant levels refer to a two-sided t-test which tests if the coefficients are different from zero.

Panel A: Regressions Including "OC_MAJORITY"

Variables	(1)	(2)	(3)	(4)	(5)
OC_MAJORITY	0.0320	0.0067	0.0206	-0.0168	-0.0155
	(0.0348)	(0.0341)	(0.0334)	(0.0308)	(0.0265)
LN_MCAP		0.1039***		0.1123***	0.0908***
		(0.0345)		(0.0318)	(0.0219)
LN_PROCEEDS		-0.0697**		-0.0708***	-0.0573***
		(0.0293)		(0.0258)	(0.0195)
RETAINED		0.0193		-0.0011	0.0132
		(0.0607)		(0.0569)	(0.0550)
LN_AGE		0.0133		0.0130	0.0113
		(0.0154)		(0.0135)	(0.0128)
ROA		0.0180		0.0220	
		(0.0373)		(0.0358)	
IPO_ACTIVITY			0.0739**	0.0994***	0.1020***
			(0.0321)	(0.0276)	(0.0253)
ROA_w					0.1534**
					(0.0614)
Constant	0.0729**	-0.3015**	0.0591*	-0.3574***	-0.2994***
	(0.0304)	(0.1354)	(0.0322)	(0.1300)	(0.1078)
Observations	96	96	96	96	96
R-squared	0.0098	0.1943	0.0501	0.2640	0.3540

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

Panel B: Regressions Including "OC_PERCENT"

Variables	(1)	(2)	(3)	(4)	(5)
OC_PERCENT	0.0277	-0.0342	0.0147	-0.0640	-0.0598
	(0.0625)	(0.0613)	(0.0583)	(0.0548)	(0.0483)
LN_MCAP		0.1040***		0.1126***	0.0909***
		(0.0346)		(0.0316)	(0.0219)
LN_PROCEEDS		-0.0670**		-0.0688***	-0.0554***
		(0.0297)		(0.0257)	(0.0194)
RETAINED		0.0102		-0.0092	0.0060
		(0.0597)		(0.0560)	(0.0543)
LN_AGE		0.0177		0.0170	0.0150
		(0.0165)		(0.0140)	(0.0134)
ROA		0.0193		0.0207	
		(0.0382)		(0.0367)	
IPO_ACTIVITY			0.0769**	0.1007***	0.1033***
			(0.0325)	(0.0287)	(0.0258)
ROA_w					0.1533**
					(0.0612)
Constant	0.0739	-0.3034**	0.0609	-0.3509***	-0.2926***
	(0.0475)	(0.1340)	(0.0483)	(0.1284)	(0.1094)
Observations	96	96	96	96	96
R-squared	0.0023	0.1963	0.0468	0.2701	0.3617

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

Panel C: Regressions Including "OC_HERFINDAHL"

Variables	(1)	(2)	(3)	(4)	(5)
OC_HERFINDAHL	0.0131	-0.0432	0.0024	-0.0683	-0.0573
	(0.0540)	(0.0547)	(0.0508)	(0.0503)	(0.0417)
LN_MCAP		0.1043***		0.1131***	0.0911***
		(0.0345)		(0.0315)	(0.0219)
LN_PROCEEDS		-0.0658**		-0.0675***	-0.0546***
		(0.0295)		(0.0254)	(0.0195)
RETAINED		0.0068		-0.0126	0.0045
		(0.0587)		(0.0550)	(0.0539)
LN_AGE		0.0194		0.0185	0.0158
		(0.0165)		(0.0141)	(0.0137)
ROA		0.0178		0.0181	
		(0.0387)		(0.0373)	
IPO_ACTIVITY			0.0776**	0.1018***	0.1037***
			(0.0324)	(0.0286)	(0.0257)
ROA_w					0.1501**
					(0.0613)
Constant	0.0842**	-0.3162**	0.0683*	-0.3718***	-0.3090***
	(0.0368)	(0.1376)	(0.0389)	(0.1332)	(0.1109)
Observations	96	96	96	96	96
R-squared	0.0007	0.1990	0.0462	0.2745	0.3642

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

Table 4 provides our main regression results. Looking at our key independent variable "OC_MAJORITY" in Panel A, that is used to test hypothesis (2), the dummy variable has a positive coefficient when changing the composition of independent variables, but a negative coefficient when all variables are added in regression (4) and (5). The negative coefficient implies that when a firm has a pre-IPO majority shareholder, underpricing decreases. The variable is however not statistically significant at a 10% level. The explanatory power increases are more control variables are added in the regression, reaching 35.40% in regression (5). The control variables for firm- and IPO characteristics in regression (2) provides an explanatory power of 19.43%, implying that these control variables can explain underpricing more than the other independent variables. We expected a negative coefficient for the variable, but we do not find enough statistical evidence to confirm hypothesis (2).

The second ownership concentration variable, "OC_PERCENT" in Panel B, shows a negative coefficient in regressions (2), (4) and (5), when more control variables are added. This implies that a 100% of pre-IPO ownership reduces the initial return with the value of the coefficient. The explanatory power increases when adding more control variables, reaching 36.17% in the winsorized regression. We expected a high ownership concentration to result in lower underpricing, as suggested by Chen and Strange (2004). Comparing our findings with Chen and Strange (2004), their coefficient is negative and statistically significant at a 10% level. Our results are however not statistically significant at a 10% level in any of the regressions.

The last ownership concentration variable, "OC_HERFINDAHL", in Panel C, shows similar results as "OC_PERCENT". The explanatory power increases as we add more control variables in the regression. Also, control variables for firm- and IPO characteristics provide the highest explanatory factors of the independent variables. The interpretation of the coefficients is however different since the variable is the sum of squares of the ownership held by the three largest shareholders. This means that when the Herfindahl index increases, the ownership stake held by the three largest shareholders increase. Since the Herfindahl index itself can be hard to interpret we multiply the coefficient with the standard error of the winsorized variable found in regression (5). The results state that an increase in one standard deviation of "OC_HERFINDAHL" will decrease underpricing by approximately 0,023%. In regression (4) and (5) the coefficient is negative, which is in line with our expectations, but the results are not statistically significant at a 10% level.

According to hypothesis (3) we believed pre-IPO owner concentration to result in less underpricing. Our predictions are based on two arguments. The first argument

emphasizes that large shareholders signal firm quality, reducing the information asymmetry and increasing the offer price. This signal of quality originates from the fact that large shareholders, through close monitoring and control of the firm, have a reputation of being an owner that increases firm value. In addition, certain types of large shareholders also have a close relationship with the underwriters. Our second argument implies that the market values firms with a large pre-IPO shareholder lower because there is a higher private benefit of control. The private benefits of control will be allocated to the large shareholder, making it less attractive for small shareholders to purchase the shares. This will be incorporated in the first-day closing price. The negative coefficient in column (4) and (5) in all panels confirms our expectations. We believe the two arguments are applicable on a company depending on the type of pre-IPO owner. This means that for private equity-backed IPOs, the reduced underpricing may be a result of the first argument. For other pre-IPO owners, such as families or private holders, the reduced underpricing could instead come as a result of the second argument.

However, our results are not statistically significant. This implies that we fail to reject the null hypothesis that the coefficient is zero, and our findings do not support hypothesis (3). We believe the reason for this to be that there are multiple types of owners in our sample and they affect underpricing levels differently. Since we do not control for different owner types, their influence on underpricing is not considered in the regression. In addition to this, it could also be the case that the IPO underwriter plays an important role in determining the offer price and that investors are given a lower offer price in return for showing their interest, as the theory proposed by Ritter and Welch (2002). Since both the underwriters as well as the owner-types are factors that we have chosen not to include in our regression models, they could serve as an explanation for the lack of significance within our results. Additionally, there are theories suggesting a positive relation between underpricing and ownership concentration, which can also be a reason for the lack of statistical significance. For instance, a large pre-IPO has an incentive to monitor the firm, this can increase firm value because the large shareholder makes it more attractive for small shareholders to purchase shares when they can reduce their monitoring costs.

Table 4 also provides the results for our control variables. When looking at the control variables we find that the variable “LN_MCAP” is significant at a 1% significance level with a positive coefficient in all regressions and in all panels. Since “LN_MCAP” is a proxy for firm size, these findings suggest that larger firms, on average, experience a higher first-day return than smaller firms. We expected larger firms to have more information

available to the public, reducing the information asymmetry between parties in the transaction. Besides challenging our expectations, the findings also suggest that market capitalization might not be a good proxy for reduced information asymmetry through firm size. The reason for this is that Beatty and Ritter (1986) found evidence that a reduced level of information asymmetry results in less underpricing and if market capitalization is a good proxy for firm size, we would see similar results as Beatty and Ritter (1986).

The variable "LN_PROCEEDS" is significant at a 1% - 5% significance level in the table 4. The coefficient is negative in all regressions and panels. We suggested that larger offerings experience lower levels of underpricing, in line with Beatty and Ritter (1986). Our findings support our predictions.

Furthermore, the variable "RETAINED" has a positive coefficient for all regressions in all panels, except for regression (4). Our findings support the expected sign of the coefficient, in line with Brealey, Leland and Pyle (1977) who found evidence that retaining more shares increases underpricing. However, the variable is not significant at a 10% level, in either of the regressions or panels.

The variable "LN_AGE" shows a positive coefficient in all regressions in Panel A, B and C. This implies that when firm age increases, underpricing increases as well. The variable is however not statistically significant at a 10% significance level. Comparing our findings with previous evidence, Mogilevsky and Murgulov (2012) and Muscarella and Vetsuypens (1989), both found that the variable age has a negative relationship with the dependent underpricing variable. We find the opposite to be true for our sample. A possible explanation for this result might be that older companies, to a greater extent, have long-term owners with an emotional attachment and desire to remain in control after the IPO. This could lead them to underprice the issue as a way to reduce the size of new, large block-holders (Brennan and Franks, 1997).

The variable "ROA" displays a positive coefficient in all regressions. We expected the relationship between "ROA" and underpricing to be negative, as a higher profitability prior to the IPO would signal a higher quality of the firm, providing an opportunity to increase the offer price, and thus lower the underpricing level. Our results challenge our expectations, but Mogilevsky and Murgulov (2012) also find the coefficient to be positive. A higher "ROA" might generate a high interest in the issue, which pushes up the closing price. This means that the higher profitability is not incorporated in the offer price and instead, is shown in the first-day closing price. When winsorizing the variable to "ROA_w", the coefficient increases and becomes significant at a 5% level.

Finally, the dummy variable "IPO_ACTIVITY" has a positive coefficient for all regression and panels, significant at a 1-5% level. We expected years with a lot of issues to show higher underpricing since market valuations are high. Our findings confirm these expectations since a positive coefficient implies higher underpricing for firms in the "hot issue market". Our results support previous findings by Ritter (1984).

Summarizing our findings in this subsection, the three ownership concentration variables all show a negative coefficient when including all variables in regression (4) and (5). When adding more control variables, the explanatory power increases, meaning that they should be included. The coefficients are however not statistically significant at a 10% significance level in neither panel nor regression. This implies that we fail to reject the null hypothesis that the coefficient is zero, and our findings do not support hypothesis (3).

6. Limitations

This section will first present limitations of our empirical model including issues regarding endogeneity, independent samples and the exclusion of market returns. We then present limitations of our data and the collection process.

6.1 The Empirical Model

6.1.1 Endogeneity Issues

A potential bias within our statistical model is the issue of endogeneity. It could be argued that ownership structures and levels of concentration are not random and there might be unknown factors that correlate with both ownership concentration and underpricing. If so is the case, this could give the false impression that ownership concentration levels affect the amount of underpricing, when in reality it is a third, unknown variable, that drives the change in both of them. For instance, as mentioned earlier, private equity-backed IPOs have shown to exhibit lower levels of underpricing than non- private equity-backed IPOs (Mogilevsky and Murgulov, 2012), while private equity firms also have a tendency to almost exclusively own more than 50% of the company they invest in (Kaplan and Strömberg, 2009). It could then be argued that in reality, it is not ownership concentration that drives underpricing, but rather whether or not the pre IPO-owner is a private equity firm or not. However, it could also be

that the high level of ownership concentration, which can be found within most IPOs made by private equity firms, is actually the driving force behind the low underpricing levels.

In regression analysis there is a risk of excluding one or more important variables when constructing the regression model. The result of this is called omitted variable bias, and could lead to the regression model compensating for the excluded variables by over- or underestimating the effect of the included variables. Besides excluding which type of owner the firm has, another potential source of omitted variable bias is the exclusion of a variable connected to the underwriter used in the IPO. Since the underwriter participates in the decision-making, in regards to which offer price to set, it could be argued that the choice of underwriter affects the underpricing level of the IPO. However, as a result of difficulties in defining reliable variables that captures the effect of the underwriter and the type of pre-IPO owner, we chose to exclude these factors from the regression model. We do this while still being aware of the possible biases it may cause.

Furthermore, an additional potential cause for endogeneity could be reverse causality, mainly between our dependent variables (underpricing) and our independent variable, "RETAINED". It could be argued that it is the beforehand, agreed upon level of underpricing that decides how much percentage of the shares the owner wants to keep, where a higher level of underpricing leads to a higher amount of retained shares. However, it could just as well be argued that the amount of shares retained is a factor that contributes to which level of underpricing the issuer decides upon. Since we are primarily interested in ownership concentration and its effect on underpricing, and "RETAINED" is only a control variable, we do not believe this potential bias to be all too serious.

Ultimately, when constructing the regression models, we try to decrease any potential biases by including variables used in previous empirical studies.

6.1.2 Independent Samples

To test whether or not there is any difference in mean between the two subgroups defined by the variable "OC_MAJORITY" we use a Welch's t-test (two-sample t-test for unequal variances). Using any kind of two-sample t-test comes with the required assumption of having independent samples and in our case it could be argued that this assumption does not hold. Multiple IPOs can very well have the same pre-IPO owner (most likely in the form of investment firms). The result from the first IPO, issued by this recurring owner, could then in

turn affect the later issued IPO, and if this recurring owner would have IPOs in both subgroups it could be argued that this affects the independence of the two samples.

6.1.3 Exclusion of Market Returns

By choosing not to adjust our underpricing variables for the specific market return of the day of the IPO, we risk biases in our results. We are only looking at underpricing in this study and it could be argued that our dependent variables are not only a measurement of the underpricing of the IPOs but also the performance of the market on that specific date. This could lead to our regression model not estimating the effect our independent variables have on underpricing but rather the effect they have on a mixture between underpricing and market return in general. However, the daily market returns are on average very low and as a result of this, previous studies have chosen to not include the daily return of the market they are studying. To ease comparisons between our results and the results of prior studies we have therefore decided to do the same and not adjust our underpricing levels for the market return.

6.2 Data Limitations

First of all, our final sample consists of only 96 firms out of the total 221 issues that took place between January 1, 2000 and December 31, 2017. This might be considered to be inconclusive and create a potential skewness, as the data set is not representative of the entire population. However, the reason for why so many firms are excluded is mainly due to the fact that 69 of the issues are list changes. The number of issues missing data is 24. Out of the 96 firms within the final sample, it is worth mentioning that there remain no issues from the years 2008, 2009 and 2012. The number of IPOs during these years are considerably lower and those that occurred are removed because the listings are list changes, secondary listings, equity carve-outs, spin-offs or have missing data. Furthermore, in 2003 there was no listing made on Nasdaq Stockholm.

For some of the observations there is an ambiguity in regards to the foundation year. Especially for firms with a history containing one or more mergers. Furthermore, collecting data by hand might result in errors. Due to this possibility, all observed outliers are controlled so that they are not data errors. Lastly, the ownership concentration prior to the IPO is collected from the prospectus. Although the prospectuses are carefully read, there can

be related party agreements that results in a consolidation of power and influence that we do not manage to identify.

7. Conclusions

The finance literature covering the phenomenon of IPO underpricing is extensive and many prominent authors have given well-founded theories of why new public issues are underpriced. There is however no straightforward, all-explaining theory of the phenomenon. Previous studies have mainly focused on the U.S. capital markets and have over time developed a wider range of explanations for IPO underpricing. These explanations can then in turn be divided into four main categories: institutional explanations, behavioral reasons, ownership and control explanations and information asymmetry (Ljungqvist, 2007).

The most common explanation of positive initial returns is information asymmetry, which implies that underpricing is a result of information asymmetry between the parties involved in the IPO transaction. One approach of studying information asymmetry is to understand how companies can signal their quality to reduce underpricing (Ritter, Welch 2002). In line with this, many researchers have therefore focused on how different types of large owners can reduce underpricing by signaling quality prior to the IPO. For instance, Mogilevsky and Murgulov (2012) investigated IPOs of companies backed by a private equity firm and Barry et al. (1990) studied companies backed by venture capital firms. Other studies have focused on companies owned by families or founders and the relationship with underpricing. These studies found a negative relationship between the large pre-IPO shareholder and underpricing. Other studies connected to signaling in the IPO covers how corporate control influences underpricing. Chen and Strange (2004) argue that the private benefits of control increases for larger shareholders. This implies that firms with dominant shareholders are valued lower, because the private benefits of corporate control are allocated to the large shareholder, making it less attractive for small shareholders to purchase the issued shares. Chen and Strange (2004) found a negative relationship between the portion of shares held by the largest pre-IPO shareholder and underpricing.

Concluding previous findings on IPO underpricing we expected a high pre-IPO ownership concentration to result in less underpricing than for companies with a dispersed ownership structure. We based this prediction on two main arguments. The first argument was that certain large pre-IPO shareholders can work as a signaling effect for the quality of the

firm, and hence increase the offer price. The second argument stated that firms with large shareholders are valued lower since the private benefits of corporate control will be allocated to the large shareholder, making it less attractive for small shareholders to purchase the shares, thus reducing the first-day closing price.

The purpose of this study was hence to analyze the relationship between ownership concentration within firms, prior to the IPO, and the level of underpricing in the public listing. This was done using a sample of 96 issues on the Stockholm Stock Exchange between January 1, 2000 and December 31, 2017. To investigate this relationship further, we developed three hypotheses and each hypothesis was tested using the appropriate statistical test. The following hypotheses were tested:

Hypothesis 1: Swedish IPOs exhibit a positive first-day return

Hypothesis 2: Swedish firms with a pre-IPO owner holding more than 50% of the voting rights exhibit different underpricing levels than firms with a dispersed ownership structure prior to the IPO

Hypothesis 3: A higher level of pre-IPO ownership concentration leads to lower underpricing levels within Swedish firms

Hypothesis (1) was tested using a t-test, which tests if the mean underpricing is significantly different from zero. Hypothesis (2) was tested using Welch's two-sample t-test, which tests if there is difference in mean underpricing between firms with a pre-IPO majority shareholder or not. Hypothesis (3) was tested using regressions, that tests if the coefficients are significantly different from zero using a two-sided t-test.

Our findings suggest that Swedish IPOs made on the Stockholm Stock Exchange between 2000 and 2017 are, on average, underpriced. This means that we can confirm hypothesis (1). The level of underpricing varies between different markets and years, when comparing our results to those found in previous studies. The exception is the Swedish and the German markets who presents similar underpricing levels, although the sample periods are different. Also, the average underpricing levels seem to have decreased over time. In line with other studies made on the Swedish market, we found similar levels of positive initial returns of 9.1% significant on a 1% level. A suggestion for further research is to examine underpricing on a more local and regional level by incorporating characteristics of

different types of capital markets. This is to truly understand how different capital markets function and what aspects can reduce underpricing on that market. In addition to this, it could also be interesting to compare the Swedish and the German markets to understand what factors drive the similarities.

When examining the results, we find no significant relationship between pre-IPO owners with full control and reduced underpricing. The difference in mean between the two subgroups is not significant, and this means that we do not find enough statistical evidence to confirm hypothesis (2). However, the coefficients in the regressions are negative for all of the three ownership concentration variables, "OC_MAJORITY", "OC_PERCENT" and "OC_HERFINDAHL", when including all control variables in the regression. This suggests that an increased level of ownership concentration prior to the IPO results in less underpricing. These variables are however not significant at a 10% level. The coefficients of the key independent variables are in line with hypothesis (3) but the lack of statistical significant makes it difficult to validate the hypothesis.

We reflect on the reasons for why concentrated ownership does not significantly result in less underpricing, as suggested by our hypotheses. We believe one reason for the lack of significance to be that there are multiple types of owners in our sample and they affect underpricing levels differently. Since we do not control for different owner types, their influence on underpricing is not considered in the regression. In addition to this, it could also be the case that the IPO underwriter plays an important role in determining the offer price. We therefore propose future studies to investigate ownership concentration and IPO underpricing when controlling for different types of pre-IPO owners and incorporating the effect of the underwriter.

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9. Appendix

Appendix 1
Variable Description

The table below describes all variables used in the paper, how the variables are defined and the sources used to collect the data.

Variable	Description	Source
OC_MAJORITY	A dummy variable taking the value one, if the largest pre-IPO shareholder holds more than 50% of the voting rights in a company.	Listing prospectus
OC_PERCENT	The percentage of voting rights held by the largest pre-IPO shareholder.	Listing prospectus
OC_HERFINDAHL	The squared sum of the three largest shareholder's voting rights prior to the IPO.	Listing prospectus
LN_AGE	The natural logarithm of (1 + the age of the firm in years). Age is defined as the difference between the foundation date and the date of the IPO.	Company website Swedish Tax Agency
LN_MCAP	The natural logarithm of the total market capitalization at the time of the IPO in SEK.	Datastream
LN_PROCEEDS	The natural logarithm of the total amount of proceeds raised in the IPO in SEK.	Listing prospectus
ROA	The return on assets is the last fiscal year's Earnings Before Interest and Tax (EBIT) divided by total assets.	Listing prospectus
RETAINED	The percentage of shares retained by the total pre-IPO shareholders.	Listing prospectus
IPO_ACTIVITY	A dummy variable taking the value one if the year of an IPO is a year when the number of IPOs is above the 75th percentile for the entire sample.	SDC Platinum, Swedish Tax Agency

Appendix 2
Underpricing Descriptive Statistics

The table reports descriptive statistics for the market return, underpricing "UP" and benchmark adjusted underpricing (UPadj) for 96 IPOs made on the Stockholm Stock Exchange between January 1, 2000 and December 31, 2017. Underpricing is defined as the percentage change between the offer price and first-day closing price. The market return is the percentage change between opening price and closing price on the Stockholm all share index (OMXSPI), on each of the IPO dates in the sample. The benchmark adjusted return is the unadjusted underpricing subtracted by the market return. The data is collected from Datastream and the Swedish Tax Agency.

Descriptive statistics	Market Return	Raw Underpricing	Adj. Underpricing
Maximum	2.2%	95.7%	95.3%
Minimum	-5.3%	-22.9%	-22.2%
Median	-0.1%	6.1%	6.4%
Mean	-0.2%	9.1%	9.2%
Standard deviation	0.011	0.162	0.160

Appendix 3
Pearson's Bivariate Correlation

The table shows the correlation between all independent variables used in the OLS regression and the dependent variable "UP", which is the percentage change in offer price and first-day closing price. "OC_MAJORITY" is a dummy variable that takes on the value of one if the largest shareholder prior to the IPO holds more than 50% of the voting rights, and zero otherwise. "OC_PERCENT" is the percentage of voting rights held by the largest pre-IPO shareholder. "OC_HERFINDAHL" is calculated using the Herfindahl index, which sums the squares of the percentage of voting rights held by the three largest shareholders prior to the IPO. "LN_AGE" is the natural logarithm of (1 + the age of the firm in years), defined as the number of years between foundation date and the listing day on the Stockholm Stock Exchange. "LN_MCAP" is the natural logarithm of the market capitalization in SEK at the end of the first day going public. "LN_PROCEEDS" is the natural logarithm of the amount of capital raised from the IPO denominated in SEK. "ROA", return on total assets is defined as the last fiscal year's Earnings Before Interest and Tax (EBIT), divided by total assets in the firm. "RETAINED" is the percentage of ownership held by the total pre-IPO shareholders after the issue. "IPO_ACTIVITY" is a dummy variable that takes on the value of one if the number of IPOs during the observation's year is above the 75th percentile of our sample, and zero otherwise.

Variables	UP	OC_ MAJORITY	OC_ PERCENT	OC_ HERFINDAHL	LN_ AGE	LN_ MCAP	LN_ PROCEEDS	ROA	RETAINED	IPO_ ACTIVITY
UP	1									
OC_MAJORITY	0.10	1								
OC_PERCENT	0.05	0.85	1							
OC_HERFINDAHL	0.03	0.80	0.98	1						
LN_AGE	0.17	0.41	0.48	0.48	1					
LN_MCAP	0.32	0.34	0.36	0.37	0.33	1				
LN_PROCEEDS	0.06	0.37	0.40	0.41	0.27	0.77	1			
ROA	0.18	0.26	0.21	0.17	0.22	0.38	0.26	1		
RETAINED	(0.03)	(0.34)	(0.37)	(0.37)	(0.31)	(0.30)	(0.37)	(0.29)	1	
IPO_ACTIVITY	0.21	0.17	0.11	0.10	0.02	(0.12)	(0.06)	(0.06)	0.07	1

Appendix 4
Variance Inflation Factors

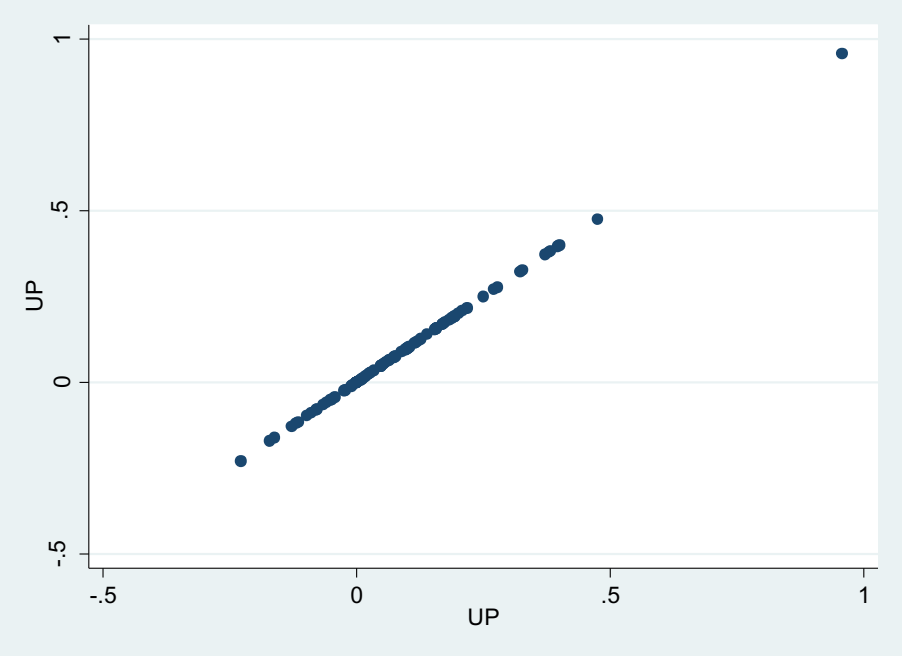
The table shows the variance inflation factors (VIF) for all independent variables used in this paper. VIF is used to test for multicollinearity between the independent variables. "OC_MAJORITY" is a dummy variable that takes on the value of one if the largest shareholder prior to the IPO holds more than 50% of the voting rights, and zero otherwise. "OC_PERCENT" is the percentage of voting rights held by the largest pre-IPO shareholder. "OC_HERFINDAHL" is calculated using the Herfindahl index, which sums the squares of the percentage of voting rights held by the three largest shareholders prior to the IPO. "LN_AGE" is the natural logarithm of (1 + the age of the firm in years), defined as the number of years between foundation date and the listing day on the Stockholm Stock Exchange. "LN_MCAP" is the natural logarithm of the market capitalization in SEK at the end of the first day going public. "LN_PROCEEDS" is the natural logarithm of the amount of capital raised from the IPO denominated in SEK. "ROA", return on total assets is defined as the last fiscal year's Earnings Before Interest and Tax (EBIT), divided by total assets in the firm. "RETAINED" is the percentage of ownership held by the total pre-IPO shareholders after the issue. "IPO_ACTIVITY" is a dummy variable that takes on the value of one if the number of IPOs during the observation's year is above the 75th percentile of our sample, and zero otherwise.

Variables	**VIF**	**1/VIF**	**Variables**	**VIF**	**1/VIF**	**Variables**	**VIF**	**1/VIF**
LN_MCAP	2.82	0.36	LN_MCAP	2.82	0.36	LN_MCAP	2.82	0.35
LN_PROCEEDS	2.71	0.37	LN_PROCEEDS	2.72	0.37	LN_PROCEEDS	2.74	0.37
OC_MAJORITY	1.45	0.69	**OC_PERCENT**	1.53	0.65	**OC_HERFINDAHL**	1.54	0.65
RETAINED	1.32	0.76	LN_AGE	1.39	0.72	LN_AGE	1.39	0.72
LN_AGE	1.31	0.77	RETAINED	1.33	0.75	RETAINED	1.33	0.75
ROA	1.25	0.80	ROA	1.24	0.81	ROA	1.24	0.81
IPO_ACTIVITY	1.08	0.93	IPO_ACTIVITY	1.05	0.95	IPO_ACTIVITY	1.05	0.96
Mean VIF	1.71		Mean VIF	1.73		Mean VIF	1.73	

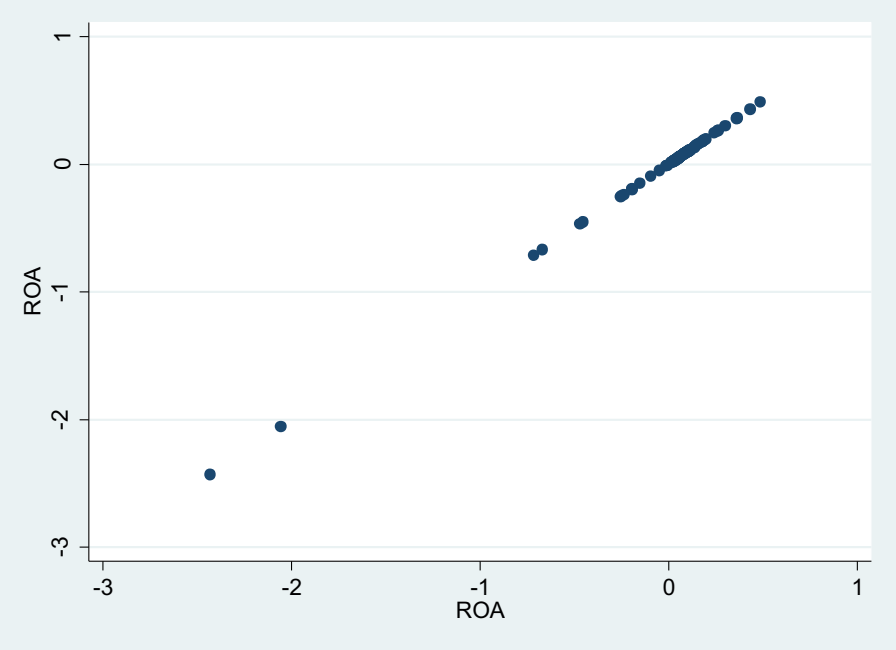
Appendix 5
Scatter Plot for the Variables "UP" and "ROA"

The scatterplots below display the variables "UP" and "ROA". "UP" is defined as the percentage change in the IPO offer price and the first-day closing price. "ROA", return on total assets is defined as the last fiscal year's Earnings Before Interest and Tax (EBIT), divided by total assets in the firm. The scatter plots are used to identify potential outliers.

Panel A: "UP"



Panel B: "ROA"



Appendix 6
Breusch-Pagan Test

The table illustrates the results from a Breusch-Pagan test conducted on all independent regression variables, which tests if the error term is homoscedastic or not. "OC_MAJORITY" is a dummy variable that takes on the value of one if the largest shareholder prior to the IPO holds more than 50% of the voting rights, and zero otherwise. "OC_PERCENT" is the percentage of voting rights held by the largest pre-IPO shareholder. "OC_HERFINDAHL" is calculated using the Herfindahl index, which sums the squares of the percentage of voting rights held by the three largest shareholders prior to the IPO. "LN_AGE" is the natural logarithm of (1 + the age of the firm in years), defined as the number of years between foundation date and the listing date on the Stockholm Stock Exchange. "LN_MCAP" is the natural logarithm of the market capitalization in SEK at the end of the first day going public. "LN_PROCEEDS" is the natural logarithm of the amount of capital raised from the IPO denominated in SEK. "ROA", return on total assets is defined as the last fiscal year's Earnings Before Interest and Tax (EBIT), divided by total assets in the firm. "RETAINED" is the percentage of ownership held by the total pre-IPO shareholders after the issue. "IPO_ACTIVITY" is a dummy variable that takes on the value of one if the number of IPOs during the observation's year is above the 75th percentile of our sample, and zero otherwise.

Ho: Error term is homoscedastic		
Variables:	**Variables:**	**Variables:**
OC_MAJORITY	**OC_PERCENT**	**OC_HERFINDAHL**
LN_AGE	LN_AGE	LN_AGE
LN_MCAP	LN_MCAP	LN_MCAP
LN_PROCEEDS	LN_PROCEEDS	LN_PROCEEDS
ROA	ROA	ROA
RETAINED	RETAINED	RETAINED
IPO_ACTIVITY	IPO_ACTIVITY	IPO_ACTIVITY
chi2(7) = 28.80* **	**chi2(7) = 31.42*** **	**chi2(7) = 34.67*** **
Prob > chi2 = 0.0002	**Prob > chi2 = 0.0001**	**Prob > chi2 = 0.0000**

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

Appendix 7
T-test on Underpricing

The table displays the results from a two-sided t-test performed on the dependent variable underpricing for the total sample and divided by subgroup. The t-test tests if the mean is significantly different from zero. The subgroup is divided into two groups based on the level of ownership concentration prior to the IPO. The group OC > 50% includes firms with a pre-IPO owner holding more than 50% of the voting rights and the group OC 0-50% includes all other firms. The table displays both conventional underpricing and winsorized underpricing in each panel. Underpricing is defined as the percentage change between offer price and first-day closing price. The winsorization is made on a 95% cut-off. Panel A shows the t-test for the total sample and Panel B shows the total sample on winsorized underpricing. Panel C and D displays the t-test for OC>50%, conventional underpricing and winsorized underpricing, respectively. Panel E and F shows the t-test for OC 0-50% for both conventional and winsorized underpricing, respectively.

Panel A: T-test on Total Sample

Variable	obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
UP	96	0.0905	0.01651	0.1618	0.0577	0.1233
mean = mean(UP)						t = 5.4820
Ho: mean = 0			Degrees of freedom			95
Ha: mean < 0			Ha: mean != 0			Ha: mean > 0
Pr(T < t) = 1.0000			Pr(T > t) = 0.0000			Pr(T > t) = 0.0000

Panel B: T-test on Total Sample (winsorized)

Variable	obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
UP_w	96	0.0847	0.0138	0.1350	0.0574	0.1121
mean = mean(UP_w)						t = 6.1483
Ho: mean = 0			Degrees of freedom			95
Ha: mean < 0			Ha: mean != 0			Ha: mean > 0
Pr(T < t) = 1.0000			Pr(T > t) = 0.0000			Pr(T > t) = 0.0000

Panel C: T-test on OC > 50%

Variable	obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
OC > 50%	53	0.1048	0.01688	0.1229	0.0710	0.1387
mean = mean(UP1)						t = 6.2116
Ho: mean = 0			Degrees of freedom			52
Ha: mean < 0			Ha: mean != 0			Ha: mean > 0
Pr(T < t) = 1.0000			Pr(T > t) = 0.0000			Pr(T > t) = 0.0000

Panel D: T-test on OC >50% (winsorized)

Variable	obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
OC > 50%	53	0.1034	0.0163	0.1189	0.0707	0.1362
mean = mean(UP1_w)						t = 6.3328
Ho: mean = 0			Degrees of freedom			52
Ha: mean < 0			Ha: mean != 0			Ha: mean > 0
Pr(T < t) = 1.0000			Pr(T > t) = 0.0000			Pr(T > t) = 0.0000

Panel E: T-test on OC 0-50%

Variable	obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
OC 0-50%	43	0.0729	0.0305	0.1998	0.0114	0.1344
mean = mean(UP0)						t = 2.3911
Ho: mean = 0			Degrees of freedom			42
Ha: mean < 0			Ha: mean != 0			Ha: mean > 0
Pr(T < t) = 0.9893			Pr(T > t) = 0.0000			Pr(T > t) = 0.0107

Panel F: T-test on OC 0-50% (winsorized)

Variable	obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
OC 0-50%	43	0.0617	0.0230	0.1509	0.0153	0.1081
mean = mean(UP0_w)						t = 2.6821
Ho: mean = 0			Degrees of freedom			42
Ha: mean < 0			Ha: mean != 0			Ha: mean > 0
Pr(T < t) = 0.9948			Pr(T > t) = 0.0104			Pr(T > t) = 0.0052

Appendix 8
Welch's T-test on Underpricing

The table below illustrates the results from the Welch's t-test used in the paper to test the difference in mean between the two subgroups. The subgroups are based on the level of ownership concentration prior to the IPO. The first group includes firms with a pre-IPO owner holding more than 50% of the voting rights (OC > 50 %) and the second group includes all other firms. Panel A shows the t-test for conventional underpricing and Panel B shows winsorized underpricing. The sample includes all IPOs made on the Stockholm Stock Exchange between January 1, 2000 and December 31, 2017. The data is collected from the listing prospectuses, Datastream, SDC Platinum and the Swedish Tax Agency.

Panel A: T-test on Underpricing

Group	obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
OC >50%	53	0.1048	0.0169	0.1998	0.0710	0.1387
OC 0-50%	43	0.0729	0.0305	0.1998	0.1137	0.1344
Total	96	0.0905	0.0165	0.1618	0.0577	0.1233
Diff		-0.0320	0.0348		0.1015	0.0375
Diff = mean(0)	- mean(1)					t = -0.9178
Ho: diff = 0			Welch's degrees of freedom			= 67.7833
Ha: diff < 0			Ha: diff != 0			Ha: diff > 0
Pr(T < t) = 0.1810			Pr(T > t) = 0.3620			Pr(T > t) = 0.8190

Panel B: T-test on Winsorized Underpricing

Group	obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
OC> 50%	53	0.1034	0.0163	0.1189	0.0707	0.1362
OC 0-50%	43	0.0617	0.0230	0.1509	0.0153	0.1081
Total	96	0.0847	0.0138	0.1350	0.0574	0.1121
Diff		-0.0417	0.0282		0.0979	0.0144
Diff = mean(0)	-mean(1)					t = -1.4784
Ho: diff = 0			Welch's degrees of freedom			= 80.453
Ha: diff < 0			Ha: diff != 0			Ha: diff > 0
Pr(T < t) = 0.0716			Pr(T > t) = 0.1432			Pr(T > t) = 0.9284